Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF SMART WATER IRRIGATION SYSTEM WITH IOT CONTROLLING BASED

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MOHD ASHRAF BIN ROSDIH

A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology with Honours

Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

DECLARATION

I declare that this project report entitled “Development of Smart Water Irrigation System with IoT Controlling Based” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :

Student Name : MOHD ASHRAF BIN ROSDIH

Date : 05/01/2022

APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electrical Engineering Technology with Honours.

Signature :

Supervisor Name : TS. DR. SUZIANA AHMAD

Date : 17.01.2022

Signature :

Co-Supervisor Name (if any) :

Date :

DEDICATION

To my beloved mother, Nirri binti Hj. Jalil, and father, Rosdih bin Miasin,

and

To my family.

ABSTRACT

Technology is one of the most effective ways to increase the quality of an agriculturally based product in this modernizing period. Agriculture may be done in housing areas without engaging large regions, according to the Malaysian government, and it can even be done in our own backyard. In administering this agricultural system, various issues have arisen. One of the issues is that it necessitates physical labor and wastes a significant amount of water. As a result, the project's goal is to create a smart irrigation system for agricultural. The goal of this project is to use NodeMCU to create a completely automated Smart Water Irrigation System, to monitor and operate the system using Blynk application, and to construct a system in agriculture that can comply with water conservation. This farm system utilizes an NodeMCU v2 ESP8266 WiFi model as the microcontroller to control the system's input and output, as well as Blynk application for monitoring and control. To detect soil condition, a moisture sensor is employed. This initiative is both environmentally benign and simple to implement, as it improved the agricultural system.

ABSTRAK

Pada era pemodenan ini, teknologi adalah salah satu inisiatif yang ideal untuk meningkatkan kualiti produk berasaskan pertanian. Kerajaan Malaysia mengesyorkan agar pertanian dapat dilakukan dikawasan perumahan tanpa melibatkan kawasan yang luas di mana ia dapat dilakukan di halaman belakang rumah kita sendiri. Terdapat beberapa masalah yang dihadapi dalam menguruskan sistem pertanian ini. Antara masalahnya ialah memerlukan tenaga kerja manual dan membuang banyak air semasa prosesnya. Oleh itu, tujuan projek ini adalah untuk mengembangkan sistem pengairan pintar untuk industri pertanian. Objektif projek ini adalah untuk mengembangkan Sistem Pengairan Air Pintar sepenuhnya automatik dengan menggunakan NodeMCU, untuk memantau dan mengendalikan sistem melalui aplikasi Blynk dan untuk mewujudkan sistem pertanian yang dapat memenuhi penjimatan air. Sistem pertanian ini menggunakan model NodeMCU v2 ESP8266 WiFi sebagai pengawal mikro untuk mengawal input dan output sistem dan penggunaan aplikasi Blynk juga dilaksanakan ke sistem ini untuk memantau dan mengendalikan sistem. Sensor kelembapandigunakan untuk mengesan keadaan tanah. Projek ini mesra alam dan mudah digunakan kerana memperkenalkan peningkatan yang baik terhadap sistem pertanian.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Ts. Dr. Suziana binti Ahmad for their precious guidance, words of wisdom and patient throughout this project.

I am also indebted to Universiti Teknikal Malaysia Melaka (UTeM) for the financial support through which enables me to accomplish the project.

My highest appreciation goes to my parents and family members for their love and prayer during the period of my study.

Finally, I would like to thank all fellow colleagues and classmates, the Faculty members, as well as other individuals who are not listed here for being co-operative and helpful.

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δ	-	Voltage angle
	-	
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LIST OF ABBREVIATIONS

V	-	Voltage
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CHAPTER 1

INTRODUCTION

1.1 Background

Water is necessary for the human population, as well as other animals, plants, and bacteria around the world, to have a sufficient food supply and a productive environment. Global freshwater demand has been quickly increasingas human populations and economies have grown (Hinrichsen et al. 1998, Postel 1999, Rosegrant et al. 2002, Shiklomanov and Rodda 2003, UNEP 2003a, Gleick 2004). Irrigation is critical for raising crop yields and maintaining production stability. Irrigation is important for economically successful agriculture in arid and semi-arid regions, while it is frequentlyrequired as a supplement in semi-humid and humid locations (Oron et al., 1986). Irrigated agricultureis the world's largest user of diverted water, accounting for 70–80 percent of the total in dry and semi-arid regions. It's hardly surprising, however, that irrigated agriculture is seen as the principal supplierof water in those places, particularly during emergency droughts. Currently, irrigated agriculture is caught between two opposingviewpoints: some believe that agriculture is inefficient because it grows"water-guzzling crops" (Postel et al., 1996), while others believe that irrigation is necessary for the production of sufficient food in the future, given expected increases in food demand due to global population growth and climate change. The goal of this project is to aid individuals who work in agriculture in their own communities by reducing the strain of having to execute a task that can be readily completed with today's technology. The automatic irrigation system, for example, is utilised to eliminate human participation while also ensuring proper irrigation.

1.2 Problem Statement

Today, the agriculture industry is thriving, regardless of large scale or small scale agriculture. Also, agriculture industry contributes a lot in providing food and raw material to non-agriculture sectors. All of those related to the agricultural industryare needing sufficient amountof water resource to ensure the crops maintain its health. Nevertheless, there is also wastage of water during watering process to the crops. It occurs when the farmer only use dippers and buckets when watering their crops. In order to improve these problem, a water sprinkler was introduced andto some extent it helps on reducing water wastage. It only comes with a sprinkler and a roll of hose and the only thing the farmer will do is just turn on the tap and turn it off when the f armer desired. However, installing a water sprinkler to the crops also can lead to wastage of water since the farmer do not know when exactly the farmer should turn off the tap and to make sure the crops soil has the maximum amount of water needed. Consequently, an alternative irrigation system is design with an addition of moisture sensor to overcome the previous problem. It provides an efficient irrigation to the crops by using an overhead water sprinkler and the moisture sensor will play its part by identifying the crops soil was in dry condition or wet condition.

1.3 Project Objective

a) To develop an automated smart water irrigation system by using microcontroller based on IoT.

b) To implement the water irrigation system using soil moisture sensor, DC motor and water pump.

c) To analyze the smart water irrigation system by testing in organic soil.

1.4 Scope of Project

The scope of this project is made to inform the features and components usedin this project. Among the scope of the project is using NodeMCU microcontrolleras the brain of this project and its function to control all the components used in this project. And, the usage of Blynk application to monitor and control the system. Moreover, soil moisture sensor is used to detect the moisture in the soil. DC supply or battery is being used in this project to be connected to NodeMCU microcontroller and the circuit. In addition, this project utilized forward and reverse motor to move the irrigation bar and also a water pump to supply the water through hosethat attached tothe irrigation bar. Finally, this project is only dedicated to the domestic agriculture industry.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Literature review is a part of research branch where the connection between the past research and present research are found. Organizing a literature review is significant for advancing a research concept, for synthesizing what is already know about a subject and for searching any space in knowledge and how your exploration could provide further comprehension (Winchester and Salji, 2016).

This chapter is composed according on the past research, journal, thesis, article or any other form of published information that is related within the project title and scope.

2.2 History of irrigation system

The irrigation system innovation relocated similarly as the flow southwestern U.S, where the Hohokam, possessed in the Central Arizona fabricated nearly 700 miles of water system waterways to take care of their human progress, and deserted bafflingly there in the fourteenthcentury AC. Perhaps the most mind-boggling water system frameworks in history was found in antiquated Sri Lanka, where the most seasoned water works dating from around 300 BC, during the rule of King Pandukabhaya are realized. Verifiably, it has been of vital significance for the civilizations to have legitimate water system frameworks to have productive cultivating frameworks, which is the significant achievement for food security and the life spanof a civilization. On the off chance that we investigate the American mainland or the supposed ‘’New World’’, we see the most punctual impressions of water system frameworks in the Zana Valley of the Andes Mountains in Peru, with dates as ahead of schedule as 4000 BC. In the event that the historical backdrop of the water system is dissected, the principal puts that should be inspected are Egypt and Mesopotamia, where the primary effective endeavors were made to control the water stream. Numerous historyspecialists and archeologists, alongside certain designers distributed articles and reports on the idea of old water works until the second 50% of the 20th century (Koç, 2018).

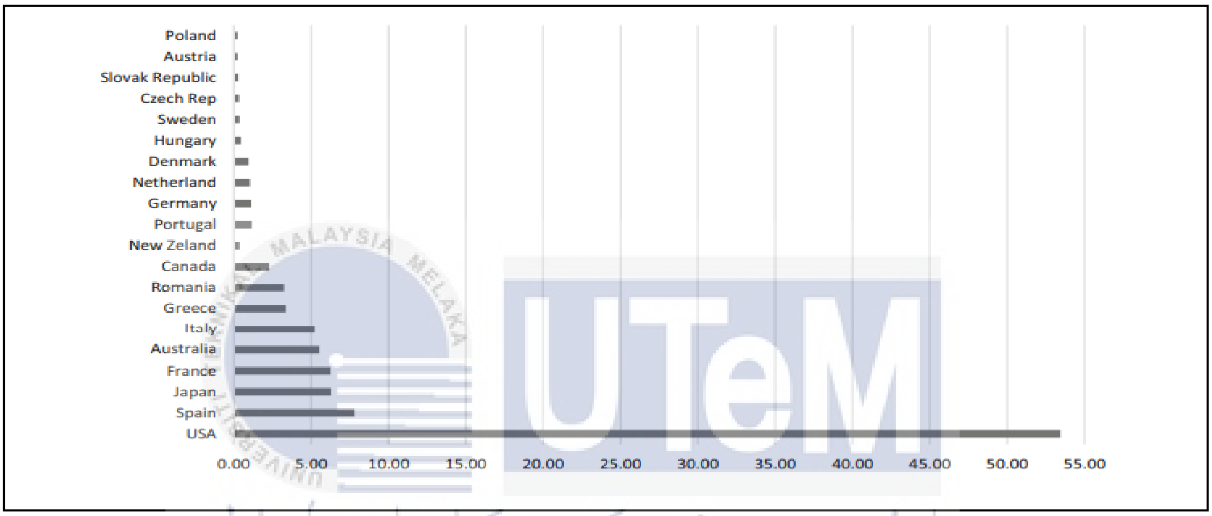

Figure 2.1: Percentage of irrigated areas in developed countries in the world (%)

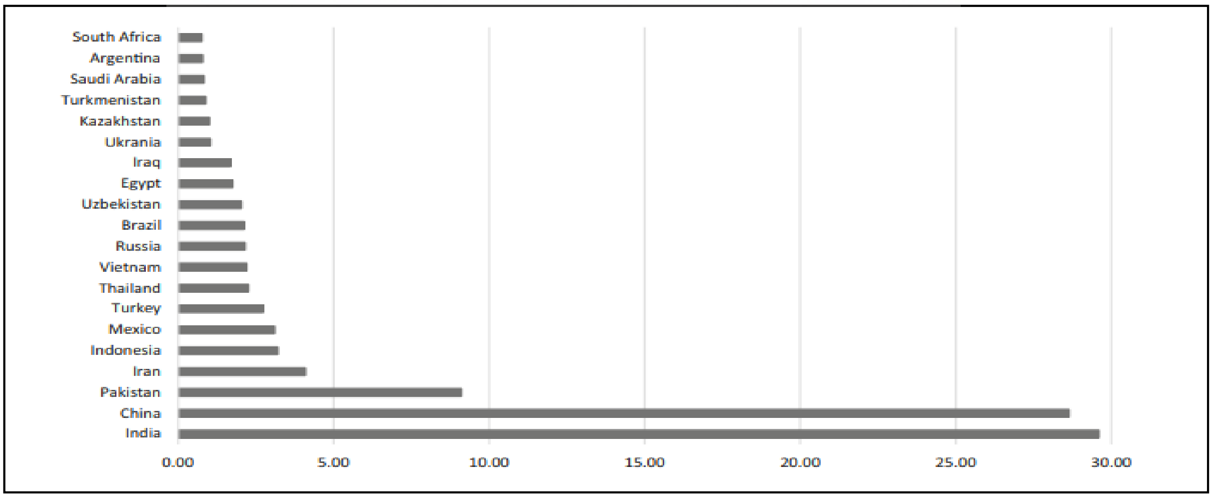

Figure 2.2: Percentage of irrigated areas in developing countries in the world (%)

Inside Mesopotamia and over Tigris reach, there are Ishaqi project, Nahrawan project, Middle Tigris projects, Dujailah project, Dalmaj venture, and Gharraf Canal projects.There are additionally numerous blasts on Tigris and Euphrates, a portion of these floods are some portion of Tharthar and Habbaniyah projects, while others serving the irrigation system projects in Mesopotamia. On Euphrates, there are a few irrigation projects, where the activities upstream Fallujah city are practically little or medium undertakings watered by siphoning. There are six huge dams inside Iraq, 5 are existing in Tigris bowl, and one in Euphrates bowl, these dams which were worked since 1950's are experiencing a few issues, similar to establishment liquefaction, seismic impacts, and others. On Tigris bowl, there are Jazeera project flooded by siphoning from Mosul Dam, Kirkuk project that is watered from Lesser Zab River, and Diyala are projects. Water system projects incorporate a few classifications, which are dams, blasts, channels, channels, siphoning stations, controllers, and supplies (Abdullah and Al-Ansari, 2020).

