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Prediction of Crop and Fertilizer Recommendation using Machine Learning and E-Commerce in Agriculture

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Abstract: *As we know that, India stands second as largest population country in the world and main occupation of people in India is agriculture. Farmers are using same traditional farming methods repeatedly without trying new methods of farming using technology and they are applying various fertilizers in random quantity without knowing the deficient content and quantity. So, this is directly affecting on crop quality as well as crop production and also causes the soil infertility because of various fertilizers are been used due to sudden changes in climatic conditions and damages the crops. So, we have developed a system using machine learning algorithms for the welfare of farmers and will be used as guide or helping hands for farmer for their query or problem related to farming. The proposed system accuracy metrics is more as compared to previous systems as the accuracy of the system will play an important role in these types of systems. And also, the system provides crop prediction, fertilizer recommendation, e-commerce site for farmers, disease detection of crops using image processing, facilities of applying for crop insurance and also farmers can share their experience with other farmers.*

Keywords: Crop Prediction, Machine Learning, RFA, Image Processing

I. INTRODUCTION

The science of coaching machines to be told and manufacture models for future predictions is wide used, and not for nothing. Agriculture plays a essential role within the international economy. In India major work of farming is mostly done through traditional method also due to some of these there is decrease in crop production and quality due to known new diseases that damage crop or due to some climate reasons .so, these systems basically acts as a helping hand for farmers such giving farmers suggestion of which crop to sow in which area based some reasons such as climatic conditions of that area, previous crop history of that region ,weather casting i.e. amount of rainfall in that region and soil ph of that region. The system also provides crop insurance facilities to farmers for claiming crop insurance and system also recommend which fertilizers should be used for a particular with its quantity based on area. The system provides farmers facilities to detect the crop dieses by uploading the photos of damage crop and also e-commerce section where farmers and others can buy the crop, vegetables, fruits directly from farmers from the ecommerce section using cash on delivery method. With the continued growth of the human population understanding worldwide crop yield is central to addressing food security challenges and reducing the impacts of temperature change. Crop yield prediction is a crucial agricultural downside. correct info regarding history of crop yield is very important for creating selections associated with agricultural risk management and future predictions. Cuisine varies greatly round the world, however the essential ingredients that sustain humans square measure pretty similar. we have a tendency to eat loads of corn, wheat, rice and different easy crops.

II. LITERATURE REVIEW

Agriculture plays a essential role among the international economy. With the continued growth of the human population understanding worldwide crop yield is central to addressing food security challenges and reducing the impacts of natural process[1].They developed system victimization classifier models like decision Tree Classifier, KNN, and Naive Bayes Classifier. The projected system can be used to realize best time of sowing, growth of plant and Plant harvest[2]. They used totally different classifier for achieving higher accuracy for example: call tree shows less accuracy once dataset has a lot of variations however Naïve Bayes provides higher accuracy than call tree for such datasets[3]. The best advantage of system

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that it can easily scalable as it is/be used to test on different crops.[5]. For crop yield prediction they used algorithms like Random Forest and for simply used they developed that it will be simple to use for all. The most advantage of projected system is accuracy rate is quite 75 % all told the crops and districts hand- picked within the study [6]. The dataset thought-about for the crop yield prediction was obtained from Krishi Bhawan (Talab-Tillo) Jammu. The parameters present in the information are Macro- Nutrients (ph,Oc,Ec,N,P,K,S) and small Nutrients(Zn,Fe,Mn,Cu) present in samples collected from different regions of Jammu District[7].After analysis Machine learning algorithms are applied to predict the category of yield.[8]

III. Proposed System

The proposed system for crop prediction and fertilizers recommendation using machine learning techniques and E-commerce in agriculture provides farmers the detail information of farming and it acts as a helping hand. this system acts as a suggestion box for farmers as suggesting farmers about farming at every stage of crop growth.[2] The main aim is to provide the details information of crop from the period of cultivation and process of using different fertilizers at different stages of crop to prevent from various diseases. In this project with the help of some machine learning algorithms there will be prediction of crop on the basis climatic conditions, soil type, rainfall. using ML algorithms their will be prediction of fertilizers for good crop production..[3] The crop disease detection is done by using some classification algorithms such segmented algorithms for detecting the diseases of crops and vegetables. [1] The system also provides user for buying the crops, vegetables, fruits directly from the farmers and farmers can also share their experience with sharing their videos or images. So, it is expected that the proposed system will allow a board range of users the system proposed in this paper includes some of the additional features for the user interface and an improved and optimized implementation.

