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JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

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POLITEKNIK BANTING SELANGOR

SESI 1: 2024/2025

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PRODUCT: REMOTE CONTROLLED SPRINKLER

TITLE: REMOTE CONTROLLED SPRINKLER

SESSION 1: 2024/2025

1. We, NOOR SYUKRIE ZAMANI BIN SHUHAIMI (24DTP22F1053), UJIN BADRISAH BIN SHAFIEE (24DTP22F1028), MUHAMMAD AFIQ SYAHMI BIN ZAKARIA (24DTP22F1006), and NUR FHARAH AYUNI BINTI SHA'ABAN (24DTP22F1055) are final year student of Diploma of Mechanical Engineering, Politeknik Banting Selangor, which is located at Persiaran Ilmu, Jalan Sultan Abdul Samad, 42700 Banting Selangor Darul Ehsan.

2. We represent that 'REMOTE CONTROLLED SPRINKLER Project' and the intellectual property contained therein is our original work / design without taking or imitating any intellectual property from other parties.

3. We hereby agree to relinquish the ownership of the intellectual property in 'the Project' to 'the Polytechnic' to fulfil the requirements for the award of Diploma in Mechanical Engineering to us.

Subscribed and solemnly declared by the above named;

1. NOOR SYUKRIE ZAMANI BIN SHUHAIMI

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Before me, as supervisor of the project

Ts. MOHD HAZWAN BIN MOHAMED NORLI …….

ACKNOWLEDGEMENT

In the end, the last bow thence has to rest with Ts Encik Mohd Hazwan bin Mohamed Norli as a lecturer because there is a place within sis's heart, mind and soul – that deserves an acknowledgment for showing immense patience and assistance throughout the development of the proposal. He made an enormous contribution to the course by assisting in the achievement of the project 2 objectives during the process of preparing its documentation.

Appreciation is also extended to all members of the team for their commitment and contributions in ensuring the completion of this paper. The writing stage brought those ideas to the paper because of the difference in the inputs of each member and the input that each member was willing to give.

Last but not least appreciation goes to everyone in the family. Who has faith in us, supports us and prays for us all the time. Though in difficulties, but their love and care is adequate to motivate us so that we exert much effort in doing the tasks given to us.

ABSTRACT

A sprinkler combined with a remote-controlled car is a product technology that was once released by foreigners. Using controls enables them to move anywhere. They are often used on a small scale, having a small farm. Based on analysis and research we have studied, several shortcomings are found in radio-controlled sprinklers, one of which is that they use expensive materials and electrical sources. Hence, we find that it can be fixed. We also found that the material used on the remote controlled sprinkler can replaced by cheaper and more effective ones.

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CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Farmers can typically be categorized into two groups: small scale farmers and large scale farmers. A small scale farmer example is of a person who can own a 500 square meter farm which is not inappropriate for a housewife who wants to do some gardening around her house. The large scale farmers in this case are for the ladies who are traders who are called suppliers to the grocer.

Since large scale farmers are not faced with a lot of problems since they employ the use of heavy farming tools and the machinery is heavy and expensive making the risks involved costly to bear. But there are limitations to the use of heavy machines in small scale farming as the area of operation is small and its portable devices are very light. However the disadvantage comes in the area of how long the products can last.

In this work created a device to assist the small scale farmer to improve on the daily activities performed on the farm. This product can also make things easier for example there will be less strain on the back. This also has been designed by foreigners and the same product will be manufactured at a risk and I hope there will be encouragement when the product is about to be mass produced.

1.2 BACKGROUND

The Development of the Remote Control Sprinkler System Patronized by Sime Darby Industry which is found in Carey Island. That is because there are a lot of machines showcased to facilitate the task of fertilizing the trees that have already been planted by the farmers. Consequently the team found it easy to come up with a product that was related to agriculture thanks to the concept of an r/c car sprinkler. This is suitable for use by small scale farmers who are involved in gardening. This design has also alleviated the burden on small farmers such as back pains for example by providing a high level of services. The quantity of materials needed to manufacture the product is very few. It is not limited to farmers only, a housewife with plants in her compound can also use it.

1.3 PROBLEM STATEMENT

Smallholder farmers frequently use primitive means of watering their crops, which is not only laborious but also resources taxing. Farmers in this process of management are forced to go back and draw water into the containers several times in a day. The supply of adequate water for plants is a continuous process, which increases the amount of work done and lowers the efficiency in large scale farming, particularly during dry climatic seasons.

Furthermore, small holder farms do not have the capacity to utilize bulky machines or farm equipment's intended for mechanized farming. This machinery is also impractical and expensive for use in the smaller arable lands and also in some cases may cause harm to the land. There is no technology made for them that would allow farmers to improve the irrigation process, consequently resulting in increased dependence on physical work.

Manual watering is a time-consuming process of farming, and it also exposes the farmers to fatigue or injury because of doing an activity that requires effort for extended periods of time. The problem of lack of effective and inexpensive irrigation solutions for small-scale farmers is their inability to combine high productivity and good health. In that regard, we can safely say that there is a gap in the market for a low cost, simple product that helps overcome these problems and benefits farm management.

1.4 OBJECTIVES

The objective of this study is:

i) To create a small scale machine for small scale farm

ii) To achieve a successfully operating machine to use

iii) To design a remote control car combine with sprinkler

1.5 SCOPES OF PROJECT

The scope of our project is to develop a product specifically designed for small-scale farmers who lack access to heavy machinery and sufficient manpower. Our solution aims to assist farmers who typically rely on manual labour but require an easier and more efficient method for watering their crops. By creating a user-friendly, battery-powered remote-controlled system, we hope to provide farmers with an affordable and practical tool to simplify their daily tasks, particularly in managing irrigation. This innovation is intended to meet the needs of those who operate smaller farms without the resources for more expensive, large-scale equipment.

1.6 EXPECTED RESULT

To emphasize, the purpose of this product is to support farmers who have small-scale farms and are combined with sprinklers. Although this product is only a small machine, but this product can help to reduce the burden on farmers.

