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Sri Lanka Institute of Information Technology

IT1040 - Fundamentals of Computing

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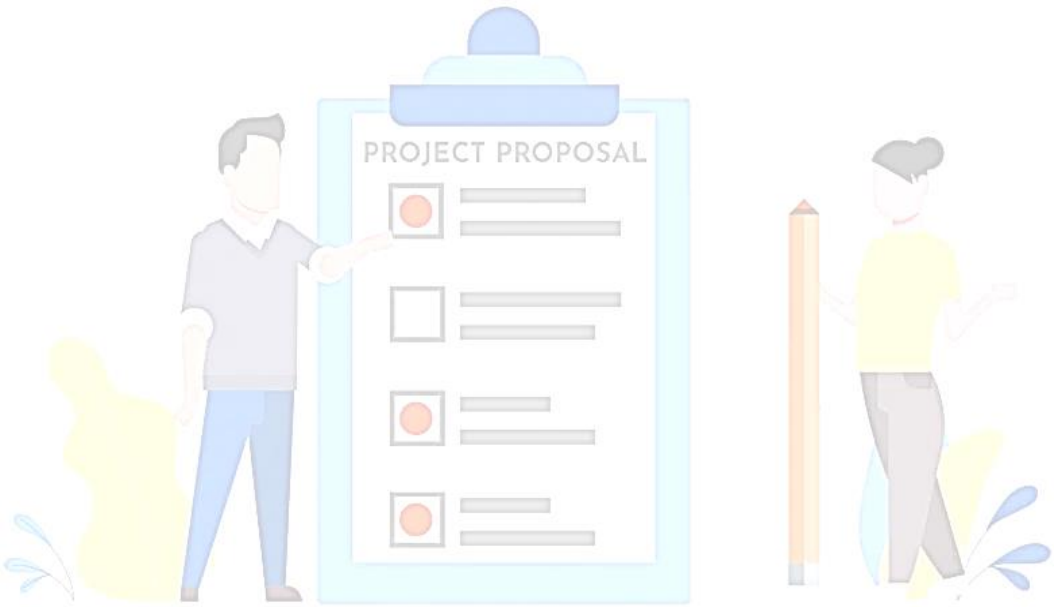
INTELLIGENCE WATER TANK MONITORING SYSTEM

Proposal Document

Group ID - P5 10

IT Number	Name
IT24101551	Kuyilini. T
IT24103103	Nithushan. U
IT24102004	Mugesh. R
IT24100945	Liyanage S.L.U
IT24103059	Premasekara J. J
IT24100267	De Silva N.R. P

Content



1. Background

Water is an essential resource for human existence. Water plays a special role in various aspects including domestic use, agriculture, industry, and sanitation and thus faces various challenges in the use of water in various aspects. Among them, there is an urgent need for innovative solutions to effectively manage and conserve water resources in agriculture.

As of today, farmers are facing a lot of difficulties due to water scarcity and inefficient irrigation systems. For that, by creating an intelligent water tank monitoring system, these farming inconveniences can be avoided. Here primarily rainwater is conserved and also water level monitoring in the tank, overflow prevention water conservation, etc. are controlled. Thus, using modern technology, this project tries to contribute to water management methods and promote water conservation.

HYDRATION

The Intelligent Water Tank Monitoring System

2. Problem And Motivation

Following are the various problems faced by the crop growers while watering the crops and the motivation for society to use a Hydration Intelligent Water Tank Monitoring System as a solution to them.

Problems

1. Receiving irregular water supply

Irregular water supply or lack of sufficient tank water in the areas where agriculture takes place as well as in various places where the cultivation activities are carried out.

2. Waste of water

Natural water without any payment is wasted during the rainy season and over-watering of crops results in wastage of water and may even destroy crops.

3. Sudden breakdowns in water transport systems

Leaks caused by sudden breakdowns in water transport systems often go undetected, resulting in significant water wastage.

Motivation

1. Automation and Convenience

By integrating Node MCU ESP32 and the Blynk app, remote monitoring and control can be done.

