CPG NO. 85

IntelliGROW

SMART IRRIGATION AND FERTILIZATION SYSTEM

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Growing Intelligence,
Cultivating Success...

Under the Guidance of
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PROJECT OVERVIEW

The smart irrigation and fertilization system is an innovative project that aims to enhance crop production while reducing water and fertilizer usage in agriculture.

The project involves the integration of advanced sensors and algorithms to provide farmers with real-time insights and alerts about their crops' health and needs.

The system aims to provide farmers with a more sustainable, profitable, and efficient way of agriculture.

The system will be accessible via a user-friendly mobile application, allowing farmers to monitor their crops anytime remotely. The mobile app will provide real-time alerts for critical plant health conditions and automatically optimize soil nutrient and moisture levels.

PROJECT SCOPE

- **Real-time Monitoring:** Implement sensors to continuously monitor plant growth, soil nutrient levels, and moisture content at regular intervals.

- **Data Transmission and Engaging Dashboard:** Pioneering a user-friendly dashboard, transmitting the gathered data instantly, empowering users with a captivating visual representation of their plant's journey, fostering a deeper connection between humans and nature.

- **Intelligent Nutrient and Water Supply:** Develop ingenious mechanisms that tap into the power of IOT, enabling the system to analyze the monitored data and autonomously supply plants with precise nutrients and water, ensuring their flourishing health.

- **Excessive Moisture Detection:** Incorporate sensors to detect excessive soil moisture levels and prevent root damage caused by waterlogging.

- **Water Conservation:** Design and integrate a reservoir system to collect and store excess water, thereby minimizing wastage and enabling future use during dry periods.

PROBLEM DEFINITION

- Small rooted plants require precise moisture and nutrient levels, but traditional methods of monitoring and control are time-consuming and imprecise. Additionally, waterlogging can harm plants and waste resources.

- An automated irrigation and fertilization system monitors and controls moisture and nutrient levels. It also includes a mechanism for storing excess water in the reservoir during waterlogging.

OBJECTIVES

- Develop a smart irrigation system to monitor soil conditions, plant health, and environmental factors such as temperature and humidity.

- Automate the system to predict the optimal timing for irrigation and fertilization using real-time data analysis.

- Creation of a user-friendly dashboard that allows farmers to visualize the crop data remotely.

- Utilization of subsurface drainage system to drain out excess water by deploying perforated pipes with filters.

LITERATURE SURVEY

- Savani, V., Mecwan, A., Patel, J.G., & Bhatasana, P.M. (2019). Design and Development of Cost effective Automatic Fertilization System for Small Scale Indian Farm. International Journal of Electronics and Telecommunications.

- Prabha, R., Sinitambirivoutin, E., Passelaigue, F., & Ramesh, M.V. (2018). Design and Development of an IoT Based Smart Irrigation and Fertilization System for Chilli Farming. 2018 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), 1-7.

- Ghosh, S., Sayyed, S.B., Wani, K., Mhatre, M.P., & Hingoli Wala, H.A. (2016). Smart irrigation: A smart drip irrigation system using cloud, android and data mining. 2016 IEEE International Conference on Advances in Electronics, Communication and Computer Technology (ICAECCT).

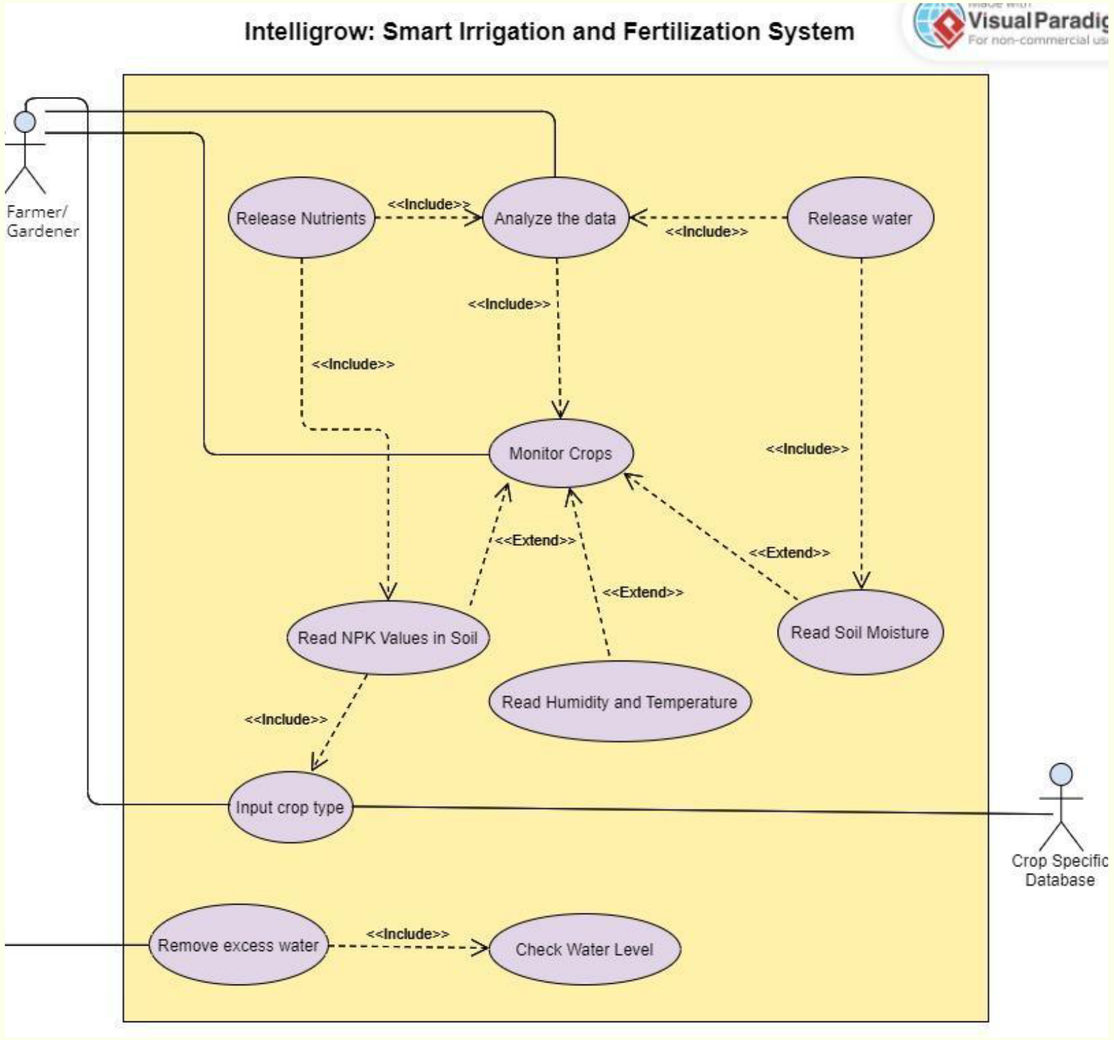
- Roy, S.K., Misra, S., Raghuwanshi, N.S., & Das, S.K. (2020). AgriSens: IoT-Based Dynamic Irrigation Scheduling System for Water Management of Irrigated Crops. IEEE Internet of Things Journal, 8, 5023-5030.

