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Weather Forecast-Based Crop Recommendation Using Machine Learning

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ABSTRACT

Agriculture is highly dependent on weather conditions, which directly influence crop productivity and farmers' decision-making. Traditional crop selection methods rely on historical data and experience, which are often inadequate due to unpredictable climatic changes. This paper presents a Weather Forecast-Based Crop Recommendation System that uses machine learning techniques to suggest suitable crops based on real-time weather parameters such as temperature, humidity, and rainfall. The proposed system employs Random Forest and Convolutional Neural Network (CNN) models to analyse environmental conditions and generate accurate crop recommendations. The application is developed using Python for backend processing and HTML, CSS, and JavaScript for the frontend interface. Experimental results show that the system improves crop selection accuracy and supports sustainable farming practices by enabling data-driven agricultural decisions.

KEYWORDS

Crop Recommendation, Weather Forecasting, Machine Learning, Random Forest, CNN, Smart Agriculture

INTRODUCTION

Agriculture plays a vital role in the economic development and food security of many countries. However, changing weather patterns and climate variability make crop selection a challenging task for farmers. Incorrect crop selection can lead to reduced yield, financial losses, and inefficient use of resources. With

advancements in machine learning and data analytics, agriculture has entered a new phase of smart farming. Weather Forecast-Based Crop Recommendation systems utilize real-time climatic data to assist farmers in choosing the most suitable crops for prevailing conditions. This approach minimizes risks associated with climate uncertainty and improves productivity. This paper proposes a machine learning-based crop recommendation system that dynamically analyses weather conditions and provides accurate crop suggestions through a user-friendly web interface.

LITERATURE SURVEY

Several studies have explored the use of machine learning in agriculture. Random Forest algorithms have been widely used for crop prediction due to their robustness and high accuracy. Deep learning techniques such as CNNs have also been applied for agricultural image analysis and environmental classification. Earlier crop recommendation systems mainly depended on static datasets and historical records, limiting their adaptability to real-time conditions. Some systems integrated IoT sensors but required high infrastructure costs. Recent research emphasizes combining weather forecasting with machine learning to provide dynamic and accurate recommendations. However, many existing solutions lack simplicity and accessibility for small-scale farmers**.**

RELATED WORK

Several studies have applied machine learning techniques to improve agricultural decision-making. Random Forest and Decision Tree models have been widely used for crop and yield prediction due to their high accuracy and ability to handle complex datasets. Some researchers have integrated historical weather data to recommend suitable crops, but these systems lack adaptability to real-time climate variations. Deep learning approaches such as Convolutional Neural Networks (CNN) have been explored for agricultural analysis, mainly in crop disease detection and environmental classification. IoT-based smart agriculture systems provide real-time monitoring but require expensive infrastructure. Compared to existing approaches, the proposed system combines real-time weather forecasting with machine learning models to provide dynamic and accurate crop recommendations through a simple web-based platform.

EXISTING SYSTEM

Traditional crop recommendation methods rely on historical weather data and farmers' experience. Some existing systems use basic machine learning models but provide

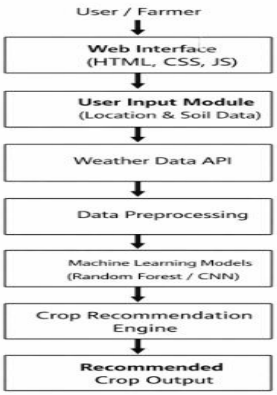
static recommendations that do not adapt to real-time weather changes. These methods lack accuracy during sudden climatic variations and offer limited decision support, leading to reduced crop yield and inefficient resource utilization.

PROPOSED SYSTEM

The proposed system uses machine learning techniques combined with real-time weather forecasting to recommend suitable crops. Random Forest and CNN models analyse weather parameters such as temperature, humidity, and rainfall to generate dynamic crop suggestions. A web-based interface developed using Python, HTML, CSS, and JavaScript allow farmers to easily access accurate and timely recommendations, improving productivity and sustainability.

