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Agriculture Soil Analysis, Classification and Crop Suitability Recommendation Using Machine Learning

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Abstract: *It can be very important to increase the crop to meet the needs of the growing population. Indian farmers often have fragmented crops and their productivity depends on many factors such as soil quality, rainfall and environment. The average annual soil loss in India is 5.3 billion tonnes. Degraded soils lose their ability to produce sufficient crops. Agriculture in India is conditioned by poor soil fertility, which depends on its vitamin level; in the same way the land will be suitable for plants and give a very good production when it is limited to some other plants. The physical, chemical and characteristics of the soil are useful for measuring its fertility, creating a planting plan and expecting the crops to be produced.*

Keywords—Soil analysis, crop suitability, machine learning, supervised learning, classification.

I INTRODUCTION

Agriculture is the backbone of the Indian financial system. In 2011, India devoted 60.5% of its land to agriculture, divided between arable land (fifty-two.8%), land with permanent vegetation (4.2%) and pastureland (3.5%). The distribution of agriculture and allied sports became 17.1% of the gross domestic product (GDP) in 2017-18 and its expenditure roughly accounts for 42% of all employment in the country. S. A.. Data from the Director of Business and Statistics (2015) shows that in 2013-2014, the cultivation area of main plants is 15 and 57 million hectares for Kharif and Rabi seasons respectively.

Many farmers recently collected soil samples at the Krishi Vigyan Kendra (KVK) center and were tested to understand the presence of vitamins in the soil and their respective values. Soil testing is the analysis of soil samples to determine its nutrients, composition, and

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other characteristics. Tests are usually performed on fertility levels and indicate deficiencies that need to be corrected. The Health Certificate (CSS) collects control information, but the statistics they get from it cannot immediately help them decide which crops should get the most profit from their crops.

SHCs certainly help identify better soil quality, but decisions about crops, fertilizers and the efficiency of their distribution are still primarily driven by interest and past discussions with neighboring farmers - the overall process still depends of the group's know-how. This training turned out to be long and has certain advantages. But this raises many medium and large problems such as soil degradation due to excess fertilizer, low yield over time and its consequences on people and the ecosystem as a whole.

At the same time, the calculation and statistical knowledge of educational knowledge were unexpected. We are witnessing unprecedented digitization in all areas of life, including agriculture. Land maps are digitized; We have ever-improving satellite images and topography. The size of datasets capturing soil vitamin composition should be available. Farmers also have access to all kinds of mobile computing and social networks (for example, farmers can register for SHC applications mobile phones).

II Literature Review

Many efforts have been made in this discipline. Generally speaking, there are two main ways to arrive at land allocation, generally as follows:

Soil biochemical composition such as temperature, pH value, NPK (nitrogen, phosphorus and potassium) content, etc.

- Use early detection radiography for PC imaging and ground imaging studies

The studies mentioned below relate to the first category, for example, the analysis of soil composition:

"Recommended agricultural agreement" by S. Pudumalar et al. [1] use data mining as a method that uses scientific data on the characteristics of soil, soil type, crop data and informs farmers of suitable crops as featured on their website. This reduces the negative selection of crops and increases productivity. In this form, the issue was resolved by advice in combination with random tree using the random tree, naive bay meet the people New to introduce the crop for the inconvenience of the website with too much. precision. and work.

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"A machine learning approach to evaluate crop specific for small/marginal scale croplands" reference Bhimanpallewar R et al. [2] shows the control method that the input is not: there are additives in the soil, the environment is not around the decision crop and yield or the level of fitness for crops. This tool allows the decision to make a way to improve the suitability of the land or to make the land free for the time, because it is no longer working.

"Using a sample of random forest area equations to estimate land suitable for agriculture" of Senagi K et al. [3] used the best machine learning (ML) technique to estimate the suitability of land for sorghum cultivation, based on the actual soil conditions. It carries out experiments using Parallel Random Forest (PRF), Linear Regression (LR), Linear Discriminant Analysis (LDA), KNN, Gaussian Naive Bayesian (GNB), and Support Vector Machine (SVM).

