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MECHANICAL PINEAPPLE SAPLING PLANTER

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This report was submitted to the Mechanical Engineering Department as part of the requirements for the award of the Mechanical Engineering Diploma

MECHANICAL ENGINEERING DEPARTMENT

JUNE 2023

STATEMENT OF AUTHENTICITY AND PROPRIETARY RIGHTS

RESEARCH OF MECHANICAL PINEAPPLE SAPLING PLANTER

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ACKNOWLEDGEMENT

This thesis becomes a reality with the kind support and help of many individuals. We would like to extend our sincere thanks to all of them. Foremost, we want to offer this endeavour to Allah S.W.T. Almighty for the wisdom he bestowed upon us, the strength, peace of our mind and good health in order to finish this research. Even though there is many challenges and obstacles that we have been face in order to finish up our final year project assignment during fabrication and paperwork, we manage well to overcome it with our own patience, struggles and strength among the group members.

We would like to express our gratitude towards our respected supervisor, Mrs Asiah Binti Yunos for the encouragement, guidance, invaluable support and motivations which helped us in completion of this project. I would also like to drop our sincere appreciation to the role of the staff of Mechanical Workshop for giving the permission to use all required machinery and the necessary material to complete this project.

Thank you as well to the team for coming up with this idea together successful. Without your encouragement and support, we wouldn't have been able to complete this work as well as our other friends. In addition, many thanks to our colleagues who worked hard to produce this work and exchanged ideas to help us complete this project. Finally, we believe that the work we undertake will broaden our knowledge and improve our cooperation and responsibility.

Thank you.

ABSTRACT

This report's objective is to present the design and assessment of a mechanical pineapple sapling planter, which provides a creative way to efficiently and automatically plant pineapple saplings in agricultural settings. Traditional manual planting is labour- and time-intensive, which results in low productivity and higher costs. In order to simplify planting and boost productivity, a mechanical planter was created in response to these difficulties. The main goals and specifications of the mechanical planter are covered in the report's opening section, along with issues like ease of use, accuracy, and adaptability to various soil types. In order to maintain planting accuracy while enduring the rigors of fieldwork, a sturdy mechanical framework had to be developed during the design phase. To guarantee accurate and consistent planting depths, several mechanisms, including soil penetration and sapling placement, were painstakingly designed. Field tests were carried out in pineapple plantations under various environmental conditions to assess how well the mechanical planter performed. In comparison to manual planting, the tests looked at planting speed, accuracy, and general effectiveness. The findings showed that the mechanical planter significantly outperformed manual techniques, resulting in higher planting accuracy and a significant reduction in planting time. The planter also demonstrated soil type adaptability, increasing its usefulness and potential for wide adoption. The report's conclusion emphasizes the advantages of widespread use of the mechanical pineapple sapling planter. With lower labour costs, increased productivity, and minimal environmental impact, it provides a sustainable solution for the agricultural sector. The mechanical planter's successful design and testing contribute to agricultural automation advancements, opening the door for improved pineapple cultivation productivity and efficiency

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LIST OF SYMBOLS

SYMBOL

f	Frequency
m	Mass
P	Pressure
r	Radius

LIST OF ABBREVATION

DCV	Direct Current Motor
RM	Ringgit Malaysia
V	Voltage
RPM	Rotation Per Minute
Covid-19	Coronavirus Disease 2019
AC	Alternating Current
m	Metre
mm	Millimetre
cm	Centimetre
kg	Kilogram
LBP	Low Back Pain

CHAPTER 1

INTRODUCTION

1.1 INRODUCTION

Pineapples are one of the popular fruit crops grown in Malaysia. The Spanish first introduced pineapple to Malaysia in the sixteenth centuries. The pineapple industry in Malaysia is the oldest agro-based export-oriented industry dating back to 1888. Though relatively small compared to palm oil and rubber, the industry also plays an important role in the country's socio-economic development. The world pineapple production trends have undergone severe changes since 1980's with the new producers entering the world markets. With the world demand for canned pineapple estimated to increase around 4 to 5% yearly, there is a bright prospect for the world pineapple industry (MPI 2001). The pineapple industry in Malaysia is unique because nearly 90% of the crop is planted on peat soil, which is considered marginal for most other agricultural crops. Malaysia, once ranked as one of the top 3 pineapple producers in the world in the 60's and early 70's, has only a relatively modest industry today. The total area under pineapple in the last 5 years was only around 7-8 thousand hectares. More than 65% the pineapple area is managed by estates, which grow pineapple for canning purposes (Chan 2000).

