POLITEKNIK MALAYSIA

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# TITLE: AUTOMATIC WATERING PLANTS.

## DEPARTMENT: ELECTRICAL ENGINEERING (COMMUNICATION)

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**NO. MATRIC :** 08DEP17F1149

A project report submitted in partial fulfilment of the requirements for the award of diploma in electrical engineering communication.

Faculty of Electrical Engineering

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# DECLARATION

This Final Year Project is presented in partial fulfilment of the requirements for a diploma of electronic engineering communication. It is entirely our own work and has not been submitted to any University or higher education institution, or for any other academic award in this Polytechnic. This report has been made by me and the work has been fully acknowledged and fully referenced.

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# APPROVAL FOR SUBMISSION

I certify that this project report "AUTOMATIC WATERING PLANTS" was prepared by Nurnadia Binti Adzhar has met the required for submission in partial fulfilment of the requirement for the award in Diploma of Electrical Engineering Communication at Polytechnic Sultan Salahuddin Abdul Aziz Shah.

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# DEDICATION

I dedicated this project to all those humble beings who have guided me in any way to become what I am today. Whose scarifies seeded my success, specially dedicated to my beloved mother, father, teachers who have felt my pain beyond us and showered us win never ending prayers and support. I deem them as a divine source of inspiration.

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# Abstract

Proper watering is oxygen for the plants and trees which are grown in containers. Many people unsure how to take good care of an expensive plants or trees like Bonsai because of improper timing or lack of watering. An automated system which is capable of perceiving the proper situation of watering plants can be convenient in this regard. In this paper, a micro-controller board Arduino has been used, which has an ATMEGA 328p chip in it. A couple of sensors are integrated into it for detecting daylight, moisture of soil and water level in the plant's pot. A program has been set to the Arduino to take the norm from the sensor, comparing the retrieved value with our predefined standard threshold and turn on or off the water pump according to the plants need. A message alert system has been set to notify the owner if there is any problem in supplying water from the main source.

# Acknowledgments

Without the unconditional love of my parents and  to my supervisor, I  would not be where I am today and this project wouldn't be possible. Thank you for all of your continuous support and guidance in all of my endeavors. Thank you for encouraging me to pursue my goals within the agriculture industry and thank you for allowing me to be apart of the irrigation transition process. I hold the up most respect and deepest gratitude for each of you, from the bottom of my heart, thank you.

# CHEPTER 1
# INTRODUCTION OF THE PROJECT
# PROJECT NAME : AUTOMATED EXPEDIENT WATERING SYSTEM FOR SMALL PLANTS.

## Introduction

The process of producing foods by plants or trees is called Photosynthesis. During photosynthesis, plants and their organisms use Carbon Dioxide from Air and Water from soil or other source in the presence of light and produce Sugar and Oxygen. The chemical reaction occurs in photosynthesis is:

$6CO2 + 6H2O \rightarrow C6H12O6 + 6O2$
Carbon dioxide Water Sugar Oxygen

The core elements of photosynthesis are light, water and carbon dioxide, which they need together during photosynthesis. Plants can get the carbon dioxide anytime as it can be found from the air and also daylight can be provided if it is kept in the right place. Most of the time for the lacking of water, the plants cannot raise well and become morbid. On the other hand, supply of excessive water at a time can result a venturesome effect on the plants especially the sensitive trees like bonsai. Such trees also need timely water supply for the perfect growth. That means, for the perfect growth, water is needed in proper time along with proper quantity. Currently there are some micro-controller based plant watering project available, but the problem with the projects are, they don't have a particular time for watering. But there are some sensitive and expensive plants which need water at the particular time and unusual watering could cause them to death. Moreover, the best time for watering is early morning, while the environment is cool. This allows water to go into deep and reach the roots of the plants without too much excess water lost to vaporization. Watering at night could cause damage in the base of the plant and could also be responsible for fungal problems such as, powdery mildew or sooty mold, which is very harmful for plants. Besides, the existing works do not have the feature to track any leakage in water supply or identify the shortage in the water source. As a result, any implausible situation can be created in absence of person at home.

To extrude all of these problems, we have propounded a system for automated watering plants to make sure that the plants are getting water when its moisture of the soil is below a threshold value and sunlight is available. The system has also feature of preventing over watering by measuring water level height, maintaining continuous water supply so that the plants never gets de-moisturized and notify the owner by sending a particular message about the leakage in water supply or lack of water in the main water source.

## 1.1 Project Background

Plants are a pleasing home decor for those longing for greener interior, it can be a creative decorating ideas for homes too. Besides, growing plants in indoor spaces naturally help purify the air human breath and also acts as little oxygen supplier which is beneficial to human being. It is proven in a study by NASA and the Associated Landscape Contractors of America (ALCA) (Johnson, 1989).

However, most people faced problem in keeping their plant healthy and alive. According to some research, people often tend to forget to nurture their plant(s), between daily activities (Sanberg, 2012). The plant need to be watered with an adequate amount to keep them fertile. The previous research said that, the principal environmental requirements for plant growth include adequate space for root and canopy development, sufficient light, water, oxygen, carbon dioxide, and mineral elements, and temperature suitable for essential physiologic processes (Iles, 2001). Therefore, watering is an important activity in plant care. Each plant needs vary adequate quantity of water because too much water can suffocate plant roots and too little water causes growth to become erratic and stunted.

## 1.2 Statement of Problem

Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and re vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. When a zone comes on, the water flows through the lateral lines and ultimately ends up at the irrigation emitter (drip) or sprinkler heads. Many sprinklers have pipe thread inlets on the bottom of them which allows a fitting and the pipe to be attached to them. The sprinklers are usually installed with the top of the head flush with the ground surface. When the water is pressurized, the head will pop up out of the ground and water the desired area until the valve closes and shuts off that zone. Once there is no more water pressure in the lateral line, the sprinkler head will retract back into the ground. Emitters are generally laid on the soil surface or buried a few inches to reduce evaporation losses.

Healthy plants can transpire a lot of water, resulting in an increase in the humidity of the greenhouse air. A high relative humidity (above 80-85%) should be avoided because it can increase the incidence of disease and reduce plant transpiration. Sufficient venting or successive heating and venting can prevent condensation on plants surfaces and the greenhouse structure. The use of cooling systems during the warmer summer months increases the greenhouse air humidity. During periods with warm and humid outdoor conditions, humidity control inside the greenhouse can be a challenge. Greenhouses located in dry, dessert environments benefit greatly from evaporative cooling systems because large amounts of water can be evaporated into the incoming air, resulting in significant temperature drops.

Since the relative humidity alone does not tell us anything about the absolute water holding capacity of air, a different measurement is sometime used to describe the absolute moisture status of the soil. The vapor pressure deficit is a measure of the difference between the amount of moisture the air contains at a given moment and the amount of moisture it can hold at that temperature when the air would be saturated. Pressure deficit measurement can tell us how easy it is for plants to transpire: higher values stimulate transpiration (but too high can cause wilting), and lower values inhibit transpiration and can lead to condensation on leaf and greenhouse surfaces.

In the mid 20th century, the advent of diesel and electric motors led to systems that could pump groundwater out of major aquifers faster than drainage basins could refill them. This can lead to permanent loss of aquifer capacity, decreased water quality, ground subsidence, and other problems.

Apart from all these problems and failures, there has been a considerable evolution in the methods to perform irrigation with the help of technology. The application of technology in the areas of irrigation has proven to be of great help as they deliver efficiency and accuracy.