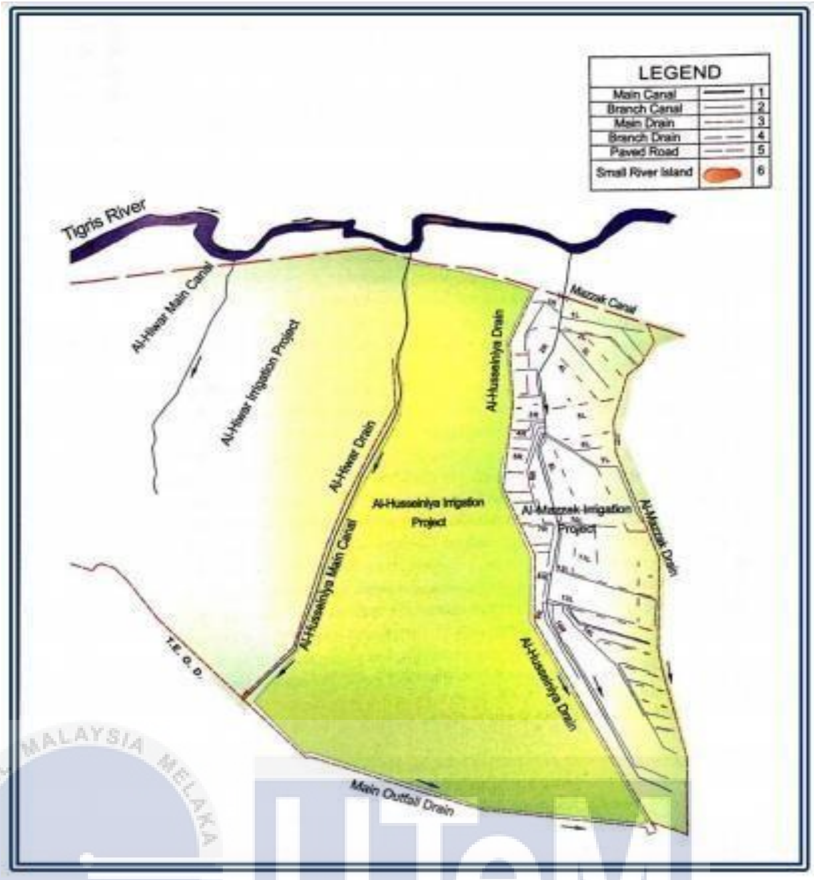

Figure 2.3: Map of Dalmaj Irrigation Project

2.3 Modern irrigation system

Biophysical parameters, family demographics, family economic resource situations, market access and distribution services, social capital, loan limits, and other factors are all shown to impact farmers' adoption of sophisticated irrigation equipment in this study. The importance of efficient water use in agriculture irrigation was reaffirmed in the central document No. 1 for 2020, which wasfurther emphasised by the policy of "acceleratingthe development of efficient water-savingirrigationtechnology and realising 100 million hectares of new and efficient farmland for irrigation water conservation." The promotion of modern irrigation technology and the development of water-efficientagricultural production in the arid and semi-arid regions of Northwest

China is crucial for ensuring water security, food security, and environmental safety in China, as well as promoting the long-termdevelopment of modern agriculture-based rural areas. However, it is clear from the literature reviewsections of this article that existing works of literature pay less attention to the impact of natural disasters on farmers' behaviour when using modern irrigation technologies, and that no researcher hasever considered the risk-taking network in this impact process. (Tan *et al.*, 2020).

The sample area	The total number of households (%)	Using technology: Low-pressure tube irrigation technology	Sub membrane drip irrigation	Micro-sprinkler irrigation technology	Unused technology
Dangzhai town	135 (27.61%)	14 (2.81%)	88 (17.67%)	0 (0)	33 (6.63%)
Ershilipu town	28 (5.62%)	8 (1.61%)	15 (3.01%)	0 (0)	5 (1.00%)
Shangqin town	125 (25.10%)	73 (14.66%)	0 (0)	20 (4.02%)	32 (6.43%)
Shajing town	97 (19.48%)	67 (13.45%)	18 (3.61%)	0 (0)	12 (2.41%)
Mingyong town	75 (15.06%)	48 (9.63%)	18 (3.61%)	0 (0)	9 (1.81%)
Sanxia town	38 (7.63%)	38 (7.63%)	0 (0)	0 (0)	0 (0)
Total	498 (100%)	248 (49.80%)	139 (27.91%)	20 (4.02%)	91 (18.27%)

Note: The numbers in brackets are the proportion of samples to the total samples

Figure 2.4: Adoption of modern irrigation technology of farmers

The explanation that environment changes impacts on farming frameworks ought to be concentrated distinctively in the watered and non-inundated croplands. Various logical investigationsshow that without variation, environment changes are veryhard test for agrarian creation, especially,in non-watered states of parched and semi-dry zones, yet reasoning transformation measures can lessen defenselessness of farming In assessment of certain researchers, there would be no damage torural creationsupportability in light of an Earth-wide temperature boost at the flooded terrains. Alongthese lines, the objective of our examination was to decide potential impacts of present day environment changes on crop creation supportability in the Kherson locale both at the flooded and non-inundated grounds, and to propose a few different ways of tacklingthe issues, which may happen,especially, by utilization the modern irrigation methods. It was anticipated that temperature incrementof 1-3°C over the closest many years would increment worldwide expected evapotranspiration by 75-225 mm each year, while precipitation sums would probably diminish by around 4-5%. Truly, this

assessment is very reasonable and researchers from everywhere the world are expressing about increment of normal worldwide temperature. As indicated by agronomic exploration, a worldwide temperature alteration is almost certain to influence rural production sustainability (Vozhehova *et al.*,2018).

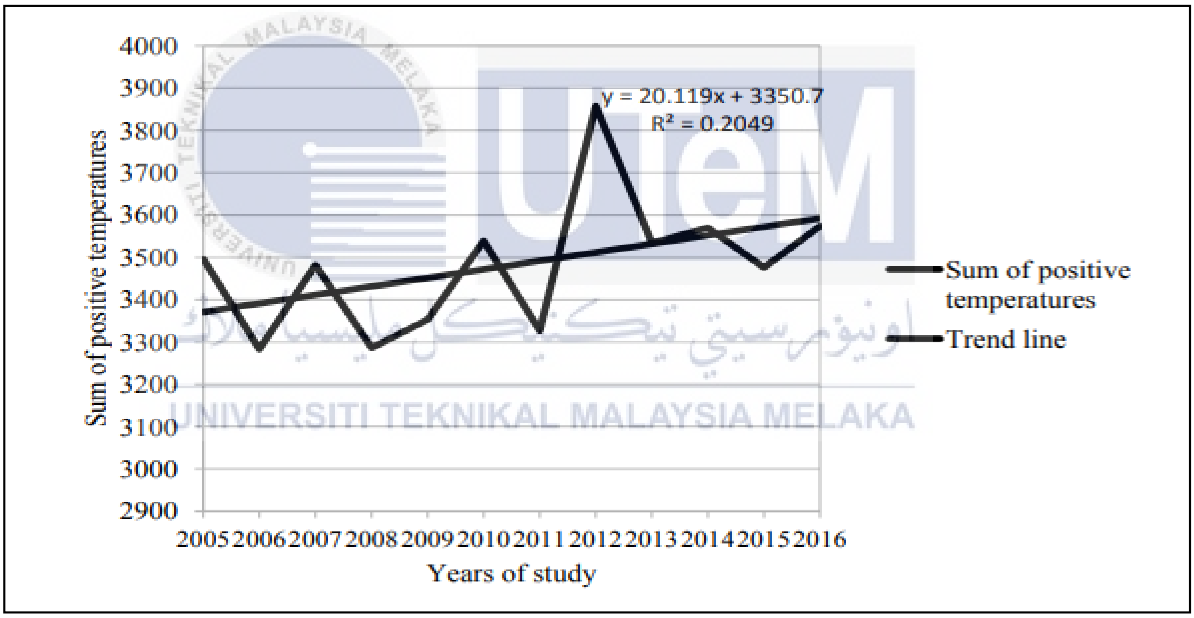

Figure 2.5: Average annual sum of positive temperatures (above 10°C) for the studied period from April to September of 2005 - 2016.

2.3.1 Surface irrigation

The report said that since the 1970s, USDA-ARS-ARS has been engaged with the improvement of mathematical models detailed WinSRFR by reenactment and investigation of surfaceirrigation. The product is intended to change over introductory DOS-based programming to the Windows working framework. The normal preparation profundity of the V irrigation area (IDV) in Bardenas, Spain was 117 mm. It was perceived that this is high, however this isn't basic in the Ebro Valley, Spain, and isn't equivalent to the normal in the Yellow River Valley, where the normal watersystem profundity is 100 mm. The report said the product was intended to utilize water at a pace of 2-10 mm/day, at a profundity of 100 mm and at a length of 50-150 mm. This is what could be compared to utilizing water at the length of the Yuma Mesa irrigation and drainage region in the U.S.and in the irrigation region along the lower ranges of the Yellow River. The examination utilized a product that was intended for the ideal length of watered fields along the edge of the water system spaces of the Yellow River. The ideal incline relies upon different boundaries like entrance boundaries, length and inflow. It shows that on account of exceptionally low inflow the consistency of the conveyance is generally inhumane toward slope (Anwar *et al.*, 2016).

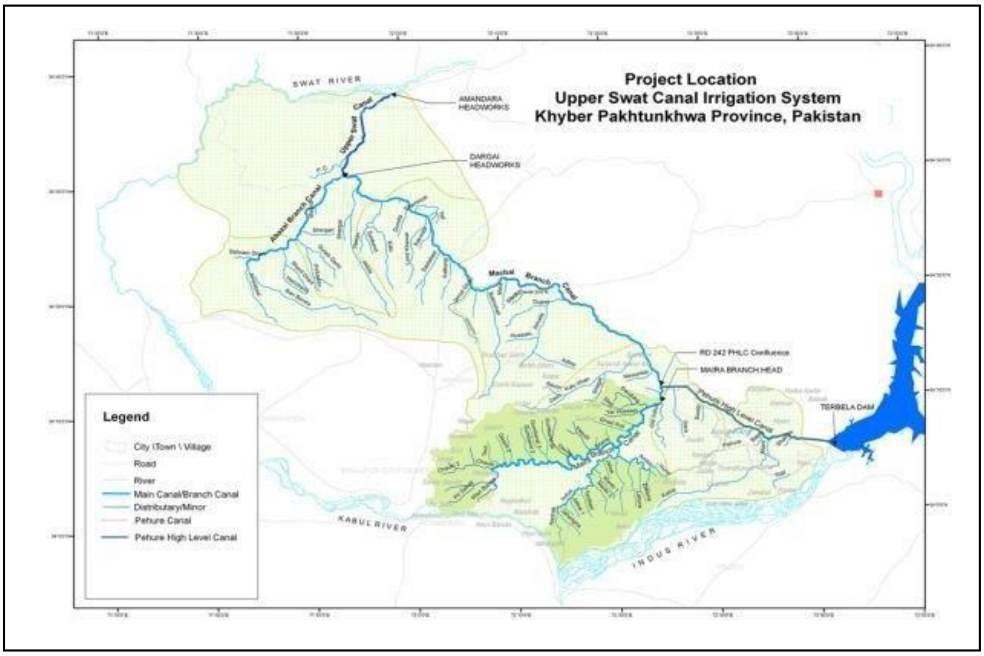

Figure 2.6: Location map of the Upper Swat Canal Irrigation System, Pakistan.

Figure 2. 7: Farmer irrigation and abstaining from irrigation behavior.

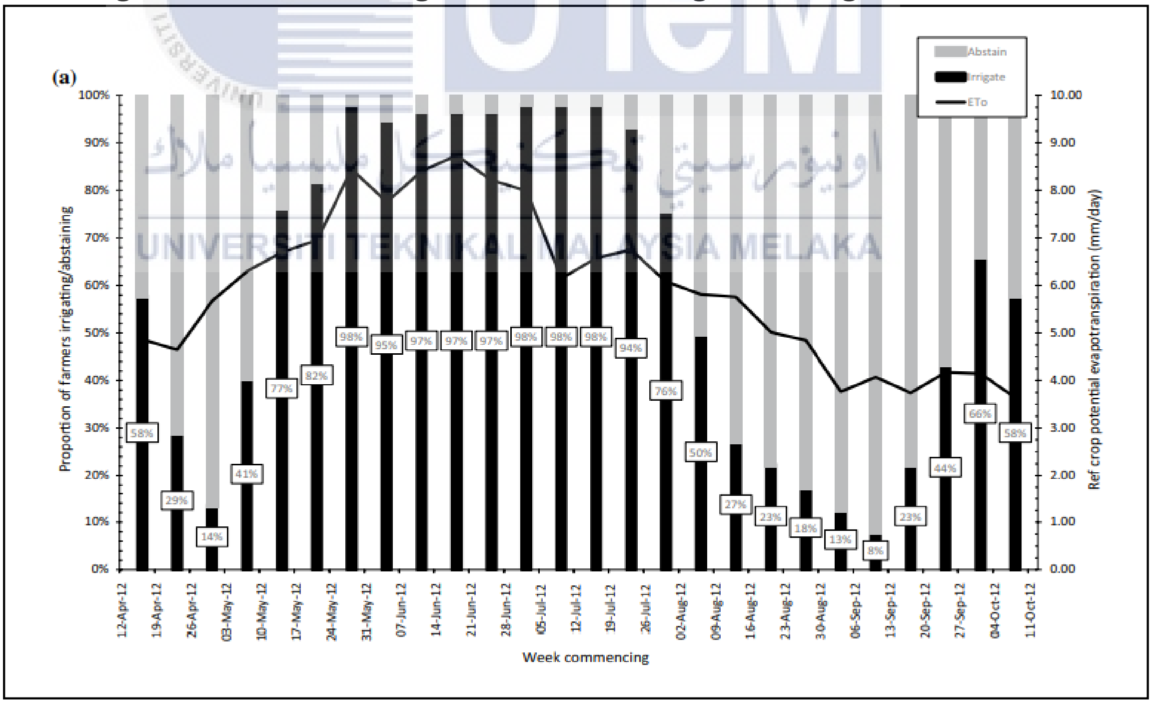

Figure 2.7: Farmer irrigation and abstaining from irrigation behavior.

SRFR predicts the coupled surface and subsurface flow of water in a surface irrigation systemframework as a component of framework type, calculation, pressure driven opposition and invasion attributes of the dirt, and the pace of water inflow as an element of time. The goal is to assess irrigationexecution for a mix of data sources, and accordingly to portray the last penetration profile and how much the water system prerequisite is fulfilled, and to describe misfortunes by profound permeation and spillover. WinSRFR incorporates devices for irrigation system framework assessment, plan, andoperational investigation, which are all upheld by SRFR estimations. Moreover, on account of lines and bowls, the model can't manage the impact of slant across the width of the field and accepts that inflow is dispersed consistently along the upstream limit (Bautista, Schlegel and Clemmens, 2016).

