# Kelompok B8

Remote Agriculture System

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# Introduction

In agriculture, the lack of tools for real-time monitoring of essential factors like soil moisture and temperature hinders informed decision-making by farmers. Existing solutions fall short in addressing modern farming challenges, such as resource efficiency and environmental sustainability. The proposed "Remote Agriculture System," utilizing the ESP32 and sensors, aims to bridge this gap by providing farmers with user-friendly, real-time insights for intelligent and sustainable crop management.

# ACCEPTANCE CRITERIA

### Cloud Connectivity

The system must establish a reliable connection to Blynk for real-time data transmission and remote monitoring.

### User Interface

The system must provide a user-friendly interface for farmers to monitor environmental conditions, set threshold values, and configure monitoring parameters.

### Data Acquisition and Monitoring

The system must successfully retrieve real-time data, including temperature, humidity, soil moisture, and soil temperature.

### Environmental Monitoring

The system must effectively monitor and report changes in temperature, humidity, soil moisture, and soil temperature in real time

### Sensor Integration

The system must seamlessly integrate the specified sensors, including DHT11, YL39 soil moisture sensor, and LDR, to ensure comprehensive environmental monitoring.

### Actuation System

The system must incorporate an actuation mechanism to automatically activate the water pump when soil moisture falls below a predefined threshold.

| Roles | Software | Hardware | Field-Tester |
| --- | --- | --- | --- |
| **Responsibilities** | Develop algorithms for data processing, actuation triggers, and communication with IoT cloud platforms. | Integrate sensors (DHT11, YL39, LDR), water pump, and LED strip into a cohesive system. | Develop algorithms for data processing, actuation triggers, and communication with IoT cloud platforms. |
| **Person** | Muhammad Farrel Mirawan, Handaneswari Pramudhyta Imanda, Sulthan Satrya Yudha Darmawan, Jeremy Ganda Pandapotan | Muhammad Farrel Mirawan, Handaneswari Pramudhyta Imanda | Muhammad Farrel Mirawan, Handaneswari Pramudhyta Imanda, Sulthan Satrya Yudha Darmawan, Jeremy Ganda Pandapotan |

# Timeline and Milestones

| Number | Task Title | November | | | | | | | | | | | Desember | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | HARDWARE DESIGN | | | | | | | | | | | | | | | | | | | | | |
| 1.1 | Planning and Preperation | | | | | | | | | | | | | | | | | | | | | |
| 1.2 | Gathering Components | | | | | | | | | | | | | | | | | | | | | |
| 1.3 | Component Testing | | | | | | | | | | | | | | | | | | | | | |
| 1.4 | Assembly | | | | | | | | | | | | | | | | | | | | | |
| 2 | SOFTWARE DEVELOPMENT | | | | | | | | | | | | | | | | | | | | | |
| 2.1 | Making the flowchart | | | | | | | | | | | | | | | | | | | | | |
| 2.2 | Coding for YL39 | | | | | | | | | | | | | | | | | | | | | |
| 2.3 | Coding for DHT11 | | | | | | | | | | | | | | | | | | | | | |
| 2.4 | Coding for LDR | | | | | | | | | | | | | | | | | | | | | |
| 2.5 | Connecting to Blynk | | | | | | | | | | | | | | | | | | | | | |
| 2.6 | Putting the code together | | | | | | | | | | | | | | | | | | | | | |
| 3 | INTEGRATION AND TESTING OF HARDWARE AND SOFTWARE | | | | | | | | | | | | | | | | | | | | | |
| 3.1 | Software and Hardware Integration | | | | | | | | | | | | | | | | | | | | | |
| 3.2 | Trial and error | | | | | | | | | | | | | | | | | | | | | |
| 3.3 | Raw testing | | | | | | | | | | | | | | | | | | | | | |
| 3.4 | Troubleshooting | | | | | | | | | | | | | | | | | | | | | |
| 4 | FINAL PRODUCT ASSEMBLY AND TESTING | | | | | | | | | | | | | | | | | | | | | |
| 4.1 | Final Assembly | | | | | | | | | | | | | | | | | | | | | |
| 4.2 | Final testing | | | | | | | | | | | | | | | | | | | | | |
| 4.3 | Finished Product | | | | | | | | | | | | | | | | | | | | | |
| 4.4 | Finished Report | | | | | | | | | | | | | | | | | | | | | |