## 1.3 Research Objectives

The major objectives of the present work are;

- The system support water management decision, which determines the controlling time for the process and monitoring the whole system through Wi-Fi module apps Blynk.
- The system continuously monitors the water level in the tank and provide accurate amount of water required to the plant or tree(crop).
- The system checks the temperature, humidity and dew point so as to forecast the weather condition.
- Low cost and effective with less power consumption using sensors for remote monitoring and controlling devices which are controlling using a Wi-Fi module using apps Blynk.

### 1.3.1 Function.

The Moisture sensor is used to measure the water content of soil. When the soil is having water shortage, the module output is at high level. This sensor reminds the user to water their plants and also monitors the moisture content of soil.
It has been widely used in agriculture, land irrigation and botanical gardening.

### 1.3.2 Benefits.

- Ability to read soil voluemetric water content directly.
- Low cost.
- Continuous measurements at the same location.

## 1.4 Research Question

**This study will answer all the following research question:**

I. What is solution to prevent climate change?
II. How to make tree conservation ?
III. How to take good care of an expensive plants or trees like Bonsai?

## 1.5 Scopes of Project

This project is an improvement of conventional method of watering plants to the auto watering system. The auto watering system development is divided into software and hardware implementation and the development of this system will cover these areas:

a) Arduino Uno Board and The Arduino programming language
b) The sensor system
c) The output system

## 1.6 The Definition of the important terms

**Drip Irrigation**: "a system of crop irrigation involving the controlled delivery of water directly to individual plants through a network of tubes or pipes (Dictionary)".

**Micro-Sprinkler Irrigation:** "Micro-irrigation" means the application of small quantities of water on or below the soil surface as drops or tiny streams of spray through emitter or applicators placed along a water delivery line. Micro-irrigation includes a number of methods or concepts such as bubbler, drip, trickle, mist or micro-spray, and subsurface irrigation".

## 1.7 Chapter Summary

Finding a good balance between environment concerns and personal concerns can be quite difficult when it comes to farming. Switching this orchard from a drip irrigation system to a micro irrigation system will solve both of these concerns. This proposal is the perfect solution for not only P&S Ranch but for many valley farm currently facing this same problem. With the ominous drought and time being a concern, many farmers and ranchers a looking fir quick solution for harvesting and irrigating. Implementing this change is the first step and a significant one in moving towards a more efficient farm.

# CHAPTER 2
# LITERATURE REVIEW

## 2.1 Introduction Chapter

ATMEGA micro-controller based plant irrigation system is proposed in. A moisture sensor used in the system which further connected with an op-amp and used to control the relay. But they used only a single sensor to handle the whole situation and the system cannot find the existence of any leaks in the system. A smart irrigation system is propounded in for the savings of water in the large field. But they considered only soil and temperature sensor in which temperature sensor is almost of no use. Moisture sensor can handle the whole criteria. Besides, the disadvantage of the system is that, it cannot understand the water level, as a result, savings of water actually not optimized. In, an automatic irrigation system using ZigBee in WSN has been proposed. They used temperature, soil moisture and the air humidity sensor to control the irrigation system. But the system is not capable of predicting the best timing of watering and also unable to measure the water level. Moreover, there is no auto notification system if there is a shortage in water supply.

An automatic irrigation system has been proposed in using solar power. But the most downside of a solar power system is that it hardly works at the rainy season or winter. If the crops are in a shaded zone, crops won't get water and the system may fail. Besides, the system will only work in paddy fields. There is also another pullback of the system is that the system only measures the water level above the ground. Here, the fact is, water doesn't always stay on the ground after watering. The soil absorbs it and reaches them to the plant's root. Now, if the base of a plant is always submersed in water, it could get rotten and the plants would die. In such situation, the system may cause bad damage.

In, the paper discusses about a watering system for gardening using WSN controlling the irrigation system using a valve. The system only uses soil moisture sensors which is not enough to detect the level of water in field as water doesn't instantly absorb by soil. Moreover, the system is not optimized for the best timing of watering.

The authors in presented a plant irrigation system using soil sensors which whenever generates a voltage, the system converted the ADC module into 8 bit signal which results carried classification. The classification is dependent on low, medium and high level of water requirement. In, It planter has been introduced which is an indoor cultivation device that has LED and water pump controlled by PIC. This device is for researching plants by monitoring temperature, light and water level using thermos, photo and water level sensor in it. Some water measurement results have also been reported. In, the water status of economic plants has been monitored using continuous terahertz wave radiation. Since any radiation is harmful for human body or any animal, so do terahertz radiation. But using a sensor for monitoring the water status would be effective and healthy rather than terahertz radiation.

## 2.2 Previous Research

### 2.2.1 Intelligent Irrigation Management System.

It is widely known that water resources are decreasing around the world. Rapid urbanization, population growth, industries and the expansion of agriculture are increasing demand for freshwater. In most countries, including Algeria, irrigation is the largest consumer of water, with about 70% of all freshwater withdrawals being used for irrigation. Therefore, it can be said that solving the problem of water scarcity is based on the adjustment of irrigation. The aim of this paper is to shed light on the irrigation systems, how they can be applied, and what are their benefits. With the adoption of solar energy to feed the system; this energy source is strongly available in arid zones.

Irrigation is strongly linked to food security. This sector is largely affected by water crisis. Algeria, like all African countries, is largely affected by the scarcity of water. In order to emerge from this crisis, further efforts should be made to develop the irrigation process. The integration of new technological developments such as wireless sensor networks and the Internet of Things are among the most important solutions to this crisis. Besides, solar power can be used to resolve energy constraints problem of WSN implementation. In this paper an intelligent irrigation management system will be proposed.

**[Review from: Dassanayake et al. Water saving through smarter irrigation in Australian dairy farming: Use of intelligent irrigation controller and wireless sensor network, paper presented at the 18th World IMACS / MODSIM Congress (2009) Cairns, Australia. From http://mssanz.org.au/modsim09.]**

### 2.2.2 An Arduino-Based Wireless Sensor Network for Soil Moisture Monitoring Using Decagon EC-5 Sensors.

According to a recent report by the United Nations, the world's population continues to increase, reaching nearly 7.6 billion in mid-2017, adding one billion people since 2005 and two billion since 1993. The global population is growing by around 83 million per year and is expected to reach 8.6 billion in 2030, 9.8 billion in 2050 and 11.2 billion in 2100. Ensuring that agricultural production can satisfy the needs of a growing population, not only globally but also locally, presents a tremendous challenge for farmers, scientists, and governments in the 21st century.

It is estimated that agricultural production will have to increase by 60% by 2050 to satisfy the expected demands for food and feed. During the Green Revolution of the 1960's, the world was able to meet the demand of the growing population for food and fiber by predominantly developing new high-yielding crop hybrids, increasing the application of farm inputs (such as water, fertilizers, pesticides, herbicides), and improving mechanization of farm-ing operations. At that time, however, the potential environmental impacts of considerably increasing application of farm inputs was not a major concern as it is today.

Nowadays, the impact of agricultural inputs on the environment, especially in surface and groundwater resources is a critical aspect of current and future agricultural practices. At the same time, the economic sustainability of modern farming demands an ever more efficient use of agricultural inputs. In addition, the potential challenges imposed by climate change on agricultural production are also a major concern. As a consequence, in recent years, many organizations such as The United Nations are promoting the concept of Climate-Smart Agri-culture as agriculture that sustainably increases productivity, enhances adapta-tion through increasing resilience, enhances mitigation through reducing or re-moving greenhouse gases (mitigation) where and when possible, and enhances achievement of national food security and development goals.

