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Prediction of Crop Yield using Machine Learning

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Abstract - *Looking at the current situation faced by farmers in Maharashtra, we have observed that there is an increase in suicide rate over the years. The reasons behind this includes weather conditions, debt, family issues and frequent change in Indian government norms. Sometimes farmers are not aware about the crop which suits their soil quality, soil nutrients and soil composition. The work proposes to help farmers check the soil quality depending on the analysis done based on data mining approach. Thus the system focuses on checking the soil quality to predict the crop suitable for cultivation according to their soil type and maximize the crop yield with recommending appropriate fertilizer.*

Key Words **: Kohonen's SOM(Self-Organizing Map), BPN(Back-Propagation Neural Networks), API(Application Programming Interface).**

1.INTRODUCTION

[10]As per the statistics of 2016 around 272.82 million farmers dwell in Maharashtra. With this myriad number of farmers and increasing suicide rates , we want to help farmers to understand the importance of prior crop prediction, to flourish their basic knowledge about soil quality, understanding location-wise weather constraints, in order to achieve high crop yield through our technology solution. Most of the existing system are hardware based which makes them expensive and difficult to maintain. Also they lack to give accurate results. Some systems suggest crop sequence depending on yield rate and market price. The system proposed tries to overcome these drawbacks and predicts crops by analyzing structured data. [8]The project being "Prediction of soil quality using data mining approach" certainly focuses on agricultural aspects. Being a totally software solution, it does not allow maintenance factor to be considered much. Also the accuracy level would be high as compared to hardware based solutions, because components like soil composition, soil type, pH value, weather conditions all come into picture during the prediction process.

2. LITERATURE SURVEY

[9]Agriculture sector plays a major role in indian economy, as 70 percent households in india depends purely on this field. Agriculture in India contributes to about 17% of Gross Value Added as of 2015-16.But there is a continuous decline in agriculture's contribution to Gross Value Added.Food is essential for life and we depend on agricultural outputs, so farmers play a very important role. The following comparison is shown below :

The study in [1] used Multiple Linear Regression(MLR) technique for crop analysis.Decision tree algorithm and Classification is used to perform analysis of over 362 datasets and provide result.The training dataset here is classified into as organic,inorganic and real estate for predicting the type of soil. Results computed by this system are accurate as well as reliable.

The study in [2] fed data to a Back Propagation Network to evaluate the test data set. Back Propagation Network uses a hidden layer which helps in better performance in predicting soil properties. Back Propagation Network here, is employed to develop a self-trained function to predict soil properties with parameters. This gives more accuracy and performs better than the traditionally used methods ,however, sometimes the system becomes slow and inconsistency is seen in the output.

In [3] two regression supervised machine learning methods are used: Support Vector Machine(SVM) and Relevance Vector Machine(RVM) to show effectiveness in soil quality prediction. a smart wireless device for sensing soil moisture and meteorological data. The wireless device gives an error rate of 15% and 95% accuracy. However, it has not been tested for real time data.

The paper [4] involves a check for Soil Fertility and Plant Nutrient by using back propagation algorithm. The results are accurate and enables improvement in soil properties. It performs better as compared to traditional methods. However, system is slow inefficient and not stable.

According to paper [5], three methods are used which includes Decision tree, Naive Bayes Classifier, and KNN Classifier which analyses soil and predicts crop yield, However rule based induction and SVM can be used for more accuracy as results are not accurate.

3. Proposed System

The system aims to help farmers to cultivate proper crop for better yield production. To be precise and accurate in predicting crops, the project analyze the nutrients present in the soil and the crop productivity based on location. It can be achieved using unsupervised and supervised learning algorithms, like Kohonen Self Organizing Map (Kohenon's SOM) and BPN (Back Propagation Network). Dataset will then trained by learning networks. It compares the accuracy obtained by different network learning techniques and the most accurate result will be delivered to the end user. Along

with this, the end user is provided with proper recommendations about fertilizers suitable for every particular crop

