



Faculty of Electrical and Electronic Engineering Technology



**PERFORMANCE ASSESMENT VIA COMPARATIVE STUDY OF A
HUMAN POWERED AND SMART GREENHOUSE SYSTEM**

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Bachelor of Electrical Engineering Technology (Industrial Power) with Honours

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POWERED AND SMART GREENHOUSE SYSTEM**

MUHAMMAD FARHAN BIN ABDULLAH SANI

**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

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I declare that this project report entitled “Performance Assesment Via Comparative Study Of A Humanpowered And Smart Greenhouse System” 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.

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DEDICATION

My dissertation is dedicated to my family and many friends. A special gratitude to my loving parents Abdullah Sani Bin Omar and Rosmi Binti Ishak. Not forget to my friends and my supervisor TS. Zaihasraf Bin Zakaria for helping me to complete my project report.



ABSTRACT

The purpose of this project is to design a smart greenhouse that uses less human power and is more efficient. In this system, parameters such as air temperature, air humidity, soil temperature and soil moisture are measure by sensors. Based on the analysis of the observe parameter, some mechanical appliances, such as ventilation, heating, and irrigation, will be controlled according to pre-defined parameters. This type of automation helps us reduce the amount of human power for irrigation and ventilation. This project proposes to have two greenhouses with the same characteristics, one controlled by a smart system and the other controlled traditionally, with all operations performed out by humans. This smart automatic system is design with Arduino Microcontroller to monitor and control the crop condition. The data of the crop parameter such as temperature, humidity, light intensity, and soil moisture will be sent to the users via IoT using web server.



ABSTRAK

Projek ini adalah untuk mereka mengenai teknologi rumah hijau yang menggunakan pengurangan tenaga manusia dengan lebih cekap. Dalam sistem ini, parameter seperti suhu udara, kelembapan udara, suhu tanah dan kelembapan tanah diukur menggunakan sensor. Berdasarkan kajian daripada pemerhatian parameter, beberapa peralatan mekanikal, seperti ventilasi, pemanasan, dan pengairan, akan dikawal mengikut parameter yang telah ditentukan. Jenis automasi ini membantu mengurangkan jumlah tenaga manusia untuk pengairan dan pengudaraan. Projek ini mencadangkan untuk memiliki dua rumah hijau dengan ciri yang sama, satu dikendalikan oleh sistem teknologi dan yang lain dikendalikan secara tradisional, dengan semua operasi dilakukan oleh manusia. Sistem teknologi automatik ini direka dengan Arduino Mikrokontroler untuk memantau dan mengawal keadaan tanaman. Data parameter tanaman seperti suhu, kelembapan, percahayaan dan kelembapan tanah akan dikirim kepada pengguna melalui IoT menggunakan web server.

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TABLE OF CONTENTS

	PAGE
DECLARATION	
APPROVAL	
DEDICATIONS	
ABSTRACT	i
ABSTRAK	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	i
LIST OF TABLES	iii
LIST OF FIGURES	iv
LIST OF SYMBOLS	vi
LIST OF ABBREVIATIONS	vii
LIST OF APPENDICES	viii
CHAPTER 1 INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Project Objective	2
1.4 Scope of Project	3
CHAPTER 2 LITERATURE REVIEW	4
2.1 Introduction	4
2.2 Type of Technology	4
2.2.1 Human Power	4
2.2.2 Smart Automated System	4
2.3 Method to design smart greenhouse	5
2.3.1 Type of hardware	5-6
2.3.2 Type of software	6-7
2.4 First Review ‘ A Smart Greenhouse Based on IoT’	7-8
2.5 Second Review ‘ Internet of Things Based Smart Greenhouse : Remote Monitoring and Automatic Control	8-9
2.6 Third Review ‘Greenhouse Monitoring Using Raspberry	9-10
2.7 Summary	11-17
CHAPTER 3 METHODOLOGY	18
3.1 Introduction	18
3.2 Process Flowchart	19