IV. System Analysis

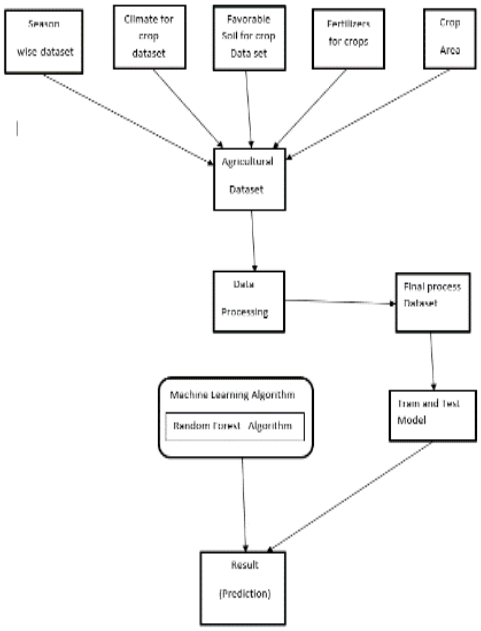

Figure 1: System Architecture

A system architecture is the conceptual structure that defines the structure, behavior, and more parts of a system. An architecture description is a formal description and representation of a system. The system works in a organized way starting from user login to whole working of a system. A system architecture can consist of system components and the sub-systems developed, that will work together to implement the overall system. We will be using MySQL database along with Apache web server for viewing web pages as well as user information. [5] Presentation layer will be containing activities which user

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will be interacting with and as so that object can be seen in real space. The system architecture defines all the working of a system.

A. Proposed Technique

The crop prediction process based on dataset. The dataset consists of different data that is taken under consideration while building a dataset for crop prediction. The has information about previous year crop details, amount of rainfall in that region, type of soil, season wise crop, temperature, humidity, crop production in last few years.

Crop prediction - Decision tree algorithm.

- **Crop Prediction:** The flow chart of crop prediction as shown in fig 2

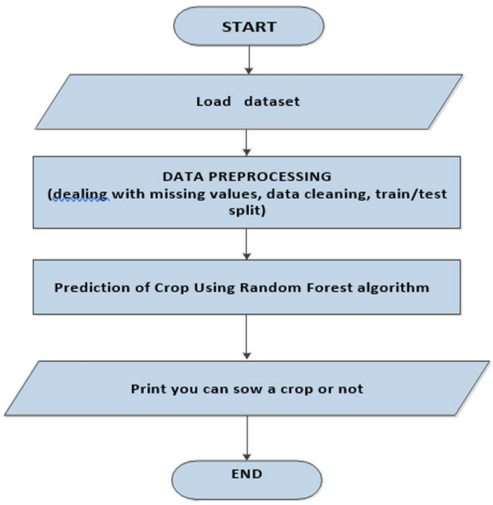

Figure 2: Flow Chart for crop prediction

Crop prediction method being with the loading the external crop datasets. Once the dataset browses then pre-processing are done by numerous stages as mentioned in information Pre-processing section. once the information pre-processing, train the models victimization call tree classifier into coaching set. For a prediction of the crop, we tend to contemplate a numerous issue like temperature, humidity, soil hydrogen ion concentration and foretold precipitation. Those area unit the input parameter for a system which will be entered by manually or taken from the sensors. foretold precipitation and input parameter values are appended during a list. the choice tree formula can predict the crop supported list information.