2. Conservation of water

Installing a water safety system can save water and prevent potential property damage by alerting users and taking corrective action, and early detection of leaks in drainage systems can prevent water loss.

3. Achieving sustainable crops and yields

Sustainable yields can be achieved by monitoring soil moisture and automatically ensuring that plants receive the right amount of water based on sensor data.

According to the above, this project not only improves water management but also makes a wide effort to promote sustainable harvest.

3. Aim and Objectives

Aim

This project aims to provide innovative solutions for the water scarcity and inefficient irrigation systems faced in agriculture. The goals of automating water supply, identifying leaks, and promoting water conservation can also be achieved. Accordingly, water management can be sustainable in agriculture using an intelligent water tank monitoring system.

Objectives

- Conservation and use of natural water

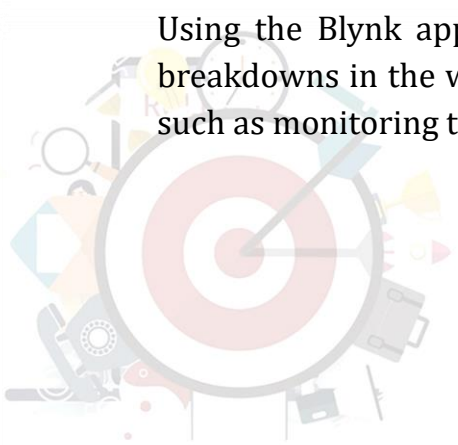
  Natural water conservation and water use can be done using Rain drop Sensors and Soil Moisture Sensors to conserve natural rainwater and measure the water required for crops.

- Managing water safely

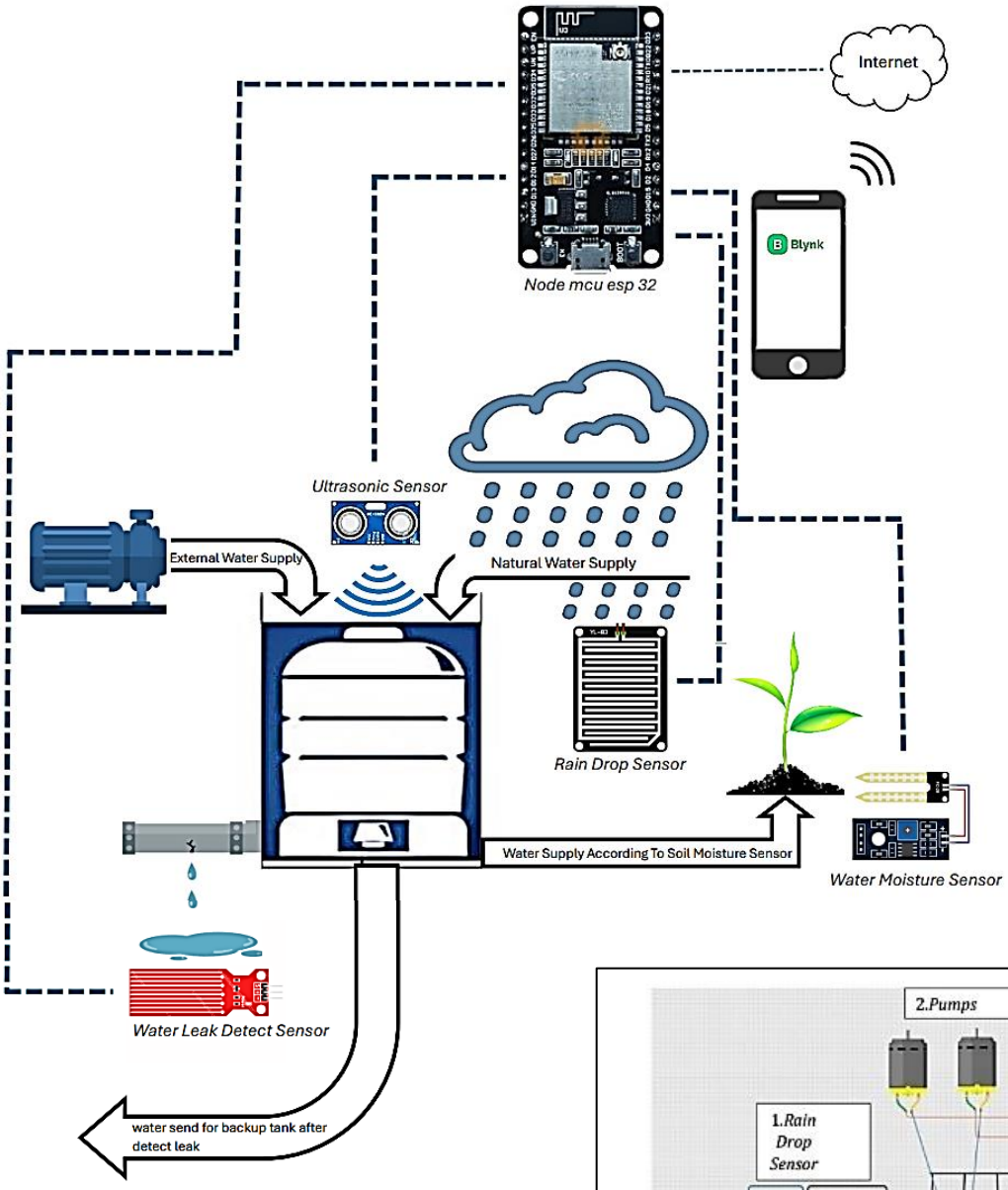
  An ultrasonic sensor is used to check the water level while storing water in the tanks, and the leaks in the system can be known early by using the water sensor. Accordingly, water management can be done safely.