However, then, it is clear that pineapple cultivation in Malaysia is one of the sources of income for the local population. So basically, the agricultural industry will face difficulties in planting pineapples in small areas that are difficult for heavy machinery to enter. in addition, small farmers will also only use hoes to do the planting process, this will affect production results and use higher labour.

This product is also to help increase working capability, to reduce time and labour required which is currently lacking in present, and to cut importation cost from other countries. In addition, this study aimed to design and create model of machine and finally to conduct the test seeking for its efficiency.

1.2 PROBLEM STATEMENT

Growing demand for pineapples in Malaysia is increasing day by day, so the supply of pineapples in the market must also be comparable to the demand. But the agricultural industry and small farmers have problems in the production of pineapples, it is due to the way of planting pineapples using hoes will take a lot of time and also use a lot of manpower. Manual planting of pineapple sapling makes a farmer needs to bend their body for too long. Stay in wrong position for too long can cause a back pain. This can cause farmers to fall sick and not be able to plant a big amount of pineapple sapling. When the manpower is decreasing the farmer will not be able to supply more pineapples as demanded. Apart from that, planting a big amount of pineapple sapling using hoes needs a lot of concentration to count the pineapple sapling that have been planted. This will cause the farmer lost count so it’s hard to predict the amount of pineapple that they can produce and pineapple production can be less productive. Planting a big amount of pineapple saplings using hoes takes a lot of time and manpower. In addition, the way crops are used with hoes will also expose farmers to many health and safety risks. Planting a big amount of pineapple saplings using hoes takes a lot of time and manpower.

1.3 OBJECTIVE

The idea of this project is to design and develop a Mechanical Pineapple Sapling Planter mechanism with little effort compared to doing it manually. The project will include several objectives to achieve, there are:

- To identify the small farmer’s needs of a product, by conducting surveys to the target respondents.
- To produce concept design of the product based on small farmer’s needs.
- To fabricate a mechanical pineapple sapling planter to minimize working time and labour cost

1.4 SCOPE OF PROJECT

The main scope of production of our products is for small area and small farmers. They are our main target because they are humans who are closer to the pineapple industry. So, they often face the problem that we mentioned before. We hope the products we produce can give satisfaction and solve the problems they face.

Furthermore, residents who wants to plant pineapple in their backyard are also the scope of our project. So, it can help they to plant without spending too much in tractor or any heavy machine. It can help to reduce farmer works and effort in planting pineapple compare to plant using hoes.

Our product is also suitable for small to medium farmers with low cost but still want to decrease time and farmers in tight budget because our product can help in cost because it didn’t cost any petroleum or electricity. Otherwise, it is also help to reduce the backpain problems for the agriculture workers.

1.5 SUMMARY

Throughout this we have achieved in showcasing each and every topic. Also be able to identify the problem statement and we also be able to clarify the objective of this project clearly. Furthermore, we also well-constructed the scope of this project clearly above. With that said we are also going to discuss the article review of each and every component we have been used in our project in the following topic which is Literature Review.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Literature means research articles that are referred to understand and study the research issues. The literature review is used to provide contextual studies by looking at the research that has been conducted in the field of research and not just 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.

The literature review is essential to commence our invention of a design to fit the objective of the project. This research is important so that there is no duplication of existing projects. In addition, it also helps students to gain access to information about the success of the project and to ensure that it can run properly, it is necessary to obtain information about the project, to meet the objectives that have been submitted. This chapter contains the different types of materials to meet the necessary features used to produce an effective design rather than the previous design. This process is important for the quality of the product to be more effective and more robust and satisfactory.

