

# Smart Plant Watering System

## 1 Executive summary

It is a system that helps determine when to and automates the watering of one's plants based on their moisture levels, as well as send the data to an API. From said API, the user should be able to turn on the system to water the plants. This is beneficial because it is common problem to forget or be uncertain when plants should be watered.

## 2 Background

Our proposed product is an innovative watering system for home gardens, greenhouses, and small-scale agricultural setups. This system combines hardware and software to create an automated watering solution that monitors the humidity levels in the soil and waters the plants accordingly.

The intelligent watering system relates to the existing products in the market that use traditional watering methods, such as manual watering or timer-based watering systems. However, the proposed product offers several advantages over these methods. It eliminates manual intervention, saves water by only watering when necessary, and ensures consistent and optimal plant watering.

The intelligent watering system interests individuals and businesses that want to maintain healthy plants with minimal effort and water usage. It is ideal for busy homeowners, plant enthusiasts, urban gardeners, and small-scale farmers who want to optimize crop yield and reduce water waste.

The purpose of the proposed product is to address the common problem of over or under-watering plants, which can lead to plant damage, stunted growth, and reduced crop yield. The intelligent watering system is designed to provide an automated and optimized watering solution that considers each plant's specific moisture requirements. By doing so, it ensures healthy and thriving plants while also promoting sustainable water usage.

## 3 Vision

The proposed solution is an innovative watering system that aims to provide a sustainable and efficient way of watering plants. The problem that this product address is the inconsistency and inefficiency of manual watering methods. Many people tend to over-water or under-water their plants, leading to plant damage or even death. This intelligent irrigation system will help users to water their plants accurately and effectively based on the amount of moisture present in the soil.

In addition to the functional benefits, the intelligent watering system also incorporates sustainability features. By providing an accurate and efficient way of watering plants, this system can help to reduce water waste and promote sustainable plant growth. Furthermore, using a web server interface allows for remote control of the system, reducing the need for physical checks and adjustments, which can save time and resources.

The high-level features of the intelligent watering system include a moisture sensor that detects the amount of moisture in the soil, a relay module that controls the water pump, and a web server interface that enables remote control of the system. Overall, this project aims to provide an innovative and sustainable solution to the common problem of watering plants.

### 3.1 Business opportunity

Compared to existing watering systems, our product has several significant advantages.

First, our intelligent plant watering system can save plenty of water from daily routine watering. Our system also fulfils the requirement of UN sustainable goal number 6.

Second, our intelligent plant watering system can provide a better solution for people who want to grow a plant at home but are worried about its difficulty. The user of our system can monitor their plant information and do many things, such as water their plant by simply touching a few buttons on their phone. Our new system may encourage more people to buy a potted plant, which makes our neighbourhood more "green". This also fulfilled the requirement of UN sustainable goal number 11.

Finally, our intelligent plant watering system is not expensive to manufacture. Because of its low price, the physical part of the system can be integrated to a bundle and sold as an extension of a pot of plants to the customers. Therefore our system can be profitable.

In conclusion: saving water, being simple to use and having a huge customer base, and being cheap to manufacture are our business opportunities.

### 3.2 Problem statement

The problem of inefficient and inconsistent manual watering methods affects plant owners and the environment, the impact of which is plant damage, wasted water, and unsustainable plant growth. A successful solution would be a smart watering system that accurately measures the moisture in the soil, delivers the appropriate amount of water to plants, promotes sustainable plant growth, and allows for remote control of the system. Thus reducing the need for physical checks and adjustments.

### 3.3 Product positioning

For homeowners, plant enthusiasts, and small-scale farmers who want a semi-automated and sustainable watering solution, the Smart Watering System is a state-of-the-art product that offers optimized and consistent watering for plants. Unlike traditional watering methods, our product measures soil humidity levels and waters plants only when necessary, reducing water waste and promoting healthy plant growth. The Smart Watering System provides a hassle-free and efficient way of maintaining plants, making it ideal for busy individuals who want to ensure the well-being of their plants without the need for manual intervention.

### 3.4 Product features

Smart plant watering system includes the following features:

- Moisture sensor monitoring humidity
- Remote motor to re-hydrate the plant
- LEDs to indicate the current hydration state
- Webb app to upload data from measurements every 10 min
- Access control with a user authentication mechanism

## 4 Project goal and execution plan

### 4.1 Goal

The main goal for this project is to develop a working system which will water plants automatically as well as on-demand through an API, while also displaying humidity levels on said API. The project aims to finish development at the end of week 19. However, additional features might be added if time allows, such as displaying more information and adjusting certain parameters on the API.

### 4.2 Execution plan

- User story 1: As a homeowner, I want the Smart Watering System to automatically water my plants based on their humidity levels so that I can ensure their health and growth.
- Acceptance criteria 1: Given a plant with a Smart Watering System installed, when the soil humidity level drops below a predefined threshold, then the system should automatically water the plant until the humidity level reaches the optimal range.
- User story 2: As a plant enthusiast, I want to be able to monitor the soil humidity levels of my plants remotely through a mobile app, so that I can track their progress and make adjustments as needed.
- Acceptance criteria 2: Given a mobile app connected to a Smart Watering System, when the user opens the app and selects a plant, then the app should display the current soil humidity level of the plant and allow the user to adjust the watering settings as desired.
- User story 3: As a small-scale farmer, I want to be able to control multiple Smart Watering Systems remotely through a centralized platform so that I can efficiently manage my crops and save time.
- Acceptance criteria 3: Given a centralized platform connected to multiple Smart Watering Systems, when the farmer logs into the platform and selects a group of plants, then the platform should display the current soil humidity levels of each plant and allow the farmer to adjust the watering settings for each plant individually or as a group.

### 4.3 Resources

Item	Quantity
ESP32 Wrover-Dev board	1
RGB LED	3
dirt Humidity/moist sensor	1
Electric motor	1
PVC 8mm	1
water pump small	1