3.3	Process Project	20
3.4	Process Block Diagram	21
3.5	Hardware Component	21
3.5.1	Arduino Uno	22-23
3.5.	ESP8266	23-24
3.2.3	DHT11 Sensor	25
3.2.4	Soil Moisture Sensor	26
3.2.5	LDR sensor	27
3.2.6	Ultrasonic Sensor	27
3.2.7	Motor Pump	28
3.2.8	LED Light	29
3.5.9	Motor Driver L298N	29
3.5.10	Buzzer	30
3.5.11	Ventilation Fan	30
3.6	Software	31
3.6.1	Arduino IDE	31
3.6.2	Web Server (ThingSpeak)	31
3.7	Circuit Simulation	32
3.7.1	Schematic Diagram	33
3.7.2	Simulation in Proteus	33
3.8	Project Design Prototype	34
3.9	Summary	34
3.10	Gantt Chart	35-36
CHAPTER 4 RESULTS AND DISCUSSIONS		37
4.1	Introduction	37
4.2	Performance of Crop	37
4.3	Comparative Result	38
4.3.1	Temperature Data	38-40
4.3.1	Humidity Data	41-43
4.3.1	Soil Moisture Data	43-45
4.4	Graph Comparative Data	46
4.4.1	Temperature	46
4.4.2	Humidity	47
4.2	Cost	48
4.3	Summary	49
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS		50
5.1	Conclusion	50
5.2	Future Works	50-51
5.2	Commercialization	51
REFERENCES		52-53
APPENDICES		54-56

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Project Summary	11-17
Table 3.1	Specifications Arduino Uno	22
Table 4.1	Crops Performance	37
Table 4.2	Temperature Data in First Day	39
Table 4.3	Temperature Data in Second Day	40
Table 4.4	Humidity Data in First Day	42
Table 4.5	Humidity Data in Second Day	42
Table 4.6	Soil Moisture Data in First Day	44
Table 4.7	Soil Moisture Data in Second Day	45
Table 4.8	Greenhouse Cost (Ringgit Malaysia)	48
Table 4.9	Human Power use in The Greenhouse	48

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1	System Smart Greenhouse System based on IoT	8
Figure 2.2	Partial Circuit Diagram of The System	9
Figure 2.3	Block Diagram of Proposed System	10
Figure 3.1	Flow chart	19
Figure 3.2	Block Diagram	21
Figure 3.3	Arduino Uno	22
Figure 3.4	ESP8266	23
Figure 3.5	DHT 11 Sensor	25
Figure 3.6	Soil Moisture Sensor	26
Figure 3.7	LDR Sensor	27
Figure 3.8	Ultrasonic Sensor	27
Figure 3.9	Motor Pump	28
Figure 3.10	LED Light	29
Figure 3.11	Motor Driver L298N	29
Figure 3.12	Buzzer	30
Figure 3.13	Fan Ventilation	30
Figure 3.14	Arduino IDE	31
Figure 3.15	Web Server (ThingSpeak)	31
Figure 3.16	Schematic Diagram	32
Figure 3.17	Simulation in Proteus	33
Figure 3.18	Project Prototype	34
Figure 4.1	Test Probe	38
Figure 4.2	Temperature Data ThingSpeak	39

Figure 4.3	Test Probe Humidity	41
Figure 4.4	Humidity Data ThingSpeak	41
Figure 4.5	Test Probe Soil	43
Figure 4.6	Soil Moisture Data ThingSpeak	44
Figure 4.7	Graph of Temperature in First Day	46
Figure 4.8	Graph of Temperature in Second Day	46
Figure 4.9	Graph of Humidity in First Day	47
Figure 4.10	Graph of Humidity in Second Day	47



LIST OF SYMBOLS

<i>Hz</i>	-	Hertz
<i>KB</i>	-	Kilobyte
<i>V</i>	-	Voltage
<i>°C</i>	-	Degree
<i>A</i>	-	Ampere
<i>Cm</i>	-	Centimetre
<i>%rh</i>	-	Relative Humidity
<i>%</i>	-	Percentage