 There is a further effort to distribute the soil often as it's composition. These include: "Evaluation of Agricultural Soils Using Data Mining Techniques" using Ramesh Babu, Rajesh Reddy [4], "Behavioral Analysis and Analysis of Statistical Analysis using data mining" of Supriya D [5], "Distribution of Non-agricultural land in India" of Sirsat M et al. [6], "Plant recommendation using neural networks" [7], "Using machine learning for appropriate soil allocation" [8].

Research from early warning satellite imagery and ground imagery is: "In-depth study of land cover and crop types using remote sensing data" of Kussul N et al. [9] used a multi-level deep learning (DL) objective that focused on land cover and crop types from multi-location, multi-time satellite imagery. The core of the framework is an unsupervised neural network (NN) used for optical image segmentation and no clinical information due to cloud and shadow, as well as layers standard care NNs. As an easy-to-maintain NN model, it uses a conventional multi-layer perceptron (MLP) and advanced algorithms that are often used in the early days.

(RS) - random forests and measure them with constitutional NNs (CNN).

"Crop type development with panoramic stratification mainly based on MODIS recording time" with the help of Dries sen B et al. [10] evaluated whether the stratification based on high-resolution MODIS images can be used as an alternative stratification method based mostly on specific soil and elevation maps. It uses the concept of area stratification in

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which an area to be monitored is divided into units for effective monitoring. Classification was done using various algorithms (RF, SVM, ML, OK-NN and multinational logistic regression) at the school.

"3D convolution neural networks for crop classification with tiled images

III Proposed Framework

This opens up a new way of assessing soil, its classes and similarities in planting levels that may be suitable for certain plants. The proposed gadget should be capable of developing and confirming the process of enabling the device to know, read big data and benefit from the ever-increasing power of the cloud-based GPU processing farm. The proposed machine strategy will be used for this in 2 steps:

Level 1: the system that divides soil based on fertility level, vitamins and other factors.

Phase 2: find the relationship between the desired crops and the soil organization found in the previous section; This will be done using groups of plants with comparable soil properties and fertility needs in the land register.

The equipment is prepared to study the soil based on the following statistics:

The biochemical composition of the soil

Ground images

Satellite terrestrial images and remote sensing recordings (all sites must be available and accessible)

To draw plants for soil distribution, we will look at features such as:

Macro and micro vitamin requirements of crops

The pH level of the soil

Water retention capacity and electrical conductivity of the soil

The proposed machine strategy uses a combination of one or more of the following methods:

Classification based on decision trees, deep learning using NN (Neural Networks), SVM (Support Vector Machine), etc.

- Statistical tools such as - Bayes distribution, regression

IV Gaps and Suggested Solution

1. All previous attacks and efforts in this regard are both based on a) evaluation and classification of soil composition or b) measurement and classification, without hearing musical images or images on the ground.

2. If you want to come to a solution to the problem, we can gather and evaluate the first cost of both methods. By being able to classify soil photos based on soil

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composition category, it can significantly reduce time and cost.

3. Previous research and responses were limited to soil types or crop recommendations; we need an end-to-end streamlined field that advocates plant relevance that leverages the land distribution/labeling done in the first section.

4. The solution uses supervised machine learning (ML) techniques for soil classification and crop recommendations, which are effective experts in identifying and classifying new soil models and crops suitable for balance.

5. Overall, the response is expected to result in higher yields and better economics for farmers.

V CONCLUSION

The goal is to provide a precise soil class based on the biochemical and/or digital images provided. According to land registration, there will be a way to know the suitability of the crop and thus achieve the best crop. Modern IT techniques such as machine learning and data science will help bring more reality to the process. This will ensure that there is no loss or degradation of the soil, prevent excessive cultivation of one crop and help to restore the nutrients lost in the soil.

The proposed system should attempt to achieve the following goals:

Analyze soil based on biochemical and environmental composition and/or digital images.

Divide the soil into appropriate groups based on factors such as fertility, nutrients, water holding capacity and many more.

- Recommended for the appropriateness of plants for categorized land associations.

- Help reduce soil degradation and eliminate soil loss.

- By helping to bring plants into the soil, preventing over-growing of one crop and thus reducing fertility.

- Improve crops and get a better return on investment.

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