

Soil Classification and Crop recommendation using IoT and Machine Learning

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Abstract – Agriculture is an important part of economy and soil is the most important ingredient of it. There are several kinds of soil. Each type of soil has its own features and characteristics which make them best for particular crop. Soil types like red, black, clay, laterite etc are considered. This project aims at classifying soils based on their characteristics and thus recommending the best crop that could be produced maximum in that soil. Till now soil classification and recommendation of crop for the appropriate soil are done separately. The aim of the project is to combine both the techniques. The project uses IoT and machine learning algorithm to implement the problem stated.

Keywords– Crop, IoT, Machine Learning, Soil.

I. INTRODUCTION

Agriculture is a main contributor to the Indian economy. The main stream Indian population depends either explicitly or implicitly on agriculture for their livelihood. It is, thus, undeniable that agriculture plays a vital role in the country [1]. Agriculture is one of the important sector of Indian Economy. Indian agriculture sector accounts for 23 percent of India's GDP and provides employment to 59 percent of the country's workforce.

India is the world's second-largest producer of rice, pulses, wheat, spices and spice products. It is also the second largest producer of fruits and vegetables in the world. India is an agriculture based country, where majority of population is depend on agriculture. This forms the major source of income. The commitment of agriculture in the national income is all the more, it is said that agriculture is the backbone for Indian Economy. The contribution of agriculture in the first two

decades towards the national output is between 48 percent and 60 percent. In the year 2001-2002, this contribution reduced to just around 28 percent. The agriculture and allied sectors, including agriculture based business, domesticated animals, and fishery sub segments as far as rate of GDP is

15.4 percent during 2013-14 at 2004-05 prices. Agricultural exports constitute a sixth of the total exports of the country. In perspective of the enormous position of the agricultural sector, gathering and support of Agricultural Statistics expect incredible significance [3]. Agriculture is a standalone amongst the most critical division of numerous nations. Agriculture gives nourishment, crude material and business. Agriculture

segment faces a lot of problems, for example, sporadic precipitation, floods, drought, environmental change and so on. To overcome these problems mechanical arrangement is needed which can encourage the ranchers. The profit of agriculture is not just rely upon regular assets yet it likewise relies upon info gave to the framework. The input gave to the framework are type of Soil, availability of Water, type of fertilizers, Weather conditions and crops. These information can increment or pronouncements the profit of any harvest. Customary crop selection is not exact and does not have any examination subtleties. To overcome such issues information mining and machine learning procedures can be used [4].

In India, horticulture is not greatly assessed. Presently we found that consistently the climate is changing persistently which is destructive to the harvests and driving farmers towards obligation and suicide. Much of the time this way and with developing population to augment yield ranchers are using more pesticides and manures which are prompting

the soil barrenness just as diminishing the holding limit of soil and expanding poisonous quality of soil. Farming land is used by industrialization, so again expanding rate of the soil pollution which influences the nature of plants. Expectation of infections, expectation of climate anticipating, arrangement of soil, checking crop, yield forecast, programmed water system framework etc are the different uses of exactness agriculture. The utilization of technology in agriculture methods has started since the first twentieth century once the business transformed to mechanized tractors from the horse drawn digger. The description of chemical inputs, crop management systems and plant heredities has reshaped the business into

technology enabled and data-rich world. The progress in technology that structures this computing setting have contributed to discussing concerning large information whereas the collection of information is not new ideas within the conditions of public information assortment. The solitary begin of a number of economical mobile technologies and therefore the transformation of knowledge have allowed huge records be estimated and analyzed in a very timely and a lot of helpful ways that. Agriculture is the important economic sector of the many developing countries. Indian agricultural methods have continued in undeveloped ways in which due to lack of getting broad technologies. Drought is the contrary reason behind unproductivity, that has often affected the countries agricultural tasks since the first Seventies. This results in low productivity, weak infrastructure, low level of technology and overspill. Because of this multitude problems, Indian farmers would like skilled recommendation to own a lot of profit.

II. PROBLEM DEFENITION

Agriculture sector plays an important role in the economy and it is a major contributor to the Indian economy. The majority of Indian population relies either implicitly or explicitly on agriculture for their livelihood. The major reasons that effect the crop production are not knowing the suitable soil, climate for crops, climatic disasters and infectious diseases. This project identifies the soil and recommends the most suitable crop for that soil through a smarter technology. A farmer's decision about which crop to grow is generally clouded by his intuition and other irrelevant factors like making instant profits, lack of awareness about market demand, overestimating a soil's potential to support a particular crop, and so on. A very misguided decision on the part of the farmer could place a significant strain on his family's financial condition. Perchance this could be one of the many reasons contributing to the countless suicide cases of farmers that we hear from media on a daily basis. The most common problem existing among the Indian farmers are they don't choose the suitable crop based on their soil requirements, they just choose based on their intuition. Due to this they face a serious problems in the productivity of the crops. Precision agriculture can be used to solve this problems of the farmers in the Indian society. It is a modern agriculture technique that utilizes soil characteristics, soil types, crop yield data collection and recommends the farmers the suitable crop based on their site specific parameters. This decrease the wrong choice on a crop and increase profit.

