Smart Irrigation System using IoT and Weather Monitoring

Project Overview:

The Smart Irrigation System aims to automate the watering of crops using real-time soil moisture sensors and weather forecast integration. This system will help farmers conserve water and improve crop yield by providing irrigation only when necessary.

Objectives:

- Optimize water usage in agricultural fields.
- Automate motor control based on soil moisture and weather.
- Provide farmers with mobile access to field conditions.
- Reduce dependency on manual irrigation practices.

Key Features:

1. Soil Moisture Detection: Sensors measure soil water content.
2. Weather Integration: API checks for rain forecasts before watering.
3. Automatic Motor Control: Relay activates water pump when required.
4. Mobile App: Farmer receives real-time updates and can control motor manually.
5. Data Logging: Store historical moisture and motor data for analysis.

Hardware Required:

- NodeMCU ESP8266 (Wi-Fi microcontroller)
- Soil Moisture Sensor (analog)
- Relay Module (for motor control)
- 12V DC Pump / Motor
- Optional: DHT11 Sensor (for temp & humidity)
- Power Supply or Battery

Technology Stack:

- Backend: Firebase / Flask API
- Mobile App: Flutter / MIT App Inventor
- Frontend: Mobile app dashboard for data display
- Weather API: OpenWeatherMap

- Communication: Wi-Fi + HTTP/REST protocol

Architecture Flow:

1. Soil moisture sensor sends data to NodeMCU.
2. NodeMCU checks data and weather API.
3. If irrigation needed, relay turns ON motor.
4. Data sent to Firebase or cloud.
5. Mobile app fetches real-time status and alerts user.

Expected Outcomes:

- Efficient irrigation leading to water conservation.
- Increased crop productivity.
- Cost-effective and scalable solution for small and large farms.

Market Need:

Indian agriculture is still dependent on traditional methods. This project can revolutionize how small to mid-size farmers manage irrigation, especially in water-scarce regions.

Team & Timeline:

- Team: 3-4 developers (hardware & software)
- Timeline: 6-8 weeks from prototype to deployment

Conclusion:

The Smart Irrigation System provides a real-time, automated, and scalable solution to manage water efficiently in agricultural fields using IoT technologies.