In order to achieve agricultural systems that are socially, environmentally, and economically sustainable, it is imperative that water resources and other agri-cultural inputs are used efficiently. This will require the development and adop-tion among growers of affordable and effective precision agricultural and irriga-tion technologies to enable farmers to apply water and other inputs when, where, and in the amount needed to increase profits and protect the environ-ment. Soil moisture sensing is one of the technologies farmers can adopt to properly schedule irrigation, which has been shown to potentially increase prof-its while protecting the environment.

Although many systems are commer-cially available for soil moisture monitoring, a number of factors still limit their adoption for irrigation scheduling among commercial growers. Consequent-ly, irrigation scheduling decisions in most commercial farming operations are still based on "the condition of the crop". For example, found that around 95% of growers in South Carolina used "the condition of the crop" to decide when to irrigate, which exceeded the national

average of around 80%. The fact that most farmers are basing irrigation scheduling decisions mainly on “the con-dition of the crop” could potentially create considerable production, profitabili-ty, and environmental problems. In recent years, however, there has been considerable development in open-source electronics, wireless data communication and Inter-net-Of-Things technologies that provide opportunities for making soil moisture sensing technologies more accessible and more affordable for commercial growers. Our objective in this study was, therefore, to develop and test an affordable wireless communication system for monitoring soil moisture using Decagon EC-5 sensors.

**[Review from: http://creativecommons.org/licenses/by/4.0 José O. Payero, Ali Mirzakhani Nafchi, Rebecca Davis, Ahmad Khalilian.]**

### 2.2.3 ARDUINO BASED SMART IRRIGATION SYSTEM USING IOT.

An automated irrigation system for efficient water management and intruder detection system has been proposed. Soil Parameters like soil moisture, pH, Humidity are measured and the Pressure sensor and the sensed values are displayed in LCD. The intruder detection system is done with the help of PIR sensor where the birds are repelled from entering into the field. The GSM module has been used to establish a communication link between the farmer and the field. The current field status will be intimated to the farmer through SMS and also updated in the webpage. The farmer can access the server about the field condition anytime, anywhere thereby reducing the man power and time.

**[Review from: https://www.researchgate.net/publication/321854296 Associate Professor, Department of Electronics and Communication Engineering**
**Sri Ramakrishna Institute Of Technology, Coimbatore.**
**R.Nandhini, S.Poovizhi, Priyanka Jose, R.Ranjitha, Dr.S.Anila.]**

## 2.2.4 A Smart IoT Fuzzy Irrigation System.

Water scarcity is on one of the major concerns of today‟s agriculture. Efficient irrigation of agricultural land could be accomplished with the help of smart irrigation systems. Smart irrigation systems have as primary goal the minimization of water consumption and the maximization of quantity and the quality of the crops. A trade of between these three amounts could be made. Another concern that irrigation systems have is the power consumption of the system. As most of agricultural land is located in isolated places without stable electrical powerline the power of the system is an important factor. Smart irrigation systems use actuators and sensors to control the ground moisture of the agricultural land. The data collected from the sensors could be send through the Internet of Things (IoT) to data servers for statistical information and processing. On this basis we propose our smart - fuzzy irrigation system of arable areas. With the help of multiple soil moisture sensors, effective irrigation of agricultural land that increase production and minimize water consumption is achieved. A fuzzy computational algorithm is proposed that determines the amount of the opening of the central servo valve of the irrigation system. This fuzzy algorithm has as input interspersed in the field multiple soil moisture sensors. Soil moisture is constantly monitored. The data collected from the sensors is sent to server for statistical analyses.

**[Review from: www.iosrjen.org : George Kokkonis1, Sotirios Kontogiannis 2,**
**Dimito Tomtsis1, 1Dept. of Business administration, Western Macedonia U niversity of Applied Studies, Greece, (gkokkonis,tomtsis)@teiwm.gr 2Dept. of Mathematics, University of Ioannina, Greece, skontogiannis@cc.uoi.gr ]**

## 2.2.5 Implementation of an automated irrigation system.

The main aim of this paper is to develop an automated irrigation system based on sensors which are interfaced to the microcontroller unit. The sensors used in this paper are temperature and humidity sensor DHT11 sensor and soil moisture VH400. These sensors are interfaced to the microcontroller unit and the whole unit was placed under the root zone of the plant. The main motive of using microcontroller is to send an SMS to the mobile phone of an owner who is in the remote location. The sending of SMS is done by using SIM900A module which is also interfaced to the microcontroller unit. The irrigation system is tested under different temperatures and humidity levels of different plants under normal and wet conditions. The use of soil moisture sensor is to limit the water content to the particular areas. Throughout all the values obtained in wet and normal conditions are proved to be intuitive.

**[Review from: https://www.researchgate.net/publication/283230079**
**Dr. V. Berlin Hency School of Electronics Engineering Vit University Chenna i, India**
**& U N V P Rajendranath School of Electronics Engineering Vit University Chennai, india.]**

## 2.3 Comparison of the Watering Plants

**TRADITIONAL WATERING PLANTS VS AUTOMATIC WATERING PLANTS.**

| Traditional Watering Plants | Automatic Watering Plants |
|---|---|
| ➢ **Watering your lawn is easier than doing it by hand:** Traditional lawn sprinkler systems are a superior choice to simply walking around with a water hose. They allow you to simply place the sprinkler where necessary and let the system do its job. | ➢ **Programmable watering schedules:** Automatic lawn sprinkler systems help run a watering schedule following presets. Add in the fact that some systems have rain sensors or temperature gauges that help adapt watering schedules to be more efficient and you can see why they're a great option for homeowners. |
| ➢ **Wasted water:** It goes without saying, but failing to turn off your water sprinklers can mean a costly water bill. This comes as a result of you having to manually shut off the system once you feel that the lawn has been properly watered. | ➢ **Time saved:** It goes without saying, but using an automatic lawn sprinkler system saves time that would otherwise be spent on manually watering your lawn or setting down sprinklers. |
| ➢ **The lawn may or may not be watered correctly:** As mentioned before, you are responsible for turning off the water sprinklers. This means that you may over water or underwater if you turn off the system before. | ➢ **Precise watering that better reaches the root system:** Installing multiple sprinkler heads throughout your lawn can ensure that you have your entire lawn covered. This in turn helps solve many of the headaches commonly experienced with knowing whether you've over watered or underwater your lawn. |

## 2.4 Comparison Indoor Plants.

| | Bonsai | Cactus |
|---|---|---|
| **Soil** | **Water the trees when the soil gets slightly dry:**<br><br>This means you should not water your tree when the soil is still wet but only when it feels slightly dry, use soil moisture sensor to check the soil at around 1cm ( centimeter) deep. | **Water the tree when the soil gets dry:**<br><br>This means the Cactus needs a soil with excellent drainage. If it's in the ground, that might mean adding some loam to your soil. |
| **Watering** | **Never water on a routine:**<br><br>Keep observing your trees individually, instead of watering them on a daily routine, so that used Automatic Watering Plants to set the watering daily water. | **Never water on a routine:**<br><br>cactus does not need much water, it is best to have intervals where you add a little water, but always using the same amount. |
| **Temperature** | Subtropical Bonsai trees can withstand somewhat lower temperatures, and generally thrive when they enjoy a winter season with temperatures well below that of the standard room temperature. | The favorable temperature for indoor gardenias is about 70 degrees Fahrenheit during the day and about 60 degrees Fahrenheit during the night. Warm days and cool nights are perfect for blooming gardenia plants. |

## 2.5 Chapter Summary.

With this information provided above, it is apparent that many component and factor go into implementing a new micro-sprinkler irrigation system. With all of the technology and different equipment that goes into irrigation system, water conservation will also be a factor. All of these systems and equipment described above go hand in hand with having a properly functioning irrigation system. These are the systems that will be used throughout this proposal.

