



**DIPLOMA IN MECHANICAL ENGINEERING**

**(PACKAGING)**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**FINAL YEAR PROJECT**

**TITLE:**

**POWER SPRAYER**

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**MEMBERS NAME:**

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## **DECLARATION OF OWNERSHIP**

I hereby declare that the work presented in this report has been written entirely by myself except for quotations and summaries where stated otherwise by reference and acknowledgement. This report also has not been submitted previously in whole or in part for any other diploma in Politeknik or any other universities.

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Department : Mechanical Engineering  
Project title : POWER SPRAYER

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Last but not least, we would like to express our gratitude to everyone who contributed, directly or indirectly, to this effort.

## **ABSTRACT**

The agricultural sector generally, the farmer uses the traditional way which is spraying carried on a backpack and spraying crop. This becomes time-consuming and human fatigue is a major concern. The main reason for making this power sprayer is to make it easier for farmers and gardeners to use pesticides and herbicides to control their plants. The design is great to help gardeners, as it eliminates the need to carry a heavy tank on their back, which can cause back pain and strain. This power sprayer merely needs to be pushed forward, similar to how a trolley works. It comes with a rechargeable battery so that it will last longer, is easy to recharge, and is easy to replace if broken. To make the power sprayer to be more convenient to use, we put a 16 liter container it will place 16 liters of pesticides and herbicides. So that will reduce the working time as this product does not need to be refilled frequently. It also comes with two nozzles, left and right. Using power sprayer, may assist gardeners in terms of spraying comfort, lowering energy consumption in pump tanks, and efficiently using spraying time.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Research Background

Knapsack sprayer is a sprayer consisting of a handheld nozzle supplied from a pressurized reservoir that is carried on the back like a knapsack. Knapsack sprayers are used for spraying insecticides and pesticides. Most used by farmer and gardener. There are several different types of sprayers that have been developed until 2022 such as Pressure Water Sprayer, Typical Garden Sprayer, Shizuka Sprayer, Plastic Knapsack Sprayer and 2L Pressure Sprayer. These sprayers usually used by gardeners and farming industries to spray pesticide, herbicide, or to watering their plants in farms and gardens.

In vegetable gardens, it's used to spray pesticides, herbicides, and water. Water spraying is usually done every day, whereas pesticide and herbicide spraying is done at least once a week by gardeners. Gardeners must spray their gardens with pesticides and herbicides to prevent the growth of bushes and to keep bugs, caterpillars, and other pests at bay. Usually, gardeners and farmers may take a long time to finish 16 liter of pesticides but, by putting two nozzles at this product, it can reduce time-wasting and make working more convenient.

## **1.2 Problem Statement**

Most pesticide sprayers on the market today are large capacity and heavy. this will be difficult for farmers to use. Farmers must bend their backs slightly to lift the large, heavy sprayer when they want to use it. If used for a long period of time, this will put pressure on the farmer's back and will result in back pain. For large-scale operations, this is highly inappropriate.

Additionally, because sprayers only have one nozzle, they are now less effective. This will result in the waste of more labour and a longer spraying operation than if several nozzles were used.

## **1.3 Objectives**

- 1) To minimize the use of human efforts to reduce the burden of the operator's fatigue.
- 2) To create a more efficient sprayer machine with multiple nozzles direct to each side.
- 3) To provide a comfortable spraying action because farmers just need to pull and switch ON the power sprayer based on their comfort level and don't need to bend their back.
- 4) Prevent the contact between operator and the chemical.

## **1.4 Scope Of Research**

- 1) Can be use in farms and gardens either big or small.
- 2) Used by gardeners and farmers.
- 3) Tanks can be fill either with water for watering plants or poison for poisoning plants.
- 4) Used to apply liquids such as fertilisers and herbicides for example and is suited to spot treating areas.

