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Intelligent Crop Recommendation System using Machine Learning

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Abstract: *India is one of the leading countries worldwide in terms of farm output. Even after being aleading producer of agricultural products, India still lacks farm productivity. There needs to be an increase in productivity, in order to get more income for the farmers. To increase productivity, farmers should know which crop would suit the specific piece of land. If the right type of crop is cultivated in that piece of land, then automatically, the yield of the crop will increase. Hence, crop recommendation systems can be very beneficial for farmers. Many factors do affect the growth of crops. Temperature, humidity, pH, rainfall, amount of potassium, nitrogen, phosphorous in soil all of these are the factors on which the yield depends. Manyfarmers have no idea about what crop to be grown in which area that will lead to maximumyield as well as profit. Agriculture plays a vital role in the socioeconomic fabric of India. Failure of farmers to decide on the best-suited crop for the land using traditional and non-scientific methods is a serious issue for a country where approximately 58 percent of the population is involved in farming. Sometimes farmers were failed to choose the right cropsbased on the soil conditions, sowing season, and geographic allocation. This results in suicide, quitting the agriculture field, moving towards urban areas for livelihood. To overcome this issue, this research work has proposed a system to assist the farmers in cropselection by considering all the factors like sowing season, soil, and geographic allocation. Furthermore, precision agriculture is being implemented with a modern agricultural technology and it is evolving in developing countries that concentrates on site-specific crop management. Hence, we are going to explain how machine learning algorithmcan be used to predict the crop and price prediction*

Keywords: Productivity, Crop prediction, Factors like soil, season, geographic allocation, Machine learning

I. INTRODUCTION

Agriculture is India's prime occupation. It plays a major role in Indian economy and provides a lot of employment opportunities for the people of the nation. Nowadays, a farmer does not choose the correct crop to cultivate in that specific soil. Artificial Neural Network taken into consideration to choose the crop with the high yield rate before cultivation, Machine learning algorithms were implemented to prevent the impacts from the water stressin plants and have given a set of decision rules used in plant's state prediction. Machine learning techniques were used to predict the cost of crops and smart systems were used to provide real-time suggestions. A survey has been made on several applicationsof machine learning algorithms in agricultural production systems. Further AI-enabled systems were used to provide recommendations concerning crop management. Deep learning techniques can be used to yield better in crop cultivation. In this paper real-time monthly weather is taken into consideration to design an efficient yield forecasting mechanism. A non-parametric statistical model along with nonparametric regression methods was being used to implement the above-forecasting mechanism. Our crop prediction project dataset is collected from kaggle.com. The parameters for crop predictions are Location, temperature, humidity, ph, rainfall, N, P, K etc. Nowadays, these parameters should be considered while cultivating a certain kind of crop, on a specific type of soil. A crop recommender system, takes in consideration the various parameters of the soil, to predict the best kind of crop to be

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cultivated. This specific recommender system model, will take into consideration, the parameters like soil moisture content, humidity and temperature.

II. LITERATURE REVIEW

A. In 2017[1], Vikas Kumar, Vishal Dave, Rohan Nagrani, Sanjay Chaudhary introduces Crop Cultivation Information System on Mobile Devices. Mobile devices are used extensively by the people for communication, music, entertainment, Internet and social networking. we have proposed and implemented an information system for farmers which can be operated on their mobile phones. The system is developed using Service Oriented Architecture (SOA) to process spatial data and knowledge base. The knowledge base is maintained in the form of ontologies. The system is an effort to fill the gap between farmers and agricultural experts. A farmer can provide inputs related to crops being cultivated and location specific information to get specific suggestions, alerts and recommendations to improve productivity. It will be generated usingthe knowledge base.