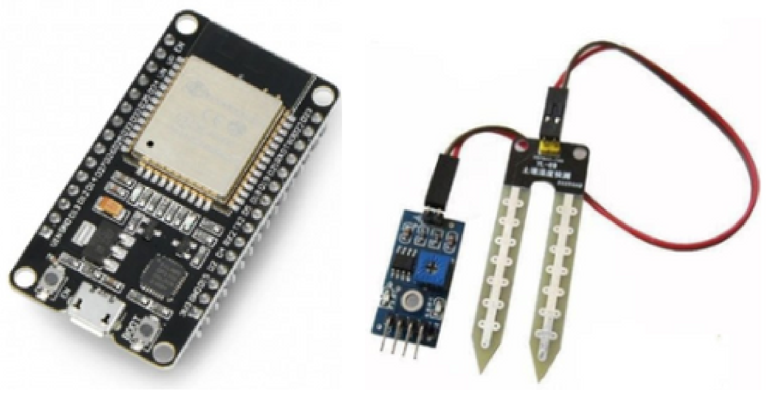
# Implementation

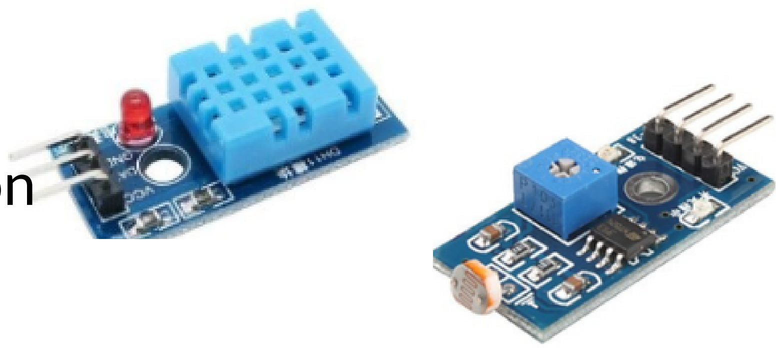
# Hardware Design

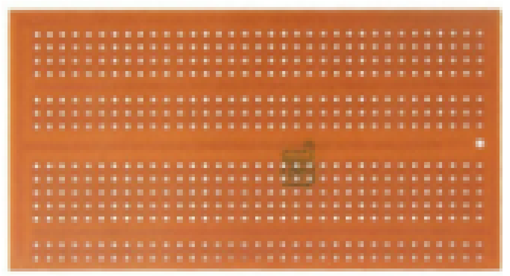
The Remote Agriculture System is an IoT project revolutionizing farming practices through real-time monitoring and automation using Blynk.

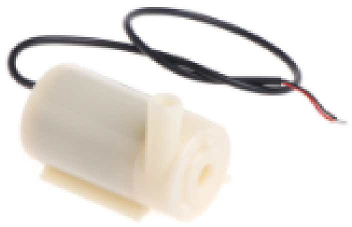
Components:

- ESP32 for seamless connectivity
- YL39 Soil Moisture Sensor
- DHT11 Temperature Sensor
- LDR for ambient light detection
- 2 LED for artificial illumination
- Water Pump for automated soil irrigation
- 20 Jumper Cables
- Protoboard









