System for predicting crop yield through machine learning

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Abstract— **A crucial element in the Indian economy is agriculture. One prevalent issue among Indian farmers is that they frequently select the incorrect crop for their soil type. They are facing a significant decline in productivity consequently. There has been use of precision agriculture. To alleviate this issue for farmers. Precision agriculture is a contemporary agricultural method that offers the best crop for the farmer based on site-specific features by using research data on soil kinds, characteristics, and crop yield data gathering. This raises crop productivity and decreases crop decision errors. With the assistance of this project, we are developing a clever system that will be beneficial Indian farmers choose the right crop to plant according to the sowing season, the location of their farm, and the properties of the soil. In addition, the algorithm will forecast the farmer's yield if he plants the suggested crop.**

Keywords: Yield Prediction, Location, Schemes, Precision Agriculture.

I. Introduction

The Indian economy, as we all know, is based on agriculture. In India, Farming is a significant industry. The land area in the country dedicated to agriculture is over 60%. The core of the economy of India is agriculture. In India, the weather has a significant impact on agricultural yield. Rainfall is the primary factor in rice farming. To ensure that assist farmers in maximizing crop production, timely advise regarding future crop productivity and analysis are required. Predicting yield is a significant issue in agriculture. Farmers used to forecast their yield based on yield experiences from the previous year.

As a result, there are several ways or algorithms for this type of data analytics in crop prediction, and we can forecast crop production with the aid of those algorithms. The algorithm of random forest is applied. A growing number of applications and the application of large-scale data analysis techniques in agriculture are made possible by all of these algorithms and the relationships that exist between them. Since evolution of fresh, cutting-edge methods and technology, The agricultural industry has steadily deteriorating. People are focused on creating hybrid, artificial things due to these bountiful inventions, which can lead to an unhealthy lifestyle.

The growing of crops at the proper time and location is not something that modern people are aware of. Food insecurity results from these farming practices' alteration of the seasonal climate, which also threatens essential resources like soil, water, and air. Upon analysing many concerns and difficulties like the weather, temperature, and other aspects, it is evident that There's not enough of appropriate solutions and technology to effectively address the current state of affairs. There are several methods for boosting agricultural economic growth in India. Both the crop output and the crop quality can be enhanced in a variety of ways. Crop yield production can also be predicted with the help of data mining.

Although the main source of food for the is agriculture. entire world, its effectiveness is continuously threatened by erratic weather patterns and shifting consumer needs. Accurate crop production forecasting is necessary to keep food security intact. allocating resources as efficiently as possible, and promoting sustainable farming practices. Using machine learning (ML) techniques has emerged as a ground-breaking remedy to meet this pressing requirement.

This research is focused on utilizing machine learning (ML) methods to create and implement a reliable crop yield prediction system. Through the integration of meteorological data, soil properties, previous agricultural data, and other relevant variables, this system seeks to predict crop yields with a level of precision never before achieved. Among the main goals of this undertaking is to develop a predictive model that can analyse intricate relationships between multiple variables affecting crop development. By utilizing this model, agronomists, farmers, and other agricultural industry stakeholders will obtain priceless perceptions that will allow them to make well-informed decisions on risk mitigation, resource allocation, and planting methods.

By employing sophisticated machine learning techniques such as Random Forest, this system aims to go beyond conventional predictive techniques. It aims to provide accurate and timely agricultural yield projections at different regional and temporal scales by utilizing large-scale data and computer power. This endeavour is important in ways that go beyond just increasing agricultural output. Its impacts are felt by everyone the way up the global food supply chain, impacting environmental sustainability, resource efficiency, and economic stability. This agricultural yield estimate based on machine learning system has the capacity to completely transform contemporary agriculture by facilitating proactive actions and well-informed decision-making. The article goes on to describe the methodology, dataset, ML algorithms, and outcomes that were obtained. These parts demonstrate the effectiveness and promise of this system to transform crop yield forecasts.

The ability to successfully share knowledge in the era of rapidly advancing technologies will aid farmers in reaching their full potential. Farmers exchange important and timely information with one another, either formally or informally. This is known as information sharing. The open mindset among farmers as demonstrated by their readiness to share knowledge.

II. PROPOSED SYSTEM

A. Problem Statement

It is challenging for farmers to maximize crop yield due to the unpredictable nature of agricultural output. A more location-specific to get better, you need strategy. forecast accuracy as current methods frequently lack precision. By combining cutting-edge algorithms for machine intelligence with geographic data, our solution seeks to close this gap.