BUT WHY?

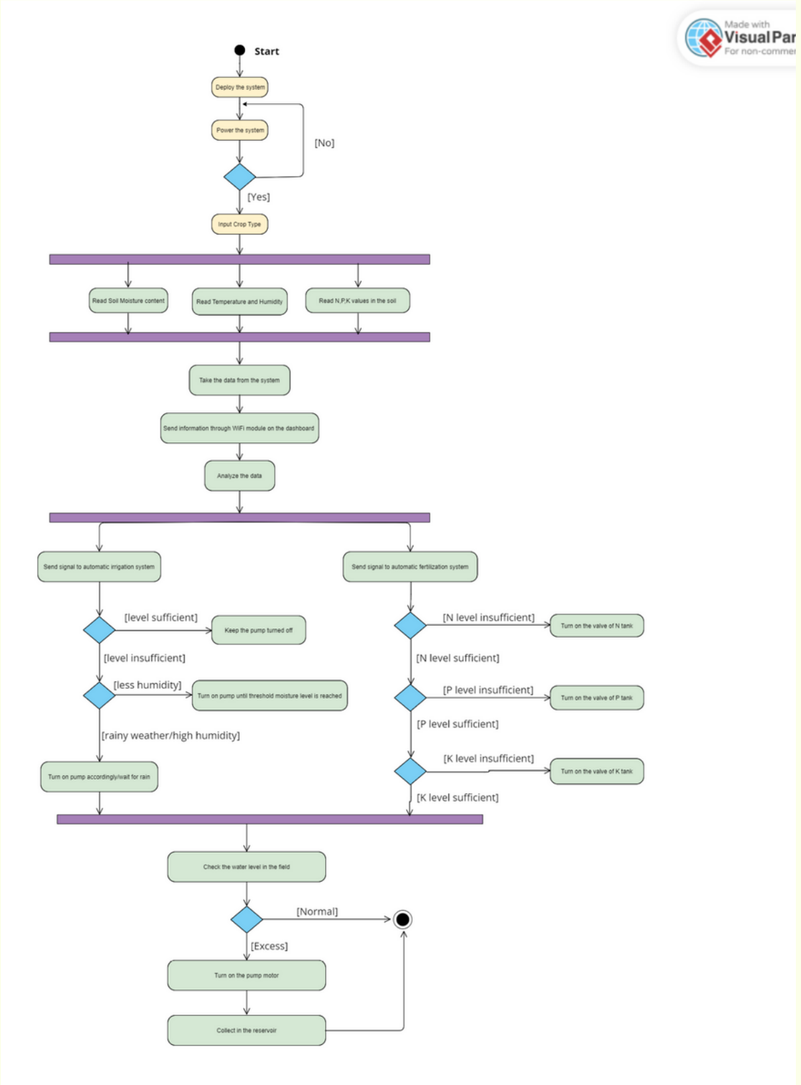
NEED ANALYSIS

- To meet the growing demand for food production and limited resources.
- To solve the challenges faced in traditional agriculture as farmers can make data-driven decisions.
- To contribute to the nation's food security by enhancing crop yield, minimizing crop wastage, and limiting the amount of fertilizer runoff.
- To help mitigate the impact of labor shortages by automating the irrigation and fertilization processes.
- To prevent waterlogging through subsurface drainage system.