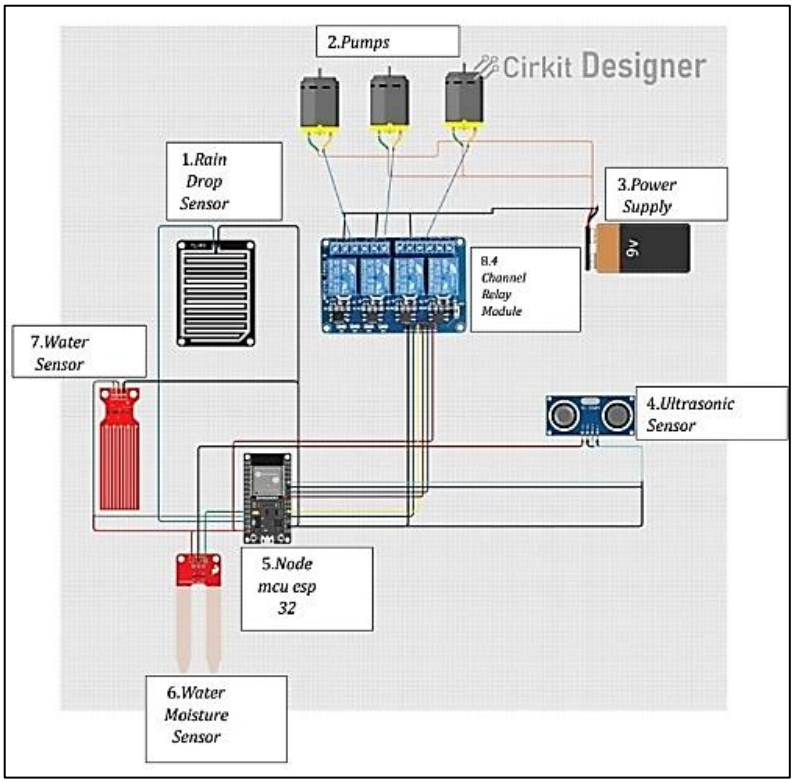
- Remote monitoring of the tank system

  Using the Blynk app to manually control the water level, be aware of sudden breakdowns in the water flow system, and remotely monitor and control actions such as monitoring the system's water level.



4. System Overview





5. Methodology

We can use various methods, tools, and technologies to develop a comprehensive water tank monitoring system, especially one that incorporates rainwater.

