Crop Yield Prediction Using Weather and Soil Data

ABSTRACT

The **Crop Yield Prediction System** is a data-driven web application aimed at helping farmers predict crop yields based on weather conditions and soil data. By utilizing machine learning algorithms, the platform processes data from weather APIs and soil sensors to generate accurate predictions, providing insights into how environmental factors affect crop production. The system assists farmers in making informed decisions about irrigation, fertilization, and harvest timing, ultimately improving productivity and sustainability. Built with **Django** for the backend and **machine learning models** for yield prediction, this platform is designed to help optimize agricultural practices.

Modules:

1. **User Module (Farmers & Administrators)**
    - **Farmer Registration and Profile:**
        - Farmers can create and manage their accounts, including farm location and crop types.
    - **Weather and Soil Data Input:**
        - Farmers can enter real-time weather conditions and soil data (e.g., moisture, pH, temperature) for yield predictions.
    - **Yield Prediction Dashboard:**
        - A personalized dashboard that displays predicted crop yields, historical data, and related weather conditions.
    - **Recommendations:**
        - Actionable insights based on yield predictions, including optimal irrigation and fertilization strategies.
    - **Historical Data Visualization:**
        - Access to graphs showing past predictions and actual yield results for better decision-making.
2. **Admin Module**
    - **Admin Dashboard:**
        - A central dashboard to monitor the overall activity, including registered users, farms, and data inputs.
    - **Weather and Soil Data Management:**
        - Admin can manage the weather data sources and ensure accuracy in the dataset.

- **Model Training and Monitoring:**
    - Admin can trigger the training of machine learning models using new data and track prediction accuracy.
- **Farm Data Monitoring:**
    - Monitor and audit farm inputs and predict crop yields across various regions.

3. **Data Collection Module**
    - **External Weather API Integration:**
        - Real-time integration with external weather data providers to fetch information like temperature, humidity, and rainfall.
    - **Soil Sensor Data Collection:**
        - Integration with IoT devices for soil monitoring, such as moisture, pH, and temperature.
    - **Data Storage and Management:**
        - Store weather and soil data in Django models, ensuring proper relationships with farm and crop data.
4. **Machine Learning and Prediction Module**
    - **Supervised Learning Model:**
        - Build and train machine learning models using historical weather and crop yield data (e.g., **Linear Regression**, **Random Forests**).
    - **Prediction Engine:**
        - Use trained models to predict crop yields based on real-time weather and soil data inputs from farmers.
    - **Prediction Accuracy Feedback:**
        - Track the accuracy of predictions and fine-tune models for continuous improvement.
5. **Visualization and Reporting Module**
    - **Yield Prediction Visualization:**
        - Present yield predictions using graphs and charts for easy interpretation.
    - **Data Reporting:**
        - Generate reports summarizing crop yields, weather conditions, and farming recommendations.

6. **Notification Module**
    - **Alert System:**
        - Notify farmers about significant changes in weather conditions that could affect crop yields.
    - **Recommendation Alerts:**
        - Automated alerts for when farmers should take action (e.g., irrigation, fertilization) based on prediction models.
7. **API Module**
    - **RESTful API for Data Fetching:**
        - Develop APIs to fetch weather data from external sources and provide crop yield predictions to mobile or external applications.
    - **Integration with External Applications:**
        - Allow integration with other agricultural apps or platforms for broader data access.

User Wise Module

Admin Module

- Farmer Control
- Complaint management
- Product control
- Online managing
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Farmer Module

- Registration
- Product adding
- Booking checking
- Payment checking
- Subsidy products purchasing
- Communication
- Plant disease detection using algorithm
- Yield prediction using algorithm

Public Module

- Registration
- Purchase
- Payment
- Complaints
- Status adding

Government Body

- Farmer Details verification
- Document uploading
- Notification passing
- Communication
- Subsidy products adding
- Subsidy collection
- NOC Passing