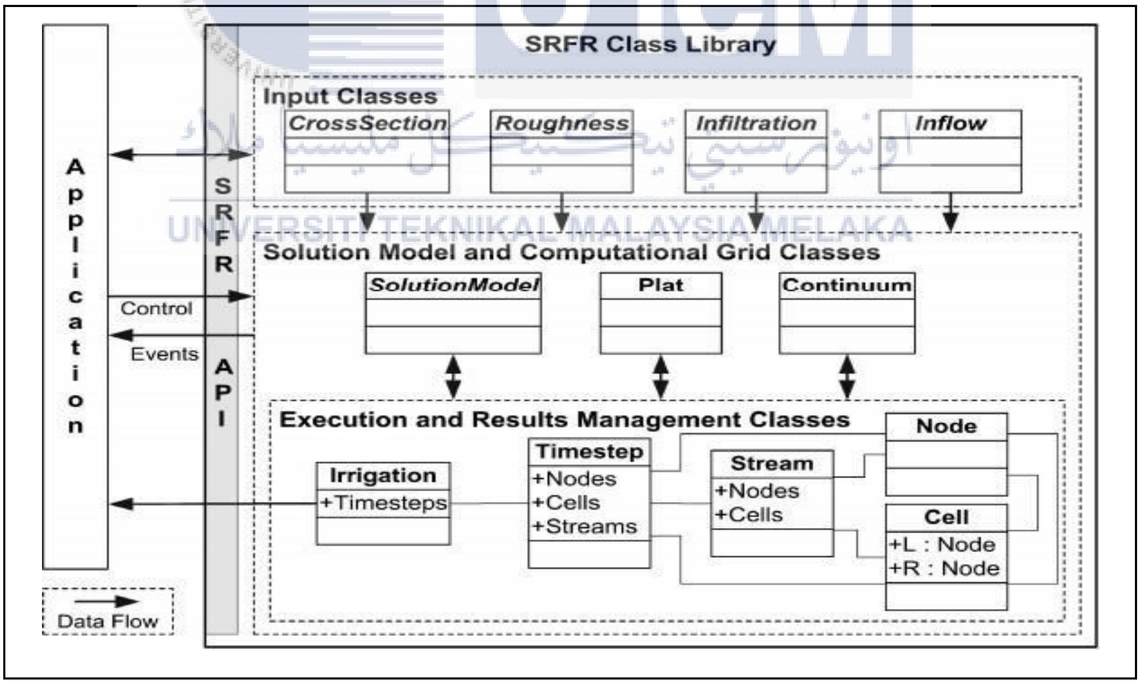

Figure 2.8: The SRFR 5 class library

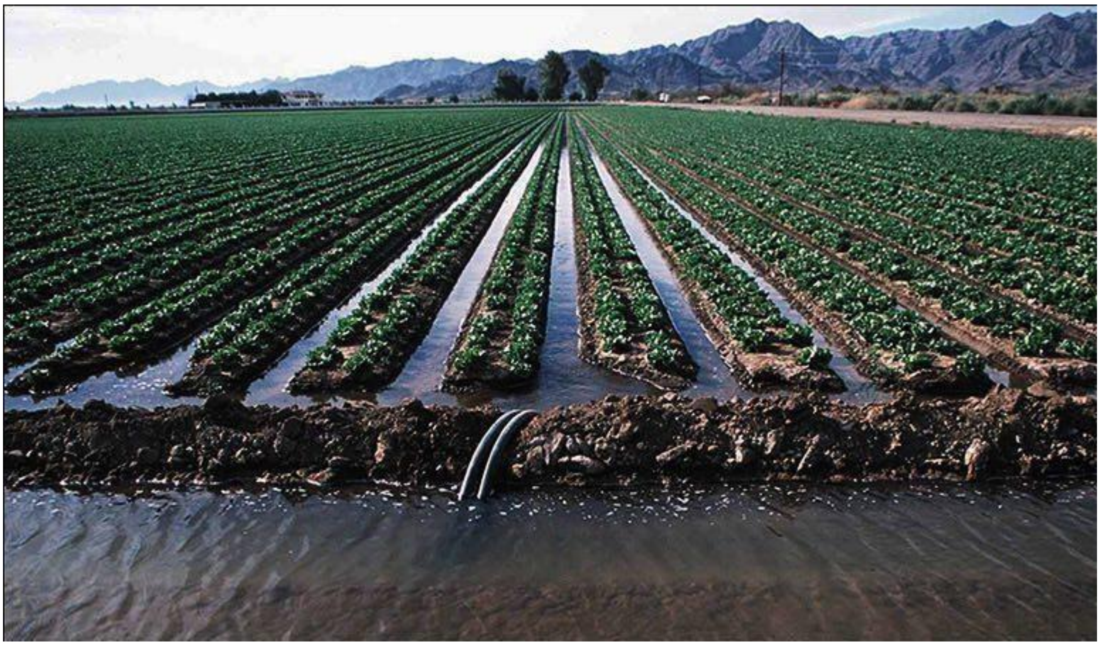

Figure 2.9: Surface irrigation system

2.3.2 Sprinkler irrigation

Since the first national standard, the Technical Code for Sprinkler Irrigation GBJ85– 85 (Chinese Standards, 1986), was published in 1986, 36 technical standards relating to sprinkler irrigation have been published, including 12 national standards and 24 industrial standards. Sprinklerirrigation, as one of the most advanced water-saving irrigation technologies, has been developed, advanced, and used in China since the 1950s, primarily through the four phases of starting investigation, first swift turn of events, low tide, and second fast turn of events.The expansion of water-saving irrigation has been decided as a key public strategy by the public authority during the 1990s, with growing attention to the worldwide water shortage and increasing need for water assets from monetary advancement in China. Water-saving and yield-expansion operations in north-east China, water-saving and productivity-expansion activities in north-west China, and water-saving and restricted investigation initiatives in north China were all dispatched. The sprinkler-flooded territory in China had grown to 4.07 million hectares by the end of 2016, although this was still just 5.60 percent of the total inundated area. (Ministry of Water Resources, P. R. China, 2016). (China's Ministry of Water Resources, 2016). Sprinkler water systeminnovation was in the testing and investigation phase prior to the 1960s, and the sprinkler-inundated territory was nearly nothing. (Yan *et al.*, 2020).

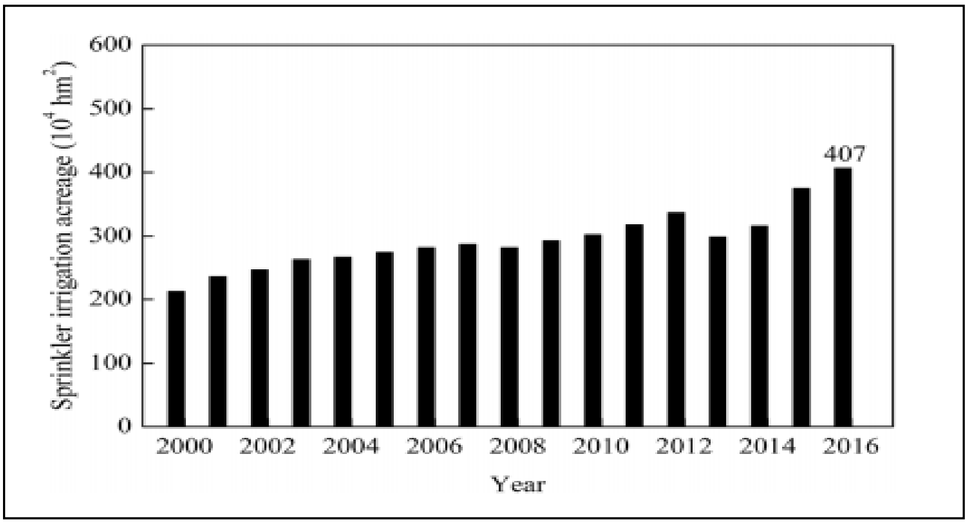

Figure 2.10: The annual variation in sprinkler irrigation acreage in China.

Sprinkler irrigation can apply water, manure and pesticides along with the right sum and frequency, compost and pesticide productivity, lessen the event of plant illnesses and insect pest, restrain the development of weeds, keep the soil total bunch, give great conditions for crop development, to expand production and improve item quality. Such sprinkler nozzles spray the waterin numerous streams that battle the breeze preferable with greater consistency over conventional splashes, especially under defined operating situations. For instance, the output of field crops under sprinkler irrigation maybe raised from 10 percent -20 percent , while monetary and vegetable harvests might be raised by 30 percent , individually. Due to the rising energy-cost and effect of environmentalchange, there is presently the requirement to save more water for optimal harvest creation using sprinkler improvements under low tension. The adequacy of sprinkler irrigation in limiting water mishaps involves both determination of correct sprinkler equipment and execution of fitting administration for the crop, landscape, soil, and climate conditions. Numerous sorts of sprinkler nozzles can be chosen for turning and parallel move sprinkler irrigation frameworks (Li *et al.*, 2019).

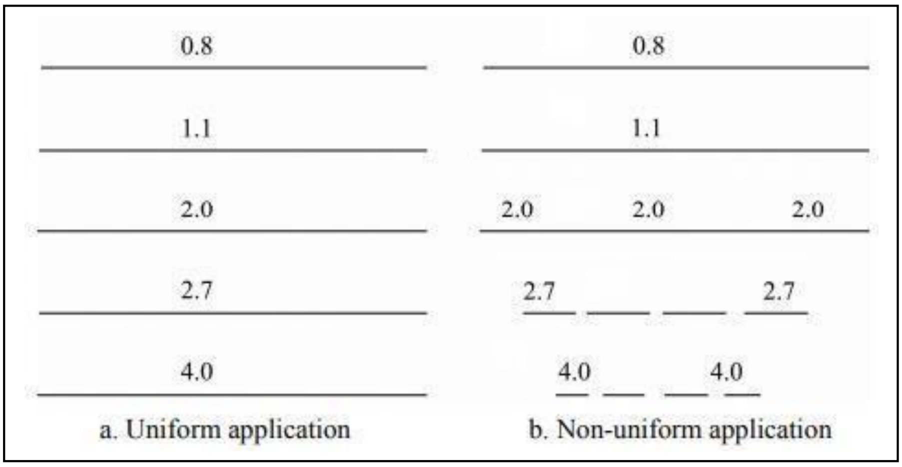

Figure 2.11: Water application from the lateral lines and layout of sprinkler system.

Figure 2.12: Spray sprinklers with pop-up heads.

2.3.3 Drip irrigation

Drip irrigation saves a lot of water from the underlying arrangement levels to reap the paddyand it is tracked down that 1.3 million liters of water are needed for raising a section of land of paddyunder ordinary flood irrigation method, while the drip irrigation framework utilizes just about 0.4 million liters of water. Flood irrigation is a strategy that deliveries water until the whole field is covered, however the harvest needn't bother with that much measure of water during its whole development range it requires just half and 25% of water in mid and beginningphases of developmentcontrasted with the completely developed stage. The drip irrigation framework is otherwise called miniature water system which supplies water either straightforwardly to the root zone or soil surface through compressed lines, valves and drippers to make water trickle gradually. Agriculture utilizes 85% of accessible freshwater assets worldwide for developing the plants utilizing customary water system techniques and it builds the interest for the water assets in everyday life as the populace develops. This requires mechanization in the irrigation framework for adequately using the water assets and the majority of the specialists are presently focusing on the computerization of irrigation framework. Drip irrigation framework saves almost 40–80% of water contrasted with conventional flood water system strategy. Consequently drip irrigation is picked to enhance the use of water assetsfor improving the harvest yield (Barkunan, Bhanumathi and Sethuram, 2019).

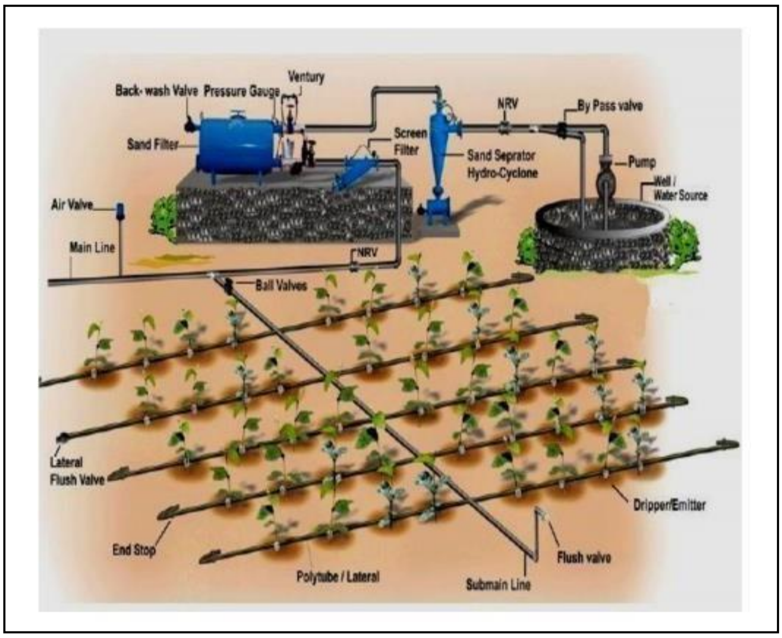

Figure 2.13: Drip irrigation layout

Figure 2.14: Drip irrigation in paddy cultivation.

The drip irrigation system appropriation expands water use effectiveness (60-200%), saves water (20-60%), decreases preparation necessity (20-33%) through fertigation, creates better quality harvest and builds yield (7-25%) as contrasted and regular water system. However, because of assembling varieties, pressure contrasts, producer stopping, maturing, frictional head misfortunes, irrigation water temperature changes and producer affectability brings about stream rate varieties evenbetween two indistinguishable producers. A best and attractive component of stream irrigation is that the uniform conveyance of water is conceivable, which is quite possibly the main boundaries in plan, the executives, and selection of this framework. For limiting the expense of water system and manures, appropriation of dribble water system with fertigation is fundamental which boost the supplement take-up while utilizing least measure of water and compost. Ground water is fundamentalwellspring of irrigation which is generally valuable and contributes just 2.9 percent of complete ground asset of the country. However, the framework gradually and incompletely wets the soil closeto the plant root zone, yet it is basically hard to apply the equivalent measure of water to all plants inside a field unit. The uniform circulation is reflected by the upsides of uniformity coefficient (CU)which thus proposes the inconstancy in the measure of water got by a plant in a subunit framework. The strategy comprises of water source, siphoning unit, blending chamber, mainline, sub- fundamental, laterals and producers. Notwithstanding, the distribution uniformity (DU) and the uniformity coefficient (CU) are capacity of hydraulic head slope of lateral and submain lines. The study was conducted with objective to assess the exhibition of drip irrigation frameworks set down in the examination region (R.C. Purohit, P.K. Singh and Kothari, 2017).

Environment	Q_{avg} lph	CU %	DU %	DC %	EU %	Ea %
OE	1.67	96.24	88.07	50.84	90.45	83.23
NVPH	1.79	93.63	89.69	54.06	89.99	85.09

Figure 2.15: Performance parameters to evaluate drip irrigation system in the study area (open environment (OE); naturally ventilated poly house (NVPH); average discharge (Qavg); Uniformity Coefficient (CU); Distribution Uniformity (DU); Distribution Characteristic (DC); Emission Unifromity (EU); application efficiency (Ea))

Drip systems having good to excellent emission uniformity indicate that water and injected fertilizer are distributed evenly throughout the vineyard.

Emission Uniformity Rating

90 - 100% Excellent

80 - 90% Good

70 - 80% Fair

Less than 70% Poor

Figure 2.16: Emission Uniformity Rating

2.4 Irrigation technology

By mentioning to the social idea of learning, believing the selection of technology to be a glimpse of something larger and that, after adoption, there will be changes in management practicesjust as additional technology, flagging trust and network as the fundamental wellsprings of this dynamic. Albeit the two cycles are connected, they can be treated as free choices and, thusly, we test separate models for irrigation technology adoption and the selection of planning. Albeit this connection has noticeable benefits, it additionally can have bothersome impacts, for example, whenawful execution of the technology received by certain ranchers prompts more extensive dismissal of the innovation inside the local area. Having depicted our examination level headed and the exploration setting, we currently present a writing audit on friendly capital, after which we present our examination structure and figure the speculations. Hence, in this paper we allude to the primaryinteraction as irrigation technology adoption and the second cycle as selection of planning. Despite the troubles in characterizing social capital, a few investigations set forward the possibility that itsfundamental commitment is to work with data streams among people, which may empower reception measures. The appropriation of better irrigation practices can profit the maker by takinginto consideration a better return and nature of the items and saving water assets that have been getting more difficult to find in the new years. As a contextual investigation we use irrigation technology adoption and the appropriation of irrigation planning among medium to little grape plantation makers in Chile (Hunecke *et al.*, 2017).