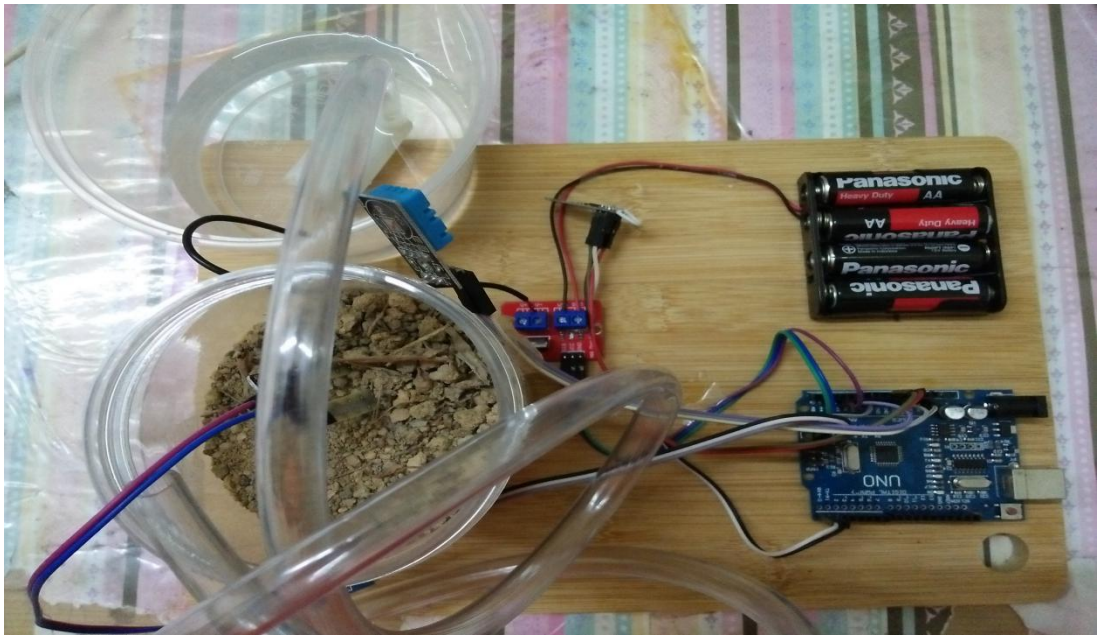
# CHAPTER 3
# METHODOLOGY
# System Description.

## 3.1 Introduction Chapter

At this chapter 3, research methodology, you will know the design, data collections method and Instruments. We also show you how we design our product. What method we use? So below is the explanation about this chapter.

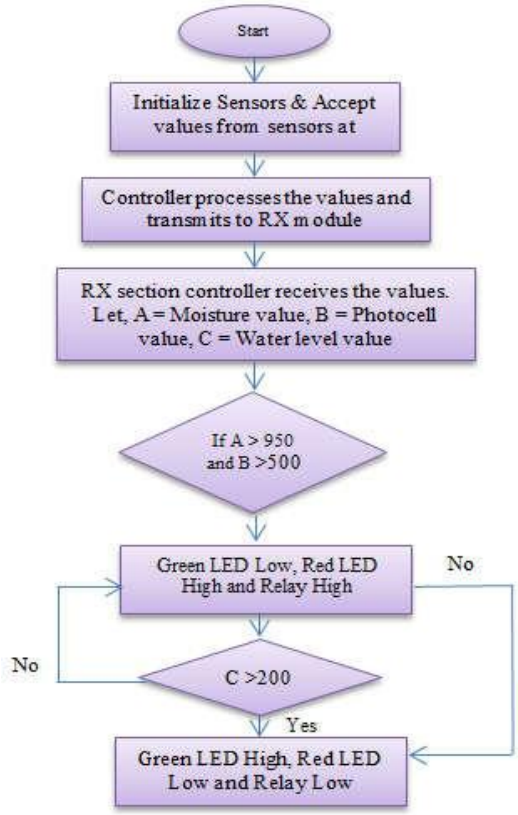
## 3.2 The Diagram

The whole system is based on the micro-controller board Arduino which is integrated three sensors- soil moisture sensor, water level sensor and photo cell. A Single Channel Relay module has been used to activate and deactivate the Water Pump and the apps in the handphone display is attached to show the current sensor values as well as to report the current status of the soil, water level, daylight and water pump. The Wifi module is needed to send notification to mobile using apps Blynk. A 6v DC power supply is needed to power up the circuit.



### 3.3 Logic Diagram.

At first, we have initialized specific pins for the three sensors, relay channel, LEDs and serial monitor port. After that, we have initialized soil moisture sensor, photo sensor, water level sensor as analog input and relaypin, greenLED and redLED as digital output. The system accepts values from sensors at regular interval. The controller processes the values and transmit to RX module. We have taken the threshold value of soil moisture sensor, photocell sensor and water level sensor as 950, 500 and 200 respectively. The power on of the red LED indicates that the plant needs water at the moment and the relay will be turned into active high. The power on of the green LED indicates that the plant does not need water and the relay will be turned into active low.



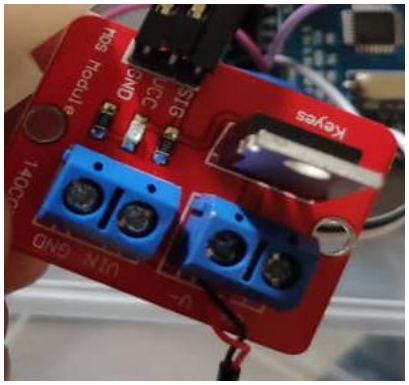
### 3.4 List Of Components used


#### 3.4.1 Arduino Micro-controller.

The Arduino Uno microcontroller board used here is based on Atmega328P. It consists of 14 digital input/ output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.

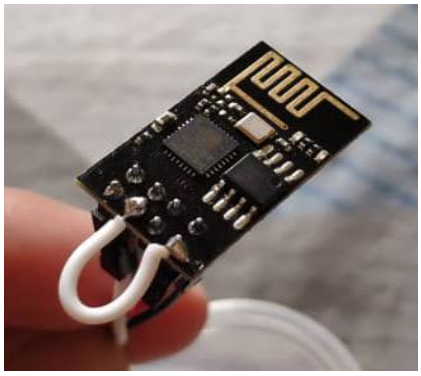
#### 3.4.2 Soil Moisture Sensor.

A capacity contact soil moisture sensor is used. Soil moisture sensor measures the volumetric water content of the soil by some indirect methods which includes measuring different properties of soil like electrical resistance, dielectric constant and interaction with neutrons. It has one probe like structure which will be dipped inside the soil. The circuit part of the sensor contains 4 pins i.e. Vin, ground, AO (analog output), DO (digital output). The moisture sensor provides an analogue output which can be easily interfaced with the Arduino.