UML DIAGRAMS



USE CASE DIAGRAM



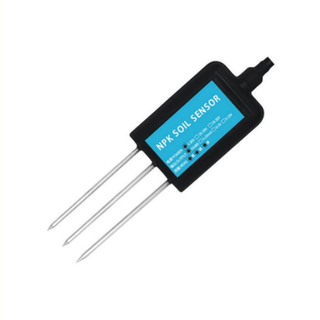
ACTIVITY DIAGRAM

PROJECT REQUIREMENTS: TOOLS

- SOIL MOISTURE SENSOR

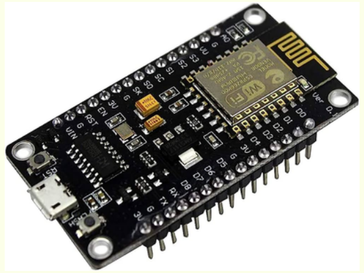
- TEMPERATURE AND HUMIDITY SENSOR

- WATER LEVEL SENSOR



- RS485 TTL CONVERTER

- ARDUINO UNO



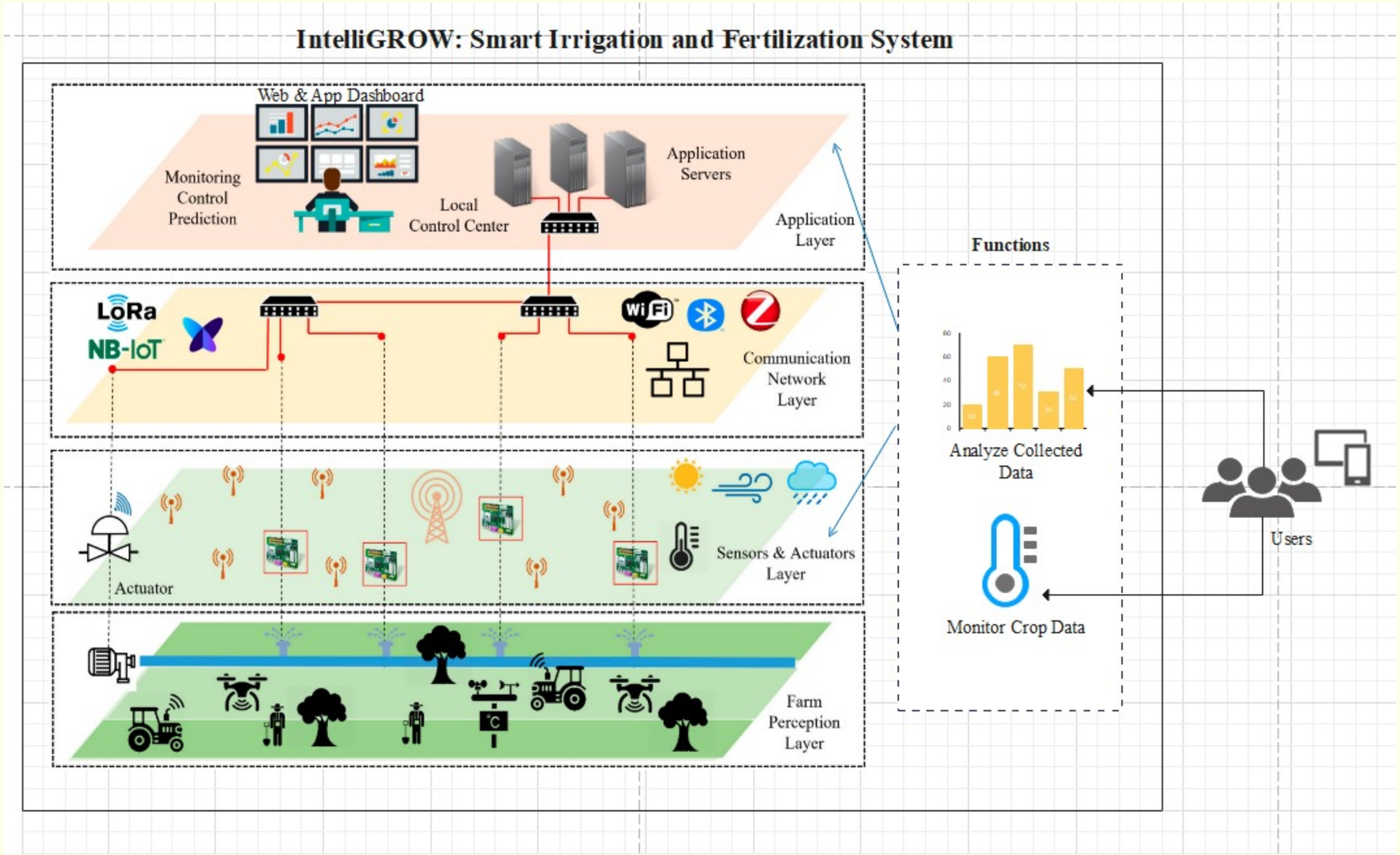
- SOIL NPK SENSOR
- MINI WATER PUMP
- ESP8266 WIFI MODULE

PROJECT REQUIREMENTS:

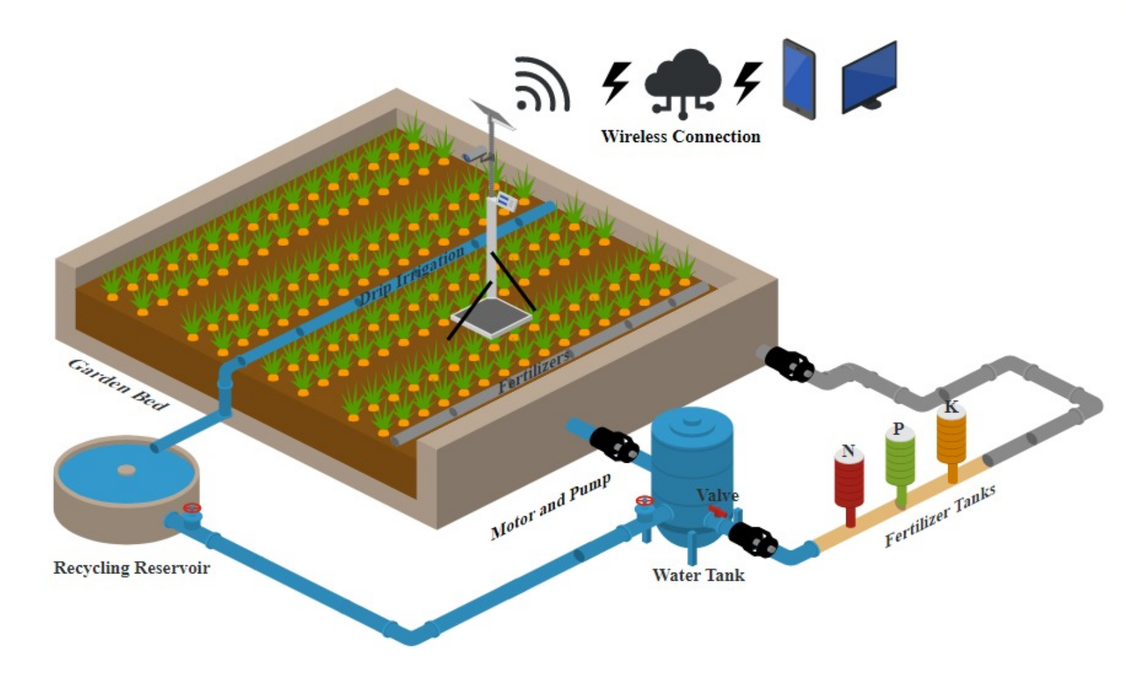
PLATFORMS USED

- BLYNK IOT - An IoT analytics platform service that allows you to aggregate, visualize, and analyze live data streams in the cloud via interactive dashboards.
- CANVA - It is a free-to-use online graphic designing tool.
- FRITZING - An electronics design and prototyping platform.
- ARDUINO IDE - The Arduino Integrated Development Environment connects to the Arduino boards to upload programs and communicate with them.