SYSTEM ARCHITECTURE

Fig 1: Architecture of the project



The user provides location and soil details through the web interface. The system fetches real-time weather data and preprocesses the inputs. Machine learning models analyse the data and predict suitable crops. Finally, the recommended crop is displayed to the user.

RESULTS AND DISCUSSION

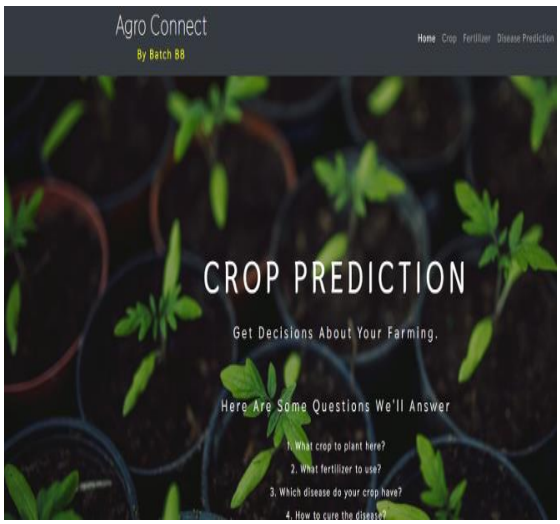


Fig 2: Home Page

Agro Connect is a smart agricultural decision-support platform designed to assist farmers in making accurate and timely farming decisions. The system uses machine learning techniques to provide crop prediction, fertilizer recommendation, and disease identification based on input data and environmental conditions. By integrating technology with agriculture, Agro Connect helps improve productivity, reduce risks, and promote sustainable farming practices.

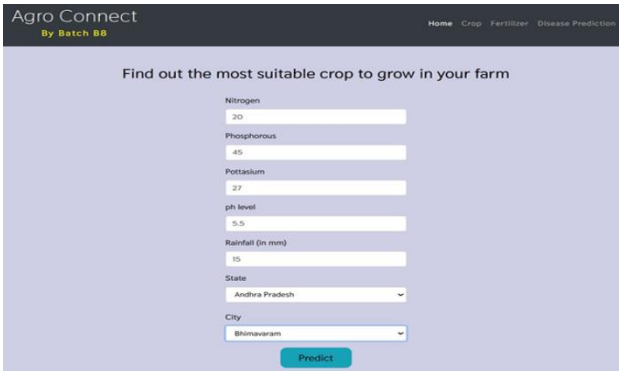


Fig 3: Crop page

The user provides key soil and climatic factors such as Nitrogen, Phosphorus, Potassium levels, pH value, rainfall, and location (state & city). Predicts the best crop that can yield optimal results. The system suggests growing mungbean as the most suitable crop for the given conditions.

Fig 4: Fertilizer page

The farmer provides soil nutrient details such as Nitrogen (N), Phosphorus (P), and Potassium (K) levels. Evaluates the input values and determines whether the nutrient levels are sufficient for optimal crop growth. If any deficiency is detected, the system suggests corrective measures.

Fig 5: Disease prediction page

The farmer uploads an image of a plant leaf showing signs of disease. The system processes the image to detect and classify the disease affecting the crop. The uploaded image shows signs of Early Blight on a potato leaf. System Provides how to prevent the disease.

CONCLUSION

Agro Connect provides an effective solution for smart agricultural decision-making by integrating machine learning with real-time data. The system accurately predicts suitable crops, recommends fertilizers, and identifies crop diseases, helping farmers improve productivity and reduce losses. This project demonstrates how technology can support sustainable and efficient farming practices.

FUTURE SCOPE

In the future, the system can be enhanced by integrating advanced machine learning models for better accuracy, supporting real-time data processing, and improving

scalability for larger datasets. Additional improvements may include a more user-friendly interface, cross-platform compatibility, cloud integration, and stronger security measures to handle sensitive data efficiently.

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