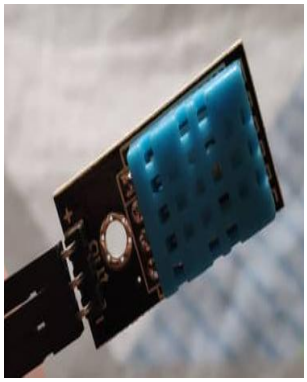

**3.4.3 Relay.**

Relay is a switch which is operated electrically. Relay is used when it is necessary to control a circuit by separate low power signal. Here it is used to control the water pump. The relay used here also contains an inbuilt motor driver required for the pump.



**3.4.4 Wi-Fi Module.**

The ESP8266 WiFi module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking function from another applications from another application processor.



**3.4.5 DHT11 Sensor.**

DHT11 sensor measures both the temperature and humidity of root zone of the plant. This sensor consists of three pins named as power supply, ground and another is data pin used measure the data of the sensor. This sensor has protecting shield above that which withstand in any climatic conditions. This sensor has a high reliability and excellent long terms stability. This sensor is used at the root zones of the plants, such that it measures both temperature and humidity at a time. The measured data is send to the analog pins of an ARDUINO board such that it coverts in to the digital output and displays both values using the apps Blynk.

**3.4.6 Water Pump.**

A pump is used to transport the water from the tank or reservoir.

**3.4.7 Connecting leads and Pipe.**

Connecting leads are required to connect all components and pipe to transfer water.


### 3.4.8 Batteries.

A batteries are common in portable electronic devices. An AA battery is composed of a single electrochemical cell that may be either a primary battery (disposable) or a rechargeable battery. Several different chemistries are used for their construction

we used four battery to run the water pump, each battery has 1.5v only.

The water pamp is use 6v.

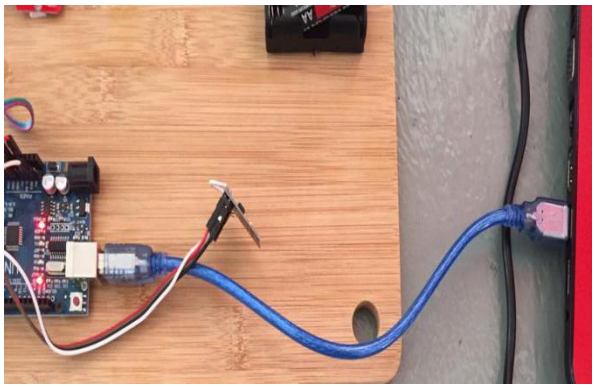
### 3.4.9 Battery holder.

A battery holder is one or more compartments or chambers for holding a battery.For dry cells, the holder must also make electrical contact with the battery terminals.

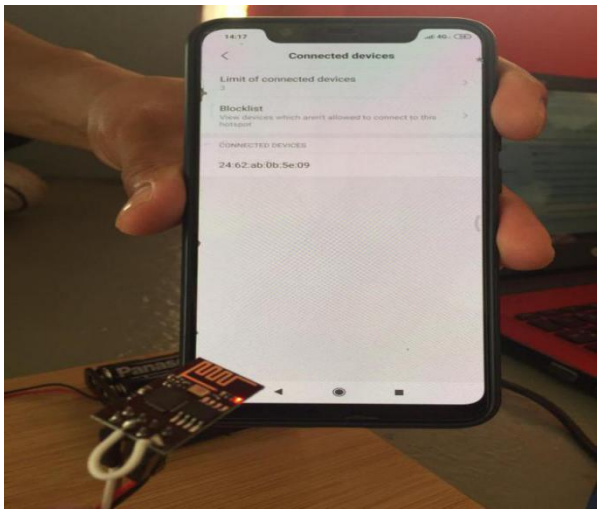
For wet cells, cables are often connected to the battery terminals, as is found in automobiles or emergency lighting equipment.

### 3.5 Automatic Watering Plants Steps.

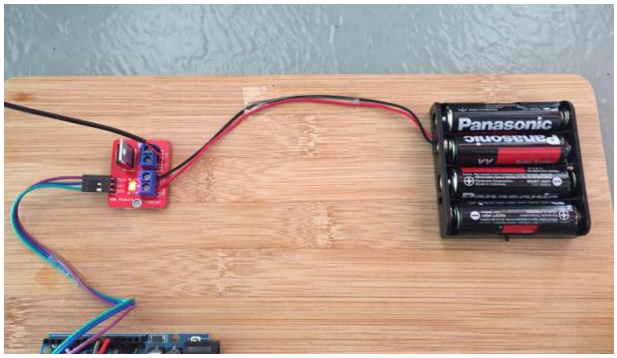
**First Step**
Connect an Arduino to the power supply.



**Second Step**
Connect the Blynk Apps to the Wi-Fi modul.

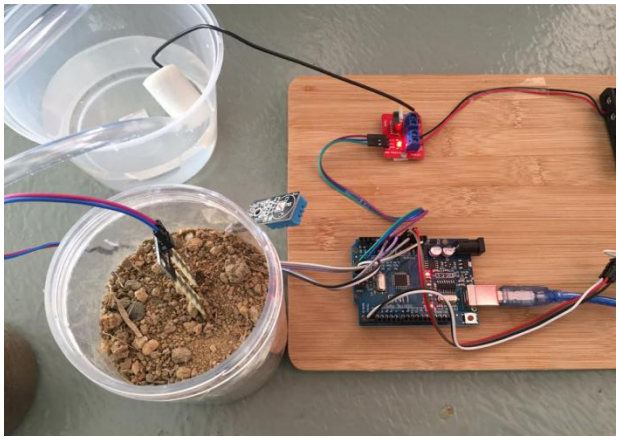



**Three Step**
Connect the relay to the battery 6volt to run the water pump. Next, relay is used to control the water pump. The relay used here also contains an inbuilt motor driver required for the pump.

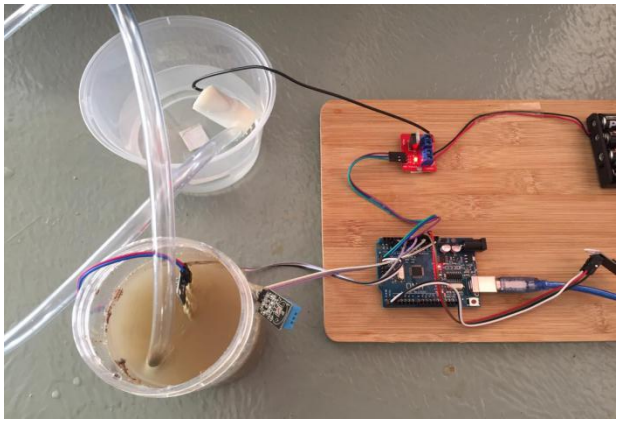


**Fourth Step**

Start measures both the temperature and humidity of root zone of the plant. Then, soil moisture sensor measures the volumetric water content of the soil by some indirect methods which includes measuring different properties of soil like electrical resistance, dielectric constant and interaction with neutrons.



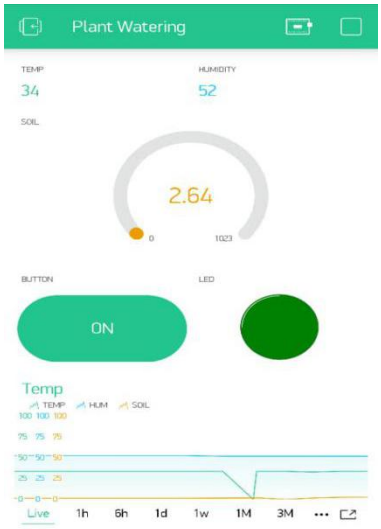
DRY SOIL.