4. System Architecture

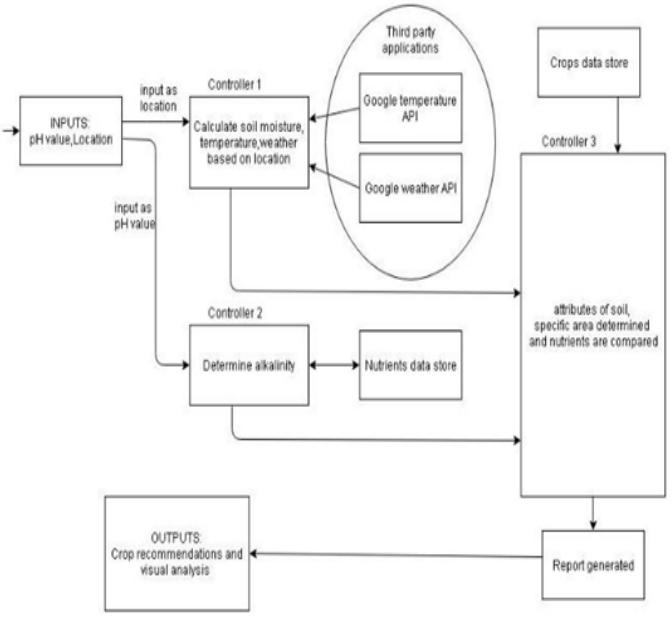

Fig -1: Block Diagram

[7]The proposed system will check soil quality and predict the cop yield accordingly along with it provide fertiliser recommendation if needed depending upon the quality of soil.

The functionality of the architecture(Fig.1.) is as follows : The system takes inputs pH value (based on percentage of nutrient) and location from the user. Result processing is done by two controllers.

Location is used as an input to controller 1, along with the use of third party applications like APIs for weather and temperature, type of soil, nutrient value of the soil in that region, amount of rainfall in the region , soil composition can be determined.

[6]pH value is given as an input to controller 2, from which alkalinity of the soil is determined. Along with it, percentage of nutrients like Nitrogen(N), Phosphorous(P), Potassium(K), Sulphur (S), Magnesium (Mg), Calcium (Ca), Iron (Fe), Manganese, Boron and Zinc and Organic matter can be obtained.

The result of the controller 1 and controller 2 are compared with a predefined "nutrients" data store. These compared results are supplied to controller 3 wherein the combination of the above results and the predefined data set present in the crop data store is compared.

Finally, the results are displayed in the form of bar graphs along with accuracy percentage.

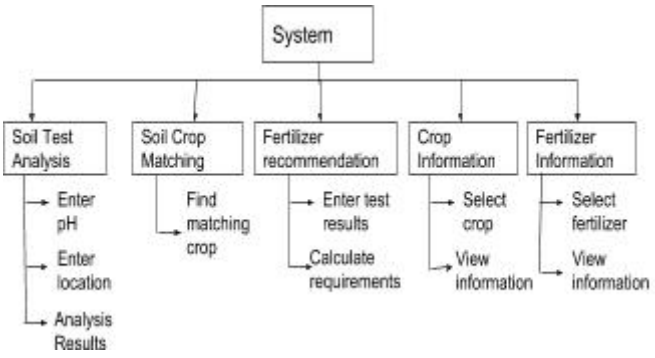

Fig -2: Modular Diagram

The system has five modules as depicted in figure. In soil test analysis user enters pH and location. Output of this module is analysis result of the percentage of nutrients in that soil.

Soil crop matching module finds the matching crop that could be grown in that soil by comparison with the crop database. In fertilizer recommendation module, user is recommended with fertilizer that will give the highest crop yield.

In the crop information module, user can select a crop and view information about it.

In fertilizer information module, user can select a fertilizer and display information about it.

5. CONCLUSION

The system uses supervised and unsupervised Machine learning algorithms and gives best result based on accuracy. The results of the two algorithms will be compared and the one giving the best and accurate output will be selected. Thus the system 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 and lessen his difficulties.

6. FUTURE SCOPE

The system can be enhanced further to add following functionality:

1. Crop diseases detection using Image Processing where users can upload picture of diseased crop and get pesticides recommendations.

2. Implementation of Smart Irrigation System to monitor weather and soil conditions, plant water usage etc. to automatically alter watering schedule.

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