LIST OF ABBREVIATIONS

<i>WIFI</i>	-	Wireless Fidelity
<i>IOT</i>	-	Internet Of Things
<i>IDE</i>	-	Integrated Development Enviroment
<i>DHT</i>	-	Digital Temperature and Humidity
<i>GSM</i>	-	Global System for Mobile
<i>LED</i>	-	Light-Emitting Diode
<i>LCD</i>	-	Liquid Crystal Display
<i>IDE</i>	-	Integrated Development Enbiroment
<i>OS</i>	-	Operating System
<i>GPRS</i>	-	General Packet Radio Service



LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	Appendix A	53-56



CHAPTER 1

INTRODUCTION

1.1 Background

Greenhouse is a structure with glass and a glass roof, for the cultivation or protection of plants, in which temperature and humidity may be regulated to grow plants. Greenhouse also can used for growing fruits, vegetables flowers and various of plants. Greenhouse can protect the plants from humid condition of heat and cold, also can protect plants from blizzards and dust storm, then help to keep pests and diseases. Greenhouse can be mad suitable for growing plants by controlling light and temperature. A greenhouse is also a structure that ensures protection and a controlled environment for raising plan indoors. The most pressing problem in greenhouse horticulture is how to control the greenhouse ecosystem to meet both economic and environment in nowadays.

The purpose of greenhouse is to improve the overall performance without user interaction to reduce the manual work, to gather and analyze data on each factor affects growth of a plant to manage the crop yields and to monitor and alert the user to make changes that requires immediate action. The control system of greenhouse is monitored by the environment element in terms of temperature and humidity inside the greenhouse. Important of data for greenhouses is through temperature and humidity as it influences to monitored crop status more accurately.

1.2 Problem Statement

Nowadays, many people use the greenhouse system because it is one of the methods of cultivation by differentiating the growing environment through temperature and humidity intoxication as well as the amount of air, type on plants and cultivars. The greenhouse system still be relay on the human power to keep the facilities in good condition without a proper monitoring system, but the human power tends to make mistakes. The parameters such as air temperature, air humidity, soil temperature and soil moisture should be maintained to prevent plants from dying or rotting and then the crops should be watered properly to ensure that irrigation should be performed within a suitable time. The automated watering system and remote monitoring are used to control the condition and solve the problem. This will reduce the time if using automatic rather than manual way of watering. Sensors such as a temperature sensor and a soil moisture detector are used to monitor the greenhouse's temperature and irrigation.

1.3 Project Objective

The objective of this project is:

- i. To observe the parameters of temperature and humidity inside the greenhouse
- ii. To analyze the growth rate of crops in the greenhouse
- iii. To study the performance between human powered and smart greenhouse system.

1.4 Scope of Project

The scope of study for this project is comparison between the two greenhouses with the same characteristics where one is managed by the smart system, while the other is traditionally managed that use human power for all operations. The performance of both systems will be analyze by looking to the rate of crop growth time and how it affects harvesting yields, so that the project can be implemented as achieve with the objectives.



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A several sources from journals or articles have been researched about the systems found in these greenhouses and will be discussed in this chapter. This chapter will present and provide an overview of some system technology in the greenhouse. This chapter also will discuss the system used to fine the parameters such as air temperature, air humidity, soil temperature and soil moisture are measure by sensors.

2.2 Type of Greenhouse Technology

2.2.1 Human Power

Humans are the main power source for the operation of small equipment. They are also used for stationary operations such as threshing, winnowing, chaff cutting, and irrigation water raising. It is widely assumed that there is sufficient human power for agricultural operations.

2.2.2 Smart Automated System

Smart automated is system will be convenient way to collect the data from greenhouse. Greenhouse is an environment in which plants can be grown under control. The continual monitoring and management of environmental parameters, such as the temperature, soil moisture and light intensity are needed for the greenhouse system to ensure maximum plant growth. According by Saraswati Shelvane, Madhuri Shedage, Akshada Phadtare. Such

automation helps us reduce irrigation and ventilation power in human beings. In the greenhouse controlled by the suggested smart system, the growing period was shorter. In comparison with the standard greenhouse, smart greens yield a larger harvest.