For our project, we developed a pineapple planting machine is 4-5x more efficient compared to artificial planting. Planting machines integrate many functions such as planting, covering with soil, as well as irrigation, thus greatly saving costs. Mechanical pineapple sapling planter is a modern agricultural equipment designed for planting pineapple saplings. This device is designed to reduce the time and labor involved in planting pineapple saplings in large and small areas. In this literature review, we will examine the existing research on mechanical pineapple sapling planter

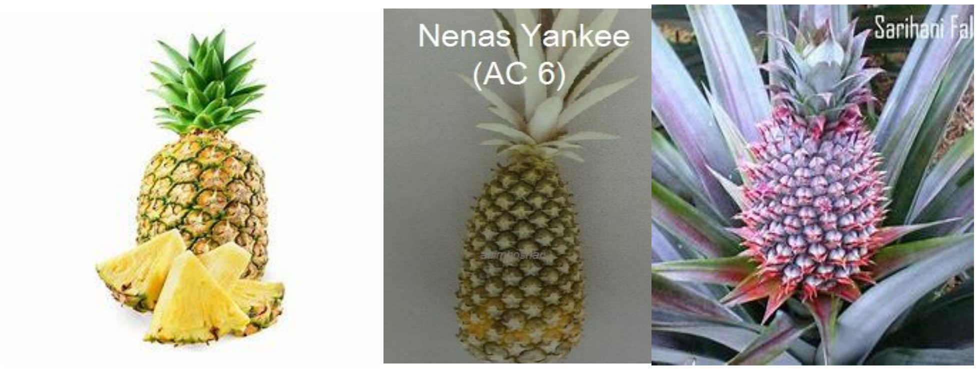


Figure 2.1: Variety types of pineapple

2.1.1 Pineapple Sapling Classification

Pineapple saplings can be classified based on various characteristics such as size, age, leaf color, leaf shape, and growth habit. Here are some common classifications of pineapple saplings:

Size: Pineapple saplings can be classified based on their size, which can vary depending on the growth stage and cultivation practices. Typically, pineapple saplings are 20-30 cm tall and have a diameter of 2-3 cm when they are ready for transplanting.

Types of Pineapple Sapling	Height (cm)	Diameter (cm)
 Small	20-30 cm	2-3 cm
 Moderate	31-45 cm	2-3 cm
 Large	46-60 cm	2-3 cm

Table 2.1: Size of pineapple sapling

Age: Pineapple saplings can be classified based on their age, which is typically measured in months. Most pineapple saplings are ready for transplanting at around 6-8 months of age.

Leaf color: Pineapple saplings have green leaves, but the shade of green may vary depending on the variety and growing conditions.

Leaf shape: Pineapple saplings have long, narrow leaves that are arranged in a spiral pattern. The leaves may be slightly curved or straight, depending on the variety.

Growth habit: Pineapple saplings can be classified based on their growth habit, which can vary depending on the variety. Some varieties have a more upright growth habit, while others may have a more spreading or prostrate growth habit.

It is important to note that the classification of pineapple saplings may vary depending on the specific criteria used and the source of the saplings. Additionally, the classification of pineapple saplings may not have significant practical implications for most agricultural purposes, as pineapple plants are typically propagated through vegetative means (e.g., planting the crown or suckers) rather than by seed.

2.2 PREVIOUS STUDY ON SAPLING PLANTER

Several researches and innovations have been conducted and produced toward the design of sapling planter during past decades. Many manual jab planter has been made such as;

2.2.1 PL1 Jab Planter

The PL1 jab planter is a manual tool used to sow (beans, peas, corn, etc.) in rows or in bunches on plastic mulch films or in the earth. Designed to make the operator's work easier, this device is used to sow seeds manually, while standing in a natural position. When sowing on mulch, the zinc-plated steel cutting edge of the planter makes a clean cut in the film and drops the seeds. The mouth is opened using a spring-mounted handle that releases the seeds.

Figure 2.2: PL1 Jab Planter

2.2.2 Manual Precision Planter

A single seed is dropped by hand into the slot through one funnel while a precise amount of fertiliser is dropped into the other funnel. The seed and nutrients are covered by flicking soil down the slots using the tips of the spears. The arrangement of the seed is intended to give each its own space to ensure minimum competition for light and soil moisture. The spacing for maize and beans should give the optimum plant population for the agro-climatic conditions for that area. This information should be available from local agricultural extension officers, which is the results of experimental work carried out in that area by research stations. The amount and type of fertiliser to be applied for each seed will depend on the results of soil testing, if it has been carried out, or advice from the extension officer.