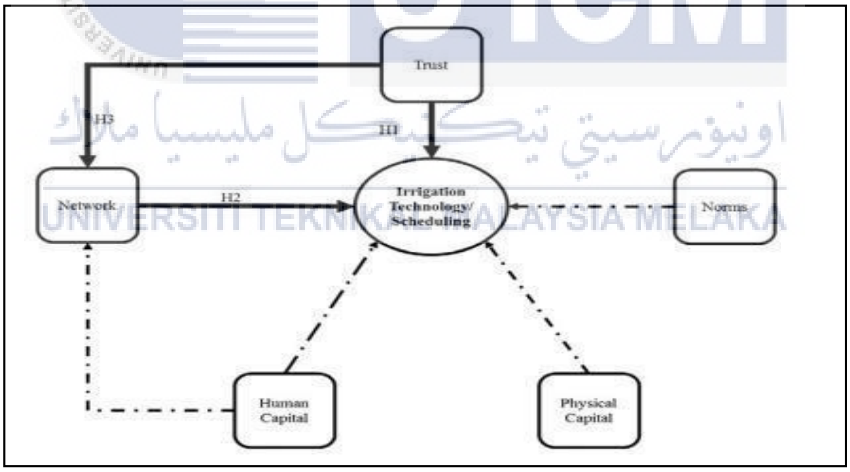

Figure 2.17: Research model and hypothesis. H1 and H2 indicate that trust and networks are associated with the adoption of irrigation technology and the adoption of scheduling, in this order. H3 indicates a positive association between trust and networks.

2.5 Instrumentation of automated irrigation system

Indian irrigation system the famers are picked the greater part of the techniques physically like drip, ditch, terraced irrigation arrangement of them. Embedded based programmed irrigation framework is appropriate for ranchers accessible for minimal price effectively introduce. India's significant type of revenue is from agriculture area and 70% of farmers and general individuals rely upon the farming. Mechanization irrigation framework notices the dampness sensors andtemperaturevarieties of around the yield region that is gives an exact season of activity the motor turn ON and OFF. So Automatic human keep away from the human blunders and check soil dampness level. Webof things (IoT) is permitting controls the frameworks from far off region over a web It can controls the sensors which are utilized at different regions at blinding streets rail routes networks and water control frameworks. So it can keep away from the human mistakes and blunders show up during framework worked. IoT is the seeming region that pushing through other region and made them so viable. It foster now a days by incorporation of new sensors, sensor organization, RF based interchanges. It can shows shrewd knowledge, exact detecting alongside great distinguishing proof. When added distributed computing with IoT a progressions has happened in PC network base advances and versatile based innovation. Presently days different organizations are 3G, LTE, GSM, WLAN, WPAN, WiMax, RFID, Zigbee, NFC, Bluetooth that creates IoT so brilliant framework andsystem works at distant spots (Nageswara Rao and Sridhar, 2018).

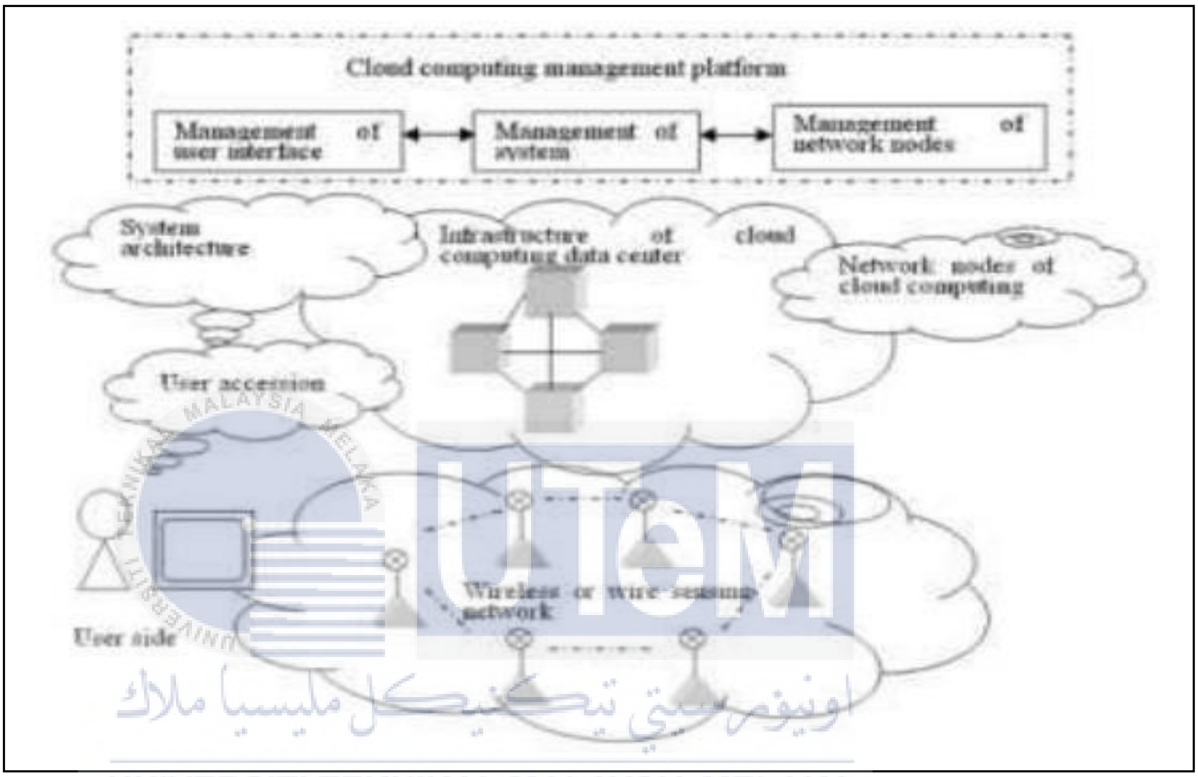

Figure 2.18: The principle of cloud computing for IoT.

2.6 Automation in irrigation system

This paper proposes state-of-the-art idea for the farmthat utilizing irrigation using IoT(Internet of Things) and Machine Learning procedures, a remote sensor network field should beset up all through the homestead field or even in the family nursery to screen every one of the pieces of the field, The proposed research presents the most ideal answer for the ranch needs, water system needs dependent on different open source information bases accessible on the web and Machine learning calculations (Classification and Regression). The smart home system arein effect widely research and grew however this significant space of Agriculture and uncommonly Smart Agriculture will in general fall behind different areas and require a considerable amount of R&D to accomplish maintainable objectives at modern level as well asat the root level of this horticulture industry. It won't just assistance in thriving supportable advancement of humanity, widely varied vegetation however will likewise help in managing the worldwide emergency, for example, environmental change and pandemics like draft. With better innovation comes better yield; accordingly, will help forestall circumstances like starvation and ailing health. Over Irrigation or less water system both would influence the yieldand the nature, so robotization of Irrigation frameworks is essential. Automation of ordinary irrigation methods can prompt numerous folds expansion in crop yield. The innovation ought to be accessible at a moderate cost with the goal that its effect could reach to billions of individuals around the world. In this way, making do and enhancing the current cultivating advances is the need of great importance. During different periods of yield creation, crop waterneeds change considerably. Irrigation needs changes with the yields and that too with the seasons (Vij *et al.*, 2020).

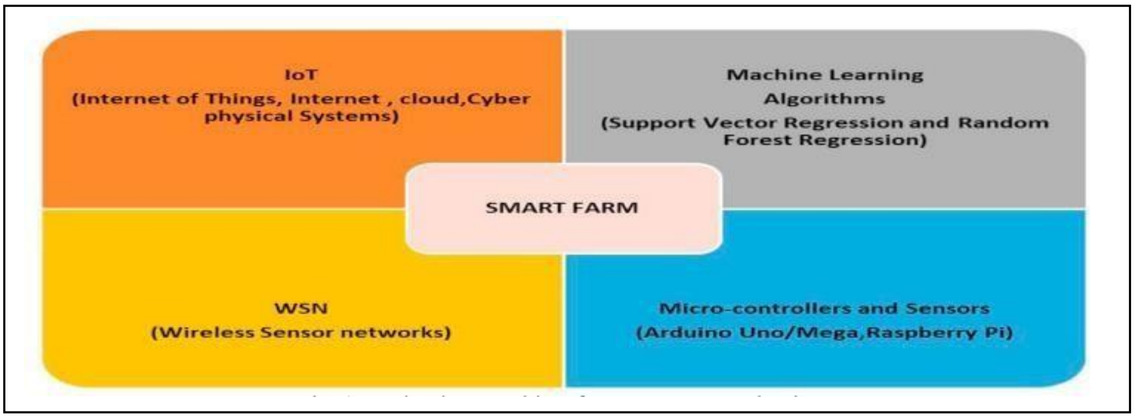

Figure 2.19: Technology enablers for Smart Farm Irrigation.

2.6.1 Microcontroller

A sensor to measure soil moisture was the reason for fostering a irrigation framework at a saving of 53% of water contrasted and water system by sprinklers in a space of 1000 m2. The moisture sensor is interface with Arduino microcontroller that will work by the way toward reproducing on PROTEUS programming and dependent on that it initiate the DC motor through operation amp which look at the degree of moisture properties of the soil with the reference value that will work the pump through the relay. Nowadays, farmer are battling hardin the agriculture field and the errand of irrigating field is getting very hard for the farmer because of lack of routineness in their work and carelessness in light of the fact that occasionally they switch on the motor and afterward neglect to turn off which may prompts wastage of water. The point of the article is to foster a keen irrigation framework which estimates the moisture of the soil and automatically turn on and off the water supply. The impacts of the applied measure of irrigation water, irrigation recurrence and water use are especially significant. In this venture we are utilizing soil moisture sensor which is accustomed to detecting moisture level whether the soil is dry or wet. The utilization of water expands step by step that may prompts the issue of water shortage. So our undertaking gadgets a basic framework, utilizing an Arduino microcontroller to manage the water system and watering of harvests with insignificant manual intervention. Likewise, they even neglect to turn ON the irrigation framework, which again prompts harm to the crops. To improve water effectiveness there should be a legitimate water system scheduling methodology. Irrigation is a tedious cycle and should be done on a timely basis. Agriculture is one of those area which devour a ton of water. To cope this issue, we have executed another strategy by utilizing Arduino microcontroller (Ghosh *et al.*, 2018).

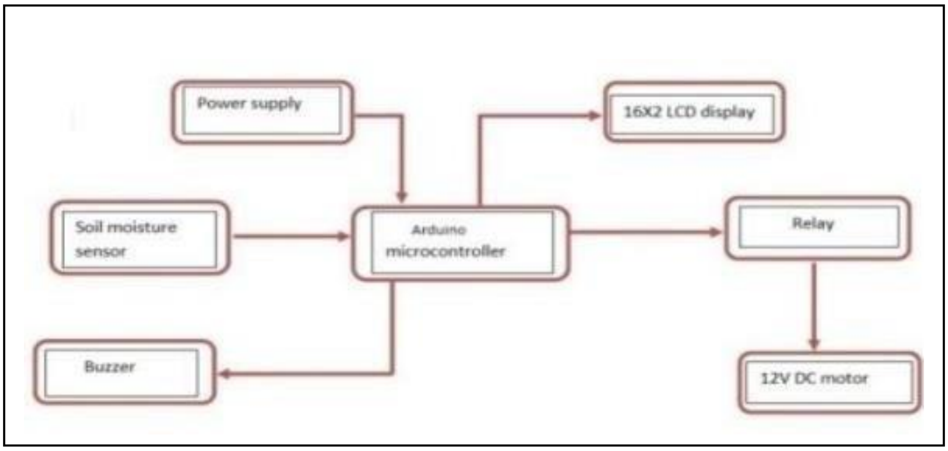

Figure 2.20: Block Diagram of Smart Irrigation System.

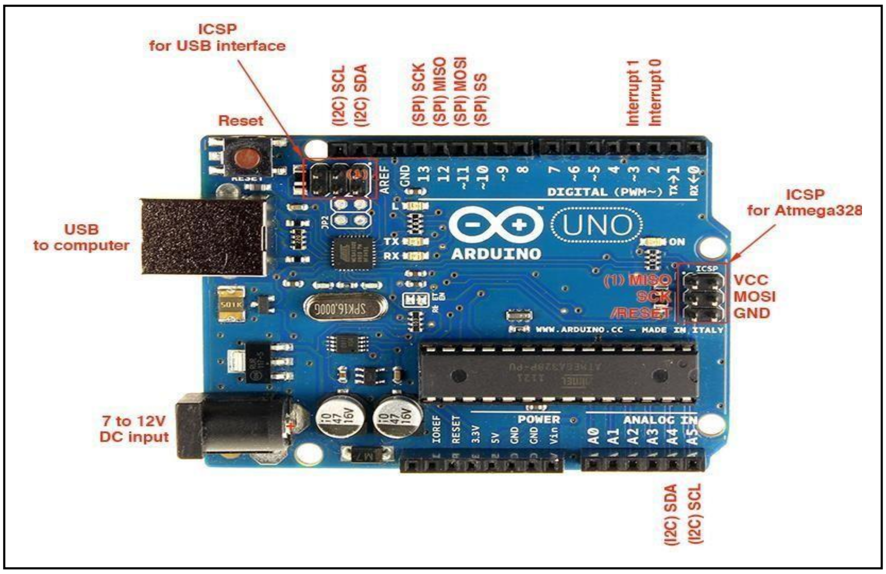

Figure 2.21: Arduino Uno microcontroller.

With the assistance of Arduino sensors and GSM sheild, controlled by Raspberry Pi 3 microcomputer, we planned a system to naturally sprinkle exact measure of water by identifyingsoil moisture, light intensity and water level. In the event that a foreordained condition is discovered, the Raspberry Pi would order a microcontroller to open the door of water supply until the moisture esteem gets more prominent than the limit esteem. Subsequently, estimatingthe right state of the soil and climate is basic in deciding the appropriate amount of water required for the plants. Moisture sensor was placed close to the roots and daylight sensor was introduced further away to plainly recognize the sunbeam. For example, water aggregated for quite a while around the foundations of a sapling may harm the roots and can likewise cause mineral misfortune in the soil. Without water, they can't endure, though the mistaken inventoryof water can likewise prompt numerous complexities. The trial required Arduino sensors, Raspberrypi 3 and line to supply water from tank constrained by the fate. Assuming there is anissue in the primary water supply, the PC will advise the overseer utilizing GSM safeguard associated with the PC. Additionally, the measure of water to be provided to the trees relies on the soil moisture and daylight accessibility. This strategic method for water supply can be extended to use in any agriculture area. Each sort of plant needs extraordinary soil dampness for smooth development (Imteaj *et al.*, 2017).

