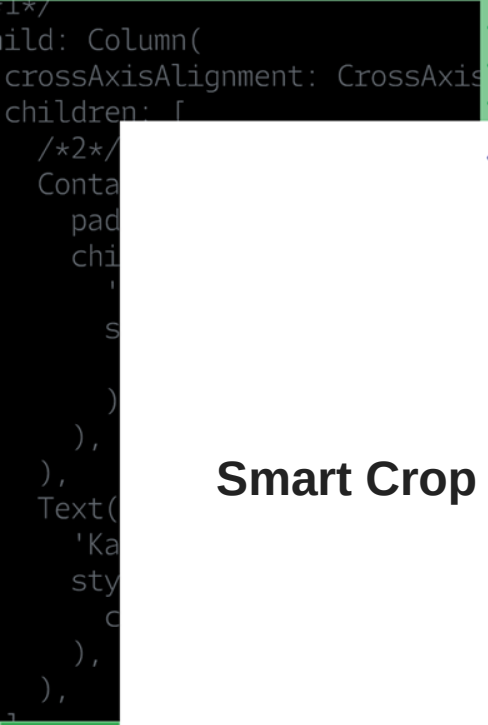

Smart Crop Protection and Water Conservation System using IoT

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Describe your problem statement and your approach to the solution

- PROBLEM STATEMENT

Excessive and unpredictable rainfall can severely damage crops, while water scarcity in many regions calls for efficient water usage. Farmers often struggle with managing water supply and protecting crops from over-saturation, as manual monitoring of soil conditions and weather can be time-consuming and inefficient, especially in large fields. To address these issues, there is a need for an automated system that can protect crops from excessive rain and optimize water management.

SOLUTION:

- To solve this problem, we propose an **IoT-based smart crop protection system** that automates the process of monitoring soil moisture and detecting rainfall. This system is built using sensors, including a **soil moisture sensor** and a **raindrop sensor**, connected to an **Arduino board**. The moisture sensor checks soil conditions, while the raindrop sensor detects rainfall levels.

- When the soil moisture is low, the system sends a notification to the farmer to indicate the need for irrigation. If the soil moisture is high, the system checks the raindrop sensor. If it detects rain, a **motor**-controlled shelter is deployed to protect the crops. If no rain is detected despite high soil moisture, the system alerts the farmer to turn off the water supply, avoiding overwatering.

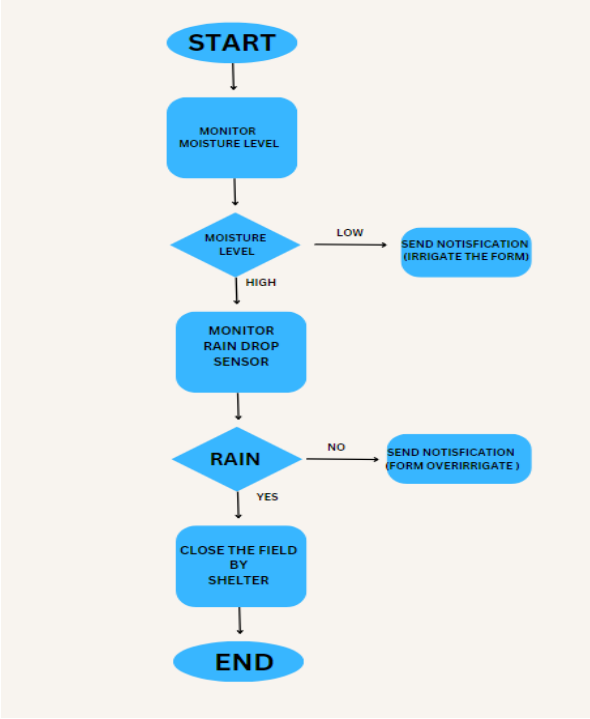
- By automating these tasks, the system ensures timely and efficient management of crops, protecting them from damage due to excess rain while also conserving water for future use. This approach enhances both crop productivity and sustainable water usage.

Describe your project's methodology and working with a flowchart.

- METHODOLOGY

The IoT-based smart crop protection system works by monitoring soil moisture and detecting rainfall. The soil moisture sensor first checks if the moisture level is low; if it is, a notification is sent for irrigation. If the moisture level is high, the system checks for rain using a raindrop sensor. If rain is detected, a motor deploys a shelter to protect the crops. If no rain is detected, an overwatering notification is sent to advise turning off the water supply. This automated process ensures efficient water management and crop protection.

- FLOW CHART



Which google and non-google technologies will you use? Why and how?

● GOOGLE TECHNOLOGY

1-**Google Cloud IoT Core**:
Why: It provides a secure and scalable solution to connect IoT devices and manage their data in real-time.
How: The IoT devices (soil moisture sensors, raindrop sensors, etc.) will send data to Google Cloud IoT Core. The data can then be processed, stored, and analyzed on Google Cloud, enabling real-time monitoring and automated actions based on sensor readings.

2-**Firebase Cloud Messaging (FCM)**:
Why: FCM is an easy-to-integrate service for sending real-time notifications to users based on events like low soil moisture or rain detection.
How: FCM will be used to push notifications to the farmers' mobile app, alerting them to conditions such as overwatering or the need for irrigation.

3-**Flutter (for App Development)**:
Why: Flutter is a cross-platform mobile development framework, allowing you to build both Android and iOS apps with a single codebase.
How: The mobile app will be built using Flutter, enabling users to view sensor readings, receive notifications, and control certain functions (like turning off water supplies).

● NON-GOOGLE TECHNOLOGY

1-Arduino/ESP32 Microcontroller:
Why: These microcontrollers will interface with sensors to gather data from the environment. They are widely used in IoT applications due to their low cost and ease of programming.
How: The microcontroller will read sensor data (soil moisture and raindrop) and transmit it to Google Cloud IoT Core over Wi-Fi.

2-**MQTT Protocol**:
Why: It's a lightweight messaging protocol commonly used in IoT projects for efficient communication between devices and the cloud.
How: The IoT devices will use MQTT to send data to Google Cloud IoT Core, ensuring a low-latency, reliable connection.

Expected Outcome

- **Real-Time Crop Monitoring**: Farmers will be able to monitor soil moisture levels and rainfall conditions in real time through the mobile app. The data collected from the sensors will be displayed clearly, providing actionable insights into field conditions.
- **Automated Crop Protection**: The system will automatically deploy a shelter to protect crops when excessive rainfall is detected, reducing the risk of crop damage due to overwatering.
- **Efficient Water Management**: The system will notify farmers when the soil is overwatered, helping them conserve water by turning off irrigation systems when not needed. Rainwater will also be collected and stored for future use.
- **Real-Time Notifications**: Farmers will receive notifications about critical conditions such as low soil moisture, excessive rainfall, or overwatering via Firebase Cloud Messaging. This ensures timely interventions, improving crop health and reducing water wastage.
- **Cross-Platform Mobile Application**: The Flutter-based app will provide a user-friendly interface, accessible on both Android and iOS devices, allowing farmers to monitor their crops anytime and anywhere.
- **Data-Driven Insights**: Historical data stored in Firebase Realtime Database will allow farmers to analyze trends in soil moisture and rainfall, helping them make informed decisions about irrigation and crop protection.