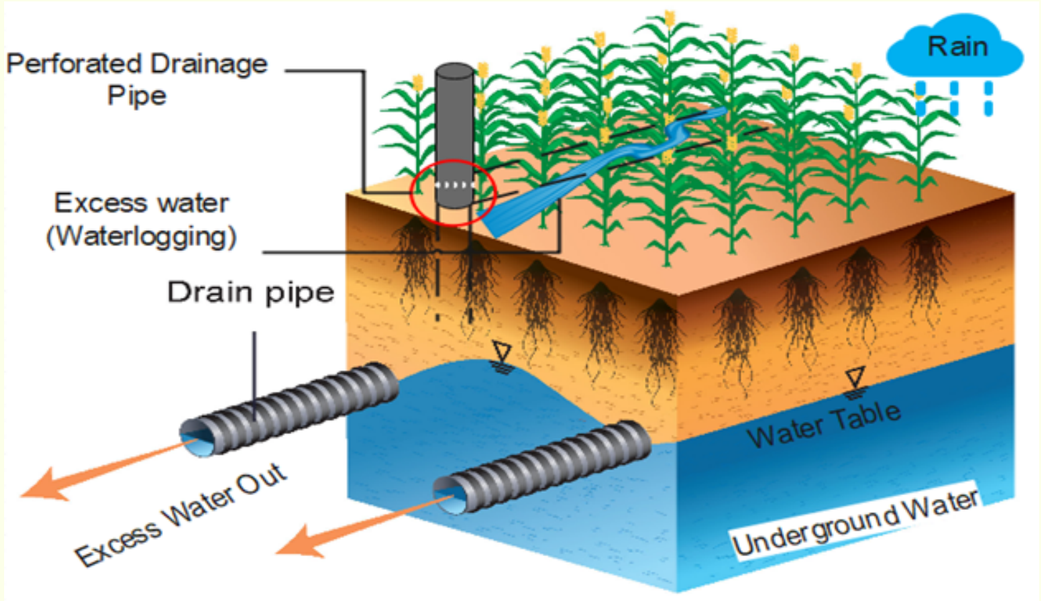
DETAILED TIER ARCHITECTURE



PROTOTYPE MODEL

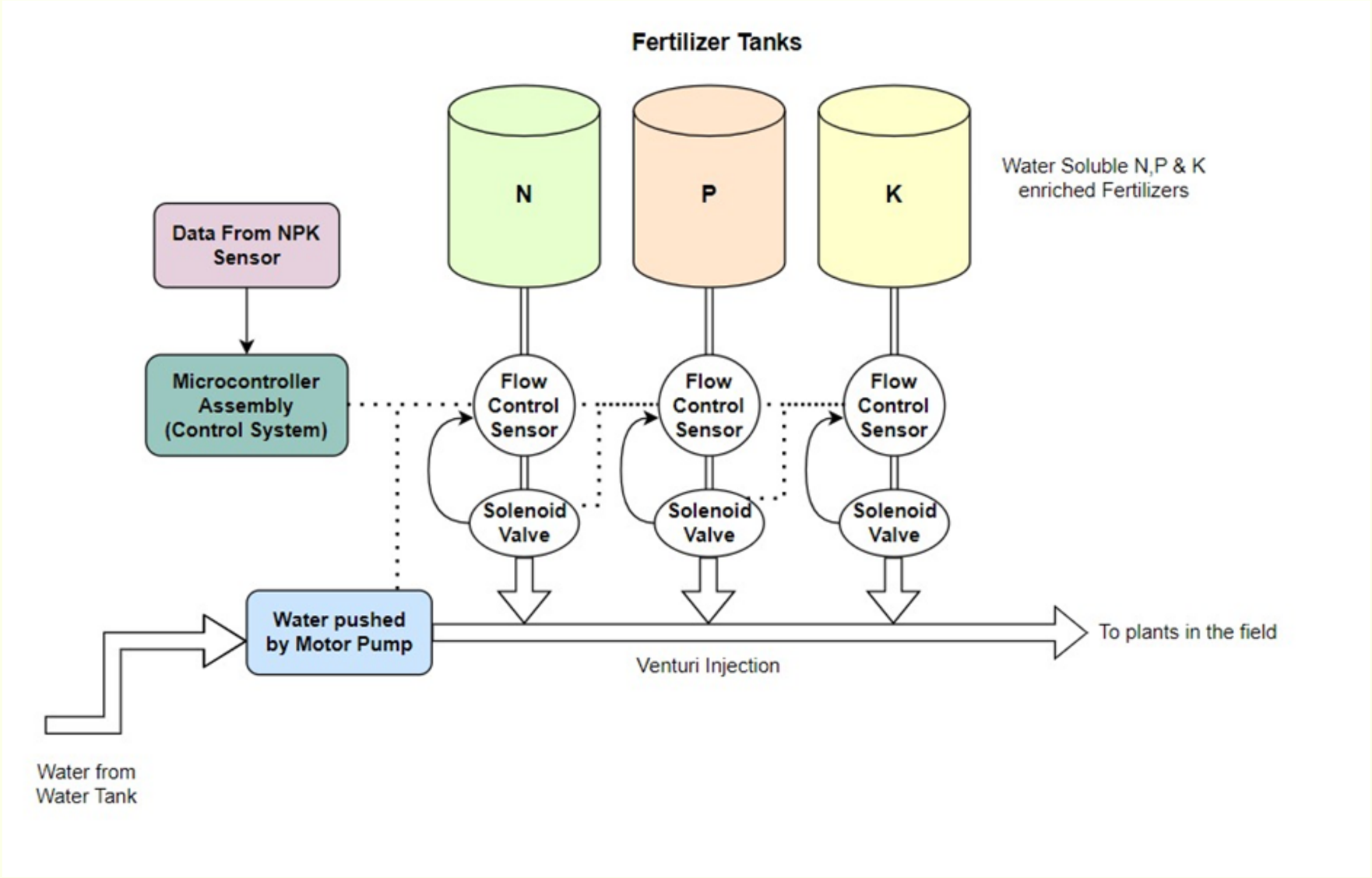


Overall Prototype Model

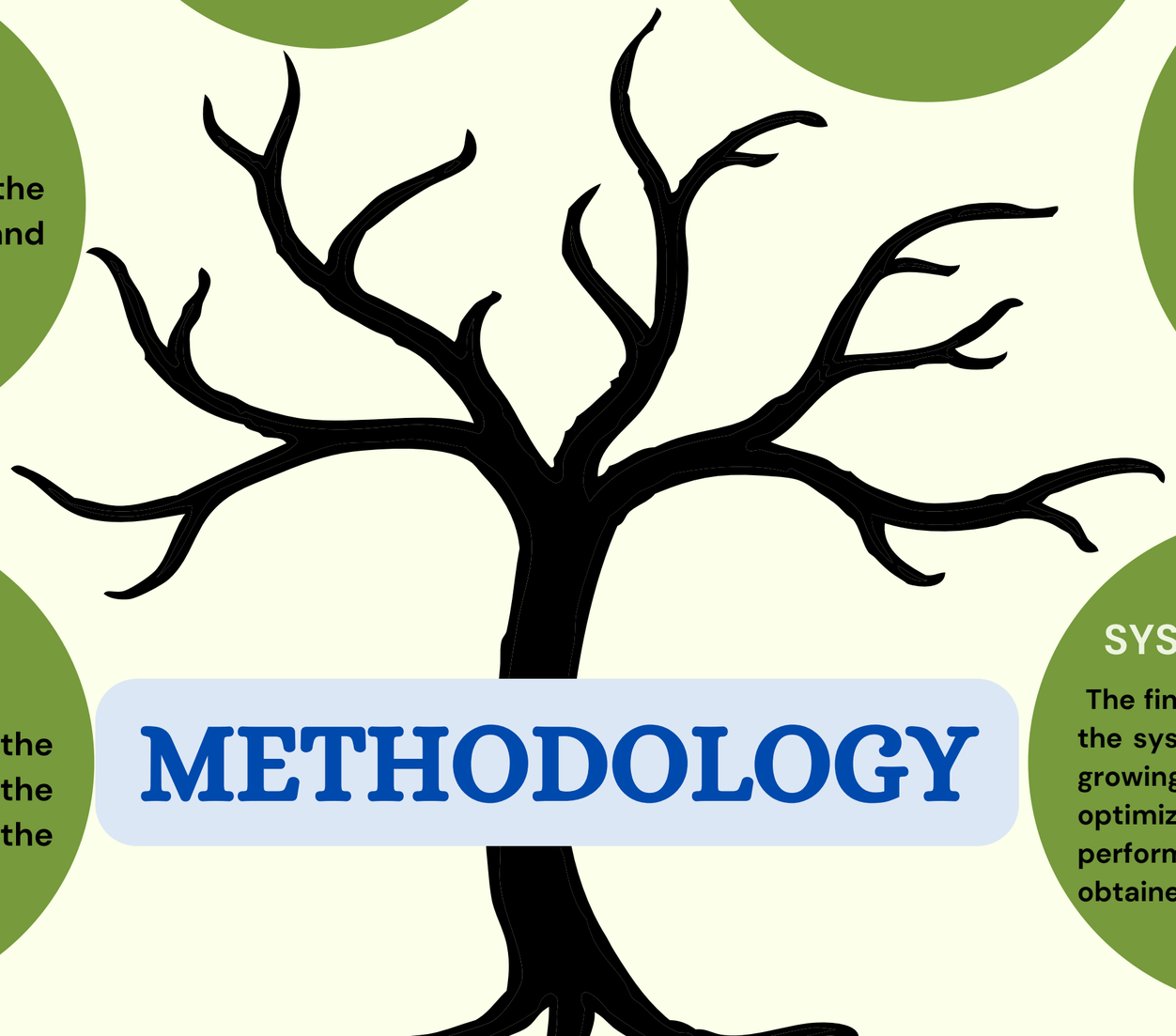


Subsurface Drainage System

PROPOSED SYSTEM DESIGN



METHODOLOGY



MODEL TRAINING

The dispenser system will be trained with sensor data and other sources to optimize crop irrigation schedules.

MOBILE APPLICATION

A mobile-based application will be developed for the system to provide ease to farmers

HARDWARE DEVELOPMENT

It involves deploying the sensors on the field and testing them.

HARDWARE & SOFTWARE INTEGRATION

The finalized hardware architecture will be integrated with the developed web application via a wireless WiFi module.

REQUIREMENT GATHERING

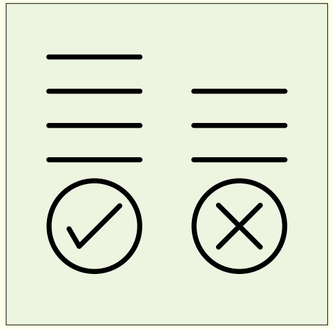
It involves defining the requirements for the system and selecting the required sensors.

SYSTEM TESTING

The final step is to field-test the system under real-world growing conditions and optimize it based on the performance and feedback obtained during field testing.