CHAPTER 2: LITERATURE VIEW

2.1 INTRODUCTION

Literature refers to research articles used to understand and examine research issues. The literature review is used to provide a contextual study by examining the research that has been conducted in the field of study and not merely summarizing the research conducted by other researchers.In addition, through the study of the literature, the researcher can also identify the weaknesses and strengths of the resulting project. Therefore, the literature review is important as it can be used from several aspects as a guide and reference for the researcher in completing this study.

According to the report issued by small farmers, farmers with small-scale gardens face several unique challenges that impact their ability to efficiently manage irrigation and overall crop health. In our search, many farmers indicated that manual watering is time-consuming and physically demanding. This supports the argument for adopting automated systems, which can reduce workload and increase irrigation efficiency. In addition, there are also not many farmers who have facilities such as modern machines, which are difficult to find anywhere in the market. Even if it is on the market, but it does not fit with their budget because it is too expensive.

From the research we found, many farmers who have large farms use the same machines, such as drones or semi-auto water trucks, but not on small-scale farms because they don't rely on machines because of limited space and time. The solution we can do is create a machine that has the same function as other machines but is smaller and lighter, such as a remote-controlled sprinkler that uses battery power, which can reduce labour and cost.

2.2 CLASSIFICATION OF CAR SPINKLER

1. 8 Axis Agriculture Drone

2. Centre Pivot Irrigation System

3. 4G IOT Remote Control Automatic Irrigation Valve

4. Smart Irrigation Automation

2.3 PRODUCT IN CURRENT MARKET

MACHINE		
NAME	8 Axis Agriculture Drone	Centre Pivot Irrigation System
SCALE	Large	large
SAFETY	High	Medium
FEATURES	-Can fly -Fast spraying system -Easy to control	-Spraying cover lot of space on farm -use large water quantity -Easy to assemble
PRICE	RM 47,000	RM 35,700

MACHINE		
NAME	4G Iot Remote Control Automatic Irrigation Valve	Smart irrigation automation
SCALE	small	large
SAFETY	Medium	Medium
FEATURES	-water is wasted due to overwatering -remote control by Mobile phone or PC computer	-balance of water and fertilizer -water and fertilizer saving -control temperature and humidity
PRICE	RM 4500	RM 15 000

2.4 EXISTING IDEA

YEAR	AUTHOR	TITLE	FINDINGS
2018	Xingye Zhu, Prince Chikangaise, Weidong Shi, Wen-Hua Chen, Shouqi Yuan	Review of intelligent sprinkler irrigation technologies for remote autonomous system	-to review the needs of soil moisture sensors in irrigation, sensor technology and their applications in irrigation scheduling and, discussing prospects
2021	P Satriyo, I S Nasution, D V Della	Controlled sprinkler irrigation system for agricultural plant cultivation	-to apply the optimized controlling system developed by means of Internet of things for controlling sprinkler irrigation systems used for agricultural product cultivation
2020	P.Rajesh Kanna, R. Vikram, M.Kumarasamy	Agricultural Robot –A pesticide spraying device	-spraying device is equipped for decreasing the measure of pesticides connected
2012	W. L. Kranz, R. G. Evans, F. R. Lamm, S. A. O'Shaughnessy, R. T. Peters	Mechanical Move Sprinkler Irrigation Control and Automation Technologies	-Electronic sensors, equipment controls, and communication protocols have been developed to meet the growing interest in using center pivot and lateral move irrigation systems to deliver different irrigation depths to management zones based on previous production levels, soil texture, or topography
2024	Chao Chen, Zawar Hussain, Junping Liu, Muhammad Zaman, Muhammad Akhlaq	Innovative Technologies in Sprinkler Irrigation	-to highlight the introduction of innovative technologies to optimize sprinkler irrigation systems. Suggestions for the future development of sprinkler irrigation technology are offered to ensure its long-term viability.

2.5 CONCLUSION

By doing this project, we found that there are many people who agree with our invention for farmers who have small-scale gardens. Our remote-controlled sprinkler is made to save on electricity and reduce human labour. Our project can also save costs for the farmers who have small-scale gardens by saving them money instead of buying a big machine and using a lot of electricity. We found that our project can provide a lot of benefits to farmers, such as the elderly and housewives, because it can be bought at a cheap price. We hope that our project can develop successfully and bring many benefits to the farmers out there.

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

Research methodology is a structured and scientific approach used to collect, analyse, and interpret quantitative or qualitative data to answer research questions or test hypothesis. A research methodology is like a plan for carrying out research and helps keep researchers on track by limiting the scope of the research.Several aspects must be considered before choosing the appropriate research methodology, such as research limitations and ethical concerns that may affect progress. There are three types of research methodologies, namely quantitative, qualitative, and mixed.

Having a good research methodology has many advantages. The advantages are:

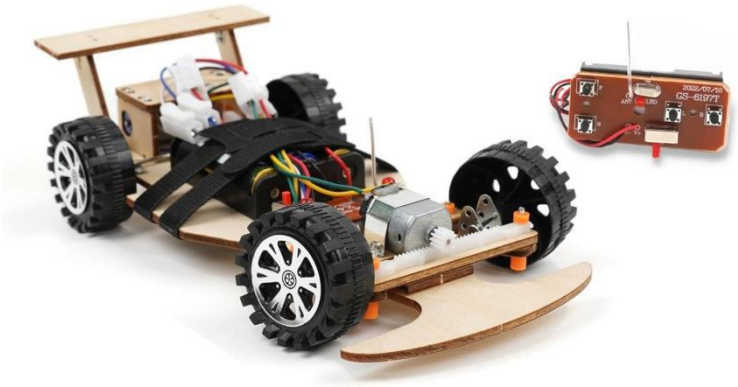
- Helping other students who might want to replicate your research; the explanation will benefit them.
- Can easily answer any questions about the research if they arise at a later stage.
- Research methodology provides a framework and guidelines for students to clearly define research questions, hypotheses, and objectives.
- It helps students identify the most suitable research design, sampling techniques, and methods for data collection and analysis.
- A robust research methodology helps students ensure that their findings are valid and reliable, as well as free from bias and errors.
- It also helps ensure that ethical guidelines are adhered to during the conduct of research.