B. Objectives

Accurately forecasting yields requires utilizing machine learning algorithms, complex data analytics, and historical crop data to build a strong location-based model for predicting agricultural yield. Minimizing yield waste is yet another crucial component of agricultural optimization. Crop production must be coordinated with market demand and consumption trends To guarantee that crops are produced in the necessary quantities. Reducing farmers' financial losses is closely related to increasing output and decreasing waste. A more general objective that contributes to the agricultural sector's overall resilience and sustainability is to encourage more individuals to become farmers. More people might be inspired to pursue jobs in agriculture by demonstrating the possibilities for data-driven decision-making, lower risk, and increased profitability through programs like reliable crop yield prediction models.

III. SCOPE OF THE PROJECT

The goal of this study is to apply machine learning methodologies for analysis a collection of crop records for the field of agriculture. Crop identification and prediction by farmers are more challenging. We make an effort to lower the risk factor in crop choosing.

A. ML Prediction of Crop Growth

Based on variables like soil type, location, and suggested fertilizers and medications, the suggested approach applies machine learning (ML) to forecast the best crop to be cultivated. The artificial intelligence program uses past data and trends to generate precise forecasts, assisting farmers in choosing crops with knowledge.

B. Reviews From Farmers

After obtaining the crop forecast, farmers are able to offer comments and assessments based on their real-world experiences. With time, this feedback loop is helps the model of machine learning becomes increasingly accurate and pertinent by enabling it to be enhanced continuously.

C. Government Schemes Displayed

In relation to the anticipated crops, the system presents the government schemes. By keeping farmers aware about available plans, subsidies, and support services, this feature encourages better use of government efforts.

D. Admin CRUD actions

The system's CRUD (Create, Read, Update, Delete) actions can be completed by administrators. They are able to oversee government programs, preserve data on crops, and update specifics on soil types, moisture content, and geographic areas.

IV. SYSTEM ANALYSIS

A. Existing System

Predictive models the present agricultural yield forecast system based on machine learning system are trained utilizing a variety of data sources, including soil characteristics, climate variables, and past crop yields. These models examine and forecast agricultural yields with great accuracy by using sophisticated algorithms such as random forests, decision trees, or neural networks. The technology supports farmers in making well-informed choices about resource management, planting methods, and crop selection. The system can adjust and grow over time by adding fresh data inputs and modifying its predictions in accordance utilizing machine learning technologies. This makes it possible to continuously improve and optimize farming techniques, which eventually boosts agricultural output and profitability.

B. Proposed System

The suggested solution incorporates cutting-edge technology and uses machine learning to forecast crops accurately. It creates a feedback loop with farmers and ensures that they are aware of government programs suited to the crops they anticipate. The admin features of the system improve data administration and control, which makes the agricultural ecosystem more responsive and effective. In general, the suggested approach seeks to end the knowledge gap between state-of-the-art technology and conventional farming methods, promoting sustainable and well-informed agricultural decisions.

V. PROPOSED SYSTEM ARCHITECTURE

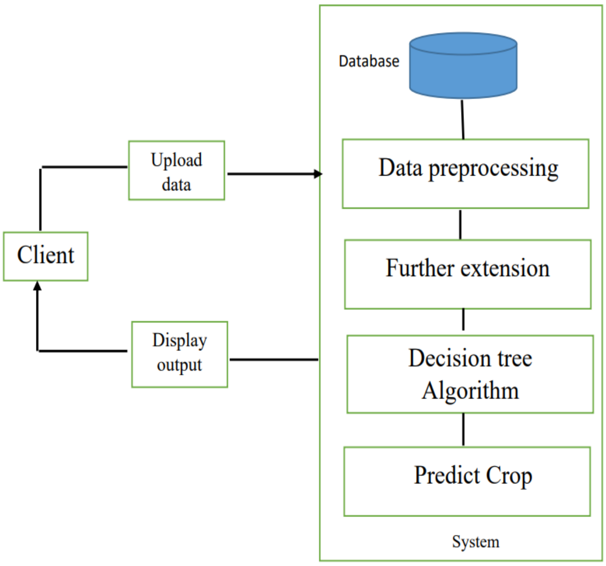

Fig1: System Architecture diagram

The System Predicts the crop as shown in "Fig1" by using the data uploaded by client. The algorithm constructs the decision tree from the information from database. The information's is preprocessed and undergone with required extension to compute the prediction.