Figure 2.3: Manual Precision Planter

2.3 CURRENT SYUDIES PLANTER

2.3.1 Vegetable Transplanter

The Paper pot transplanting system is well known in Japan and USA for its simplicity. The seedlings are prepared in trays inside paper cells which are linked to each other. The transplanting process is done rapidly by simply "unravelling" the chain of transplants in the earth. At the end of the harvest, the paper rots in the earth leaving the space free for the following crop. The transplanting process must be done using the cell system that is associated with this equipment. The machine is pulled along. Adjustable working height (handle from 76 cm to 1.07 m).

Figure 2.4: Vegetable Transplanter

2.3.2 Potato Planter

KSM-1 potato planter for motor cultivator (walking tractor single row potato planter, tiller potato planter, potato planter for engine, potato planter for two-wheel tractor) is used for automatized planting of potato at home steed and lawn-and-garden lands. The planter can be unitized with the Neva and Kaskad motor cultivators (with no additional gears) and with the ZIRKA and Mustang motor cultivators (by means of a adapting gear).

Figure 2.5: Potato Planter

2.3.3 Tugal

Tugal or menugal is a word related to agricultural activity. This activity is often associated with traditional methods of planting which have long been practiced by those who do self-sufficiency farming especially in rural areas. Farmers use self-made Tugal Tools to grow crops such as Padi Huma (Oryza sativa), Corn (Zea mays), Keladi (Colocasia esculenta) and Pineapple (A nanas comossus) some other short-lived crops. Sabah and the interior of Pahang, Perak and Kelantan have seen some of these tools used by farmers. This tool is most commonly used by the Orang Asli to grow paddy huma in Pahang, Perak and Kelantan as well as in rural areas of Sarawak and Sabah. This Tugal is a stick made from a fairly straight tree trunk. Depending on the type of crop and the expertise of galping, the size of the girth of the trunk and the length of the timber varies.

Figure 2.6: Tugal

Measure the bottom from the small one (for the rice crop) to the large one (for the garden of yam and pineapple). This wood is cut to 4 - 6 feet long and sharpened at the bottom as a tugal axis. Removing the huma paddy plants will usually use small, long timbers. The timber will be pounced on the surface of the newly burned soil with a depth of 2 - 3 cm to include the seeds of paddy huma from the suitable variety. For pineapple crops, making planting holes in the ground to lay seedlings is very important. In the peatland area this tugal tool usually uses a rather large size of wood to include a rather large pineapple seed tendril as well. The timber will be pounced on the surface of peatland 5 - 8 inches deep according to the size of the pineapple seeds. The seeds will be placed into the planting pit and buried a little ground. Depending on the planting system, the distance commonly made is 1ft x 2 feet or other high-density size.

2.4 COMPARISON OF OUR PRODUCT WITH PREVIOUS AND CURRENT TECHNOLOGY

Table 2.2: Comparison of our product with previous and current study.

TYPES OF MACHINES	 **Tractor**	 **Mechanical Pineapple Sapling Planter**	 **Tugal**
Plant Area	Large scale	Small to Medium scale	Small scale
Cost	High	Moderate	Low
Time	Short	Moderate	Long
Place to store products	Large Area	Small Area	Small Area
Manpower	1-2 people	2-3 people	3-4 people
Operating	Automatic	Manual	Manual
Motor	Yes	No	No

2.5 PREVALENCE OF LOW BACK PAIN AND ASSOCIATED RISK FACTORS AMONG FARMERS.

We set out to look into the biomechanical aspects related to agricultural employment that may contribute to low back pain (LBP) in this population. In the Safety for Agricultural Injury of Farmers cohort research, which included adult farmers, we evaluated the preliminary survey data. The analysis included 1,209 participants in all. LBP was prevalent in 23.7% of people. The kind of farming activity, length of farming career, prior agricultural injury within 1 year, and stress levels all had significant relationships with LBP. Three biomechanical characteristics were found to be strongly associated to LBP by multivariate logistic regression analysis, including improper neck and lower back posture and repetitive usage of specific body parts.

Considering the nature of agriculture, one individual may handle a variety of tasks. Depending on the nature of agricultural work, biomechanical aspects may change. Agricultural work is stressful and requires a lot of repetition. As a result, farmers frequently suffer from musculoskeletal conditions and work-related accidents. Low back pain (LBP) is the most prevalent musculoskeletal condition among them. LBP has been demonstrated to result in significant physical impairment, socioeconomic losses, and mental health effects. Unhealthy lower back posture, hard lifting, repeated motions at work, and whole-body vibrations from agricultural machines are biomechanical risk factors for LBP.