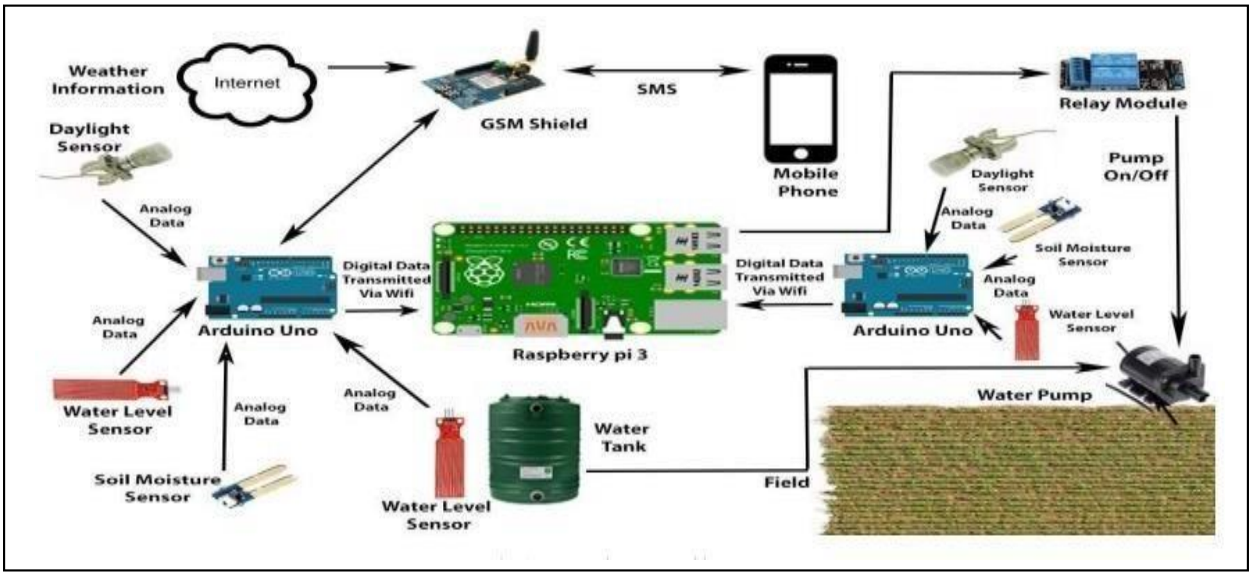

Figure 2.22: Proposed system architecture.

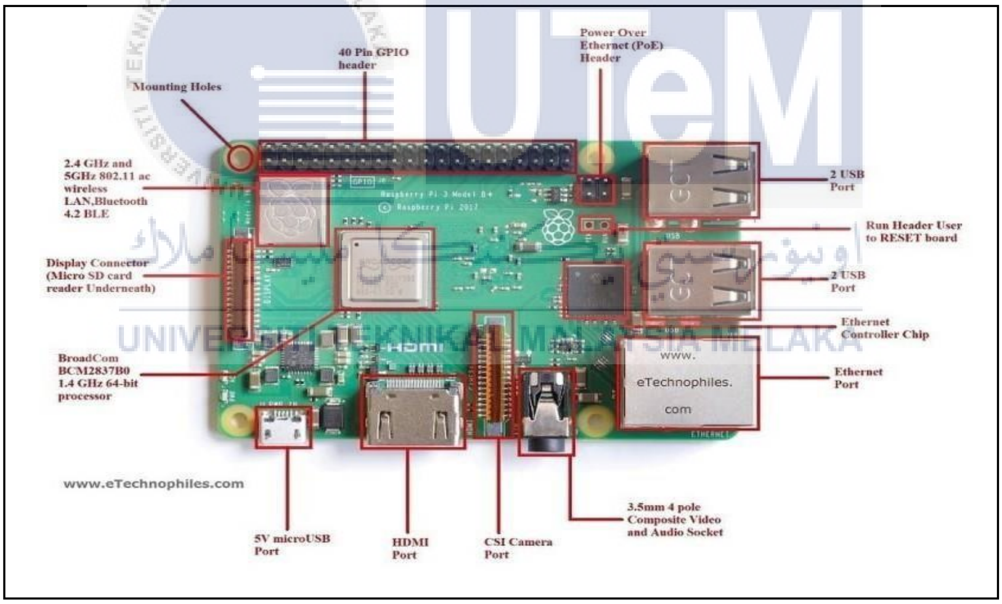

Figure 2.23: Raspberry Pi 3 microcontroller

2.6.2 Sensors

Water substance or moisture content is the amount of water contained in a material, like soil (called soil moisture), rock, fruit, or wood. Soil moisture is a critical variable in controlling the tradingof water and warmth energy between the land surface and the environment through dissipation and plant happening. Water content is utilized in a wide scope of logical and specialized regions, and is communicated as a proportion, which can go from 0 (totally dry) to the value of the materials porosity at immersion. The standard strategy for estimating soil moisture content is the thermogravimetric technique, which requires stove drying of a known volume of soil at 105 ºC and deciding the weight reduction. Fast estimation methods utilizing electronic sensors, for example, time space reflectometers, capacitance, impedance and dielectric sensors offer an option in contrast to damaging and tedious gravimetric inspecting. Soil moisture is checked by estimating electromagnetic radiations discharged by soil at various temperatures. Aside from estimating soil moisture, observing soil moisture appropriation is additionally significant in agricultural (Kumar *et al.*, 2016).

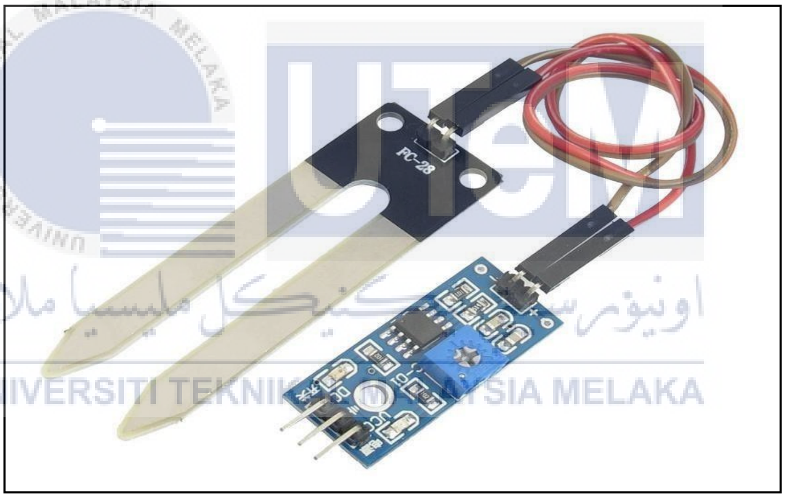

Figure 2.24: Moisture sensor

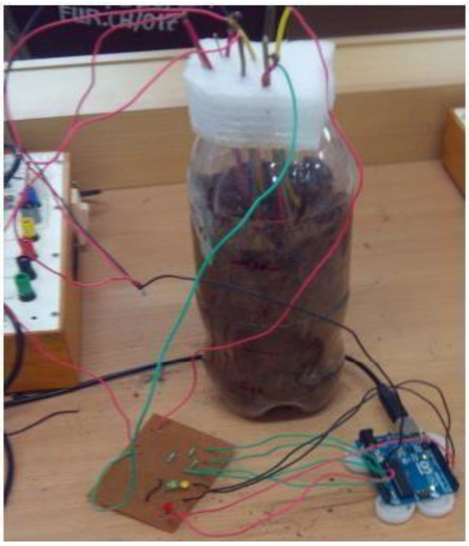

Figure 2.25: Setup for measuring soil moisture of a sample at different depths.

2.6.3 Communication

As indicated by the new improvement of science and innovation the Internet of Things (IoT)can cope the above farming issue via consequently controlling the water pump utilizing AI calculations and embedded systems. Estimating the environmental point, for example, temperature and soil dampness through a bunch of sensors will uphold the counterfeit neural organizations regulator based Arduino board to deal with the paces of irrigation level in a productive way. The created water system control framework incorporates programming and equipment apparatuses, for example, Arduino Uno microcontroller board and Remote XY for cloud Internet association with Android user interface (UI). In addition, the remote water irrigation management can be dealt with during the Coronavirus pandemic and the time of isolate. The IoT presents the center of the brilliant irrigation frameworks, including the internetwork of actual gadgets, embedded electronics, programming, sensors, and correspondence among these things to trade information over the Internetassociation. The brilliant irrigation the board assumes a significant part to build cropand to diminishcosts with adding to the environment variation and manageability (Karar *et al.*, 2020).

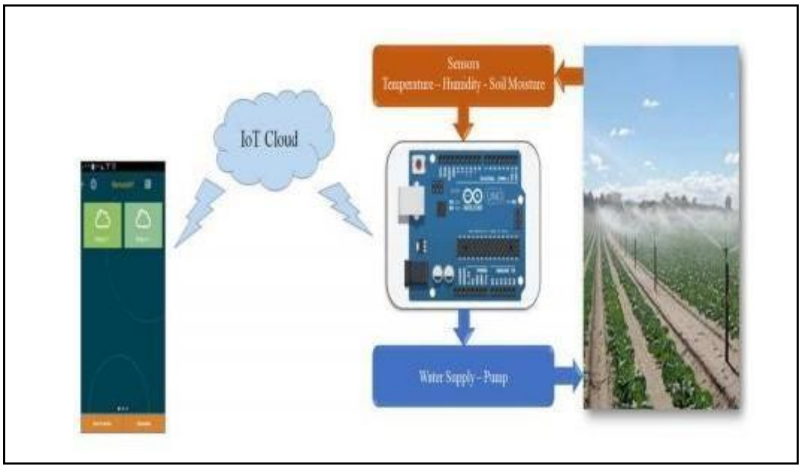

Figure 2.26: Proposed IoT-based system design of smart water irrigation including Arduino Board, environmental sensors and a water pump.

2.7 Summary

This chapter represent in specific about the history of the irrigation system, modern irrigation system, types of irrigation system which is surface irrigation system, sprinkler irrigationsystem and drip irrigation system, irrigation technologies, instrumentation of automated irrigation system, automation in irrigation system, microcontroller and sensor. Besides that, this chapter alsoproduce ideas on how to design the automated irrigation system by referring to past research including type of components, software, and microcontroller.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter it will discuss and cover on method and procedure for this PSM 2 project. Methodology is defined as a guideline and steps that should be follow to ensure the progress of the project run smoothly. According to this chapter, it will describe how the progression of the project from the start until its being complete. Every stage will be explained clearly in this chapter for further knowledge. In this case, methodology should be followed accurately to make sure the project finished properly. In addition, this chapter also covers the routine and the schedule. This project routine and schedule will be jot down all the activities that should be carried in conjunction with the period of time for every activity. It is necessary to make sure the project can be done in time and to avoid dragging too much time on the project progression.

3.2 Methodology

In this project, when the soil moisture sensor being dip to the soil it will measure the current moisture of the soil. Then the soil moisture sensor will determine whether the soil reach its maximum moisture or in minimum moisture condition. If the sensor value reaches the threshold limit, the water pump and motor driver turn on. After the soil reaches its maximum moisture the water pump and motor driver will turn off and the data will inform directly thru Blynk application.

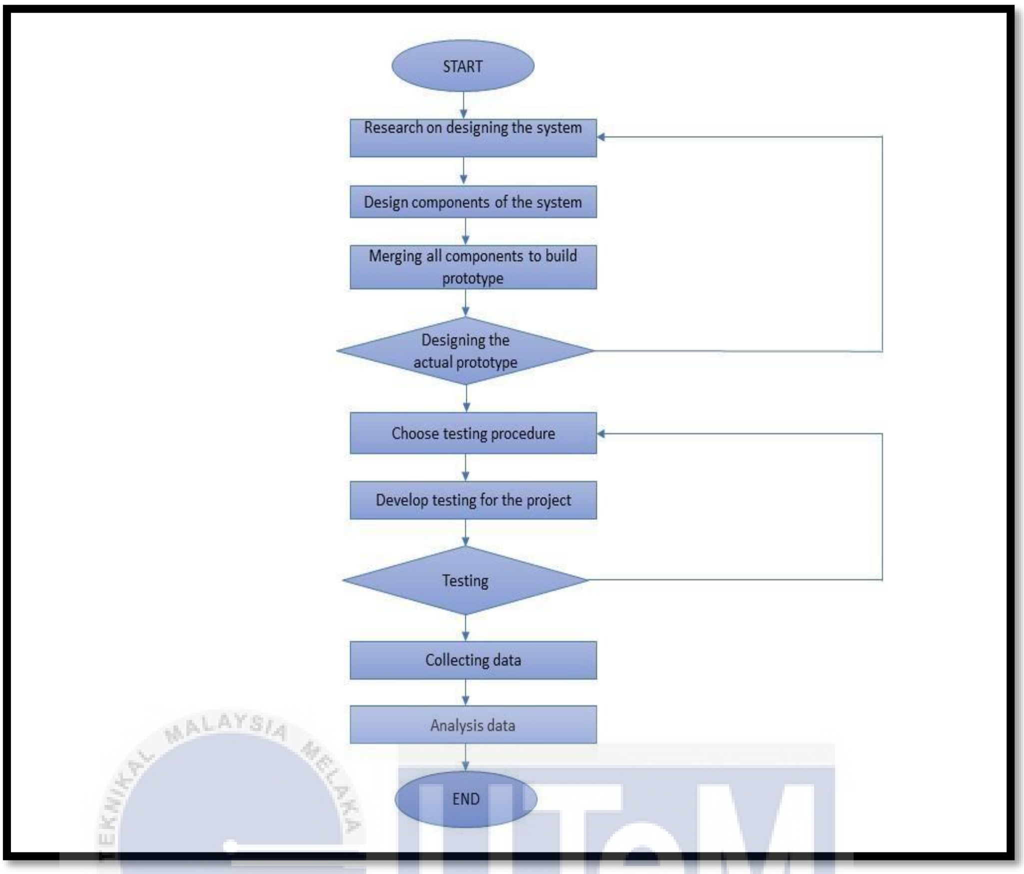

Figure 3.1: Flowchart for overall progress PSM 2

3.3 Experimental setup

In this project, when the soil moisture sensor being dip to the soil it will measure the current moisture of the soil. Then the soil moisture sensor will determinewhether the soil reach its maximum moisture or in minimum moisture condition. If thesensor value reaches the threshold limit, the water pump and motor driver turnon. Afterthe soil reaches its maximum moisture the water pump and motor driver will turn off and the data will inform directly thru WiFi.