A good research methodology helps students plan their research efficiently, ensuring optimal use of time and resources.

To create this project as a functional product with safety measure, many consideration, and clear planning is made. With limited budget and few knowledge about proper equipment and material, we take time to research and study about it to ensure this project is success with our budget. A step by step procedure is done to achieve our project. The collected data is used in order to make our product function as planned.

3.2 DESIGN OF PROJECT

3.2.1 REMOTE CONTROLLED CAR



Remote control (RC) cars have fascinated hobbyists, engineers, and researchers for decades. These miniature vehicles, controlled wirelessly from a distance, offer a unique blend of entertainment, technological innovation and educational value. So we created Remote control system for automatic sprinkler control system including remote conductor line to be attached to automatic sprinkler control system, remote processor to apply power selectively through one or more remote conductor lines to activate part of automatic sprinkler. Sprinkler control system, and a remote control to control the processor. The remote control system allows the user to operate the automatic sprinkler control system independent of the automatic sprinkler control system processor, and allows the user to carry out such control from a location adjacent to the actual sprinkler station, as opposed to a central control unit. Automatic sprinkler control system.

3.2.2 SPRINKLER

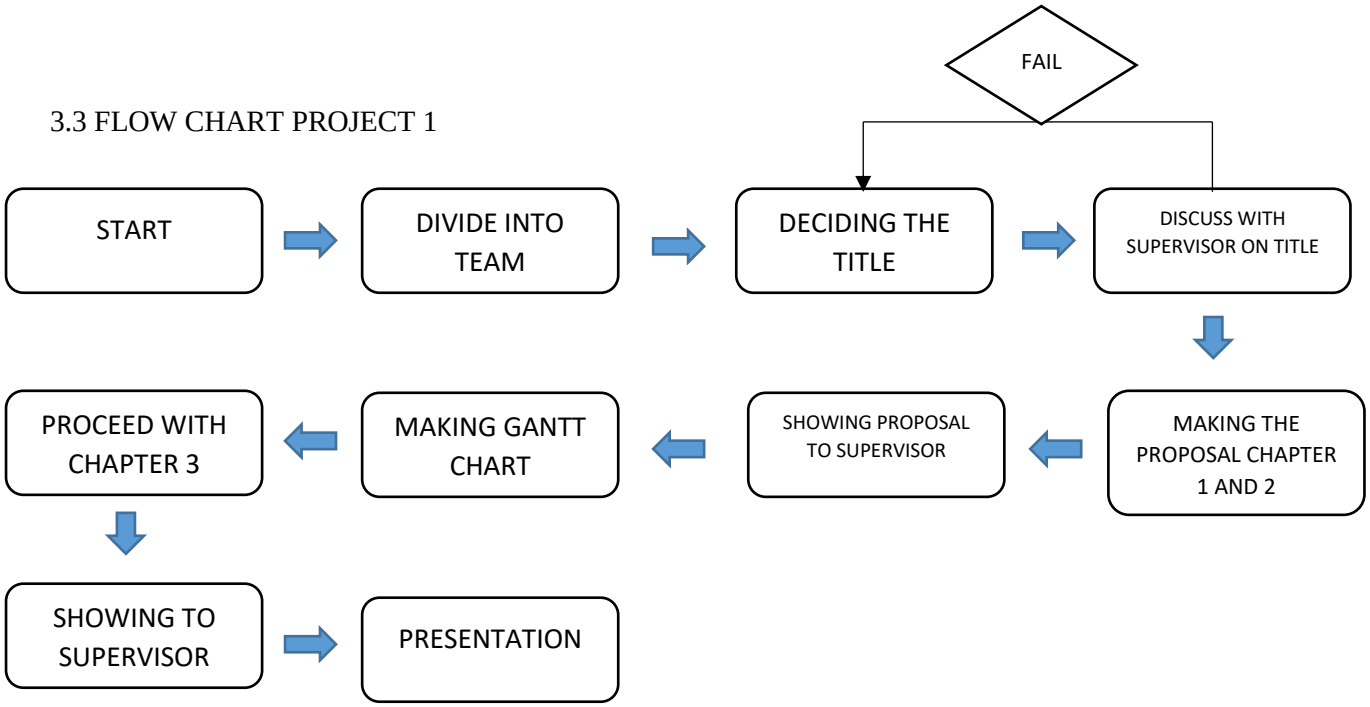
In the project we made, the sprinkler is our source of inspiration. The functions used are the same as those of other machines, but we improved on our project.

A sprinkler is a tool used to water agricultural plants, lawns, landscapes, golf courses, and other areas. They are also used for cooling and air dust control. A sprinkler is a method of watering in a controlled manner that resembles rain. Water is distributed through a network that may consist of pumps, valves, pipes, and sprinklers. Sprinklers can be used for residential, industrial, and agricultural purposes. It is useful in uneven terrain where sufficient water is not available, as well as in sandy soil. The vertical pipe, which has a rotating nozzle at the top, is connected to the main pipe at regular intervals. When water is pushed through the main pipe, it escapes from the spinning nozzle. It is sprinkled on the plants.