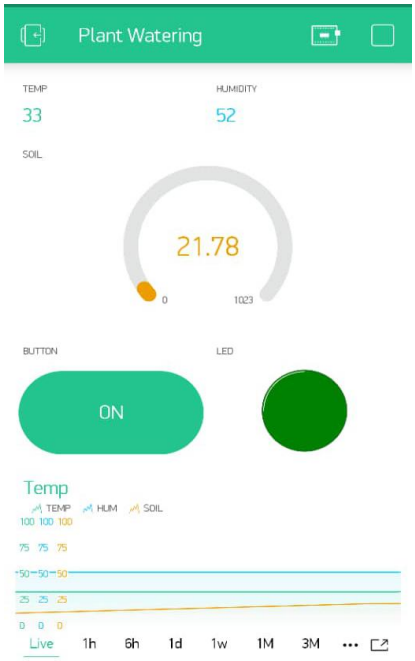
WET SOIL.

**Final results from the Blynk Apps.**

DRY SOIL Result.




WET SOIL Result.



### 3.6 Chapter Summary.

This project will beneficial to the society especially for those are busy with tight schedule whose do not have time to watering their plant, the people that usually forget to watering the plant, the people that often go travelling and outstation. Besides that, this project proposed a solution by providing a method and system to facilitate human in watering plant task.

Further studies on the system's approaches and method can be used to develop so that applicable in the wide areas such as to watering the plantation with a large number of crops. This project also contributes ideas for researchers to develop watering and irrigation system using Arduino system.

# CHAPTER 4
# RESULT AND DATA ANALYSIS

## 4.1 Preliminary

In this topic we are going to discuss about our analysis that have been answer by 100 respond related to our research that is Automatic Watering Plans, Our analysis location is around Shah Alam, Selangor. The result is taken based on the respond from the questionnaire we make that we had published. Our type of questionnaire consist 10 questions.

## 4.2 Background Research

Agriculture is the backbone of all developed countries. It uses 85% of available fresh water resources worldwide and this percentage continues to be dominant in water consumption because of population growth and increased food demand. Due to this, efficient water management is the major concern in many cropping system in arid and semi-arid areas. An automated irrigation system is needed to optimize water use for agricultural crops. The need of automated irrigation system is to overcome over irrigation and under irrigation. More Over, irrigation occurs because of poor distribution or management of waste water, chemical which leads to water pollution. Under irrigation leads to increased soil salinity with consequent buildup of toxic salts on the soil surface in areas with high evaporation. To overcome these problems and to reduce the mane power Automatic Watering Plants has been used.

## 4.3 Problem Statement

People nowadays are too busy with their work. Most of them tend to focus on something until they neglect their home task such as watering the plant. This is because people do not know how to manage their time properly. Here by, the effective solution to this problem is to design an automatic and notification plant watering system. By using this system, it will notify the user and the feedback from this notification will start automatically watering the plant. From the problem faced, we come out to design an Automatic Watering Plants.

## 4.4 Research Objective

The overall objective of this project is to design a automatic watering plants that will determine when a lawn needs to be watered and how much it needs to be watered. Below are the objective that will make this possible:

- To demonstrate to the market the technical and economical feasibility of the application of the watering plant technology for a consistent water reduction in household application.
- To confirm and set up the best production process for the solution proposed, in terms of performances, energy consumption, resources, utilization, environmental impacts.
- To ensure the most effective introduction of the innovative automatic watering plants solution into the target markets, through the development exploitation and dissemination activity.

## 4.5 Research Methodology

There are few systems proposed may related to the gravimetric method to help human to watering the plant. As an example, a watering system that has precise water dispenser for plants in greenhouse. This system also expressed in weight. A common method of restoring moisture stress to the desired level is to add water periodically to the pot until the original weight of the pot and plant is reached. However, this system requires human to measures weight of the pot manually on a balance or scale and adding water until the original weight is reached. Even though this method is give accurate result, however it is not suitable for frequent watering task since every plant may have different growing rate. Moreover, as the time passes by, the original weight need to be adjusted periodically since the plant growth and the weight may increase. Therefore, it may be desirable to adjust the original weight to account for changes in plant weight as growth occurs. This method is beneficial to save a lot of time in watering a large number of potted plants because the apparatus dispenses the water automatically into the pot and restore the weight by adding water according to the set weight.

## 4.6 Scope of the research

This project is use to keep plants watered automatically by sending notifications to the user. The focus group of this system is for people who are always busy and cannot manage their time properly to water their own plant. Users will provided 4 sensors and put the sensor at the soil. The water will be control using an automatic valve which will activate when the user give feedback. Water will flow via tubes to the plants.

## 4.7 Research Interests

We have made the Automatic Watering Plants. The result for our group is completely done. Next, an our research Is very important to us because the user can product perfectly. The main objective of this Automatic Watering Plants is to make it more innovative, user friendly, time saving and more efficient than the existing system. Measuring four parameters such as soil moisture, temperature, humidity and pH values and the system also includes intruder detecting system. Due to server updates user can know about crop field nature at anytime, anywhere using apps Blynk in their smart phone.

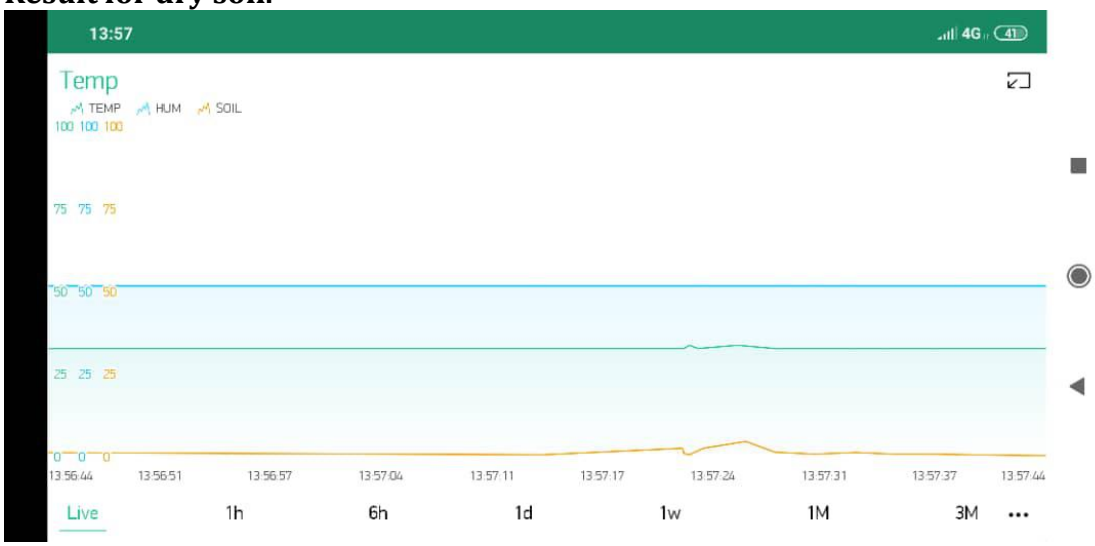
In this era, plants is very important to take care. It is because all living thinks need oxygen to live healthy in this earth. So for our project, it will help human to preserve the trees and to save our earth from natural disaster such as global warming, landslide and floods. Lastly, they can start preserve trees in an indoor area such as house and more over.