B. Algorithm

Algorithm 1 Random Forest

Precondition: A training set $S := (x_1, y_1), \ldots, (x_n, y_n)$, features F, and number of trees in forest B.

```
function RandomForest(S, F)
    H ← ∅
    for i ∈ 1, ..., B do
        S^(i) ← A bootstrap sample from S
        h_i ← RandomizedTreeLearn(S^(i), F)
        H ← H ∪ {h_i}
    end for
    return H
end function
function RandomizedTreeLearn(S, F)
    At each node:
        f ← very small subset of F
        Split on best feature in f
    return The learned tree
end function
```

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V. Result and Discussion

The proposed system recommends the simplest appropriate crop for explicit land by considering parameters as annual amount of rainfall, temperature, humidness and soil pH. Among these parameters annual precipitation is foretold by system itself by victimization previous year knowledge with and additionally the system takes affirmative and No values from the user within the input section to show the desired crop you'll be able to sow or not for the counseled crop. The algorithm is suitable for solving crop prediction. Using E-commerce system farmers can directly sale their product online to customer without involving third person. It also gives information about how to prevent crops from disease using fertilizer Every farmer can communicate with each other. The overall output is shown with Graphical user interface as shown in figure (4),

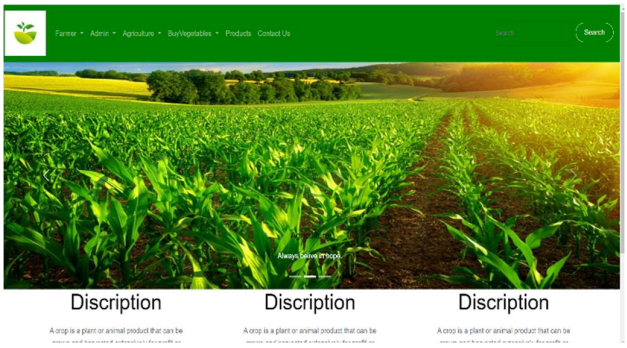


Figure 4: Home Page

We tested the system for various data set that has been collected from the different farmers for their lands and also based upon the soil type, soil color, rainfall in that area, previous year crop production details.

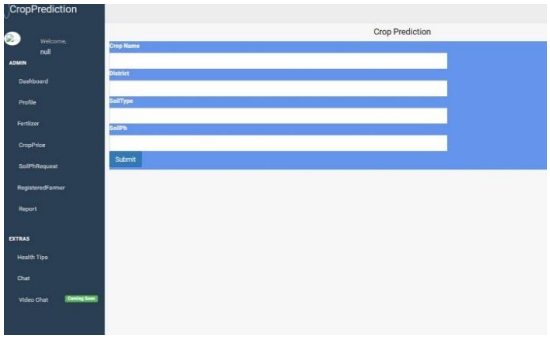
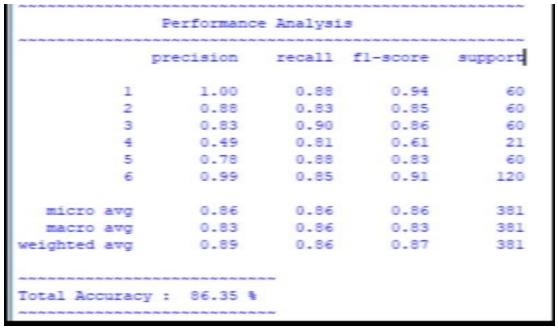


Figure 5: Output of crop prediction

VI. Performance Analysis

The performance metrics is accuracy is about 86.35% on the basis of metrics which are taken under consider deration are precision, recall, f1-score and support and accuracy will play an important role in this system to increase crop production, crop quality. Performance metric is basically a data representative of an actions & overall quality.



Performance Analysis

	precision	recall	f1-score	support
1	1.00	0.88	0.94	60
2	0.88	0.83	0.85	60
3	0.83	0.90	0.86	60
4	0.49	0.81	0.61	21
5	0.78	0.88	0.83	60
6	0.99	0.85	0.91	120
micro avg	0.86	0.86	0.86	381
macro avg	0.83	0.86	0.83	381
weighted avg	0.89	0.86	0.87	381

Total Accuracy : 86.35 %

Figure 6: Performance Analysis

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VII. CONCLUSION

The model predicts best crop that should be grown on land with less expenses among a number of crops available after analyzing the prediction of parameters. To the best of studies, there is so much work in existence that uses the same techniques in predicting the crops. Hence it is concluded that there is enhancement in the accuracy of this research when compared to the existing work that used another technique for prediction of crops, and it is provides user friendly gui for farmers to share experience and also a ecommerce platform to buy and sell their crop.

VIII. FUTURE SCOPE

We can all the required data by using to GPS technology Location of land can be trace and by taking access from rain forecasting by government, we can also predict crop by just giving the GPS location.

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