COST ANALYSIS

Component	Price(in ₹)
Soil Moisture Sensor	100
Temp and Humidity Sensor	150
Flow Sensor Module	450
Water Level Sensor(for tank)	230
Soil NPK Sensor	5500
Mini Water Pump	400
ESP32 WiFi Module	450
ESP8266 WiFi Module	300
Connecting Wires	80
Breadboard	80
LM2596 Buck Converter	50
4 Channel Relay Module	200
RS485 TTL Converter	150
12 Volt Battery	250
Miscellaneous Expenses	1500
Total Cost	**9890**



EFFICIENT PLANT GROWTH

Monitoring of moisture, temperature, and nutrient levels for efficient plant growth and better yield.

WATER CONSERVATION

Remove excess water from the soil and store it in a tank.

PLANT NUTRITION MANAGEMENT

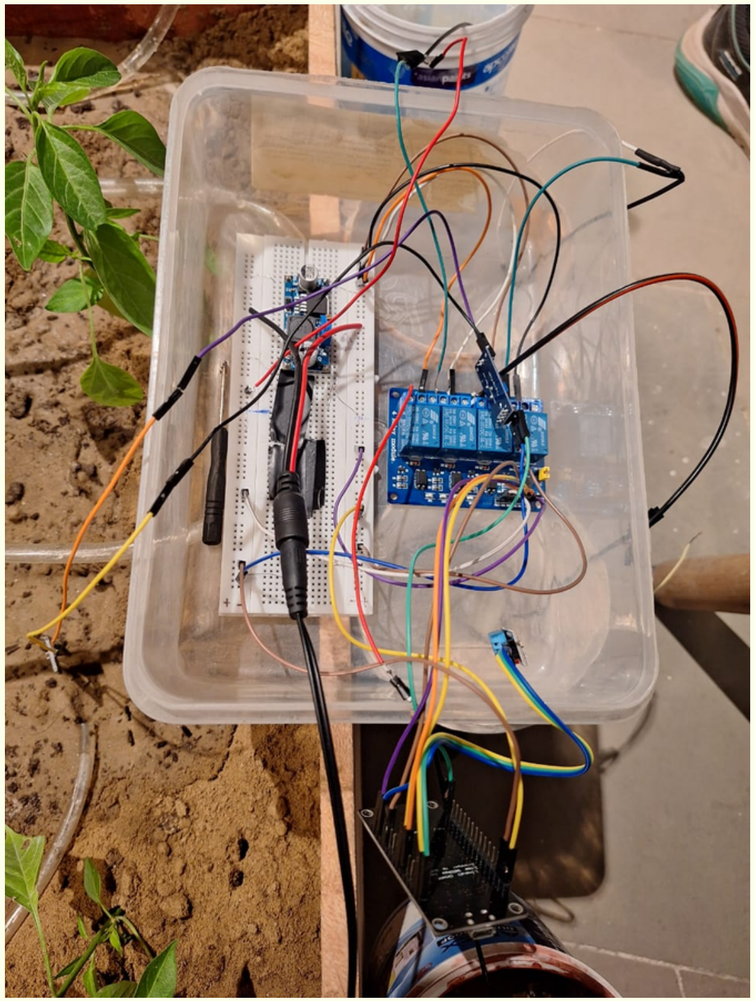
The use of NPK sensors can help ensure that plants receive the right amount of nutrients.