## 4.8 The Definition of the terms

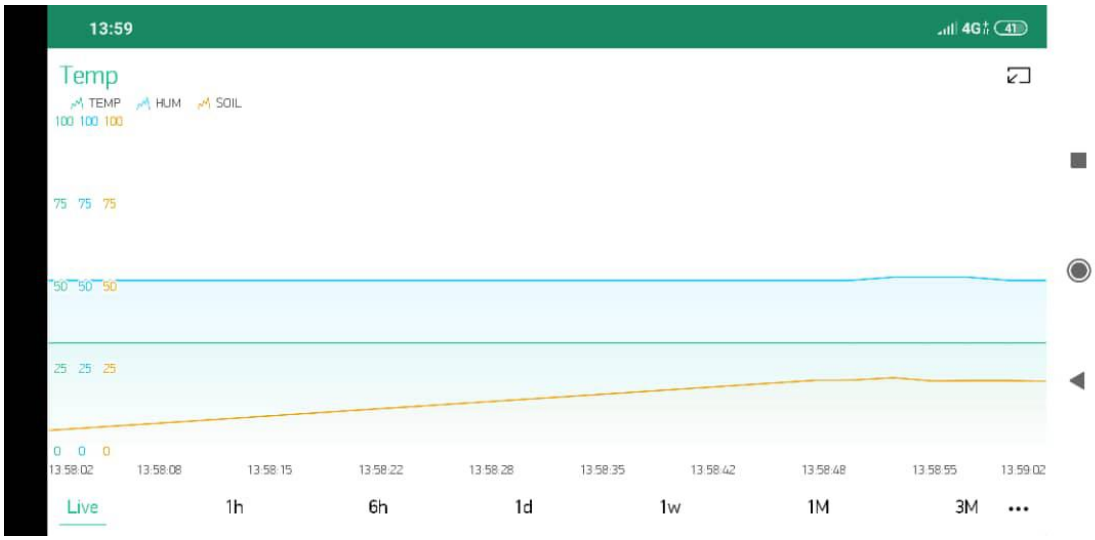
The Automatic Watering Plants is a system that is use to give notifications about the condition of the soil and automatically water the plants. This device will read the condition of the soil and give notifications to the user via Blynk Apps (IoT). According to the user's response, the system will then open a valve and water will flow to the designated plants. The main idea of the system is to help people to take care of their plants when they are not at home. The system comprises of an Arduino Mega 328p, Soil moisture, relay, wi-fi module, DHT11 sensor, water pump, battery holder, connecting leads and pipe, batteries 6volt. The data from the sensors will be used to send handphone using Blynk Apps to the user and the user's response will control the opening of the value.

## 4.9 Result

**Result for dry soil.**

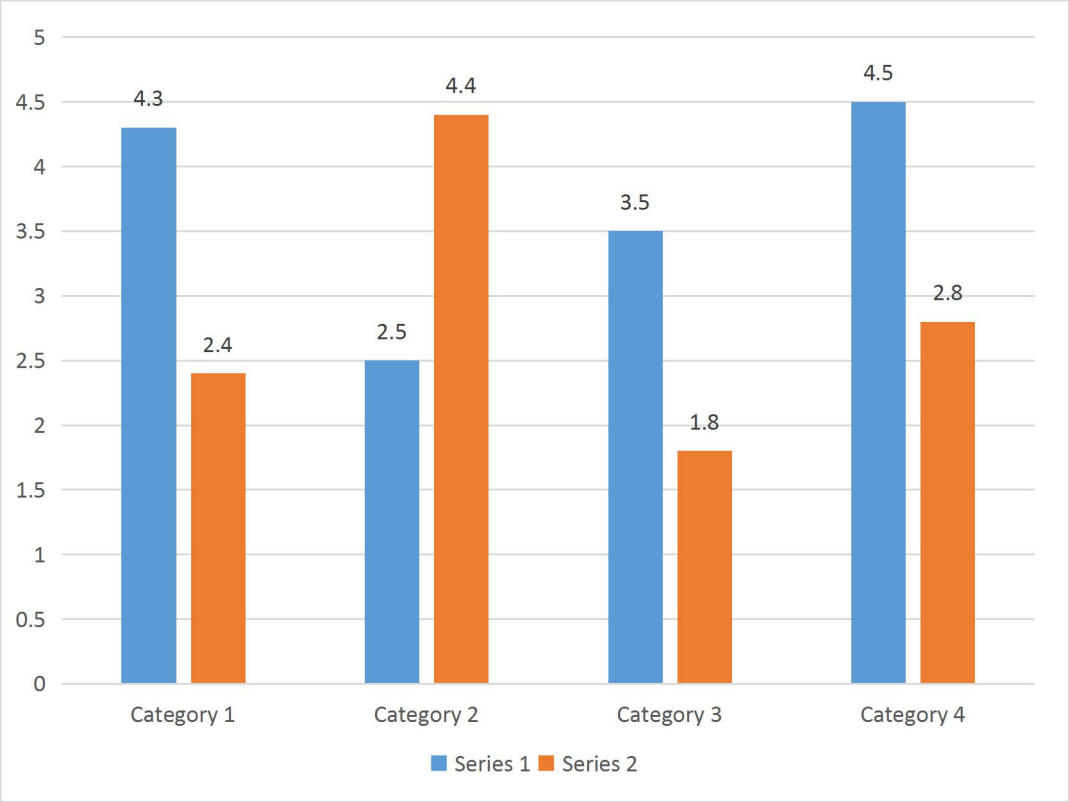



**Result for wet soil.**



## 4.10 Data Analysis

**Result Q&A**




The chart shows a result from our Q&A. The blue bar is present the automatic watering plants and the orange bar present for traditional watering plants using human energy. Furthermore, our final project can save time, money, water, and human energy. Without this final project, people must watering their plants by them self. This is cause humans are wast their time and water just to watering the plants. In this area, plants is very important to save the earth such as globing warming and to give oxygen to the living thing. Therefor, our project will help human to take a good care for their plants they can control the water amount and set the routine by using automatic watering plants. Lastly, I hope many people buy this product and save the earth together.

## 4.11 Chapter Summary

As conclusion at this chapter was we know Introduction, Background Research, Statement of Problem, Research Objective, Research Question, Scope of the Research, Research Interests, The Definition of the terms, and Result at this chapter. We can design a good quality of our product so that consumers can use it wisely. Secondly, we develop a higher quality of save an earth from global warming. Thirdly, to make people always take care of the plants in their house or indoor areas. Lastly, we can save the earth together and live healthy forever and ever.

# CHAPTER 5
# DISCUSSION AND CONCLUSION

## 5.1 Introduction Chapter

In this chapter, we will discuss and conclusion our project, AUTOMATIC WATERING PLANTS know as a system used to measures the volumetric water content of the soil by some indirect methods which includes measuring different properties of soil like electrical resistance, dielectric constant, interaction with neutrons and watering the plants. After we finish the project, we know our project can help humans to easily watering their plants using automatic watering plants and save water, time and energy. Beside that, we also learn many knowledge from this project. Lastly, below is the explanation about this chapter.

