AUTOMATED CROP PREDICTION BASED ON EFFICIENT SOIL NUTRIENTS ESTIMATION USING NAIVE BAYES CLASSIFICATION ALGORITHM

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Abstract -There are several kinds of soil. Each type of soil can have different kinds of features based on soil nutrients like Nitrogen, Phosphorous and Potassium present in the soil and different kinds of crops grow on different types of soils. We need to know the features and characteristics of various soil types to understand which crops grow better in certain soil types. Machine learning techniques can be helpful in this case. This model can predict soil series with land type and according to prediction it can suggest suitable crops. By applying Naive Bayes Classification Algorithm this process becomes more efficient.

Key Words:Soil series, Land type, Nutrients, Crop Prediction, Machine Learning

1.INTRODUCTION

Agriculture is a main occupation in India and soil is an important ingredient of agriculture.Crop prediction is the art of predicting crop yields and production before the harvest actually takes place, typically a couple of months in advance. The proposed system takes into consideration the data related to soil, weather and past year production and suggests which are the best profitable crops which can be cultivated. As the system lists out all possible crops, it helps the farmer in decision making of which crop to analyses the nutrients present in soil and crop productivity based on location.

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 machine learning, 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 Naïve 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.

2. RELATED WORK

Agriculture's contribution in GDP is significant for many countries, especially for Asian countries. Researchers are doing very extensive work from last decade to improve the productivity by using data mining & evolutionary techniques. In recent years, the question again arise "Does agriculture matters for economic growth in developing countries?" The authors have proved with results that agriculture is a backbone of economic growth for many countries. The prediction of crop helps farmers in decision making. There are many different classifiers used to build a model for predicting the spray decision on different crops. Different classifiers can be used on different features in ensemble model for predicting true class. Each model for ensemble classifier trained on different set of features to achieve the best results. And high vote getting class will be allocated to test sample.

3. METHODOLOGY

The System applies Machine Learning and Prediction Algorithm like Naive Bayes to identify the pattern among data and then process it as per input conditions. This in turn will propose the best feasible crops according to given environmental conditions.

There are three modules in our system.

1. **Admin:** Admin will manage staffs, crops, crop types, features and water level. Admin will have the authority to make change on these fields at any time.
2. **Staff:** Staff will do the Farmer Registration by taking required soil sample and will make the crop Prediction based on those values by applying Naive Bayes Classification Algorithm.
3. **Farmer:** Farmer can view the predicted crop, can view the water level and NPK level also.

NAIVE BAYES ALGORITHM:

➤ It is a term in Bayesian statistics dealing with a simple probabilistic classifier based on applying Bayes theorem with strong(naive) independence assumptions.

➤ A Naive Bayes classifier assumes that the presence of particular feature of a class is unrelated to the presence of any feature.

➤ Depending on the precise nature of the probability model, Naive Bayes classifiers can be trained very efficiently in a supervised learning setting.

4. SYSTEM ARCHITECTURE

In this design phase, the system architecture is established which starts with the requirement document delivery by the requirement phase and maps the requirement into architecture. The architecture defines the components, their interfaces and behaviors. The deliverable design document is the architecture. The design document describes a plan to implement the requirement. System development can generally be thought of having two major components: system analysis and system design.
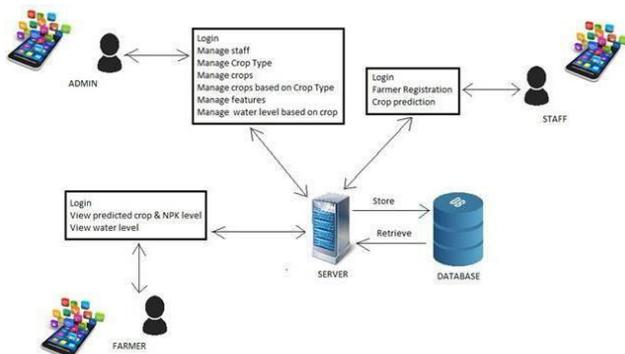

Fig -4.1: System Architecture of Crop Prediction System

Figure 4.1 depicts the system architecture of the prediction system. The system has three modules as Admin module, farmer module and staff module. Admin has the functionalities like Manage staff, Manage Crop Type, Manage crops, Manage crops based on Crop Type, Manage features and Manage water level based on crop. Admin after validating his login credentials, he can have access on Server. Admin can store and retrieve data from database. The staff can register farmer and he can predict the crop. Farmer after registration can view the predicted crop.

5. RESULTS

The proposed system takes into consideration the data related to soil, and past year production and suggests which are the best profitable crops which can be cultivated in the appropriate environmental condition. As the system lists out all possible crops, it helps the farmer in decision making of which crop to cultivate.