## **1.5 Significant Of Research**

Since 1947, Ray Hagie, the creator of Hagie Manufacturing, has created a wide variety of sprayers. Large farming companies frequently utilise automatic sprayers and motor sprayers to carry out several spraying tasks on their fields. As opposed to small businesses or vegetable gardens, they frequently used the manual Knap sack sprayer. To convert a manual knapsack sprayer into a mechanical sprayer through this research in order to give all gardeners who work in small businesses a more comfortable and efficient working environment. Last but not least, this study also gives other researchers the opportunity to do additional research that will focus more on assisting Malaysian and other countries gardeners in performing their best while spraying activities in gardens.

## CHAPTER 2

# LITERATURE REVIEW

PREPARED BY: MOHAMAD SHAZWAN BIN MOHD SHAH

(08DMP20F1017)

### 2.1 Knapsack Power Sprayer



*Figure 2.1: Knapsack Power Sprayer*

The Knapsack power sprayer is one of the most widely used sprayers in Malaysia. There are many types of brands that you can easily find in the market. using pump power from an engine or motor, this device is capable of producing high pressure with an output of 8 liters/minute.

On the market you can find tank capacities of 15 liters, 20 liters and 25 liters, with a fuel capacity ranging from 0.5 liters to 0.75 liters.

## 2.2 Hand Sprayer



*Figure 2.2 : Hand Sprayer*

A hand sprayer is a portable sprayer that is operated by a pump by hand. Not only for agricultural needs, gardening (urban agriculture), such as spraying pesticides, but also used for spraying foliar fertilizers or just for watering plants.

Outside of agricultural activities, hand sprayers are commonly used to spray pets such as birds, spray water or shampoo.

In addition, a hand sprayer can also used for vehicle needs to spray water or shampoo on the body vehicle.

For the needs of plants that are not too broad, the use of a hand sprayer is quite reliable. On the market the tank capacity assorted from 1 liter. 2 liters can be easily found in farm shops.

## 2.3 Motorized Knapsack



*Figure 2.3 : Motorized Knapsack*

It is the most basic engine-driven agricultural sprayer. It is carried on the operator's back. It is used to spray a variety of crops, the most common of which being rice, groundnut, cotton, and vegetables. When the engine is started, the blower produces high-velocity air, which the chemical is exposed to. Through the hose and nozzle, the chemical will be released. This knapsack has a capacity of 20 to 25 litres and is quite difficult to carry. The operation of an engine necessitates the presence of patrols.



## 2.4 Trailer / Tow-Behind Sprayers



*Figure 2.4 : Trailer / Tow-Behind Sprayers*

Trailer sprayers are designed as tow behind options for vehicles fitted with hitch type pull systems. Example matching vehicles include: utility tractors, ATVs, UTVs, pickup trucks, and other common vehicles featuring tow packages. Tow behind sprayers are self-contained, mobile spraying systems often used in small to medium boom/boomless spray operations. Agriculture, farmers, landowners utilize trailer sprayers for a multitude of property jobs involving watering or application of crop performance chemicals and general pesticides, herbicides.

Tow behind sprayers are engineered in 55 to 100 gallon capacity, powered by either 12V electric diaphragm pumps for sensitive spray fluids or gas motor centrifugal pumps for increased GPM and PSI at the nozzle. Trailer sprayers feature hose lengths up to 50' for walking spray applications away from the sprayer. This sprayer type is designed for quick boom or no boom integration.

## 2.5 Boom Sprayers



*Figure 2.5 : Boom Sprayers*

Boom sprayers are an advancement of the solitary spraying nozzle to an engineered design incorporating multiple nozzles to cover significantly more spray area than other sprayer types. They are often employed in the spraying of bulk land areas from small farm plots, rolling pasture land, to large multi-acreage crop fields. Boom sprayers are simple in design and feature nozzle-equipped sprayer arms that attach to a tractor or vehicle with span reaches up to 30 feet.

Booms, in themselves, are not full spraying systems and must also feature a tank, pump, and full plumbing with components to supply and drive the spray fluid. When integrating your own system components, ensure all minimum flow and pressure requirements are being met. Boom sprayer attachment arms are available from 4' to 30' with nozzle quantities ranging from 2 boom nozzles to 18 boom nozzles.