VI. SYSTEM USE CASE DIAGRAM

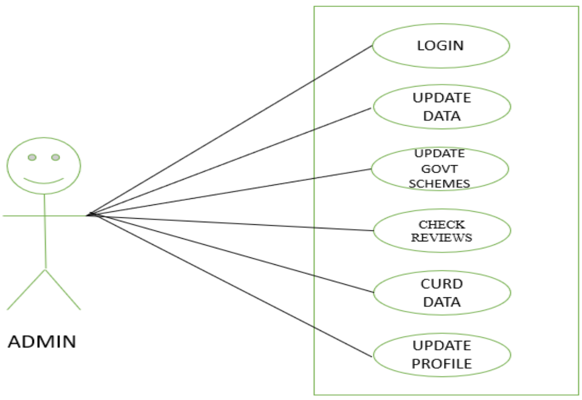

Fig2: Admin use case diagram

The admin controls the system data, updates it and verifies user entered reviews and profiles as in "Fig2". Admin also Creates, Update, Reads and Deletes the data (CURD).

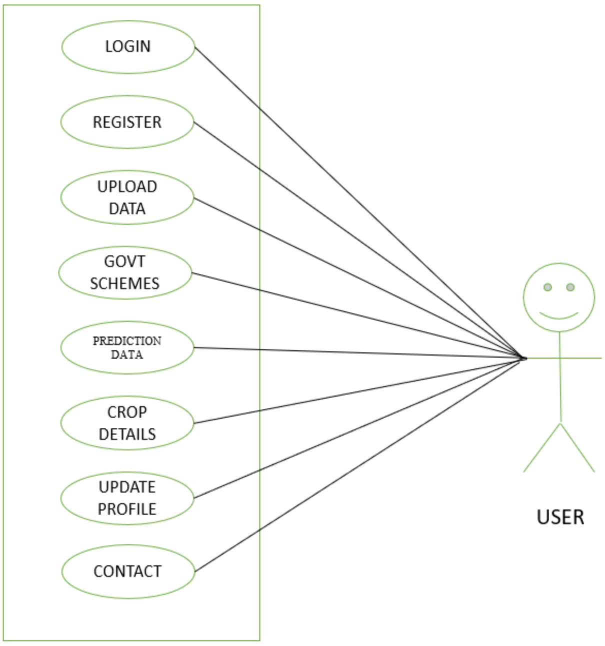

Fig3: User use case diagram

The User is authenticated as shown in "Fig3". User registration is followed by data being uploaded by the user and other user specific actions are performed as in the above figure.

VII. FLOWCHART

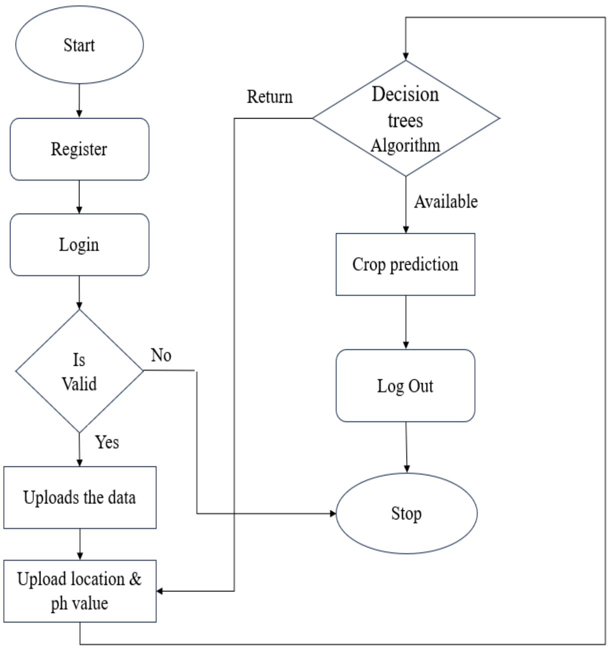

Fig4: System Flowchart diagram

The "Fig4" Describes the work flow of the system.

VIII. RESULT ANALYSIS

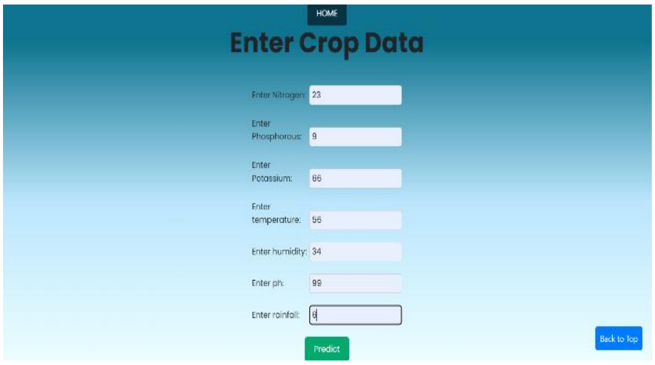

Fig5: Enter Crop Data

The user enters the soil parameters as shown in "Fig5" and the system predicts the crop that best suits in the soil.