III. LITERATURE SURVEY

The paper [1] defines the requirements and planning required for developing a software model for precision farming is discussed. It deeply studies the basics of precision farming and the author's start from the basic

requirement of precision farming and move towards developing a model that would support it. This paper states a model that applies Precision Agriculture (PA) concepts to small, open farms at the individual farmer and crop level, to affect a degree of control over fluctuations. The main objective of the model is to deliver direct advisory services to even the modest farmer at the level of his/her smallest plot of crop, using the most available and commonly used technologies such as SMS and email. This model has been designed especially for the scenario in Kerala where the average holding size is much lesser than most of India. Hence this model can be positioned elsewhere in India only with some modifications according to the population.

The paper [2] makes a qualified cogitation of assortment algorithms and their performance in yield prediction. The algorithms work on data set collected for several years in yield prediction on soya bean crop. The algorithms used in yield prediction in this paper are Support Vector Machine, Random Forest, Neural Network, Bagging, and Bayes. The conclusion at which we reached at the end is that bagging is the best algorithm for yield prediction among the above stated algorithms since the error produced in bagging is minimum with a mean absolute error of 18985.

The paper [3] shows the need of crop selection and the factors deciding the crop selection like production rate, market price and government policies are discussed. This paper proposes a Crop Selection Method (CSM) which solves the crop selection problem and improves net yield rate of the crop. It recommends a series of crop to be selected over a period considering factors like weather, soil type, water density, crop type. The predicted value of influential parameters determines the accuracy of CSM. Hence there is a need to include a prediction method with improved accuracy and performance. The paper [8] focuses to solve the crucial problem of deciding the classifiers for the ensemble learning. A method to select the best classifier technique from a pool of classifiers has been proposed. The proposal aims to achieve best accuracy and high rate performance. Using Q statistics, the dependency between most highly used, common and accurate classifiers is identified. The classifier algorithms which were not considered were combined to form the ensemble. This technique ensures higher performance and diversity of the ensemble. Different methods such as SA (Selection by Accuracy), SAD (Selection by accuracy and Diversity) and NS (No selection) algorithm were identified. Finally the conclusion is made that SAD works better than others.

The paper [7] studies various classification methods to classify the disease data set. The paper tells the importance for accuracy. As accuracy depends on the data set and the learning

algorithm. Classification algorithms such as Naive Bayes and ANN were used to classify these diseases and also to compare the effectiveness, correction rate. The

performance of the models developed where compared and studied with accuracy and computational time of the system. It was recorded that all the classifiers except naive bayes showed improved predictive performance. Multilayer perceptron show the highest accuracy rate among all other algorithms.

The paper [6] focuses on to solve the problem of food insecurity in Egypt. It provides a framework which will predict the production, and import for that particular year. It uses Artificial Neural Networks along with Multilayer perceptron in WEKA datamining tool to build the prediction. At the end we would be able to visualize the amount of production import, need and availability. And hence it would help to make decisions on whether food has to be further imported or not.

IV. PROPOSED APPROACH

The proposed system predict the crop suited for the given soil. There are different varieties of soil and only some specific crop grow on one particular soil. We first collect the data set of different soils. For that we require a IoT system which can check the moisture, pH and gas content of the soil. After connecting the system we collect data and then perform data mining steps on to it. Then we apply machine learning algorithm to the data set so that we can predict the crop suited for the soil. Web application is the front end of the system. where farmers can view the content of the soil and also the crop that matches their soil.

V. CONCLUSION AND FUTURE WORK

India is a nation in which agriculture plays a major role. In prosperity of the farmers, prospers the nation. Thus our work would help farmers in sowing the suitable seed based on soil requirements to increase productivity and obtain profit out of such a technique. Thus the farmer's can plant the suitable crop increasing his yield and also increasing the overall productivity of the nation. The goal of our future work is aimed at an improved data set with huge number of attributes and also implements yield prediction. Agriculture is a major contributor to the Indian economy. The main stream Indian population depends on agriculture for their livelihood. The major reasons that effect the crop production are not knowing the suitable soil, climate for crops, climatic disasters and infectious diseases. This project identifies the soil and recommends the most suitable crop for that soil through a smarter technology. This system would assist the farmers in making an informed decision about which crop to grow depending on a variety of environmental and geographical factors. This system classifies the soil based the soil's attributes like pH, temperature, and moisture and then recommends the best suited crop for that soil.

The proposed system assures that crop yield produced will be maximum by classifying soils based on their

features and thus recommending the best crop suited to the farmers. The proposed system is done using IoT and machine learning algorithm.

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