## 2.6 Spot Sprayers

*Figure 2.6 : Spot Sprayer*



Spot sprayers are versatile, low capacity, small transport sprayers. They are well suited for repeat, target spray operations that may be separated by land distance or located on separate properties, as in commercial uses. Spot sprayers are often used among landowners and small businesses that can benefit from the sprayer's versatility and maneuverability.

Spot sprayers feature 9 to 25 gallon tanks for increased, multi target spray areas. They are powered by 12V electric diaphragm pumps for chemical compatibility and to provide ample nozzle flow rate and pressure. Spot sprayers can have 30' hoses for application reach away from the sprayer.

## 2.7 3-Point Hitch Sprayers



**Figure 2.7 :** *3-Point Hitch Sprayers*

Three-point hitch sprayers are full equipment systems comprised of a fluid storage tank, plumbing, category one 3-point hitch attachment mechanism, handgun nozzle, and/or folding boom arms. This sprayer type is often fitted to utility tractors but can mount category 1 hitch systems also. Common uses include field and crop spraying, target spraying of long fence lines and ditches, and spray operations associated with food plots, commercial, small-business landscape applications, as well as athletic, golf, sports, and park grounds keeping.

3-point hitch sprayer systems feature 40 to 200 gallon tanks. Standard pumps are 12V electric diaphragm models. Without-pump models are also available to allow personal pump installation for preference or work case need.

## 2.8 Mist Sprayers



*Figure 2.8 : Mist Sprayers*

Mist sprayers have a slightly different spray engineering designed for increased distribution and coverage of the application spray fluid. These sprayers are known for their more effective and more uniform delivery of job spray fluids versus the other sprayer types. Mist sprayers' engineering further disperses the spray fluid into micrometer-sized droplets that is sprayed as a fine, covering mist. This design allows a job's spray fluid capacity to last longer and spray further, where a 25 gallon mist sprayer has the potential to spray up to 15 acres.

Rather than traditional spray nozzles or boom arms, mist sprayers feature cannon volutes with a 210° degree rotation for left and right spraying as required. Fans and throttle controls provide spray fluid projection with cab controls for sprayer mechanisms.

Mist sprayers have 25 to 100 gallon capacity tanks with belt driven or gas powered roller pumps as standard pump models.

### ***Common Mist Sprayer Uses :-***

- Tree Crop Spraying
- Tall Crop Applications
- Insect Barriers
- Orchard, Nut Grove, Tree Farms
- Rangeland, Pastures
- Livestock, Poultry, Barn Spraying
- Fruit, Berry Farms
- Flying Insect Control
- Roadsides, Ditches, Levees

## 2.9 Drone Sprayer



Figure 2.9 : Drone Sprayer

<b>No.</b>	<b>Advantages</b>	<b>Disadvantages</b>
1)	Easy To Use	Legal Restrictions
2)	Prevent Wild Animal Invasion	Fear of Privacy Invasion
3)	Accuracy	Expensive Investment
4)	Moisture Monitoring	Vulnerable To Wildlife

## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

PREPARED BY: DURRATUL AINI BINTI ABDUL AZIZ

(08DMP20F1012)


#### **3.1 Introduction**

This product can be used extensively in numerous farms and gardens. However, to achieve the optimum spraying results, their users' aims have been scaled back. It can be utilised in large companies, however larger industries must exert greater pressure while spraying because the area of the field is wide and spraying sessions are typically sped up by machines. Users are therefore primarily interested in little businesses and gardening. Smaller businesses were chosen because, unlike the manual knapsack sprayer that gardeners often use and must carry on their backs for spraying sessions, this device simply requires pushing forward and backward. Additionally, this product may spray on both sides of a boundary, reducing the amount of time needed compared to a standard knapsack sprayer.





#### **3.2 Research design**



After several weeks of design talks, the winning design was produced. The Gardener no longer has to bring a big tank to the spraying session after this. The various high standards of Malaysian farmers served as inspiration for the handle design. People can hold the handle in a comfortable position to control their comfort zone. The product also has a stand so that gardeners may hold it after they're done spraying or when they're tired.