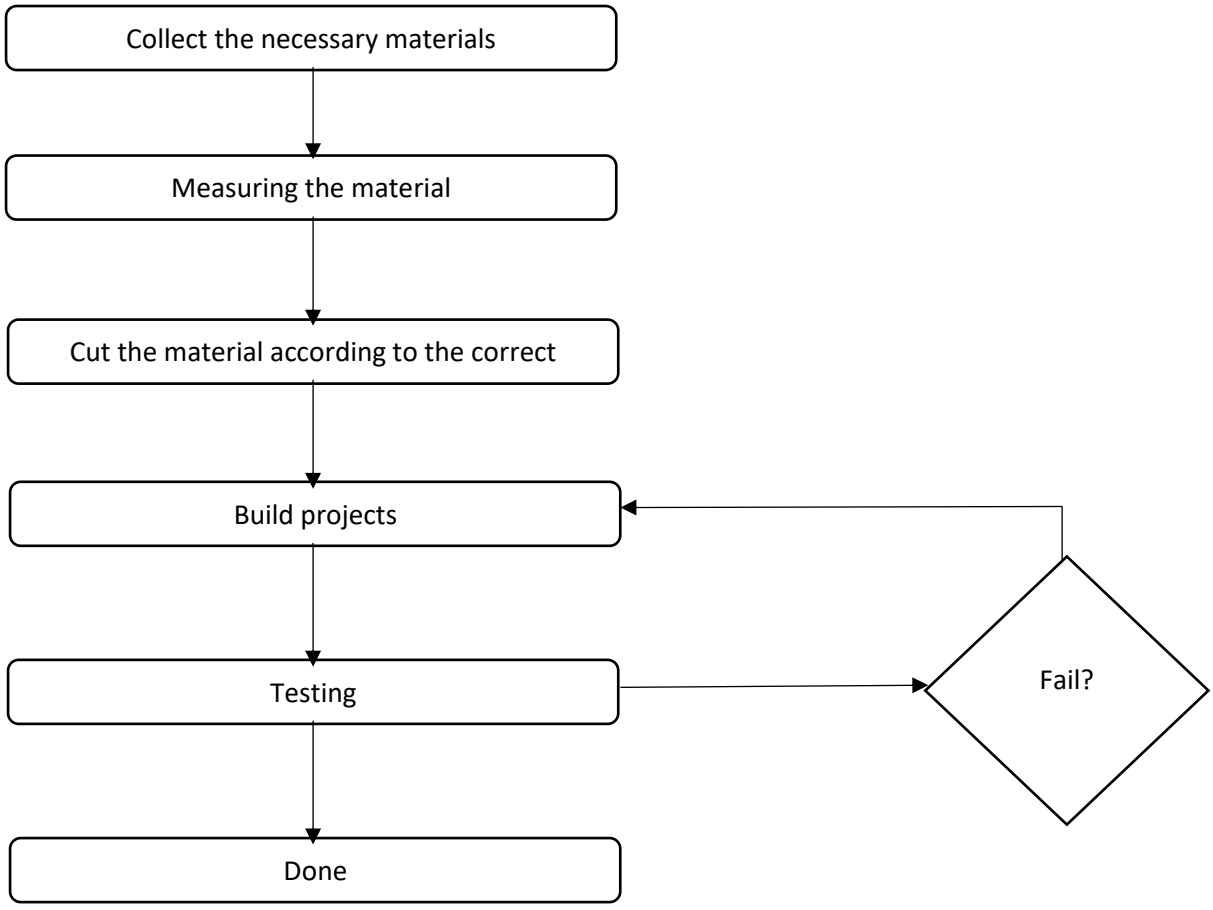
In sprinklers, water is piped to one or more central locations within the field and distributed by overhead high-pressure sprinklers or guns.

But in our project, we produce the same functions as other machines, and we improve our project, such as by making our project design more portable and easy to carry anywhere. The sprinkler used for this project also uses durable materials; it is more economical, does not directly use high costs, and works the same and better.