Methods:

1. **Water Level Monitoring:** Ultrasonic sensor.
2. **Water Presence Detection:** Water detection sensor.
3. **Soil Moisture Measurement:** Soil moisture sensor.
4. **Rain Detection:** Rain drop sensor.
5. **Water Pump Control:** 5V relay module for pump operation.

Tools:

1. **Hardware:**
   - **Sensors:** Ultrasonic sensor, Water detection sensor, Soil moisture sensor, Raindrop sensor.
   - **Microcontroller:** Node MCU esp32.
   - **Relay Module:** 5V 4-channel relay module.
   - **Water Pump:** 5V water pump.
   - **Jump Wires:** For making connections.
2. **Software:**
   - **Blynk App:** For creating a user interface and remote monitoring.
3. **Programming language :** C++/C

Technologies:

1. **Sensors:** Ultrasonic, water detection, soil moisture, raindrop.
2. **Microcontroller:** NodeMCU esp32.
3. **User Interface:** Blynk app.

Gantt Chart

ID	TASK NAME	WEEK											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Requirement Gathering												
2	Project Proposal												
3	Project Presentation												
4	System Designing												
5	Development												
6	Evaluating and Testing												
7	Final Presentation and Viva												

6. Evaluation Method

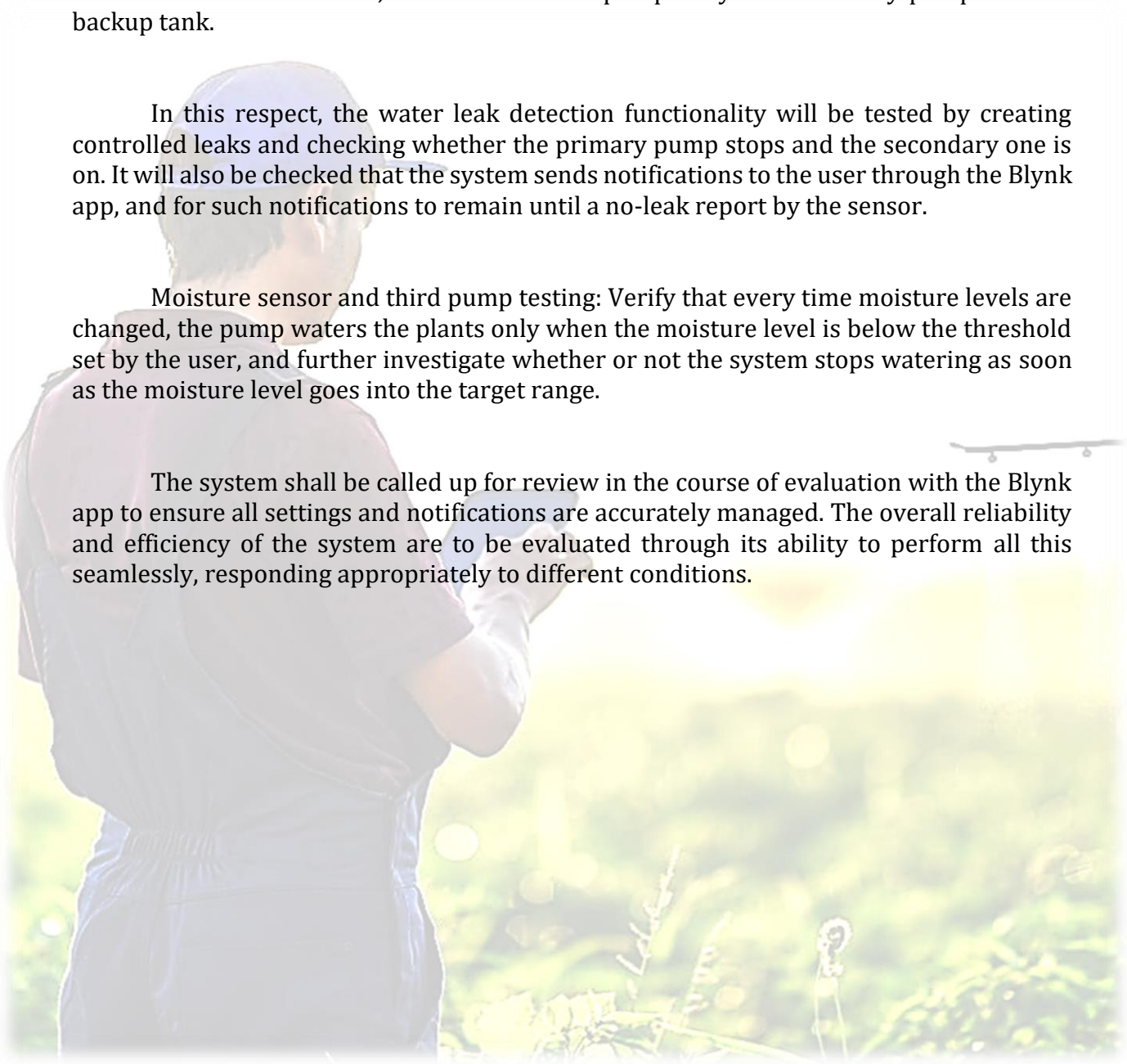
Testing and evaluation of the system will be carried out with a number of tests to ensure that everything is working as required. Testing of the rain detection system for accuracy will be done by simulating rain to check whether the primary pump stops the supply of water, and then later start again once the rain detection sensor indicates that it has stopped raining.