### 3.3 Material selection

No.	Components	Function	Cost
1)	<p>(Full Set) Ogawa Battery Sprayer (16 litre)</p>  <p>Features:</p> <ul style="list-style-type: none"> <li>- Just charge and spray</li> <li>- 4 pcs of nozzle head available for different spray</li> <li>- light and portable in size</li> <li>- Come with charger</li> <li>- Full range of spare part available</li> <li>- Complete set with sprayer hose and straw.</li> <li>- With Speed Control.</li> <li>- On/off Switch, easy charging</li> <li>- Battery meter for easy charge reading,</li> <li>- Instruction booklet included</li> </ul>	<p>Designed for the application of herbicides, insecticides and fungicides the sprayer is supplied with a variety of nozzles suitable for most spraying operations.</p>	RM 108.98



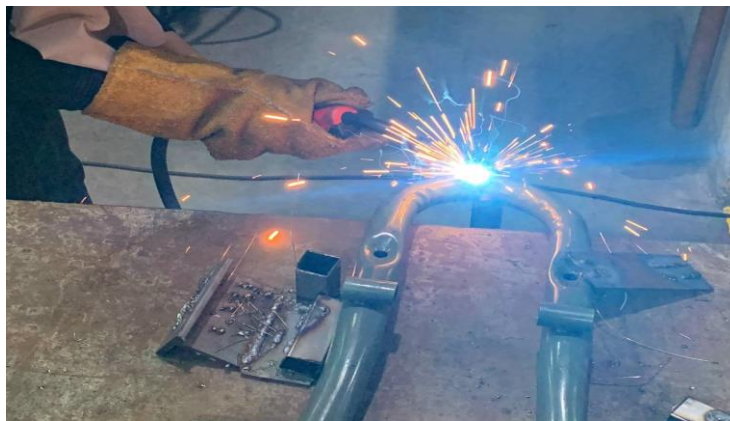
2)	<p>Wheelbarrow handle and frame</p> 	Used as a trolley to install the power sprayer	RM 54.50
3)	<p>Tyre 13"x3"</p> 	To move the trolley	RM 32.50
4)	<p>Mild steel 1"x1" (10m)</p> 	To join components that will support the trolley body and nozzle.	RM14.00
5)	<p>Multipurpose steelband (1m)</p> 	To maintain the stability of the full set sprayer.	RM7.50

6)	<p>Tube connector (10mm)</p> 	To connect the tube sprayer with the tube nozzle.	RM7.00
7)	<p>Clip hose</p> 	To connect a part so that it is not easily disconnected and detached from the tube.	RM2.00

### 3.4 Fabrication

In order to ensure that the project is completed successfully and satisfactorily, substantial fabrication works must be employed. Welding, namely MIG welding, has been used as the main bonding agent. MIG, also referred to as metal inert gas, is often used in the fabrication sector. MIG welding is used for work mainly because it is easier than other welding techniques. In addition, MIG creates a beautiful and clean weld surface.

Additionally, using mild steel with the screw technique to create the wheelbarrow frame and handle. By doing this, the trolley power sprayer can be strengthened even more.



*Figure 3.4.1 : MIG Method*



*Figure 3.4.2 : Screw Method*

### 3.5 Accessories

The ideal nozzle has been discovered after much discussion over the proper nozzle for a power sprayer. For gardeners to ensure more effective spraying, this nozzle has been designed to offer spray sessions. The ratio between the energy present at the nozzle inlet can be used to define nozzle efficiency. This sort of fog nozzle has the fundamental benefit of being able to create fog patterns at very low flow rates and pressures, as opposed to other types. The chemical then quickly emerges from the nozzle when pressure is low.