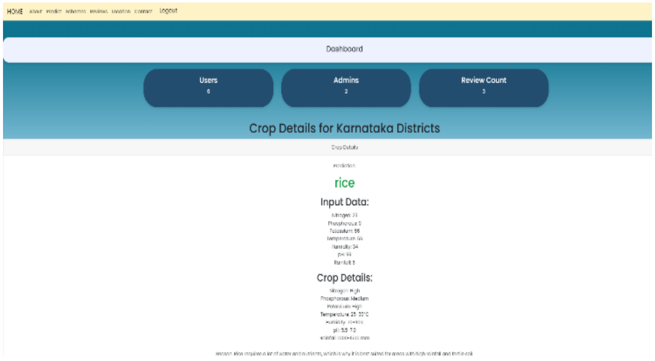

Fig6: Prediction Page

The system predicts the crop and its specifications using the data entered by the user as shown in "Fig6". The count of users, admins and reviews is displayed in the dashboard.

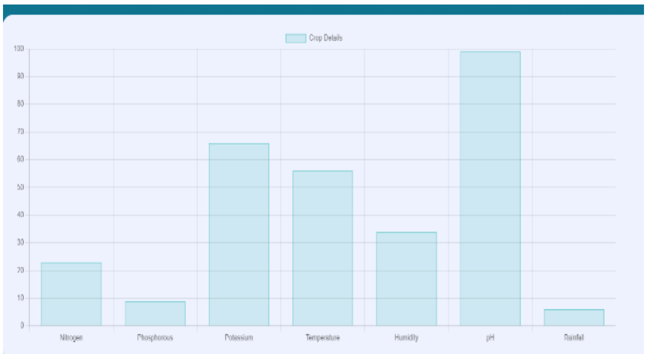

Fig7: Graph Page

The user entered data is represented in graphical way as shown in "Fig7". The soil parameters are Statistically represented as entered by the user.

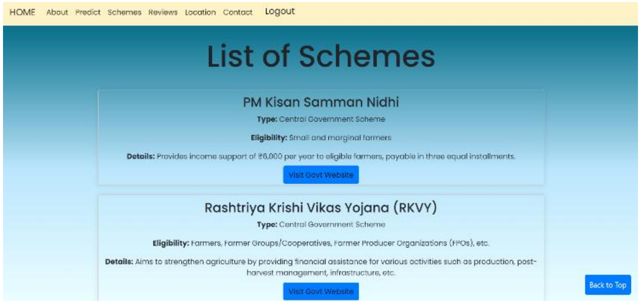

Fig8: Government Schemes

The Governmental schemes that facilitate the farmers to use and take benefit of these schemes are shown in "Fig8". These schemes additionally be accessed in regional languages to facilitate the users and avoid the inconvenience of language

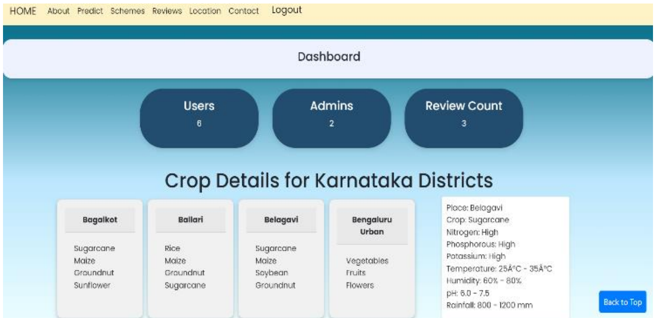

Fig9: Location Page

The system Dispaly the crop and its specifications values can show to the users in "Fig9". The count of users, admins and reviews is displayed in the dashboard.

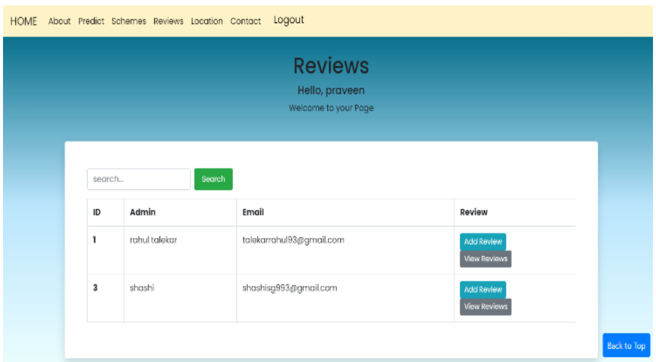

Fig10: Review Page

The users can input the reviews of the system as shown in "Fig9" and also access the reviews put up by the previous users the conveniently go through the system.

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