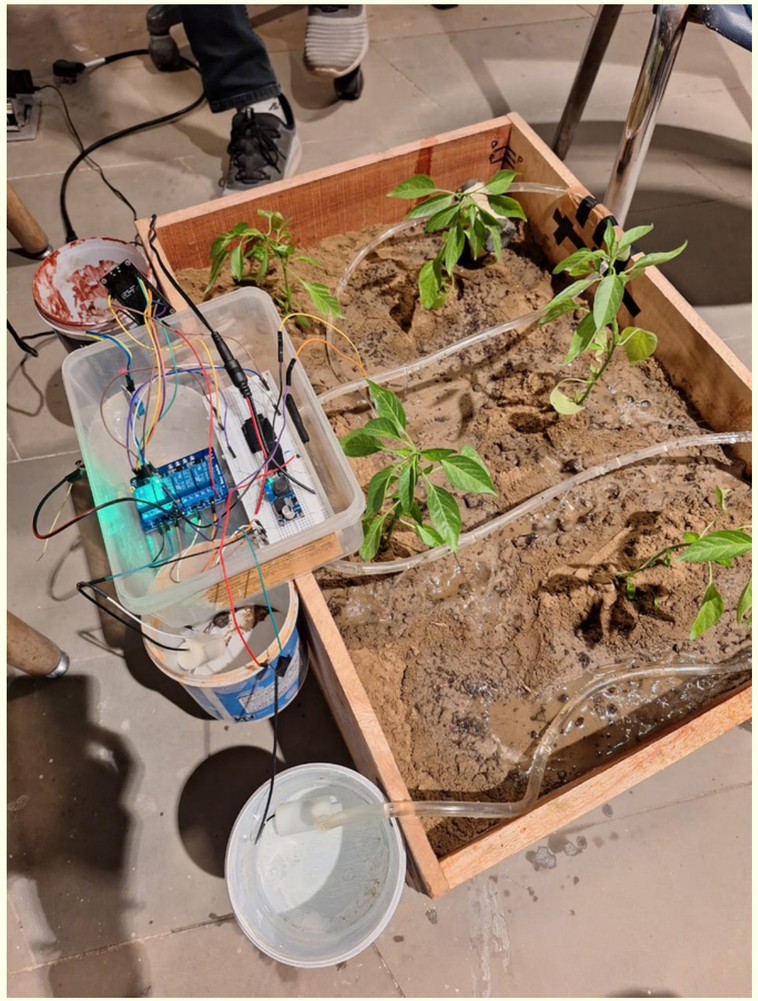
REDUCED MANPOWER AND COST

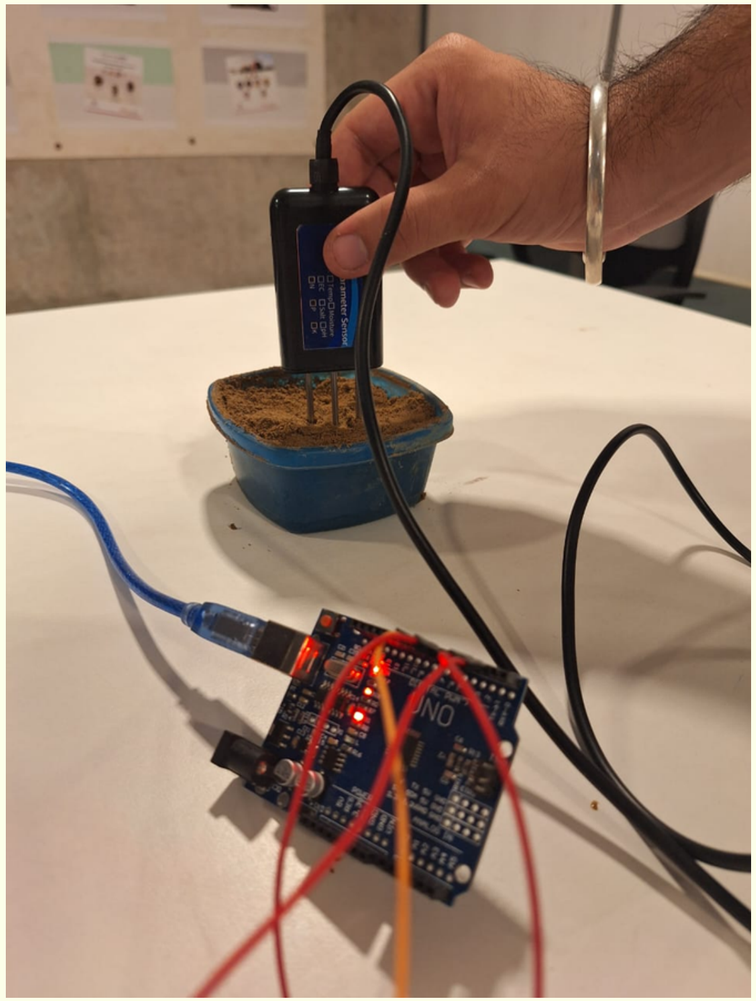
Reduce the amount of labor required for plant care, allowing farmers to focus on other tasks.