*Figure 3.5 : Accessories (Nozzle)*

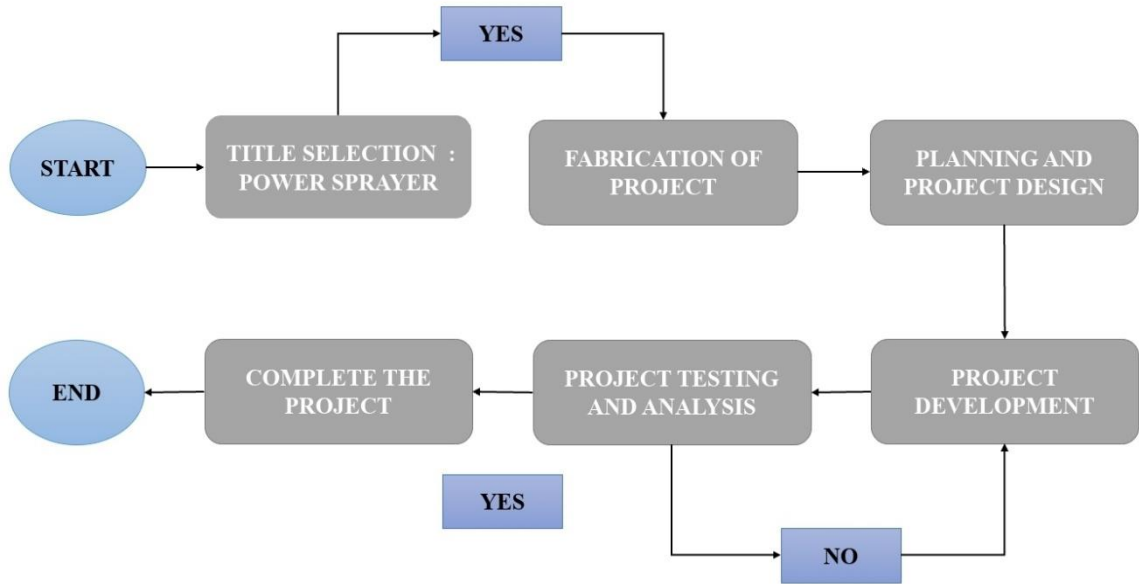
### 3.6 Appropriate Tyre

Tire selection is very important because it will roll throughout the spraying process. These tires are used to move the sprayer more easily. For this Power sprayer project, we use 13"x 3" wheelbarrow tires because they are not too big and not too small and provide comfort to the user. It is also suitable for flat and uneven ground.



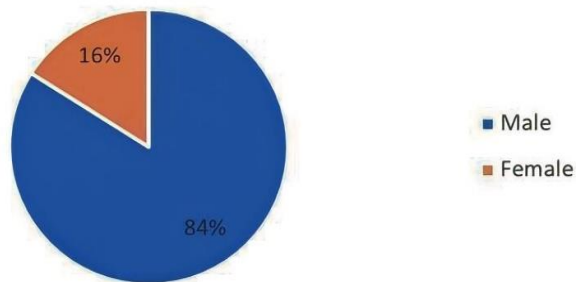
*Figure 3.6 : Wheelbarrow Tyre*

### 3.7 Method Process



### 3.8 Analysis Data Of Responses From Respondents

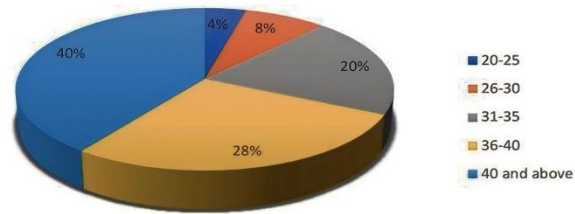
The gender that always uses the Power Sprayer



**Table 3.8.1 : Question 1**

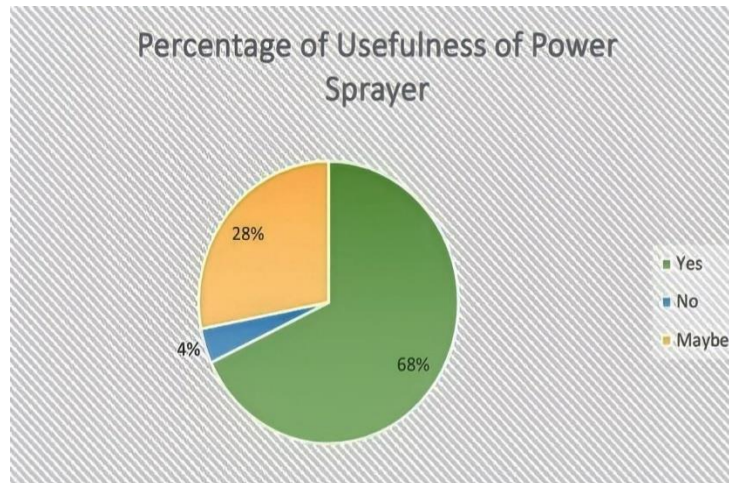
From the questionnaire on question 1, many said that men use this power sprayer more than women. The scale for men found 84%, while women only found 16%.