B.A Soil Quality technique for Sustainable Agriculture by Duraisamy Vasu, Pramod Tiwary, Padikkal Chandran in 2020[2]. Being integral to all functions o terrestrial ecosystem, soil is intended to produce ood or eeding the growing population the world. However, ood security is acing threat from soil degradation occurringworldwide. Soils degrade due to the exerting pressure from various sectors, the society including urbanization and industrialization. In this scenario, sustaining soil quality (SQ) is the major challenge to meet the increasing ood demand. Hence, evaluating and monitoring SQ is crucial to sustain agricultural production and to overcome the vagaries climate change on soil functions. However, soil quality per se is complex and site- specific because of the larger variety for soil usage, and its evaluation is difficult due to the subjectivity.

C. S.Bhanumathi, M.Vineeth and N.Rohit [3] developed a system on Crop Yield Prediction and Efficient use of Fertilizers in 2018.Data Mining is an emerging research field in crop yield analysis. Yield prediction is a very important issue in agricultural. Any farmer is interested in knowing how much yield he is about to expect. Analyze the various related attributes like location, pH value from which alkalinity of the soil is determined. Along with it, percentage of nutrients like N,P,K and location . All these attributes of data will be analyzed, train the data with various suitable machine learning algorithms for creating a model. The system comes with a model to be precise and accurate in predicting crop yield and deliver the end user with proper recommendations about required fertilizer ratio based on atmospheric and soil parameters of the land which enhance to increase the crop yield and increase farmer revenue.

D. In 2021[4], CROP YIELD PREDICTION USING MACHINE LEARNING by Mayank Champaneri, Chaitanya Chandvidkar . They both created a project that will help the farmers to know the yield of their crop before cultivating onto the agricultural field and thus help them to make the appropriate decisions. It attempts to solve the issue by building a prototype of an interactive prediction system. Implementation of such a system with an easy-to-use web based graphic user interface and the machine learning algorithm will be carried out. The results of the prediction will be made availableto the farmer. Thus, for such kind of data analytics in crop prediction, there are different techniquesor algorithms, and with the help of those algorithms we can predict crop yield. Random forest algorithm is used.

E. Crop Yield Forecasting Methods by R.K. Singh, T.R. Singh and U. Kaushal in 2021[5]. Increasing the accuracy of agricultural forecasting on the important application of earth observation.The study on review to aware about the ability to reliably forecast crop prediction yield and qualityis valuable for economic planning and commodities forecasting as well ensuring global food security. Study regarding the overview of the current crop yield forecasting methods, which includeways to use crop yield forecasting method to improve agriculture to yield forecasting have been discussed in this paper. Thus, for such kind of data analytics in crop prediction, there are different techniques or algorithms, and with the help of those algorithms we can predict crop yield. Random forest algorithm is used.

III. PROPOSED METHODOLOGY

The System prepared predict major crop yields in a particular district in Tamil Nadu. The client on their first login has to register themselves on the web application created by flask. The login details are stored in SQLite database. Once the user login into system they get all the access for predicting crop yield and using the input such as location, N,K,P and pH values depends on their forming land environment. We can also find the primary nutrients of soil by the given input as crop name.It passes the various inputs to the controller which uses the Random Forest for Classification. We

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recommended to the farmer how much fertilizer required in ratio based on soil parameters and the crop price using machine learning technology.