## 5.2 Discussion

After we finish our project, we test the project and encounter the problem of this project. Then, after finish the project we know that the project have some problems in water pump which is the water can not stop watering the plants. It is because we have error in the coding. Furthermore, we build a new coding so the the water pump can follow the relay. Next, the project have delay to watering the plants. Therefore, we build another coding to the WiFi coding, it is because we want our project does not have delay anymore. More over, our project will give notification to the owner to watering their plants through smart phone using Blynk apps. Lastly, when we encounter these problem, we will improve our project more perfect.

## 5.3 Conclusion

Creating, developing, and implementing this an automatic watering plants proposal was a success. The proposal plan not only met the objectives outlined in Chapter One, but also met the desired goals for global warming to save the earth . Each aspect that needed to be adequately addressed and developed was reached in a way that made the automatic watering plants proposal realistic and feasible. This an automatic watering plants, once put into the bonsai, will be able to watering efficiently as well as meet the needs bonsai tree.

## 5.4 suggestion

After we doing the Q&A question, interview and join the presentation we get many suggestion from the people which is the workers, contestant and professor level senior engineering. We know our project has many thing to improve and become product to let consumer to consumption. Our project is to easily watering the plants without waste the water, time and energy. This project also focus to indoor plant and sensitive plants. For example, Bonsai and Cactus. It is because the trees have their watering routine to make the plants healthy. Beside that, we believe our project can follow up to the next generation and become the commons people to use it. Lastly, whatever the cost is quite expensive our project is giving a good result to make people always take care to the plants to get a batter life for the future to make earth always have a good oxygen and forever save to living thing.

## 5.5 Summary Chapter

In this chapter, we encounter the problem for our project, Automatic Watering Plants. Suddenly, we also find the solution to solve the problem that we encounter. Beside that, our project is not competitiveness because it is the first project in Malaysia. From our research, western countries did not have the project like our project. This project can keep pace with the times and we will improve our project become more easy to use and reduce the cost to let more people to have it.

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# APPENDIX

## A. Gantt Chart

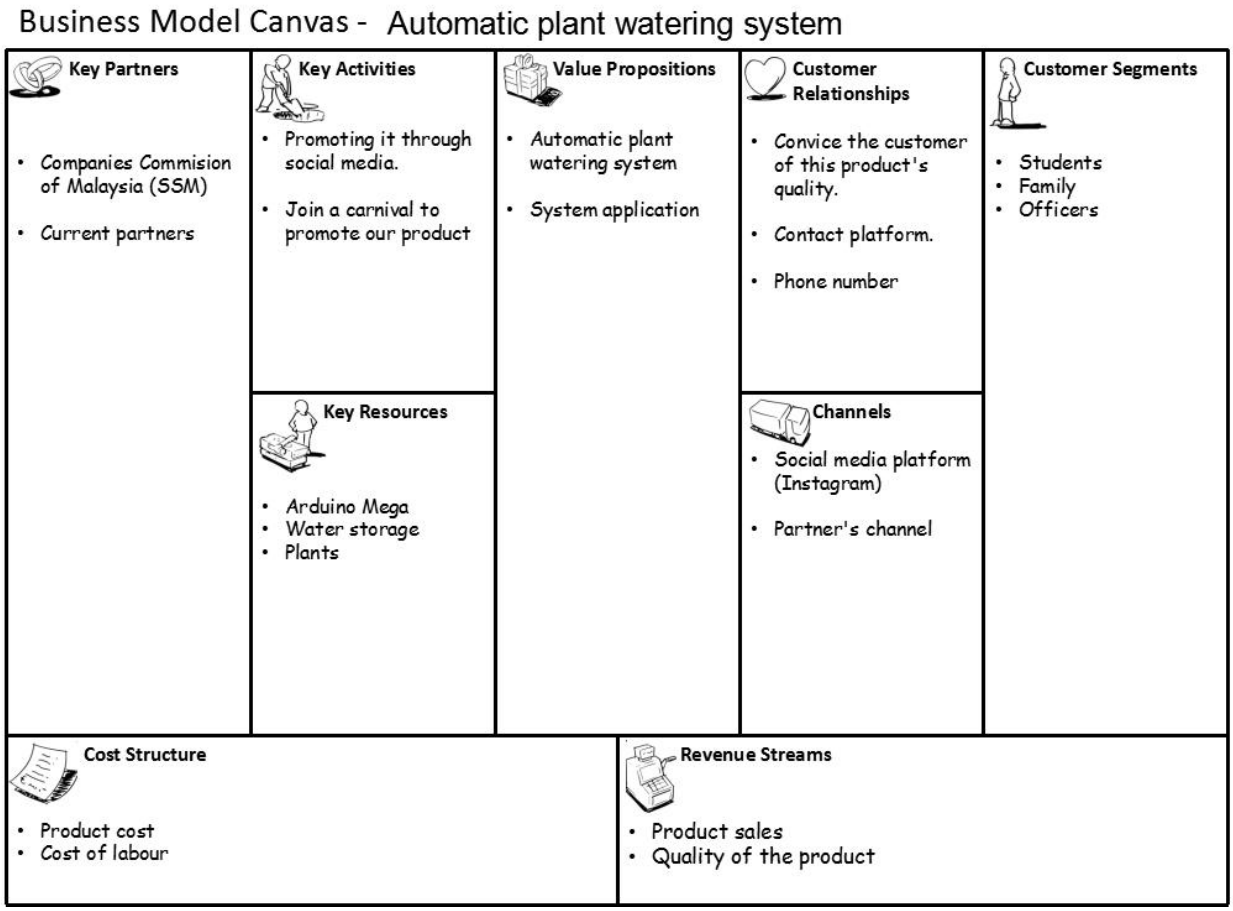
| Lecturer week \ Project Activities | LW1 | LW2 | LW3 | LW4 | LW5 | LW6 | LW7 | LW8 | LW9 | LW10 | LW11 | LW12 | LW13 | LW14 | LW15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project title selection | | | | | | | | | | | | | | | |
| Project research | | | | | | | | | | | | | | | |
| Literature Review (progress) | | | | | | | | | | | | | | | |
| Discussion with adviser about project | | | | | | | | | | | | | | | |
| Project initial proposal presentation | | | | | | | | | | | | | | | |
| Project initial submission | | | | | | | | | | | | | | | |
| Produce circuit simulation | | | | | | | | | | | | | | | |
| Understanding soldering technique and tools | | | | | | | | | | | | | | | |
| Construct project and test using appropriate steps | | | | | | | | | | | | | | | |
| Presentation project / methodology project | | | | | | | | | | | | | | | |
| Submit final report | | | | | | | | | | | | | | | |
| Testing or verification | | | | | | | | | | | | | | | |
| Submit draft/ report | | | | | | | | | | | | | | | |

Plan | Done

## B. Budget Expenditure

| Numbers | Components | Price (RM) |
|---|---|---|
| 1 | Arduino Micro-controller. | 50.00 |
| 2 | Soil Moisture Sensor. | 20.00 |
| 3 | Relay. | 15.00 |
| 4 | Wi-Fi Module. | 20.00 |
| 5 | Water Pump. | 15.00 |
| 6 | Connecting leads and Pipe. | 2.00 |
| 7 | DHT11 Sensor. | 20.00 |
| 8 | Battery Holder. | 5.00 |
| 9 | Batteries. | 7.00 |
| 10 | TOTAL | 154.00 |

## C. Business Modal Canvas



## D. MYIPO

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The Work is : ☐ Published ☐ Unpublished

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Address 3 :

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State : Country :

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