**Age Range of Power Sprayer Users**



**Table 3.8.2 : Question 2**

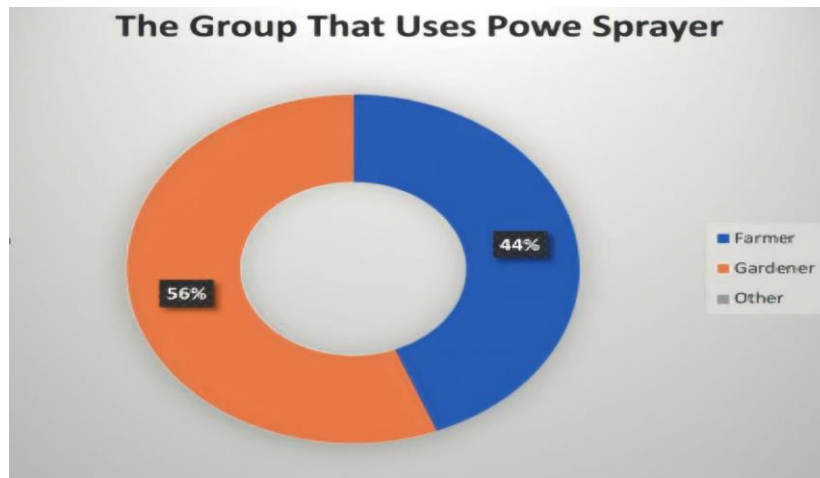
In question 2, the highest percentage for the age group that often uses this sprayer is 20–25 years old. It gets 40% of the total. But most farmers and gardeners are elderly.



**Table 3.8.3 : Question 3**

Based on question 3, there are 25 people who have answered the question. Some of them answered yes, and some answered no based on their own opinions. We found that many of the respondents chose yes to the question of the usefulness of power sprayers nowadays (68%).

*Table 3.8.4 : Question 4*



In the final question, which is question 4, most users of this power sprayer are gardeners, which is 56%. Other than that, farmers get 44%, and everyone else is 0%.

### **3.9 Analysis Conclusion For Respondents**

Based on the questionnaire, there were several respondents who gave us suggestions and ideas to improve our products. A common suggestion is that they want our products to be usable in all types of farms and gardens and develop better handling methods. And there are those who share the idea of making a power sprayer small, easy to store, and light.