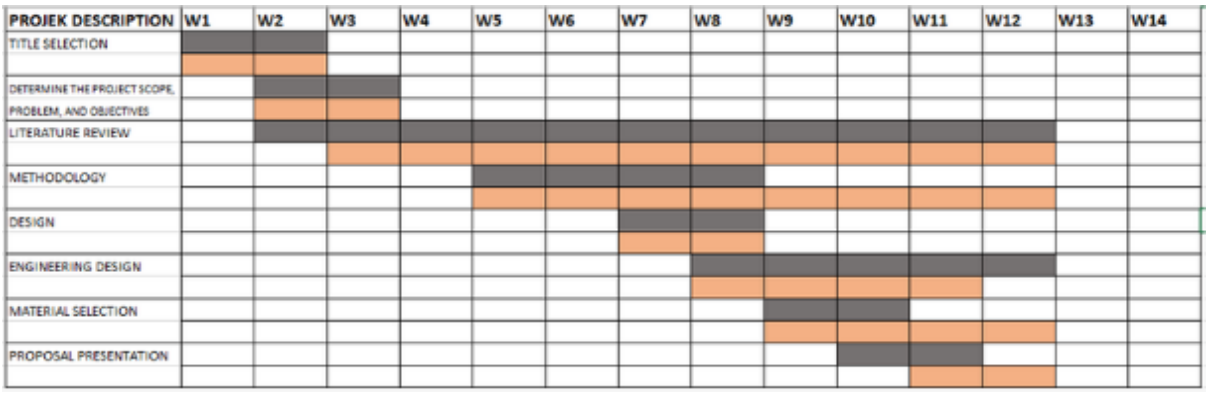
3.3 FLOW CHART PROJECT 1



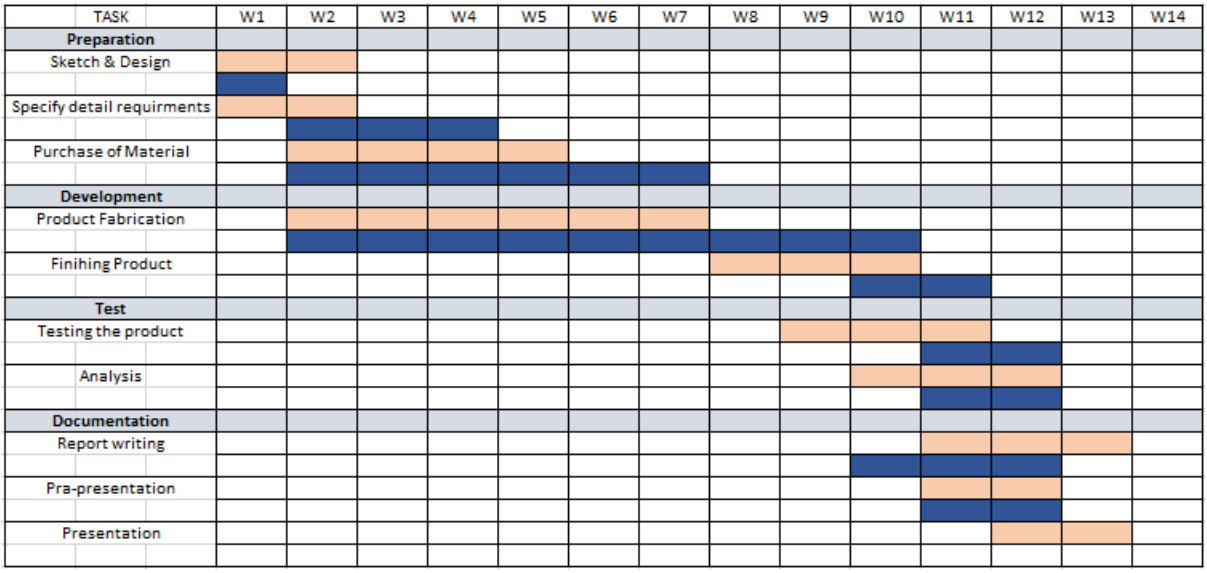
3.3.1 FLOW CHART PROJECT 2



3.4 GANTT CHART PROJECT 1

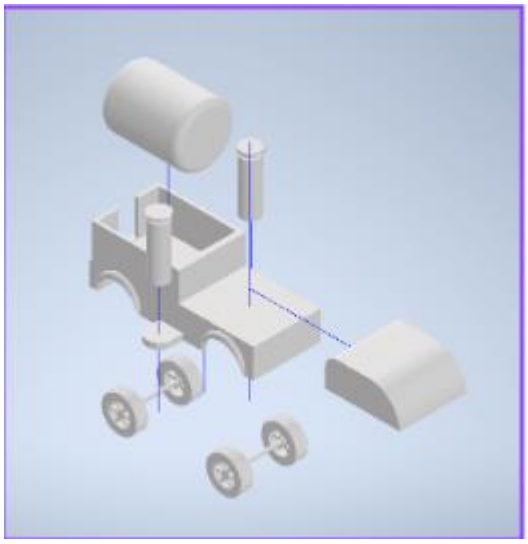


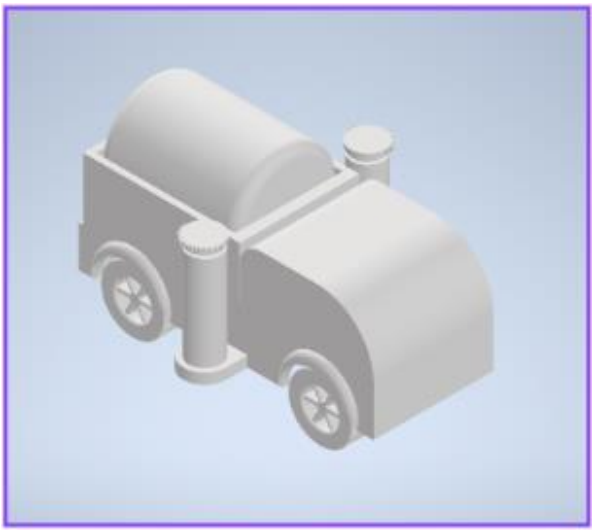
3.4.1 GANTT CHART PROJECT 2

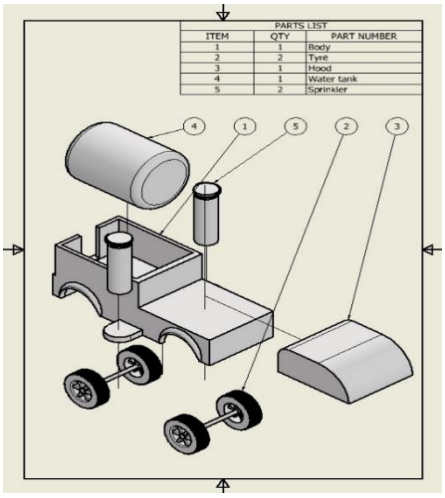


3.5 PROJECT DESIGN (PROJECT 1)

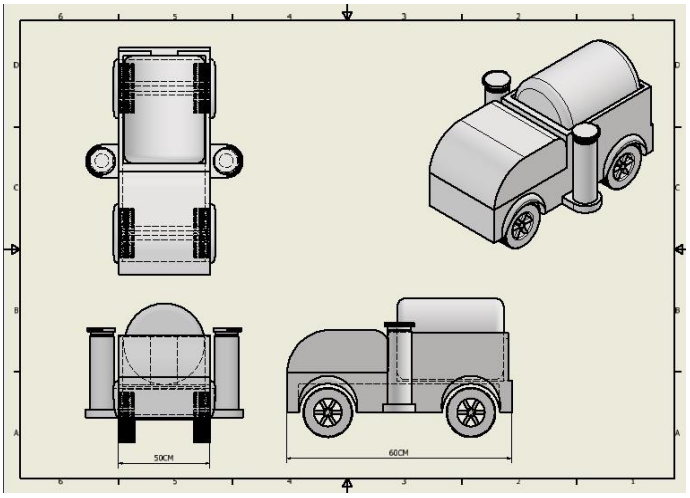
- INVENTOR DRAWING







PARTS LIST		
ITEM	QTY	PART NUMBER
1	1	Body
2	2	Tyre
3	1	Hood
4	1	Water tank
5	2	Sprinkler



3.5.1 PROJECT PRODUCTION TECHNIQUES

In our project, there are many techniques needed in order to make our car controlled sprinkler. These technique need to complete to make our project. The techniques are:

1) MEASURING AND MARKING

We use measuring tape to measure the exact dimensions of our project and stainless steel marker so we could mark the length of rod that we need

2) CIRCUIT

We make a circuit using electrical wires in order to transmit the power from the power source to the sprinkler, motors and tires.

3) PROGRAMMING

We use programming language and install the code in to motherboard such as adruino in order for the remote controlled sprinkler to take command from the controller

4) CARPENTER

We use plank wood to make the body. By using proper equipment such as saw, file and hammer we can make a body as we planned.

5) SHEET METAL PROCESS

We use thin metal sheet to cover the whole body of our product in order to protect the body from damp and rotten. It also can reduce damages to the remote controlled sprinkler if any accident or crash occur.