Fig -5.1: Login Page

Snapshot 5.1 describes the login page, it enters the System by providing the valid user that is Admin or Staff. On successful entry the user is directed to the activity page where it performs activity such as staff functions or Admin functions etc.
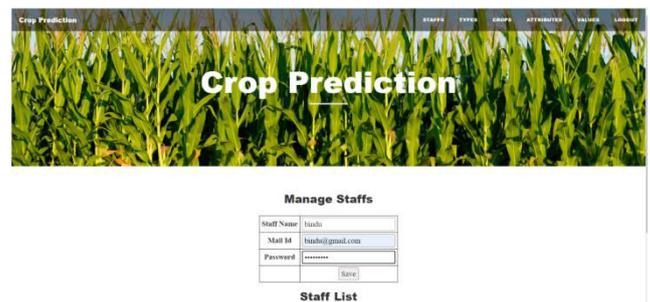
Fig -5.2: Manage Staffs Page

Snapshot 5.2 describes the Manage Staffs page, it s the functionality done by Admin to maintain and monitor staffs. Admin should enter staff name, mail id, password accordingly to get their registration done so that they can do the prediction later.
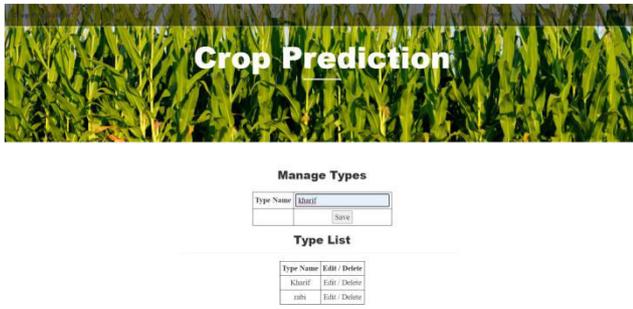
Fig -5.3: Manage Types Page

Snapshot 5.3 describes the Manage Types page, it s the functionality done by Admin to add the crop type. Basically we have gathered two types of crops that isKhariff and Rabi, under those types there are many crops available. Crops are divided according to their weather condition, location, requirements.

Fig -5.4: Manage Attributes Page

Snapshot5.4 describes the Manage Attributes page, it is the functionality done by Admin to add Nitrogen as N, Potassium as K, Phosphorous as P as nutrients. These are the main soil nutrients to maintain crop development. Admin should add all these attributes before they are used by staff. This plays a huge role in the part of Prediction.

**Fig -5.5**: Manage Values Page

Snapshot 5.5 describes the Manage Values page, it is the functionality done by Admin to add Nitrogen, Potassium, Phosphorous values in the range of 1-50.

We have taken that values as according to our location and based on soil type. If we enter correct type of the crop and values of soil tested report, we will get the predicted crop after applying Naïve Bayes Classification Algorithm.

The main inputs to the system will be the diagnosed nutritional features in soil directly from the tables of reports.We are using 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 that is Staff.
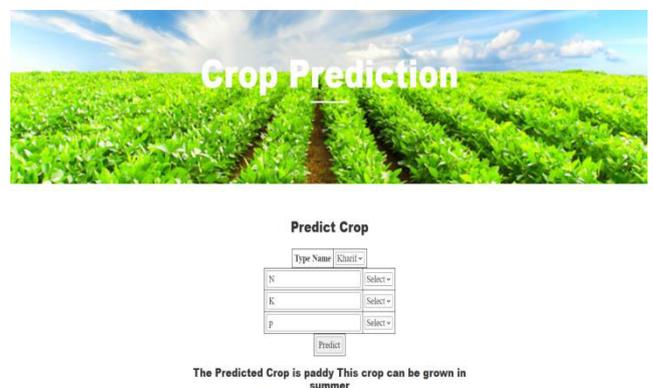
Fig -5.6: Prediction Page

As maximum types of crops will be covered under this system, farmer may get to know about the crop which may never have been cultivated. Naïve Bayes has given the highest accuracy in soil classification. The system gives the best and accurate output and will help reduce the difficulties faced by the farmers and stop them from attempting suicides. It will act as a medium to provide the farmers efficient information required to get high yield and thus maximize profits which in turn will reduce the suicide rates. The project helps us to know the nutrients level in the soil.

6. CONCLUSIONS

Agriculture is one of the most important occupation practiced in our country.. It is the broadest economic sector and plays an important role in overall development of the country. The datasets includes several parameters which are helpful to know the condition of crops and classify the data into separate classes by performing supervised training on the dataset that are collected from agriculture domain.

The proposed system takes into consideration the data related to soil, and past year production and suggests which are the best profitable crops which can be cultivated in the appropriate environmental condition. As the system lists out all possible crops, it helps the farmer in decision making of which crop to cultivate.The project helps us to know the nutrients level in the soil.

The system can be enhanced further to add following functionality: Crop diseases detection using Image Processing where users can upload picture of diseased crop and get pesticides recommendations. Implementation of Smart Irrigation System to monitor weather and soil conditions, plant water usage etc to automatically alter watering schedule.

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