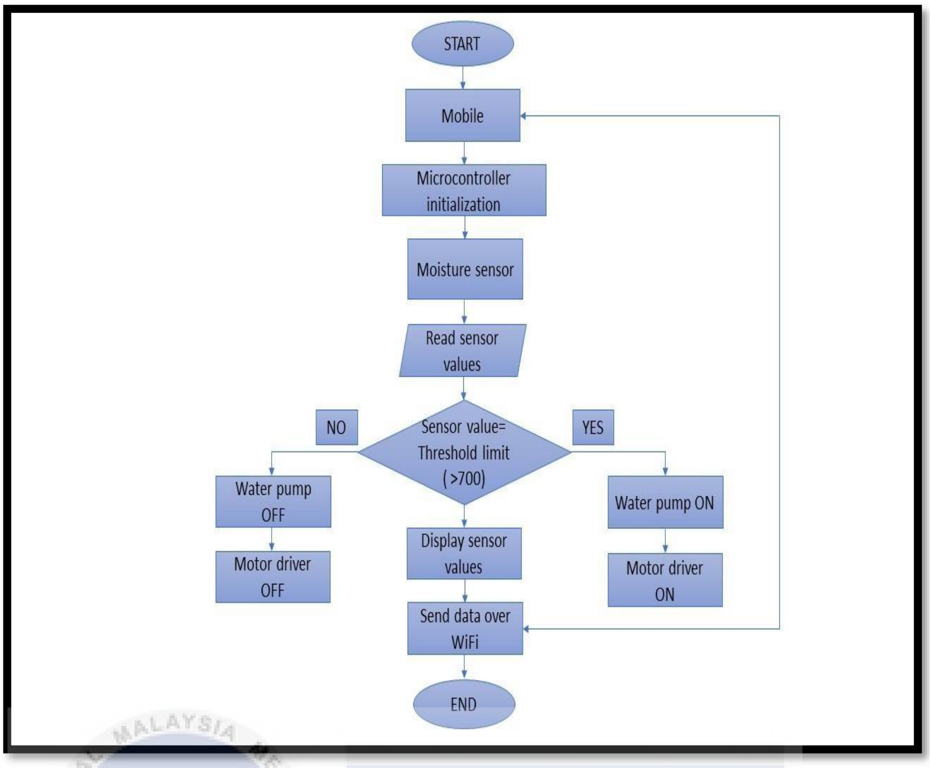

Figure 3.2: Flowchart for the whole system

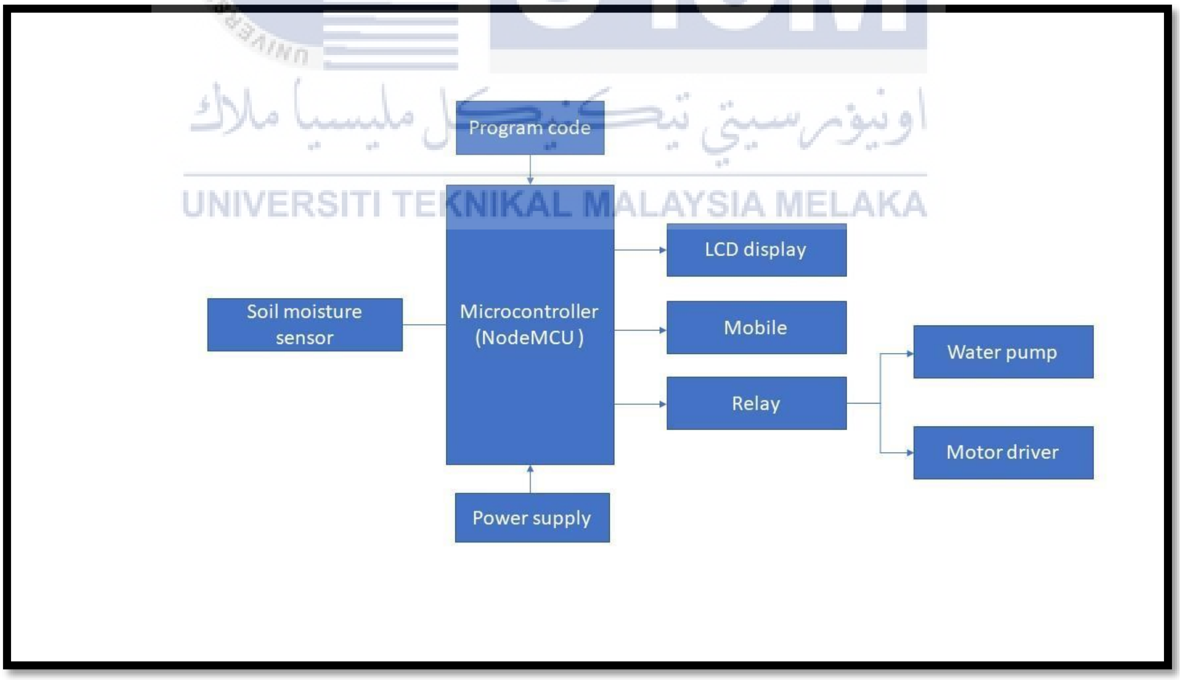

Figure 3.3: Block diagram for the whole system

3.4 Parameters

In this project the parameters or the things that being measured is soil moisture level and the voltage of the system. Soil moisture level is being measured when the soil sensor is being dip in the soil and it will measure the value of the moisture in the soil. While for the voltage, it's being measured when the system is on operating condition.

3.5 Equipment hardware & software

3.5.1 NodeMCU v2 ESP8266 WiFi

In this project the microcontroller that being used is NodeMCU v2 ESP8266 WiFi. NodeMCU v2 ESP8266 WiFi microcontroller contains 16 digital input/output pins and also 1 analogue input. The soil moisture sensor reading value will be processed by the NodeMCU v2 ESP8266 WiFi. It is the brain for the whole project system.

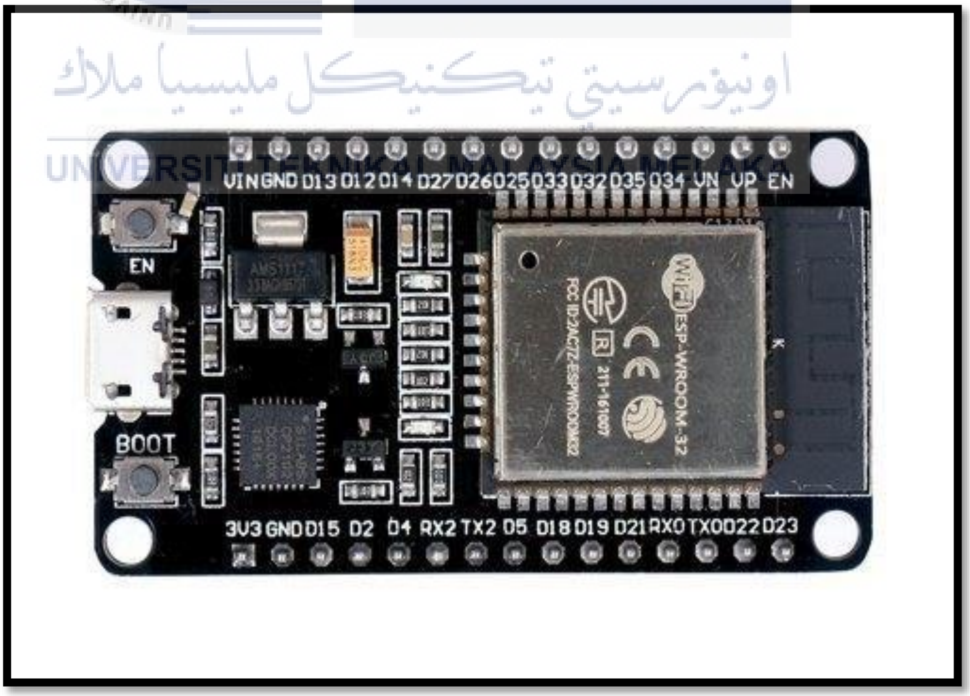

Figure 3.4: NodeNodeMCU v2 ESP8266 WiFi

3.5.2 Soil moisture sensor

Soil moisture sensor function is to measure the volumetric dampness content in soil. Since the direct gravimetric estimation of freesoil dampness requires eliminating, drying, and weighing of an example, soil moisture sensors measure the volumetric dampness content in a roundabout way by utilizing some other property of the soil, like electrical opposition, dielectric steady, or connection with neutrons, as an intermediary for the dampness content.

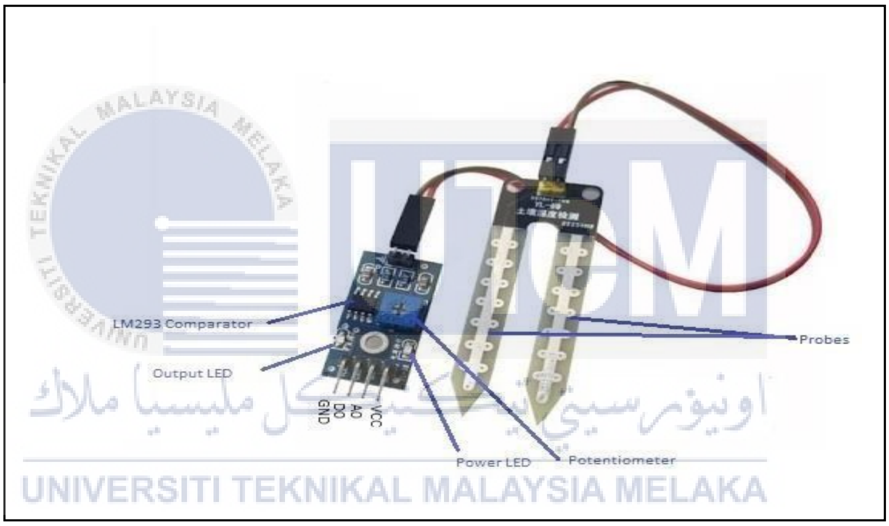

Figure 3.5: Soil moisture sensor

3.5.3 DC Motor

DC motor is any of a class of revolving electrical engines that converts direct flow electrical energy into mechanical energy. The most widely recognized sorts depend on the powers delivered by attractive fields. Virtually a wide range of DC motor have some inside component, either electromechanical or electronic, to occasionally alter the bearing of current in piece of the motor.

Figure 3.6: DC Motor

3.5.4 Battery

DC supply such as battery is being use in this project. It's purpose is to supply voltage to the DC motor to move forward and reverse and as back up supply for the whole circuit to operate.

Figure 3.7: Battery

3.5.5 L293D

The L293D is a in demand 16-Pin Motor Driver IC. As the name proposes it isbasically used to drive motor. A sole L293D IC is fit for running two DC engines simultaneously, likewise the course of these two motors can be controlled freely.

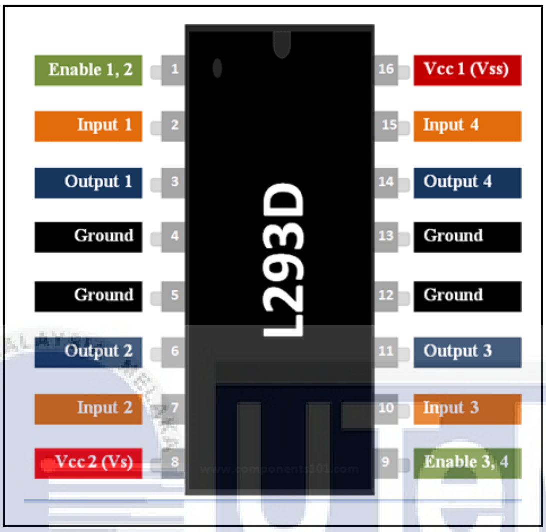

Figure 3.8: L293D motor driver

3.5.6 Arduino IDE

In this project, software development must be initiate to make sure that the equipment addresses the issues of the client. Arduino Integrated Development Environment (IDE) is the product utilized in this task. The Arduino Integrated Development Environment (IDE) is a piece of programming that incorporates a codingcontent manager, a message region, a book console, and a toolbar with catches for regular capacities and menus. The Arduino IDE is the place where the microcontroller'scode is composed to guarantee that the framework reacts to the client's orders. This product will be utilized to transfer the programming or coding to the NodeMCU board.

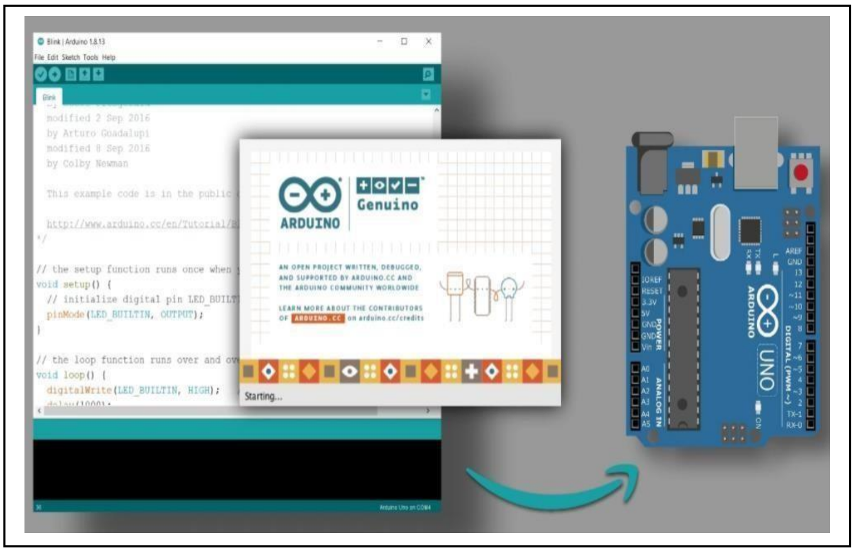

Figure 3.9: Arduino IDE

3.6 Limitation of proposed methodology

Every project has been completed must be there is a failure or problem occured. For this project, for the soil moisture reading, supposedly it's must be tested on variety of soils. Unfortunately, there is only organic soil that been taken soil moisture reading in this project.

3.7 Summary

This chapter presents the proposed methodology in order to develop an alternative water irrigation system. The primary focus of the proposed methodology is to provide an efficient irrigation system. The ultimate intend of the proposed method is not to obtain perfect irrigation system, but, for efficiency, easy to use and manipulate and practicality of this proposed alternative irrigation system.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results and analysis on the whole project in more detail. All the project data analysis and testing results are also included. The final outcome of these review is to find out whether or not target of the project has been achieved. Finally, the analysis will be produce based on the results that has been collected.

