User Panel Design
The user panel should be simple, intuitive, and accessible to farmers with limited technical knowledge. Here's a breakdown of the layout and features:

1. Dashboard (Home Screen)
Weather Overview:

Current temperature, humidity, rainfall, and weather conditions (e.g., sunny, rainy).

7-day weather forecast.

Alerts for extreme weather events (e.g., droughts, floods).

Soil Health Summary:

Soil nutrient levels (N, P, K, pH).

Soil moisture level (from IoT sensors).

Recommendations for soil improvement (e.g., fertilizers, organic compost).

Crop Recommendations:

List of crops suitable for the current season and soil conditions.

Estimated yield and profitability for each crop.

2. Crop Management
Crop Selection:

Dropdown to select the crop being cultivated.

Information on planting time, watering schedule, and harvesting period.

Pest and Disease Alerts:

Real-time alerts for common pests and diseases based on remote sensing and ML models.

Remedies and preventive measures.

Irrigation Schedule:

IoT-based soil moisture data to suggest optimal irrigation times.

Manual override for farmers to adjust schedules.

3. Market Insights
Local Market Prices:

Real-time prices for crops in nearby markets.

Historical price trends for better decision-making.

Government Schemes:

Information on subsidies, loans, and insurance schemes.

Links to apply for these schemes.

4. Advisory and Support
Personalized Advice:

AI-generated advice based on weather, soil, and crop data.

Tips for sustainable farming practices.

Community Forum:

A platform for farmers to share experiences, ask questions, and get advice from experts.

Helpline:

Direct contact with agricultural experts for urgent queries.

5. Settings
Language Selection:

Support for multiple Indian languages (e.g., Hindi, Tamil, Telugu, etc.).

Location Settings:

Allow farmers to set their location for localized advice.

Notification Preferences:

Enable/disable alerts for weather, pests, and market updates.

Functionality Using IoT, Remote Sensing, and Machine Learning

1. IoT Integration
Soil Sensors:

Deploy IoT sensors in fields to monitor soil moisture, temperature, and nutrient levels.

Send real-time data to the app for irrigation and fertilization recommendations.

Weather Stations:

Install low-cost weather stations to provide hyper-local weather data.

Integrate with the app for accurate weather forecasts and alerts.

Smart Irrigation:

Use IoT-enabled irrigation systems to automate watering based on soil moisture data.

2. Remote Sensing
Satellite Imagery:

Use satellite data to monitor crop health, detect pests, and assess drought conditions.

Provide visual maps of the farm area with highlighted problem zones.

Drones:

Deploy drones for high-resolution imaging of fields.

Identify areas with poor crop growth or pest infestations.

3. Machine Learning
Crop Recommendation System:

Train ML models on historical weather, soil, and crop data to recommend the best crops for a given location and season.

Yield Prediction:

Predict crop yields based on current conditions and farming practices.

Help farmers plan for storage and sales.

Pest and Disease Detection:

Use image recognition models to identify pests and diseases from photos uploaded by farmers.

Provide instant remedies and preventive measures.

Market Price Forecasting:

Predict future market prices for crops using historical price data and demand-supply trends.

Help farmers decide the best time to sell their produce.