The next test will be for water level management. This is done by changing the water levels and checking on how the system responds to the variation. Be sure the water supply pump is only turned on when the water level is below the set threshold level, and when it is above threshold, excess waters are pumped by the secondary pump into the backup tank.

In this respect, the water leak detection functionality will be tested by creating controlled leaks and checking whether the primary pump stops and the secondary one is on. It will also be checked that the system sends notifications to the user through the Blynk app, and for such notifications to remain until a no-leak report by the sensor.

Moisture sensor and third pump testing: Verify that every time moisture levels are changed, the pump waters the plants only when the moisture level is below the threshold set by the user, and further investigate whether or not the system stops watering as soon as the moisture level goes into the target range.

The system shall be called up for review in the course of evaluation with the Blynk app to ensure all settings and notifications are accurately managed. The overall reliability and efficiency of the system are to be evaluated through its ability to perform all this seamlessly, responding appropriately to different conditions.



7. Budget

Hardware & Software

Hardware			
Name of Item	**Amount Required**	**The Price of One (Rs.)**	**Total Price (Rs.)**
Water detection Sensor	2	130.00	260.00
Node MCU esp32	1	1290.00	1290.00
5V 4-channel relay module	1	520.00	520.00
5V water pump	3	190.00	570.00
Soil moisture sensor	1	140.00	140.00
Ultra-sonic sensor	1	240.00	240.00
Breadboard	1	230.00	230.00
Breadboard 5V power supply module	1	250.00	250.00
Rain Drop sensor	1	160.00	160.00
Jump wire 120			460.00
Software			
Blynk app	1	1800.00	1800.00
TOTAL COST			**5920.00**