# Schematic Overview

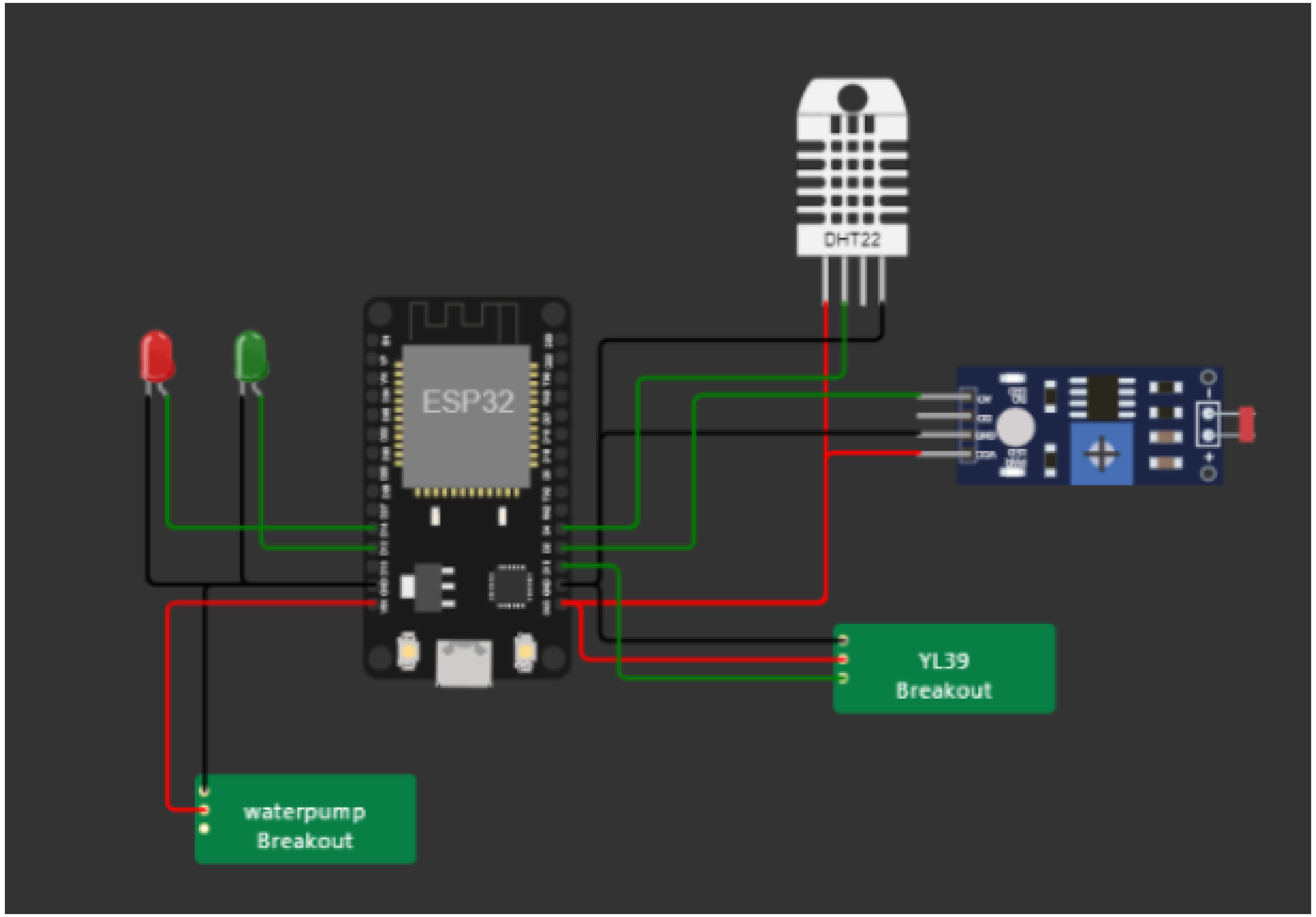
- Efficient communication between components
- ESP32 receives data from sensors
- Predefined conditions trigger actions:
  - LDR detects darkness -> LED activation
  - Soil moisture sensor indicates dry conditions -> Water pump activation

Objective:

- Ensure optimal plant growth conditions through real-time monitoring and automated actions.