IV. ARCHITECTURE DIAGRAM

The flow of the project will go as follows

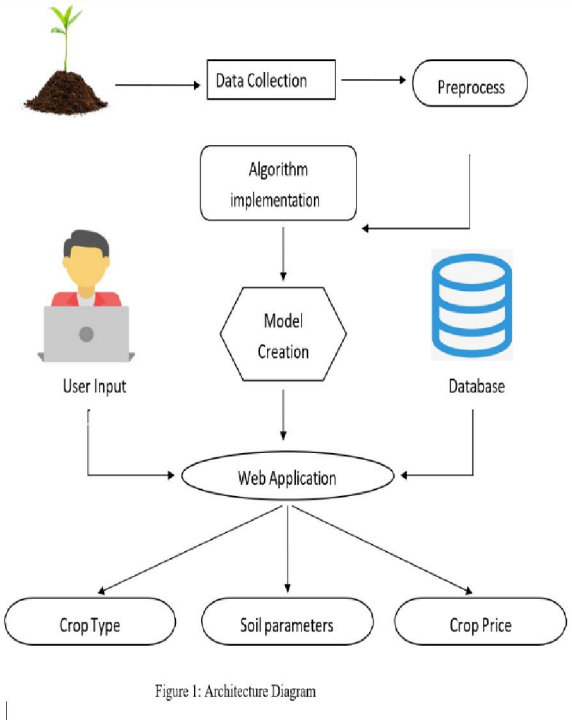

Figure 1: Architecture Diagram

Figure 1. Data Flow Graph

V. HARDWARE REQUIREMENTS

Core i3 processor

Figure 2. i3 processor

It will enable the user to do multitasking in a fast way than other processors. So a pc with i3 or more than i3 processor is recommended.

An 8GB RAM

An 8GB RAM card pc is required for processing allthe stages and makes the system fast.

Figure 3. RAM

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A Hard Disk

Figure 4. Hard Disk

For saving all the outputs, a hard disk of 60 GB minimum is required. We can access the outputs ofthe old processed statements at any time by using ahard disk.

VI. SOFTWARE REQUIREMENTS

The Software requirements needed for this workare WINDOWS Operating System

1.Python and Anaconda

2.Flask, HTML Frame works

3.SQLite Database

VII. IMPLEMENTATION

Dataset collection

Our crop prediction project dataset is collected from kaggle.com. Data is pre-processed after collection of various records. The dataset contains a greater number of records, where some records are with some missing values. Those missing records have been removed from the dataset and theremaining records are used in pre-processing.

```
Number of missing values
Crop     0
N       22
P       24
K       10
pH       0
dtype: int64
Concatanated dataset. Size=(101, 5)
After Removing Number of values
Crop    0
N       0
P       0
K       0
pH      0
dtype: int64
```

Figure 5.Crop Dataset

Implementation

The implementation part is done by using Random forest algorithm to predict the crop using ML. On an analysis conducted within various algorithms, the Random Forest was found to provide highest efficiency and precision compared to Decision tree. BecauseRF contain number of decision tree algorithm, that take the average to improve the predictive accuracy of dataset. Hence the RF algorithm is used in the proposed system to find the suitable crop.

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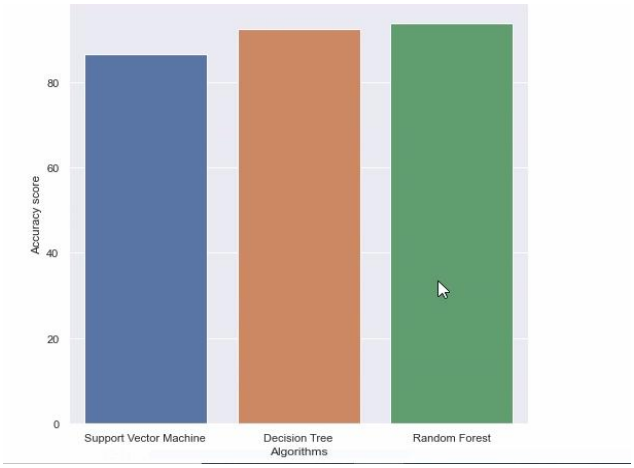

Figure 6.Algorith Implementation

Prediction

Preprocessed data are trained and input given by the user goes to the trained dataset. After prediction the predict value given as an output on web application (Flask Frame)

IX. CONCLUSION

Agriculture being an important part of our economy, it is essential to ensure that the even the smallest investment done in the agriculture sector should be taken care of and when it comes to investment, crop seeds are one of them. So, it is essential to check if the correct crop has been chosen for a land holding with matches its requirements to benefit the nation in general and farmerin particular. Our future work aims at developing this model with more soil attributes and with larger data set.

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