3.6 MATERIALS / MACHINES / EQUIPMENT MATERIAL

3.6.1 MATERIAL AND EQUIPMENT

No	Material	Description
1.	 Battery	Battery is used as power supply to our sprinklers, motors and motherboard including the controller.
2.	 Tubes	We used tube to transfer water from the water tank to the sprinkler.
3.	 Wood Planks	Wood planks is used to make the body of the product.
4.	 Metal Sheets	To make a door at the top
6.		Water tank is use to store the water. It store about 10 litter

	Water tank	
7.	 Sprocket	To move car on many situational place.
8.	 Arduino board	Use to set the command of electrical function for the car such as movement.
9.	 Wood coating	To coat wood plank and protect it from water damage and rotting
10.	 Sprinkler	To evenly distribute water over a specific area, such as a lawn or garden.
11.	 Power window motor	For control the spocket to move car

12.	 Wheel	Spare tyre at the front

3.6.2 MACHINE

NO	MACHINE	FUNCTION
1	 Hand drill	To connect plywood
2	 MIG welding	To weld plate
3	 Wood cutting machine	To cut the plywood

3.7 COST OF PRODUCT

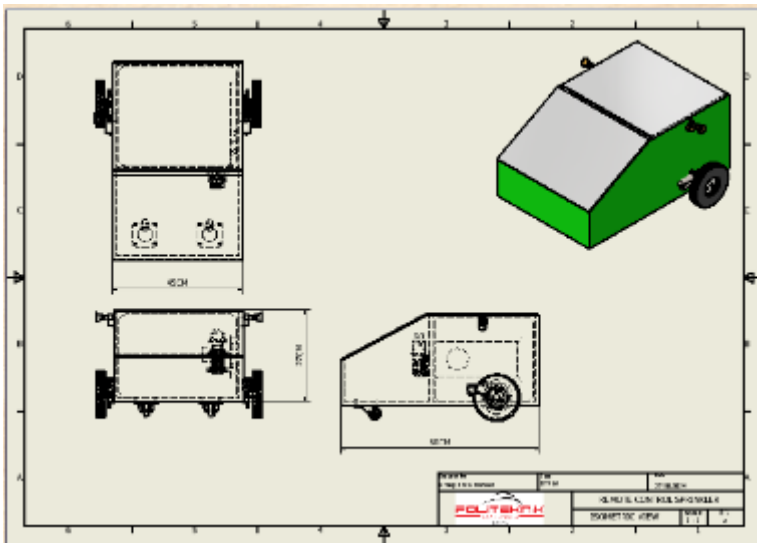
The cost of a remote control sprinkler system can vary depending on features, technology, and brand.

NAME	PRICE	UNIT	TOTAL
Plywood	RM 20	3	RM 40
Metal sheet	RM 160	1/3	RM 53.3
Sprinkler	RM 8	2	RM 16
Coding + wiring	RM 600	-	RM 600
Battery	RM 60	1	RM 60
Casing for Arduino	RM 14	1	RM 14
Power window motor	RM 82	2	RM 164
Water tank	RM 30	1	RM 30
Wheel	RM 3.60	1 set	RM 3.60
8mm transparent hose	RM 1.80	2.5 meter	RM 4.50
Brass fitting	RM 6.00	1	RM 6.00
5/16” brass Y joint	RM 7.50	1	RM 7.50
TOTAL			RM 998.90

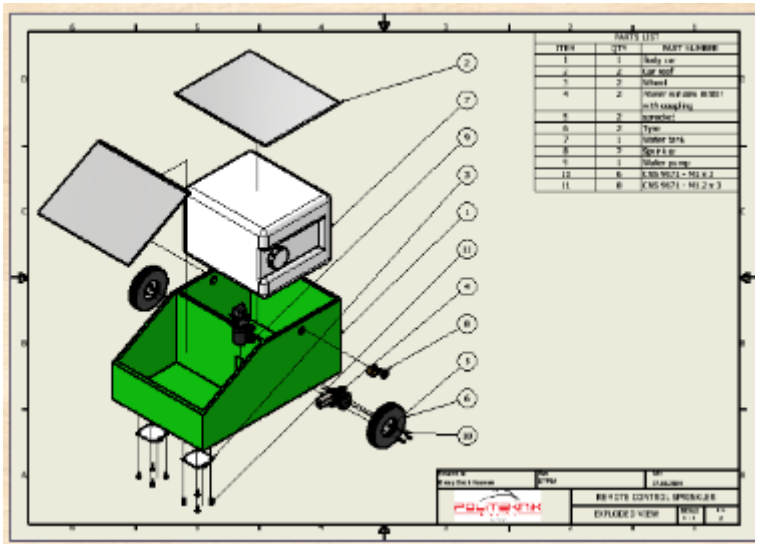
3.8 PROJECT DESIGN (PROJECT 2)

The remote control sprinkler is an innovative solution designed to improve irrigation efficiency for both residential gardens and agricultural fields. In this drawing, created using Autodesk Inventor, the main components of the system are depicted, including the main control unit, sprinkler head and wireless connection module.

3.8.1 Product



3.8.2 Exploded drawing



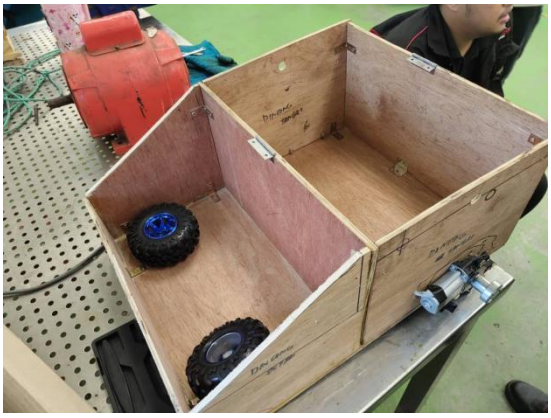
3.9 FABRICATION PROCESS

- At week 2 we measure and mark the plywood to make the body and at the same time cut the wood according to the predetermined length and width

- For weeks 3 and 4, assemble the plywood that has been cut using wood glue to stick it into the body that has been discussed. After finishing while waiting for the glue to dry, move on to cutting the metal sheet to be used as a roof for the project.