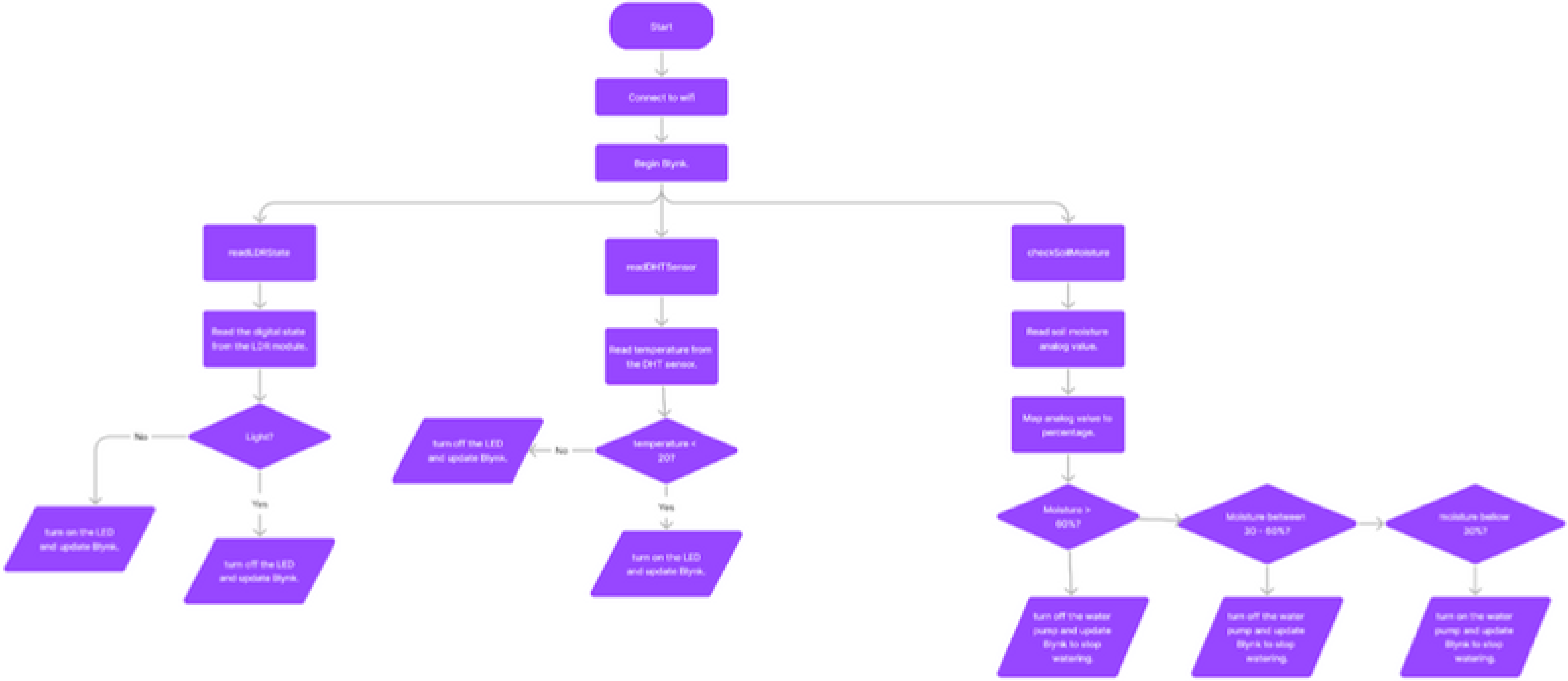
Remote Agricultural System

# Schematic Overview



Remote Agricultural System

# Flowchart

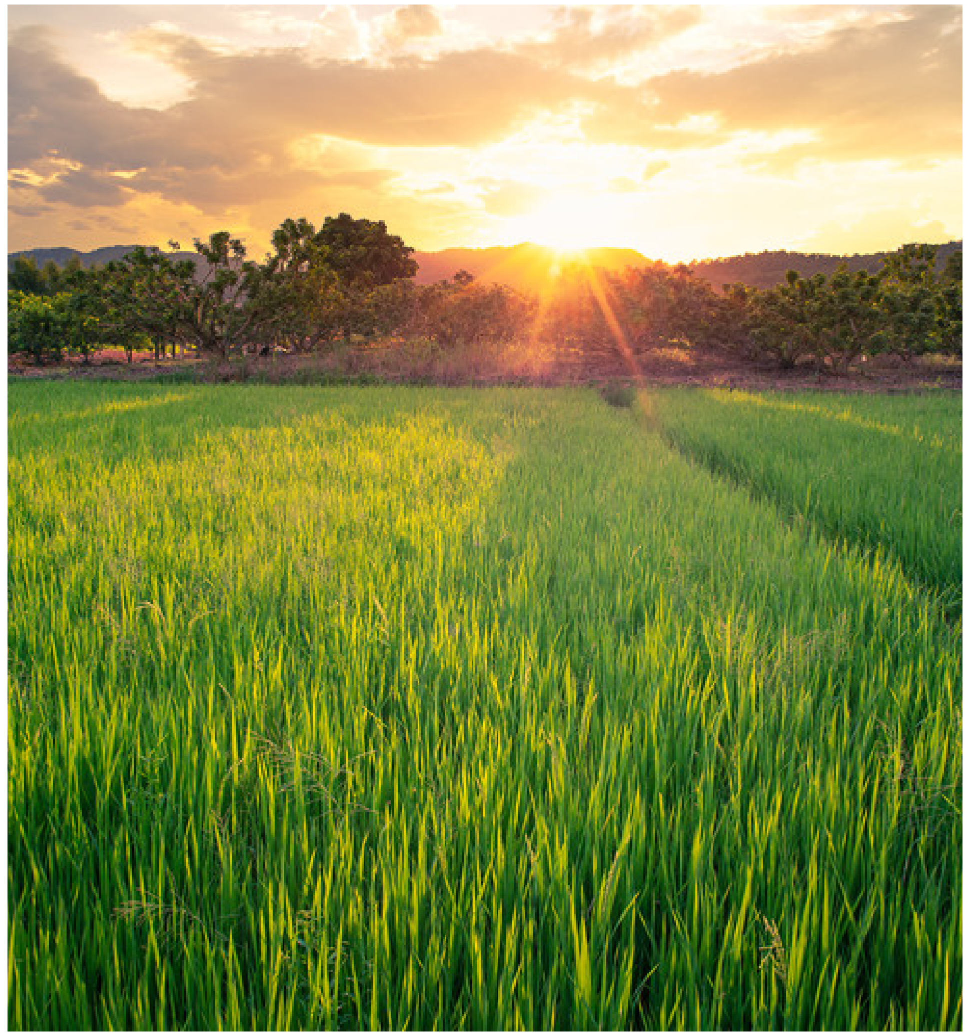


# Some Examples of Agriculture **Industry**

The agricultural industry is a series of activities from the production of raw materials, processing, and marketing and distribution as a series of activities in one system.

### Rubber plantations

Rubber plantations include rubber plantations for producing rubber latex, processing rubber (sap into latex), and marketing



### Tea plantations

Tea plantations include tea gardens to produce tea leaves, tea factories to process them into brewed tea and then export (through associations)

# Testing & Evaluation

# Testing

The Remote Agriculture System, built on C++ and the ESP32 microcontroller with Blynk connectivity, is designed for automated plant monitoring using YL39, DHT11, and LDR sensors. Rigorous testing at various stages ensures the system's reliability, with detailed methodologies and results provided for comprehensive evaluation.