4.2 Results and Analysis

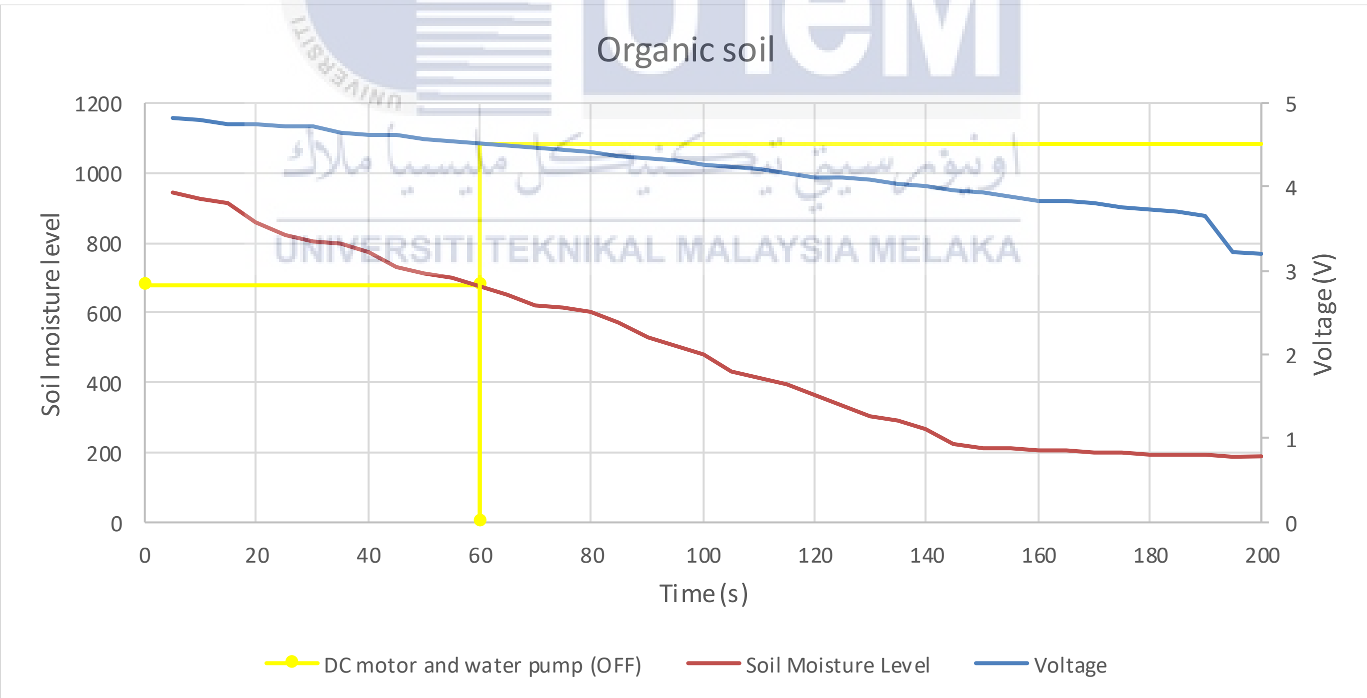

Figure 4.1: Organic soil sample

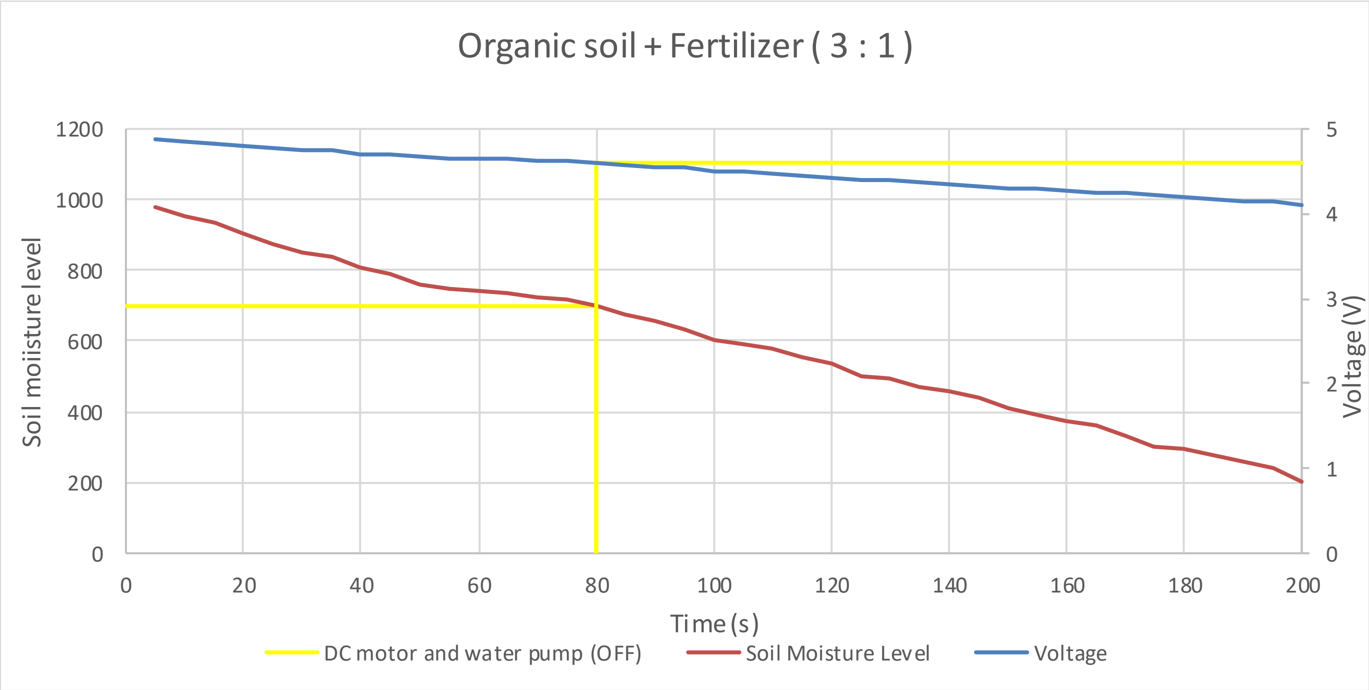

Figure 4.2: Organic soil added with fertilizer (3 : 1) sample

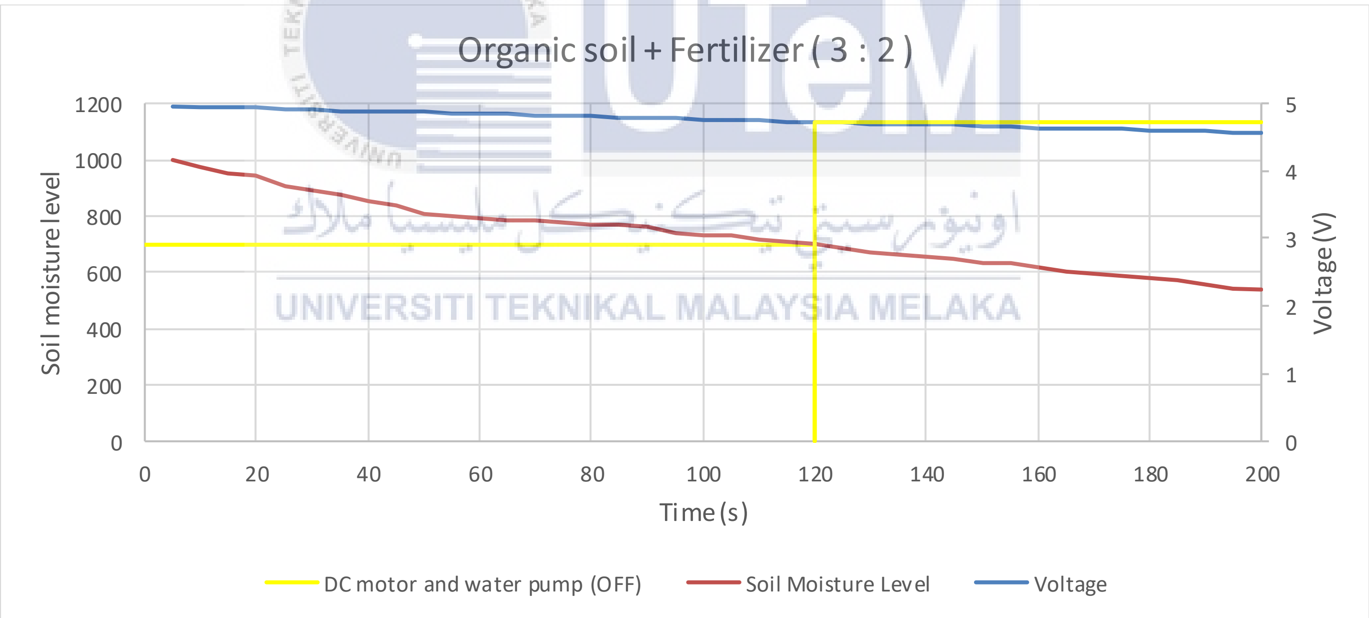

Figure 4.3: Organic soil added with fertilizer (3 : 2) sample

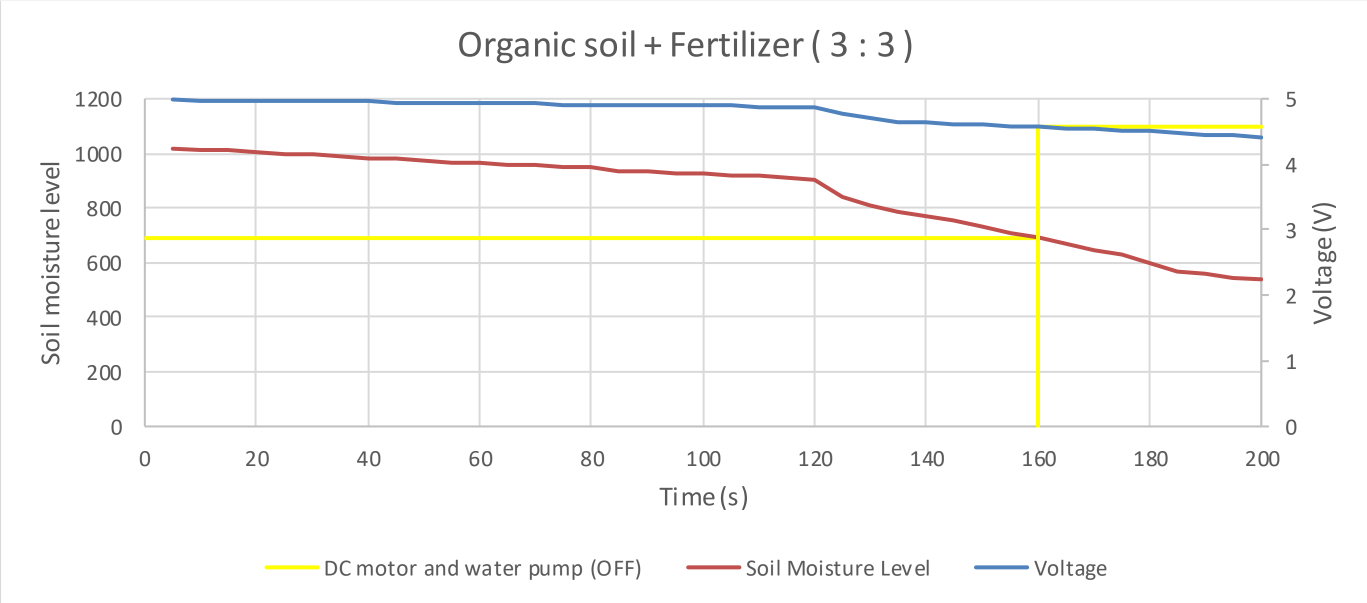

Figure 4.4: Organic soil added with fertilizer (3 : 3) sample

Based on **Figure 4.1**, **Figure 4.2**, **Figure 4.3**, and **Figure 4.4**, the soil moisture level which is the blue line and the voltage, which is the red line is being measured in the sample and the time taken for the sample to be in damp condition. The soil moisture level is being set at 700. All the data obtain is displaying a decreased trend. For the time taken of the sample to be in damped condition, **Figure 4.1** shows the quickest sample to be in damped condition, followed by **Figure 4.2** and **Figure 4.3**, and finally the slowest time taken for the sample to be in damped condition which is shown in **Figure 4.4**. As the comparisons from all the samples, conclusion has been made and we can say the less the sample using fertilizer, the faster the sample will be in damped condition.

4.3 Summary

This chapter presented the project data that have been obtain from all the samples. The collected result from all the samples is being compared. After all the results is being compared, then the analysis is being conducted. Finally, after analysis is being made the outcome of the analysis is being concluded.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The project explained the development of automated smart water irrigation system which specifically for domestic agriculture industry as for the target to develop an automated smart water irrigation system by using microcontroller based on IoT and to analyze the smart water irrigation system by testing in organic soil. The project materials and components were bought from online shop, electrical shop and metal bars for metal works from nearest hardware shop.

The irrigation system process starts from when the farmer use conventinal method by only using dippers and buckets when watering their crops. After the experimental period is done and all the data has been analyze it shows the Development of Smart Water Irrigation System with IoT Controlling Based is successfully completed and achieving the objective that has been stated in this project.

5.2 Future Works

For future improvements, the variety of results could be obtained as follows:

i) Getting a different types of soils as many as we can so that we can get many samples for the analyzing process.

ii) Install more sensor regarding to this scope project so that many measurements & data can be obtain.

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APPENDICES

Appendix 1

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<tr><th>Progress/Week</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th></tr>
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-Project Selection
-Discussion with Supervisor</td><td rowspan="9">BRIEFING SESSION</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td rowspan="9">MID SEMESTER BREAK</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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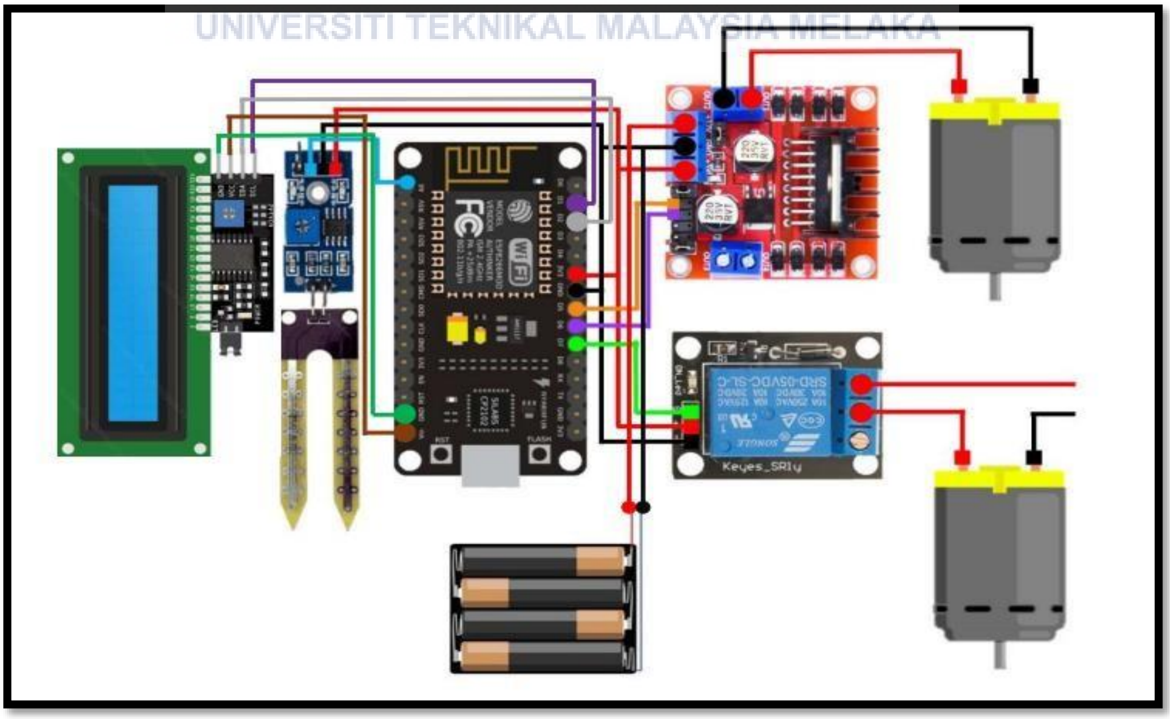
Appendix 2

