Farm Yangu Project Documentation

# Board Usage

Board to Use: ESP32

ESP32 has limitations for highly complex tasks but offers:

1. Balance of processing power and power efficiency.  
2. Built-in Wi-Fi and Bluetooth for wireless connectivity.  
3. Real-time data processing and communication support.  
4. Suitable for battery-powered applications.

# Water Control - Solenoid Valves

We need control valves to regulate the amount of water being removed by opening or closing them. Solenoid valves are commonly used for this purpose.

# Database Requirements

The database should store:

- Soil moisture levels.  
- Crop water consumption rates.  
- Recommended irrigation schedules.  
- Amount of water in the tank and usage at specific intervals.  
- Evaporation rates, crop types, and number of water requirements.

# API and Sensor Use

The system will use an API for real-time weather data or sensors such as light sensors to make irrigation decisions.

# Communication Modules

1. We need an app where farmers can monitor water usage and schedule irrigation remotely.  
2. Farmers will receive messages with irrigation data.  
3. The app should show real-time updates from soil moisture sensors, weather conditions, and allow irrigation settings to be adjusted.  
4. We will use GSM for mobile data initially and later use Wi-Fi for communication.

# Suggestions for Improvement

- Offer different crop options with specific requirements.  
- Add NPK sensors for nutrient measurement.  
- Use solar power for energy efficiency.  
- Calculate evaporation rates for more accurate irrigation.

# Web Application Features

The app will allow farmers to:

1. Choose crop types and set irrigation schedules.  
2. Monitor soil moisture and receive notifications about water usage.  
3. View weather conditions and soil health.  
4. Personalize the system with data like plant age, welcome messages, and growth stages.  
5. Monitor system connections using GSM modules and real-time weather data.  
6. Detect soil types and analyze plant suitability for the farm.  
7. Track irrigation patterns and monitor water usage over time.

# Hardware Components

The system uses the following components:

- LM7805 Voltage Regulator: 7.4V input, 5V output.  
- MT3608 Buck-Boost Converter: Boosts 7.4V to 12V.  
- 18650 Batteries: 3.7V each.  
- CR2032 Battery: 3.0V for RTC module.  
- ESP32 Microcontroller: 5V input, 3.3V GPIO output.  
- Capacitive Soil Moisture Sensors: 5V.  
- DHT22/DHT11 Temperature Sensors.  
- Pyranometer for sunlight intensity.  
- SIM800L GSM Module for communication.

# Power Transmission

The system uses 3.7V 18650 batteries in series, providing a total of 7.4V. The relay module power is calculated as Power (W) = Voltage (V) x Current (A).

# Database Structure

The database should include:

- Type of crops and their growth stages.  
- Water requirements for each crop.  
- Evaporation rates and weather conditions.  
- Water levels in the tank and irrigation times.  
- Sensor data and irrigation patterns.