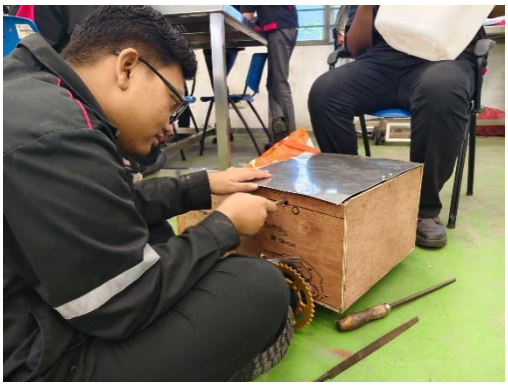
- Weeks 5 and 6, connecting the body of the project using L-Brackets in certain parts so that it is not easily detached. On the side of the project, we drill holes to insert the sprinkler according to size so that there is no looseness during the connection of the side of the project.

- After completing the assembly of the body like a small car, motors are installed on both sides to move the sprocket. On Sunday we took coding and tested the movement of the bluetooth controller.

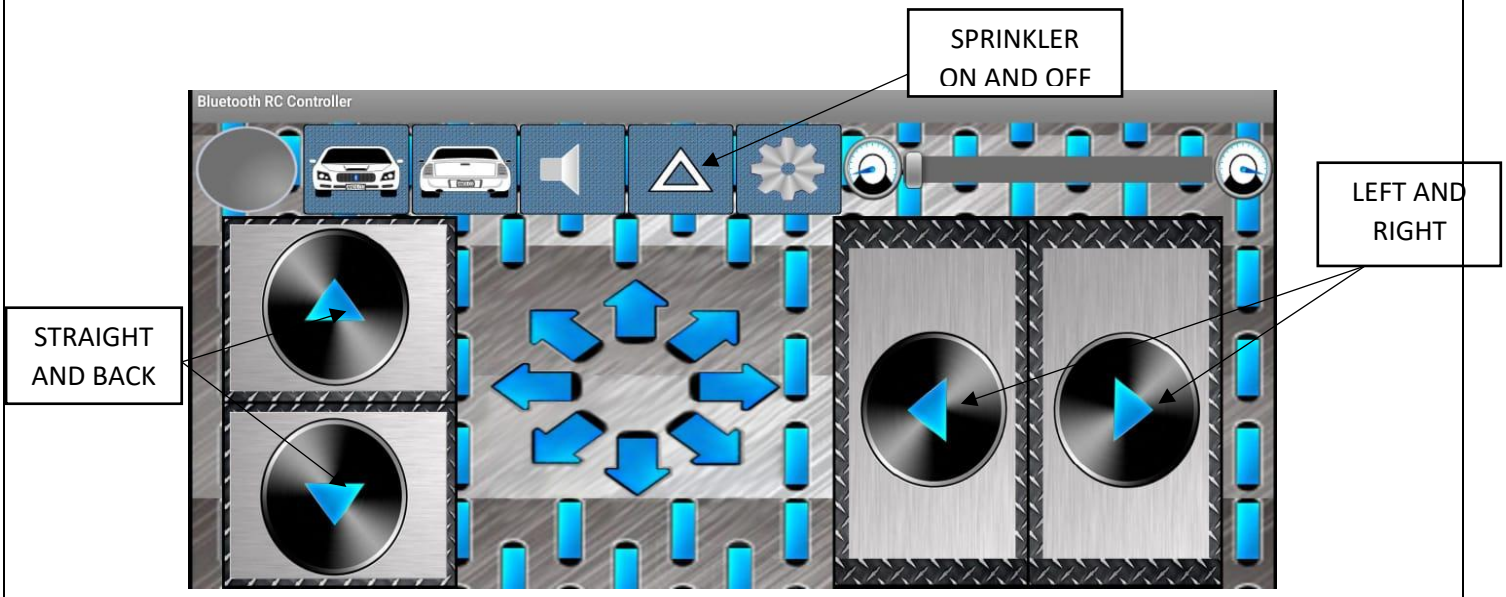


- Week 8 iron plate connection to the body to be used as a roof in the front and back. In week 9 weld the plate in the middle of the sprocket and make three holes to join the sprocket with the motor.

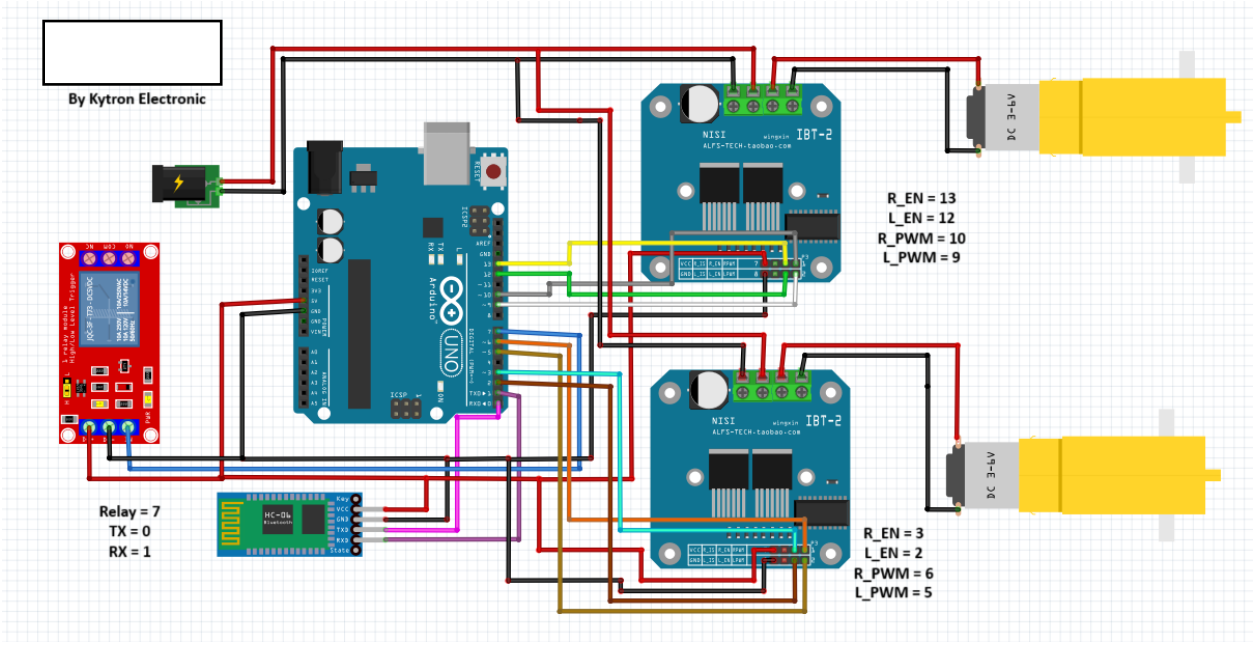
- In the sprinkler hole, it is slightly expanded to easily insert the rubber tube that is joined between the sprinkler and the water line. Once ready, we test the movement of the car using the bluetooth controller so that it can work properly.