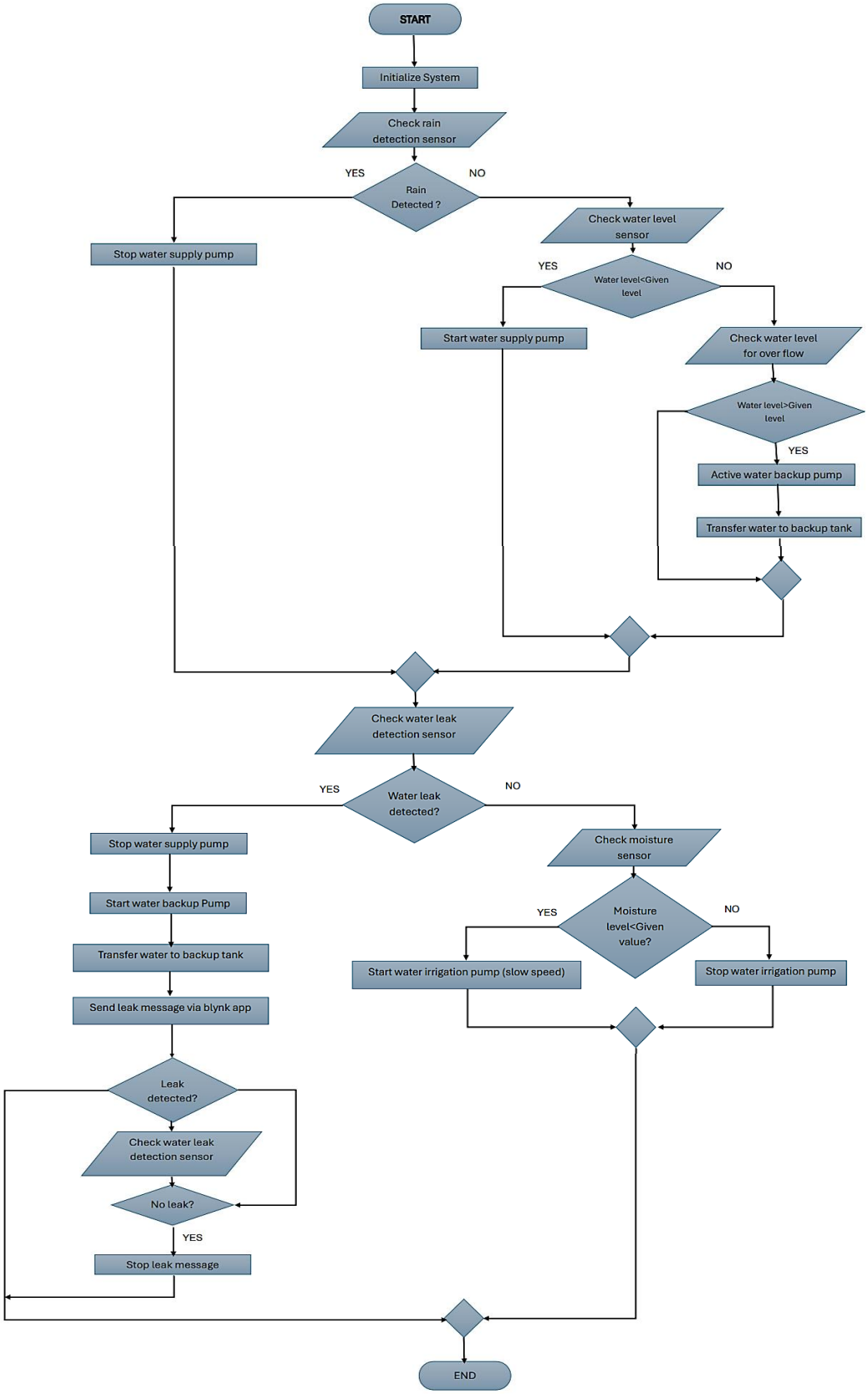
8. References

USDA's Inefficient Use of Irrigation Water: This report provides a comprehensive overview of the issue, including its impacts and potential solutions: https://efotg.sc.egov.usda.gov/references/public/AR/Excess_Water_Insufficient_Water_Inefficient_Use_of_Irrigation_Water.pdf

The Water Project: Water Scarcity and Agriculture: This article discusses the impact of water scarcity on agriculture and the role of irrigation management: https://thewaterproject.org/water-scarcity/water-scarcity-and-agriculture

ResearchGate: Irrigation management under water scarcity: This research paper delves deeper into irrigation management strategies in water-scarce regions: https://www.researchgate.net/publication/223843129_Irrigation_management_under_water_scarcity

Appendix


START
Initialize System
Check rain detection sensor
YES
Rain Detected ?
NO
Stop water supply pump
Check water level sensor
YES
Water level<Given level
NO
Start water supply pump
Check water level for over flow
Water level>Given level
YES
Active water backup pump
Transfer water to backup tank
Check water leak detection sensor
YES
Water leak detected?
NO
Stop water supply pump
Start water backup Pump
Transfer water to backup tank
Send leak message via blynk app
Leak detected?
Check water leak detection sensor
No leak?
YES
Stop leak message
Check moisture sensor
YES
Moisture level<Given value?
NO
Start water irrigation pump (slow speed)
Stop water irrigation pump
END