2.3 Method To Design Smart Greenhouse System

2.3.1 Typer of Hardware

Harun Sujadi, Yayat Nurhidayat (2019), used the Wemos D1 is a WiFi module developed from the ESP8266. Wemos one of the board modules that can works with a special arduino for the project which carries the concept of IoT. Module ESP8266 has a TTL serial output available with GPIO, which can be used stand -alone with an additional microcontroller for its handling. A strong and cost-effective WIFI module with ESP8266 built on-chip system (SoC). It is one of the most popular low-cost wireless Internet device control modules.

Mohammad Woli Ullah, Mohammad Golam Mortuza, Md Humayun Kabir, Zia Uddin Ahmed, Sovan Kumar Dey Supta, Partho Das, Syed Mohammad Didar Hossain (2018) used the GSM/GPRS module and HC05 Bluetooth module for connect to the system network and the data is delivered to the user by SMS via GSM, to the mobile application by HC05, and to the server via GPRS. The LCD display are also show real time data with the android app. This module to send data over the internet is more reliable, fast, and efficient. Greenhouses are being monitored and data shared in order to increase plants and food's comprehension and production rates.

According by Saraswati Shelvane, Madhuri Shedage, Akshada Phadtare (2019), they suggest using Raspberry Pi web server in their system. Raspberry-pi enables the user to remotely monitor environmental factors. Raspberry-pi is the cheap ARM powered Linux server

system that communicates with users via a pi-built Wi-Fi module. The control systems with enhanced monitoring system have obvious advantages, such as reducing labor, but more importantly it improves the quality of production and information collection that differentiates between profit and significant losses.

Overall, from the research is higher recommended to use microcontroller is ESP8266 because it is easy to program and setup, cheaper compare to the other microcontroller and it is customizable.

2.3.2 Typer of Software

Saraswati Shelvane, Madhuri Shedage, Akshada Phadtare (2019), suggest using Android App is used to display all the value because it boosts array of connectivity option including WIFI, Bluetooth and wireless data over cellular connection. Furthermore, Android applications are customizable because they come with a variety of useful libraries and tools for creating rich applications. Android may be programmed with a variety of tools, like Android Studio and Java Programming.

Harun Sujadi, Yayat Nurhidayat (2019), suggest using Cayenne for the system. Cayenne between electronic equipment and Internet networks need an interface or platform in order to be well connected. Cayenne is one of the IoT platforms (Internet of Things) as well as a server able to save the project being created. Cayenne also works with a variety of microcontrollers, such Raspberry Pi, Arduino, and others. Cayenne provides a user-friendly interface and supports a wide range of connection types for connecting a microcontroller to an internet platform.

Android Application is the most used system software because it includes numerous development tools and high-quality software. Furthermore, the majority of programmers prefer to use the software because it is application-based and simple to download.

2.4 First Review: ‘A Smart Greenhouse System Based on IoT ‘

Based on the article ‘A Smart Greenhouse Based system based on IoT’, the aim of this project is to monitor various parameters such a temperature, humidity, soil moisture and others. The system will be control the environment of temperature and humidity according to need of the crops grow a good and healthy. The processed data would be sent to the owner through a wireless network for remote access from anywhere. This project also suggested a design that will assess current environmental conditions to resolve issues farmers face in the natural agriculture phase. The suggested project will detect parameter changes while continuing to monitor them in a simultaneously. Farmers will receive all the data, the farmers make a controlling decision and sent to the system with help of the actuator, the environment would be controlled by the system.

The researcher use the Arduino will manage the control part here and IoT control the monitoring part. This project also designed a greenhouse system with four main environmental sensors needed to control climate change. The main of sensors will use is light sensor, humidity sensor, soil sensors, temperature sensors and Arduino Uno also used to control these sensors and to detect the strength of light and water in the external environment. The researcher used ESP8266 to send and receive data through the internet, then used the application class android to send and receive data to the thinkspeak server [1].