## Unit Testing

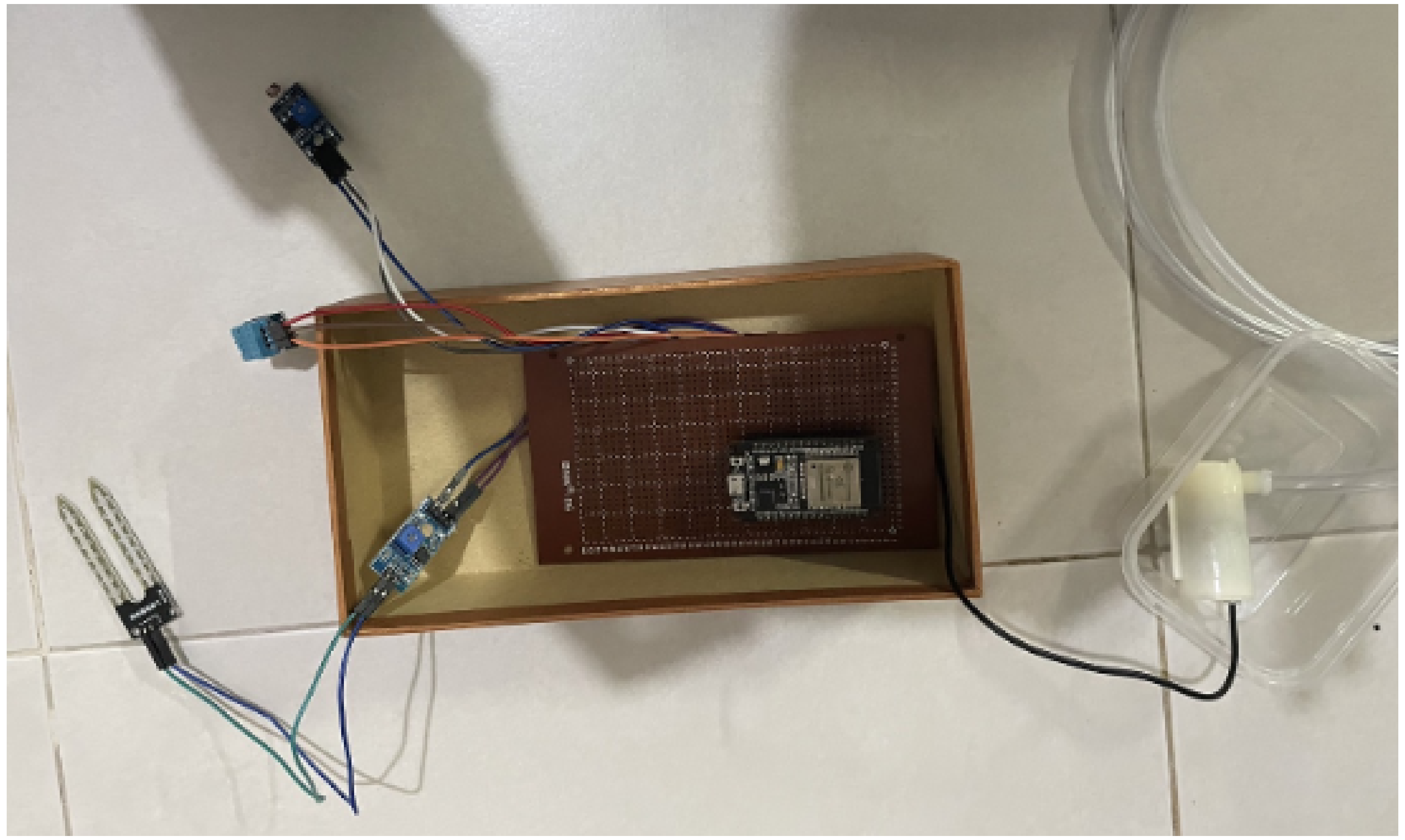
Unit testing on components of the Remote Agriculture System, such as the YL39 sensor, DHT sensor, and LDR sensor was tested separately using appropriate test cases to ensure accurate calibration and reliable readings.

## Integration Testing

Integration testing for the Remote Agriculture System aimed to evaluate the seamless integration of components like the DHT sensor, LDR sensor, and Blynk connectivity. The objective was to ensure proper data flow and communication between modules.