PROJECT OUTCOMES

HARDWARE IMPLEMENTATION

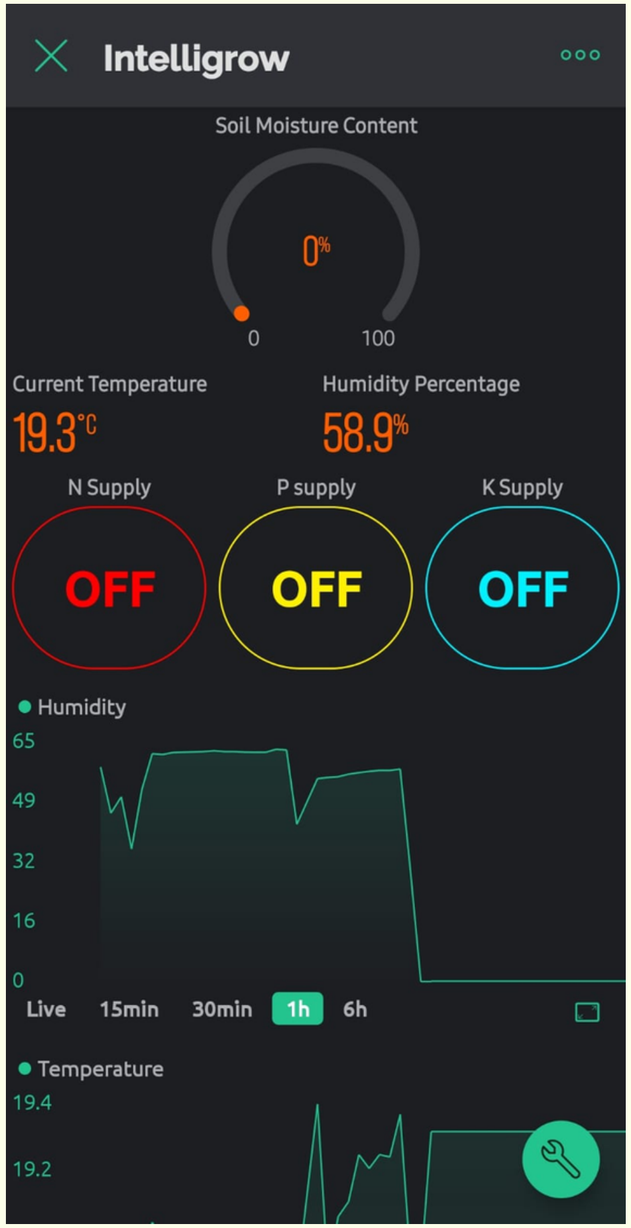


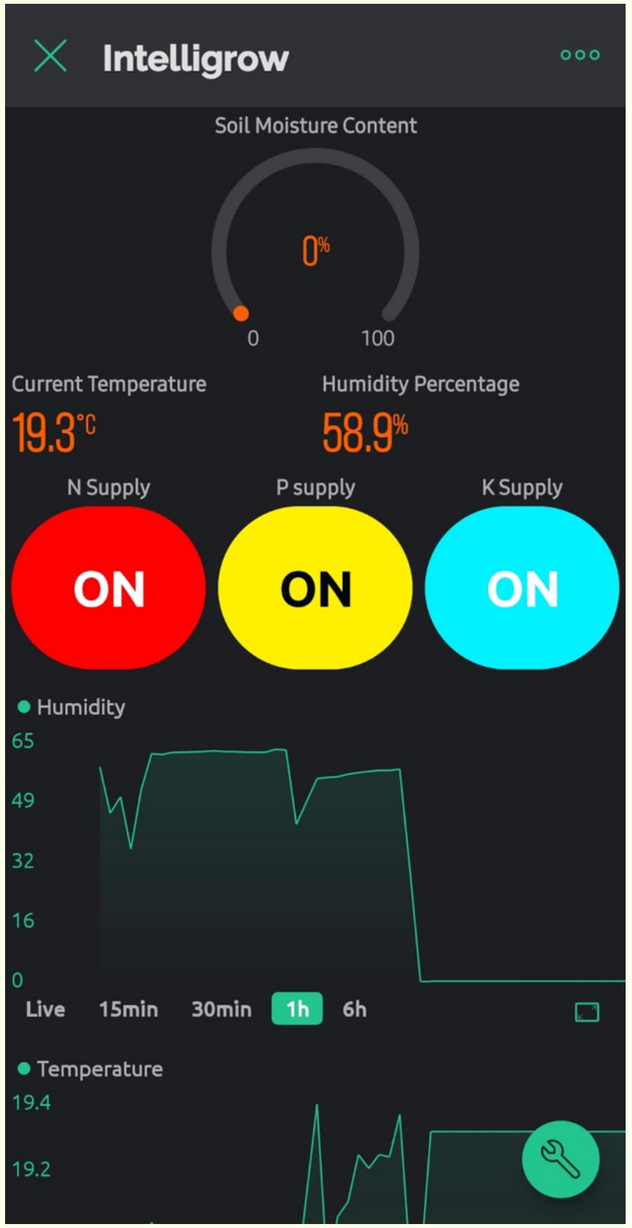


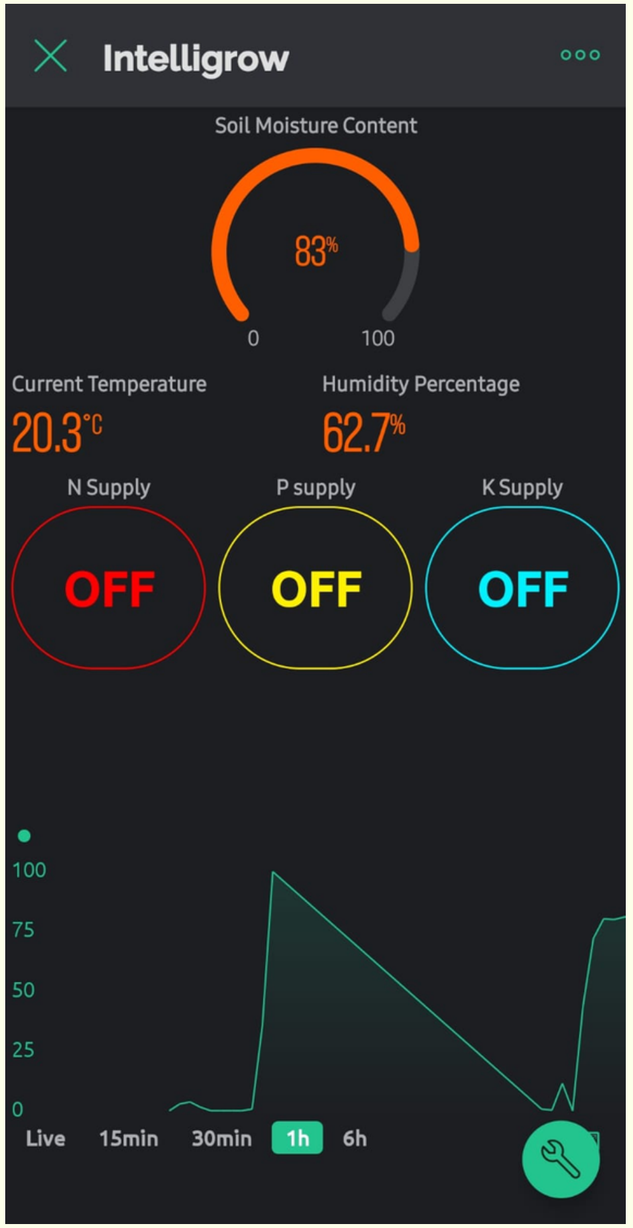


HARDWARE IMPLEMENTATION

DASHBOARD INTERFACE

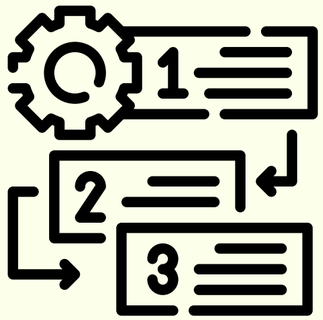






INDIVIDUAL ROLES

	Group members	Roles
1.	Satvik Maheshwari (102003283)	Software Development and Testing
2.	Romil Gupta (102003290)	Hardware Implementation, Research & Analysis
3.	Vardaan Khosla (102003295)	Hardware Implementation, Data Analysis & Visualization
4.	Nishant Sharma (102003300)	Project Planning, Research & Data Analysis
5.	Sundaram Srivastava (102183036)	System Testing, Hardware Implementation



WORK PLAN

Sr. No.	Activity	Month	January					February				March					April				May					June				July					August					September				October					November				December		
		Week no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1	Problem Identification	Plan																																																					
		Actual																																																					
2	Project Planning & Research Analysis	Plan																																																					
		Actual																																																					
3	Requirement Analysis	Plan																																																					
		Actual																																																					
4	Requirement Gathering & Sensor Testing	Plan																																																				
		Actual																																																					
5	System Design & Architecture	Plan																																																					
		Actual																																																					
6	System Development (HW & SW)	Plan																																																				
		Actual																																																					
7	Hardware-Software Integration	Plan																																																				
		Actual																																																					
8	System Execution & Deployment	Plan																																																				
		Actual																																																					
9	Testing	Plan																																																				
		Actual																																																					
10	Final Report & Presentation	Plan																																																				
		Actual																																																					

THANK YOU

WE'RE NOW OPEN TO QUESTIONS