3.10 REMOTE BLUETOOTH RC CONTROLLER



3.11 WIRING RC CONTROLLER



3.12 CONCLUSION

With this we can see possibilities with our product in world of agriculture. Our product seems to have pros and cons which some of them are our product can cover up to 500 meter square, easy to learn and use. Suitable for rough place and the product can spray water from sprinkler almost 360 degree. We also have problem with our product which is quiet heavy. Because of product weight. We make it quiet hard to carry. Despite that, we hope our product still can bring benefit to world of agriculture.

CHAPTER 4: RESULT AND DISCUSSION

4.1 INTRODUCTION

In this chapter, it presents data and analysis obtained from sprinkler remote controls. This is to ensure that all research objectives and scope are achieved. To ensure the success of the project, every piece of data was analysed.

4.2 FINAL RESULT OF THE PRODUCT

4.3 ANALYSIS

4.3.1 Analysis speed

Below is a table regarding project speed analysis.

	The time taken for the product with full tank (s)	The time taken for the product with empty tank (s)
Attempt 1 (25% speed)	0.074 m/s	0.104 m/s
Attempt 2 (50% speed)	0.147 m/s	0.3 m/s
Attempt 3 (100% speed)	0.343 m/s	0.505 m/s
Average	0.188 m/s	0.303 m/s

The data suggests a clear pattern where increasing speed results in longer times for the product in both full and empty tank conditions. However, the empty tank consistently shows more significant time delays, which could be due to changes in system dynamics when the product is running empty. This analysis may be useful for optimizing speed settings depending on the tank's condition, potentially adjusting for efficiency or performance requirements.

4.3.2 Analysis sprinkler

Below is a table regarding the analysis of water distance using project sprinklers.

TYPE OF SPRAY	DISTANCE (m)
Mist	0.8 m
Full cone	1.1 m
straight	2 m

This analysis suggests that different spray patterns have distinct functional uses, with mist providing close-range coverage, the full cone offering moderate spread, and the straight spray covering the greatest distance. The selection of the type of spray will depend on the specific watering needs, whether for broader coverage or precise long-distance watering.

4.4 PROBLEMS FACED DURING PROJECT IMPLEMENTATION

EQUIPMENT	PROBLEM
SPRINKLER	Easily torn off due to pressure that is too strong
TYRE	There is no suitable size and shape for the product so have to change to sprocket
CONNECTOR WIRE	Spark wire due to worm on a wire
TUBE	Tube leaking due to too high pressure

4.5 DISCUSSION

The analysis highlights two key points. First, in the speed analysis, the product with an empty tank consistently takes longer to move than one with a full tank, suggesting that the tank's contents impact performance. This information can help optimize speed settings based on whether the tank is full or empty.

Second, the sprinkler spray pattern analysis shows that the straight spray reaches the farthest distance at 2 meters, while the mist and full cone sprays cover shorter ranges of 0.8 meters and 1.1 meters, respectively. Each spray type is suited for different watering needs, with the straight spray ideal for long-range and the mist for close-range watering.

Challenges faced during the project included equipment failures, such as the sprinkler tearing due to high pressure, and issues with the tube and connector wires. These problems underscore the need for durable materials and proper pressure management.

4.6 CONCLUSION

The project demonstrated that the product's performance varies based on speed and tank conditions, with the empty tank taking longer to move than the full tank. The analysis of sprinkler spray patterns revealed that different types serve distinct purposes, with the straight spray covering the longest distance, and the mist being most suitable for close-range watering. However, challenges such as equipment failures due to pressure issues and faulty components highlight the importance of using durable materials and managing pressure effectively for better functionality.

CHAPTER 5: CONCLUSION

5.1 INTODUCTION

In this chapter, conclusions and recommendations to improve the weaknesses of Remote Controlled Sprinklers. As a result, this chapter also discusses the conclusion of the chapter and our project limitations in detail.

5.2 CONCLUSION

In conclusion, a remote control sprinkler system makes irrigation easier and more efficient. It allows users to control watering schedules, change settings, and monitor irrigation from a distance using wireless technology. This helps save water and reduces waste. It's especially useful for large properties or farms, where manual watering can be difficult and less accurate. With remote control systems, people can take better care of their plants and crops while also conserving resources.

5.2 PROJECT LIMITATION

Our project has a few limitations such as:

- Suitable for people who want to simplify their work style to water plants.
- Users can only control using Bluetooth that has been produced.
- The product can be controlled using Bluetooth as far as 7 meters from the user.

5.3 CHAPTER SUMMARY

Chapter 5 summarizes the conclusion and limitations of a Remote Controlled Sprinkler System project. The chapter outlines the benefits of this system in enhancing irrigation efficiency by allowing users to remotely control watering schedules, adjust settings, and monitor irrigation from a distance, thus conserving water and reducing waste. This is especially advantageous for large farms or properties, where manual watering is labour-intensive and less precise. However, certain limitations are noted: the system is best suited for users seeking an easier approach to plant watering, operates only via Bluetooth, and has a limited control range of 7 meters.

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