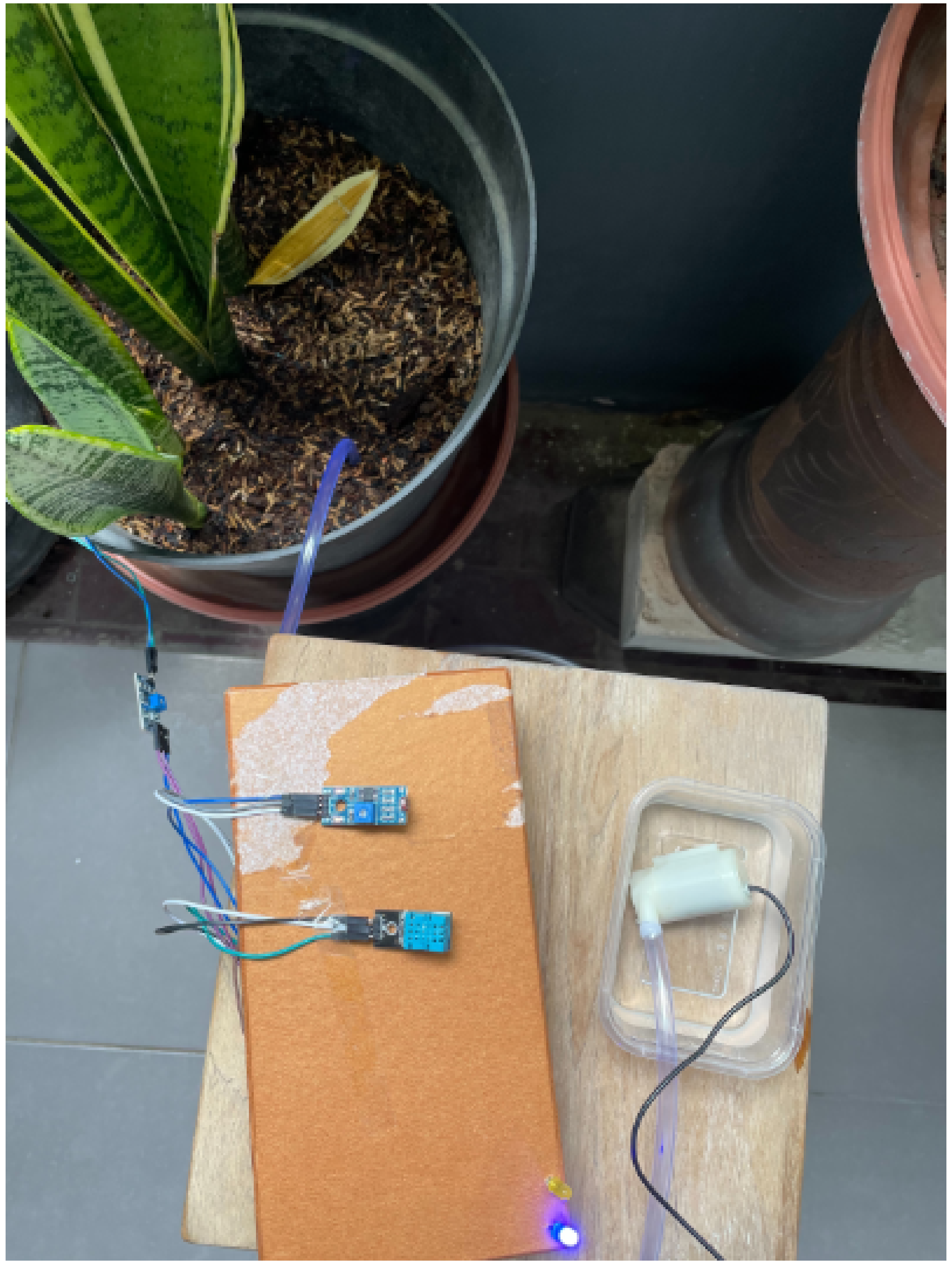
## User Acceptance Testing

this testing simulates real-world scenarios for the Remote Agriculture System, including immersing the moisture sensor in water and simulating temperature and light variations. Feedback on usability, intuitiveness, and overall experience was collected to identify and address issues for system refinement.