Progress/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discussion with Supervisor									MID SEMESTER BREAK						
- Progress of work -Project construction															
- Discussion with Supervisor - Progress of work															
- Discussion with Supervisor - Progress of work															
Project test															
Chapter 4 & 5: Result and Discussion															
Final Report Preparation + Turnitin Report															
Report correction															
Presentation PSM 2															

Appendix 3



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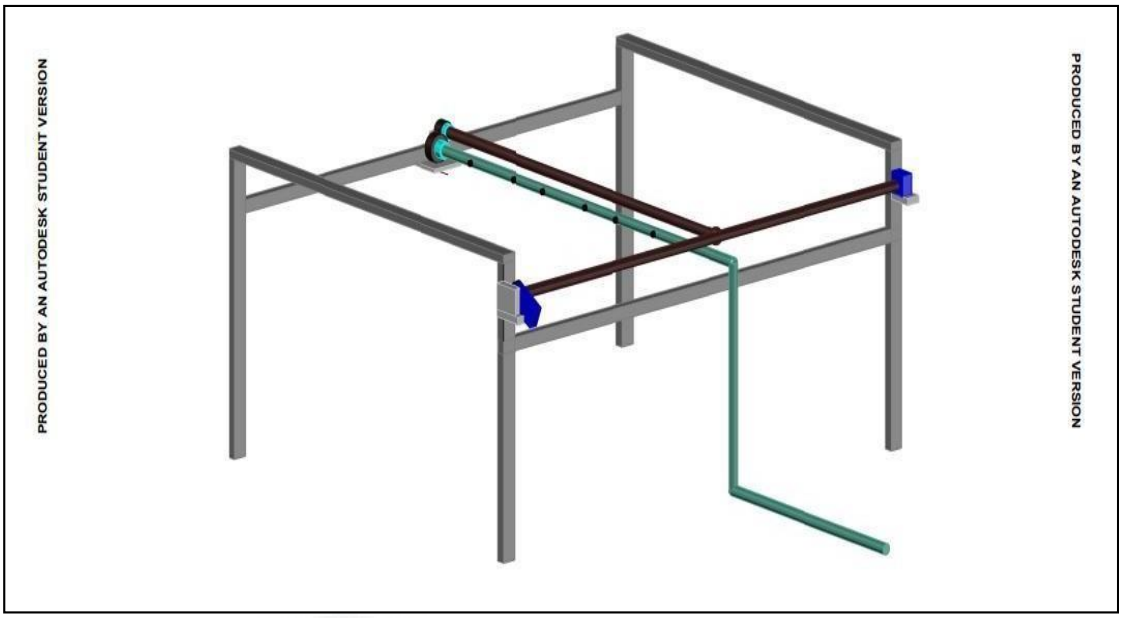
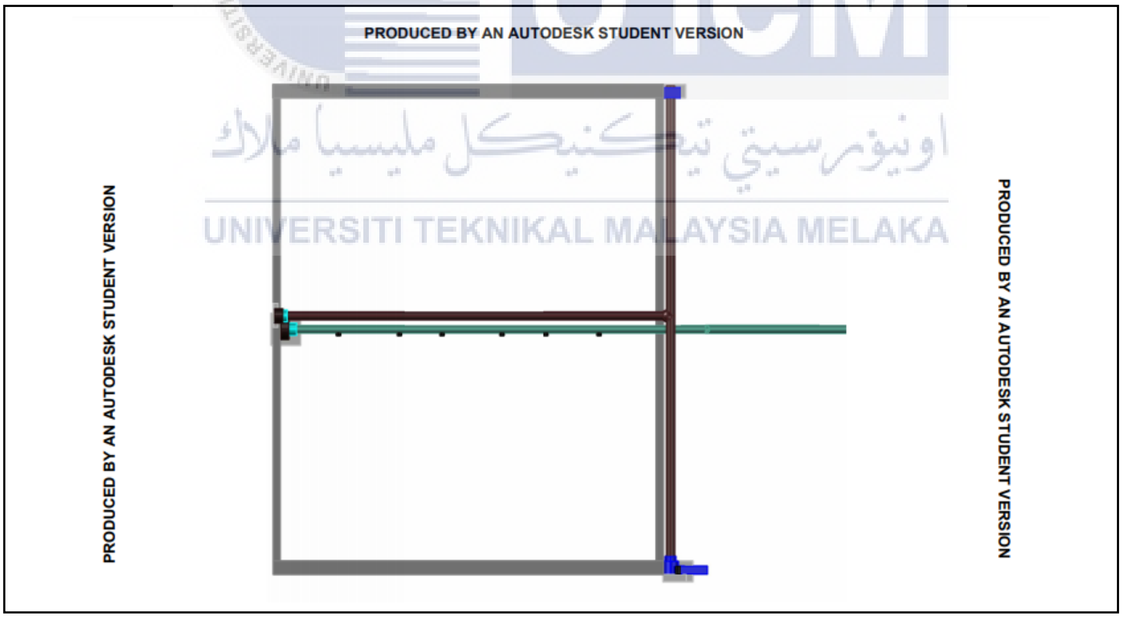
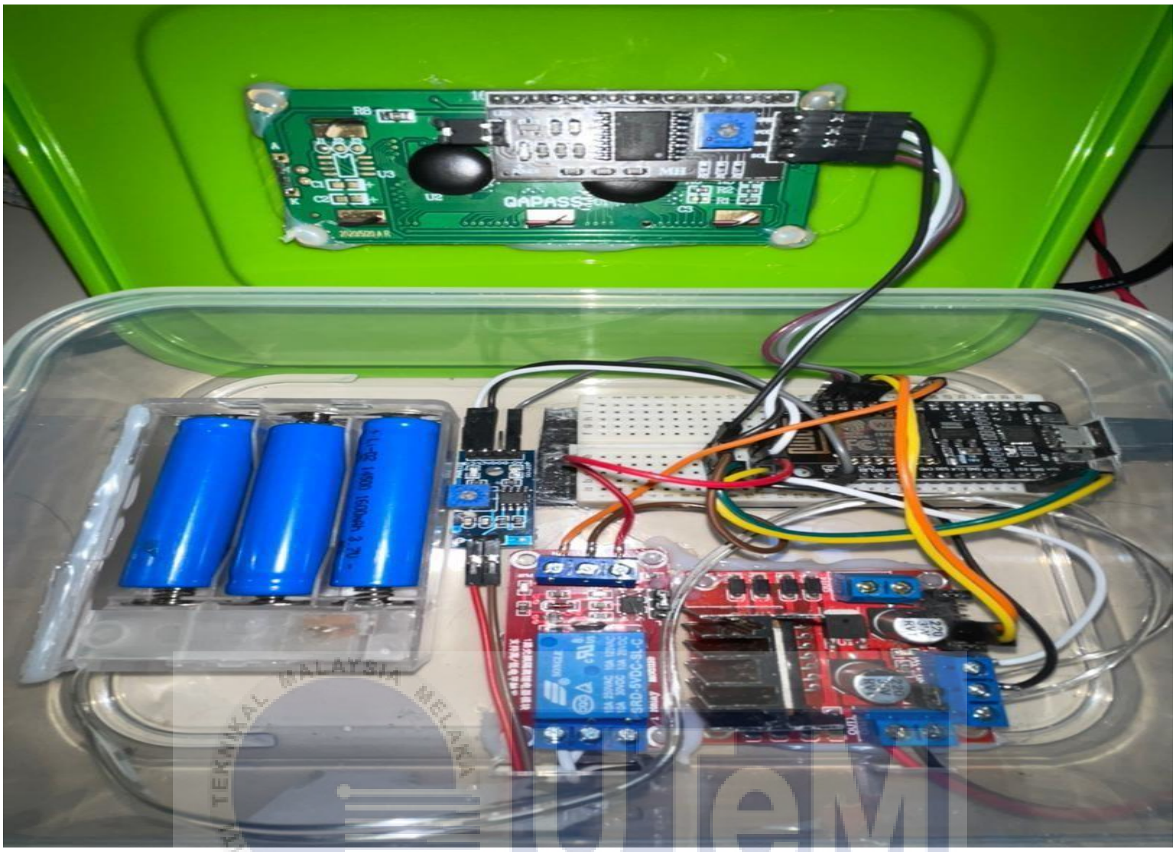


Appendix 5



Appendix 6



Appendix 7

Appendix 8

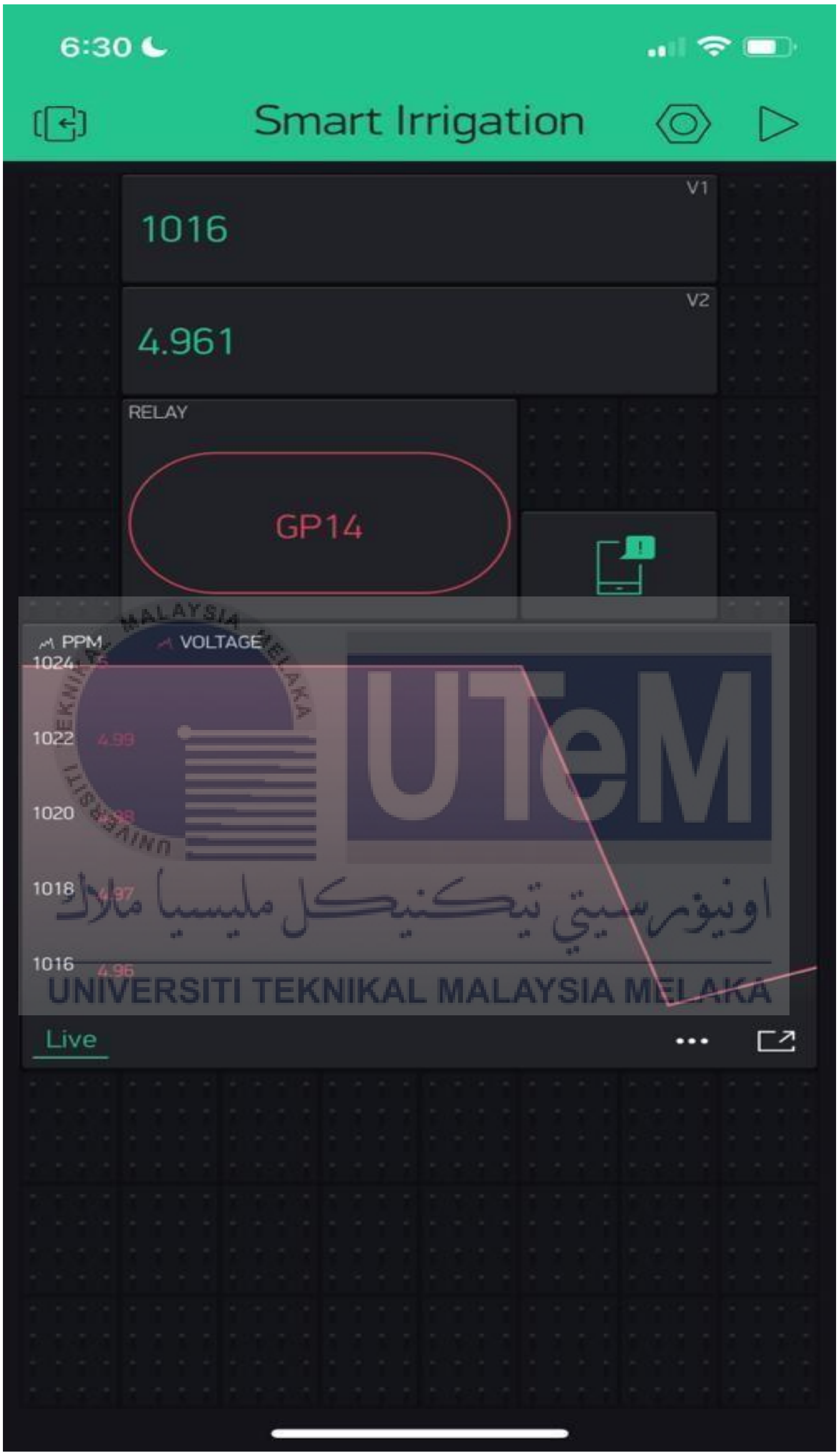
Appendix 9

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#define BLYNK_PRINT Serial
LiquidCrystal_I2C lcd(0x27, 16, 2);

char auth[] ="7MCf-vC-9DadImu_ZVNUvalPLpmUKOoV";
char ssid[] ="Mi Hogar Mi Cielo_5G";
char pass[] ="rumahsew4";

int Soil=A0;
int Relay=14; //D5
int DIRA=0; //D3
int DIRB=2; //D4
BlynkTimer timer;

void setup()
{
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);
  lcd.begin();
  lcd.backlight();
  pinMode(Soil, INPUT);
  pinMode(Relay, OUTPUT);
  pinMode(DIRA, OUTPUT);
  pinMode(DIRB, OUTPUT);
  lcd.setCursor(0,0);  lcd.print("    IOT SMART    ");
  lcd.setCursor(0,1);  lcd.print("   IRRIGATION    ");
  delay(5000);
  lcd.clear();
}

void loop()
{
  Blynk.run();
  timer.run();
  int SensorValue = analogRead(Soil);
  float SensorVolts = analogRead(Soil)*0.0048828125;
  Serial.print("Sensor Value : ");
  Serial.println(SensorValue);
  lcd.setCursor(16, 2);  lcd.print(SensorValue);
  lcd.setCursor(9, 3);   lcd.print(SensorVolts);  lcd.print("V");
  Blynk.virtualWrite(V1, SensorValue);
```



```
void loop()
{
  Blynk.run();
  timer.run();
  int SensorValue = analogRead(Soil);
  float SensorVolts = analogRead(Soil)*0.0048828125;
  Serial.print("Sensor Value : ");
  Serial.println(SensorValue);
  lcd.setCursor(16, 2);  lcd.print(SensorValue);
  lcd.setCursor(9, 3);   lcd.print(SensorVolts);  lcd.print("V");
  Blynk.virtualWrite(V1, SensorValue);
  Blynk.virtualWrite(V2, SensorVolts);
  delay(1000);

  if (SensorValue > 700)
  {
   lcd.setCursor(0,0);   lcd.print("DRY SOIL");
   digitalWrite(Relay,HIGH);
   digitalWrite(DIRA,HIGH);
   digitalWrite(DIRB,LOW);
   delay(10000);
   digitalWrite(DIRA,LOW);
   digitalWrite(DIRB,HIGH);
   delay(10000);
  }
  else
  {
   digitalWrite(Relay, LOW);
   digitalWrite(DIRA,LOW);
   digitalWrite(DIRB,LOW);
  }
}
```

Appendix 10


6:30
Smart Irrigation
V1
1016
V2
4.961
RELAY
GP14
PPM
VOLTAGE
1024
1022
1020
1018
1016
4.99
4.98
4.97
4.96
Live