Farm Yangu Requirement Documentation

# Objective of the documentation

# The goal of this project is to enhance the productivity of coffee farming through the implementation of an efficient irrigation system. The system will predict the optimal times for irrigation by utilizing weather data from a weather API and real-time data collected from the farm using sensors. Additionally, the system will monitor soil nutrient levels and provide recommendations on nutrients that need to be added to maintain optimal crop health. It will also measure the soil pH, helping farmers make informed decisions about soil management. Moreover, the system will remind the farmer when to apply pesticides based on the crop’s age and soil conditions, ensuring timely and effective pest control. This data-driven approach will improve resource management and overall farm productivity.

# 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.

- record the reading and remove outliers .

-solar battery

# mobile Application Features

The app will allow farmers to:

1. Monitor soil moisture and receive notifications about water usage.  
2. View weather conditions and soil health.  
3. Personalize the system with data like plant age, welcome messages, and growth stages.  
4. Monitor system connections using GSM modules and real-time weather data.  
5. Detect soil types and analyze plant suitability for the farm.  
6. 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. (to esp32)  
- MT3608 Buck-Boost Converter: Boosts 7.4V to 12V.( to the solenoid valve)  
- 18650 Batteries: 3.7V each.  
- CR2032 Battery: 3.0V for RTC module.  
-\* ESP32 Microcontroller: 5V input, 3.3V GPIO output. Or lilyGo -SIM7600 -H (GSM).  
- Capacitive Soil Moisture Sensors: 5V.  
- \* Pyranometer for sunlight intensity.  
- SIM800L GSM Module for communication.

- pyranometer Apogee SP-215.

- BRASS LIQUID SOLENOID VALVE - 12V - 3/4"

- LCD 12c Display

- RTC module

- 4x4 Membrane keypad

- DHT22/DHT11 measure temperature and humidity.

- Ph sensor

- NPK sensor

- TP4056 lithium ion battery charging module

- solar cell 6v 330mA

- Water Flow sensor - 3/4"

# \*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.