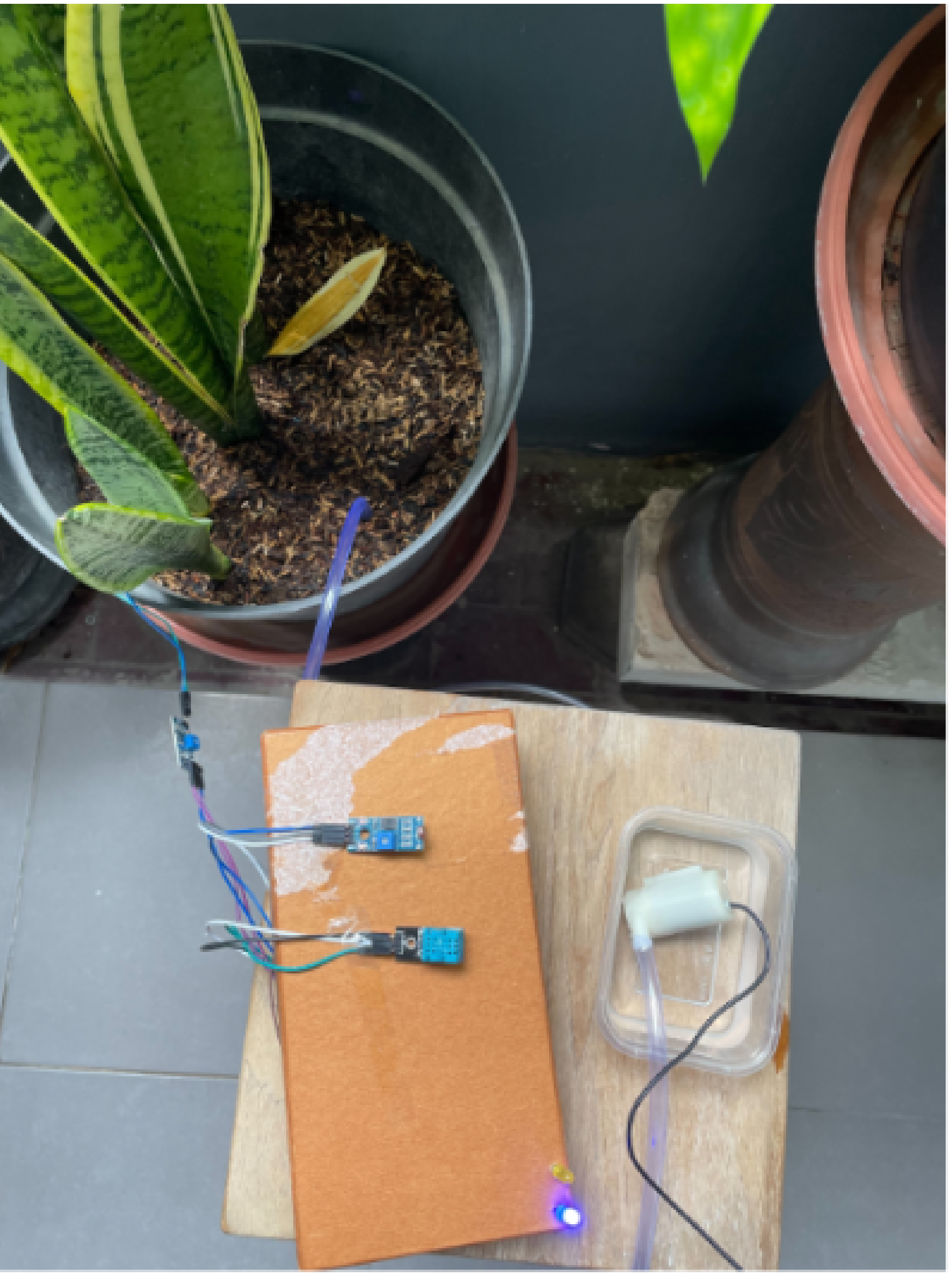
# Result: Unit Testing

All components passed unit testing, but initially, the DHT11 sensor failed to pick up temperature readings, providing only 0 values. Replacing it with a new sensor resolved the issue. The YL39 moisture sensor and LDR are accurate, and both LEDs and the water pump function as expected.



# Result: Integration Testing

The integration testing phase verified that the components of the Remote Agriculture System were effectively integrated. Data flow between modules was smooth, and the system provided accurate and real-time readings of environmental parameters for the plant such as its temperature, soil moisture, and the light reading.




# Result: User Acceptance Testing

The Remote Agriculture System excelled in user acceptance testing, demonstrating seamless integration of components in a simulated real-world environment. Accurate temperature, moisture, and light readings were displayed on Blynk, supported by reliable status indicators. This confirms the system's ability to provide relevant data in diverse environmental conditions.

# Evaluation

Remarkably, the system effectively fulfilled its primary objective of automating agriculture monitoring, delivering dependable measurements of crucial parameters like moisture levels, temperature, and light level. User acceptance testing garnered positive feedback, indicating a high level of accuracy. The impact of the system extends to improved agricultural practices, significant time savings, and a notable reduction in the risks associated with plant damage.

While the Remote Agriculture System showcased considerable strengths, areas for improvement were identified. One notable enhancement involves incorporating manual change such as being able to water the plant and turning on the light manually using an app that is connected to Blynk.

# Conclusion

This IoT-based smart agriculture project integrates ESP32 microcontroller and sensors, transforming traditional farming into a technologically advanced, remotely monitored system. Blynk facilitates real-time data access and system control from any internet-connected location. FreeRTOS ensures efficient task execution, emphasizing responsiveness. The system optimizes resource usage by monitoring temperature, light, and soil moisture for informed decision-making, promoting sustainable, data-driven farming practices and increased productivity.

# Thank You

Part of the Agricultural Production Industrial Complex