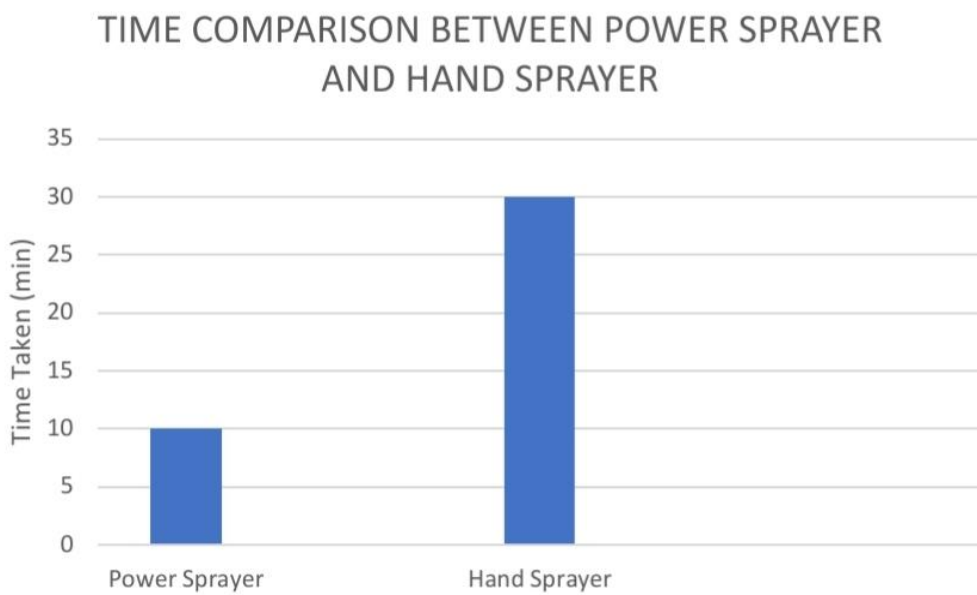
# CHAPTER 4

## RESULT

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### 4.1 Time Taken To Finish The Liquid In The Tank (16litre)



*Table 4.1 : Comparison between power sprayer and hand sprayer*

The POWER SPRAYER has been tested in the field because we did not get a chance to run it in the garden or farm. The test was held at the Bandar Baru field, which is only 168 metres long. Some tests have been done to get the real time difference between the hand sprayer and the power sprayer. There is a big difference in the time taken after the test. A normal hand sprayer takes a very long time to empty the tank compared to using a power sprayer.



# **CHAPTER 5**

## **DISCUSSION AND CONCLUSION**

PREPARED BY: NUR AZMINA BINTI MOHD RAZALI  
(08DMP20F1004)

### **5.1 Discussion**

The study focuses on how farmers and gardeners apply liquids to their crops, such as water, pesticides, and herbicides. They can spray their plants in a variety of ways, but the most popular is with a manual plastic bag sprayer. We discovered that our goal in developing this product had been accomplished once the product testing was over. The time it takes to spray herbicide has been cut in half, making it almost three times as quick as a manual backpack sprayer. Next, by adding two nozzles in front of the trolley power sprayer, we were also able to increase the efficiency of spraying. Our final goal was to enable the farmer to spray effectively and comfortably.

### **5.2 Conclusion**

Water and poison sprayers are highly vital on a farm or garden, and everyone knows about them, especially farmers. Pesticides or liquids are sprayed onto plants using these sprayers. Without these sprayers, farmers and individuals would have to worry about keeping their plants fresh because they won't receive enough water, and they won't be protected against bugs and pests since they won't be sprayed with pesticide or poison.

Because it is more ergonomic to use and manage, this invention and innovation can assist people in spraying their farms and gardens. Plus, with this new sprayer, we can cut down on spraying time since it has a wing on both the right and left sides of the sprayer, so when we spray, both sides of the wing will spray plants nearby.

People who employ this revolutionary innovation will reap several rewards. I'm hoping that this new invention will help farming sectors achieve better outcomes and productivity.

### **5.3 Recommendation**

Users will be happier after this study is over because they won't have to carry and hoist their sprayer to spray their crops in the field or garden. Additionally, people who want to expand and improve this study are welcome. can work together to make this project better because the use of the plantation business is so important and motivating. The best advice we received was to attach the wheelbarrow frame to the power sprayer so we wouldn't have to carry it on our backs. We strongly hope that this project can boost national revenue, be exported internationally, and serve as a role model for other nations.

## **ACKNOWLEDGEMENT**

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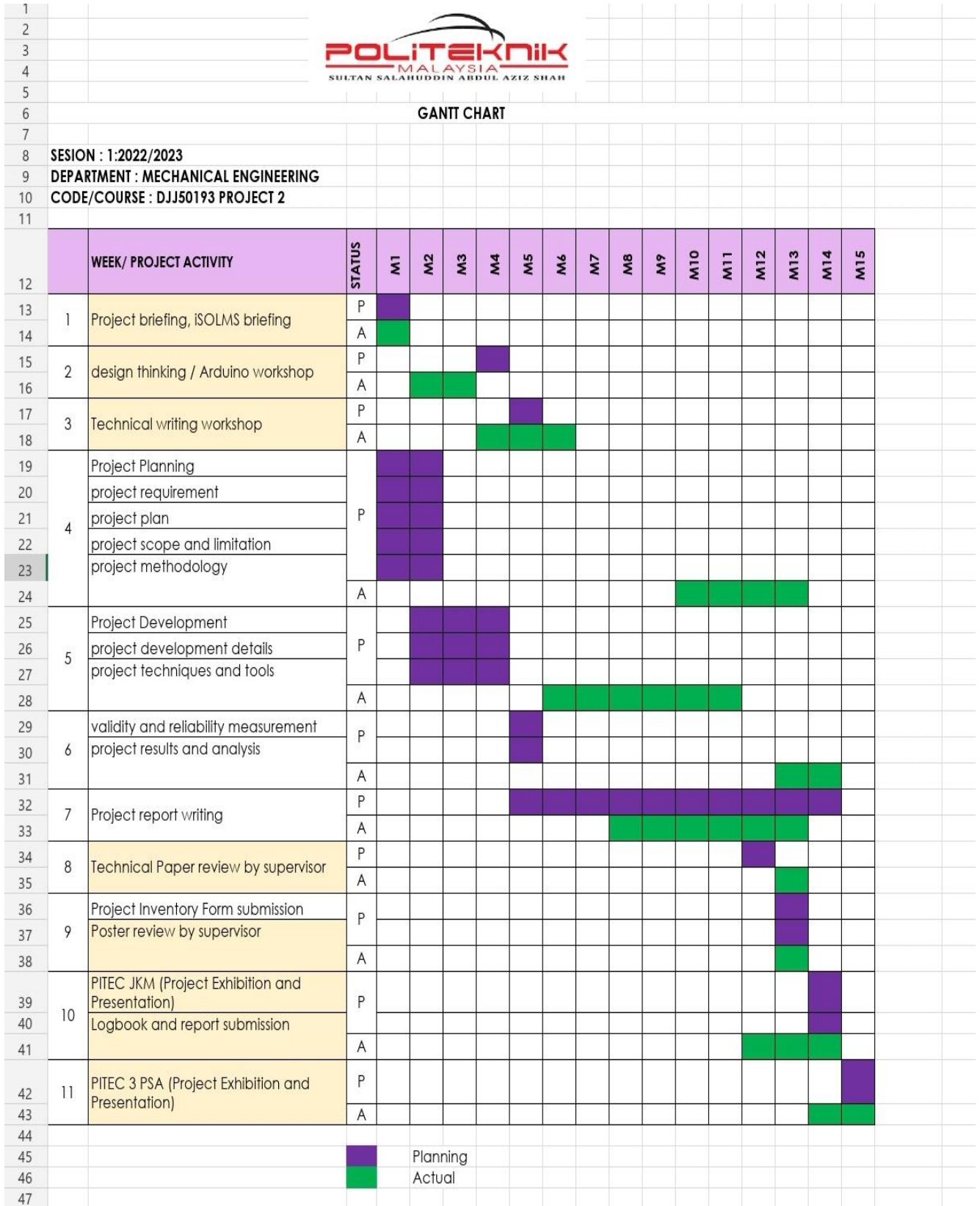
# APPENDICES

## A. Gantt Chart



GANTT CHART

SESION : 1:2022/2023  
 DEPARTMENT : MECHANICAL ENGINEERING  
 CODE/COURSE : DJJ50193 PROJECT 2



█ Planning  
 █ Actual

## B. Estimate Of Cost

<b>NO.</b>	<b>MATERIALS</b>	<b>PRICE (RM)</b>
1.	(Full Set) Ogawa Battery Sprayer (16 litre)	RM108.98
2.	Wheelbarrow handle and frame	RM54.50
3.	Tyre	RM22.90
4.	Multipurpose steelband	RM7.50
5.	Mild Steel (1x1)	RM14.00
6.	Tube connector	RM7.00
7.	Clip Hose	RM2.00

**TOTAL : RM216.88**

## C. Technical Drawing