2.5.1 Agricultural work-related biomechanical factors

Using a questionnaire created by the Korean Rural Development Administration, the biomechanical aspects of agricultural activity were examined. Using a 5-point Likert scale that corresponds to rarely, sometimes, usually, often, and always, participants were asked to rate the frequency of the following each day in the questionnaire, which was made up of 11 questions about biomechanical aspects. associated to agricultural activity.

- Moving heavy objects (more than 30 kg) by pushing or tugging them.
- Using vibrating agricultural equipment including cultivators, tractors, rotaries, and mowers
- Shovelling, pickaxing, and pounding
- Constant use of specific body parts, including the hands, wrists, elbows, and shoulders
- Bending, twisting, or reclining your back more than 30 degrees.
- Constantly raising your arm above your head.
- Stretching or twisting the forearm.
- Neck twisting or flexion of more than 20 degrees
- Squatting and kneeling on the ground (such as when streaming)
- Applying force with the fists or knees like a hammer
- Uncomfortable ramp posture.

Figure 2.7: Low Back Pain (LBP)

2.6 FARM INFRASTRUCTURE AND DRAINAGE SPECIFICATIONS FOR PINEAPPLE PLANTS

2.6.1 Farm Roadway

Farm road 3 m wide = 300 m/ha

2.6.2 Trenches

a) Secondary Trench

Types of Soil	Dimension of Trench (mm)
Clay soil (Mineral)	2000 × 910 × 1520
Peat soil	2440 × 910 × 1520
Acidic soil	1980 × 610 × 1520
Sand	2440 × 610 × 1520

Table 2.3: Dimension of Secondary Trench

b) Farm Trench

Types of Soil	Dimension of Trench (mm)	Density of Trench (m/ha)
Clay soil (Mineral)	1220 × 610 × 762	220 - 270
Peat soil	1220 × 910 × 910	164 -180
Acidic soil	1060 × 460 × 762	200 - 220

Sand	1220 × 460 × 762	164

Table 2.4: Dimension of Farm Trench

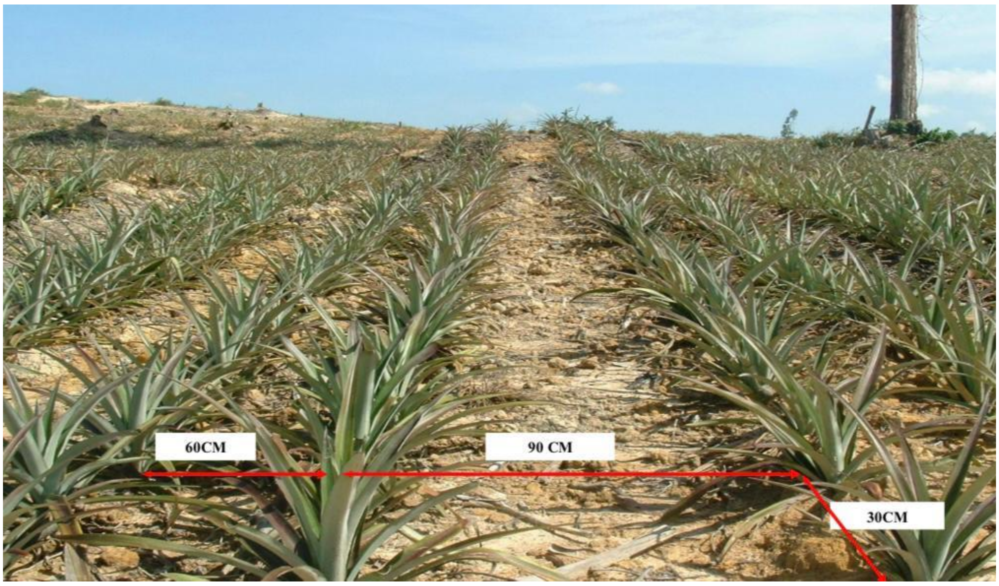


Figure 2.8: Pineapple sapling arrangement

Figure 2.9: Pineapple Farm

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Research methodology refers only to the practical "how" of any particular area research. More specifically, it is about how researchers systematically design studies ensure valid and reliable results that address the goals and objectives of the research. In this moment, we are doing and getting some necessary research about pineapple planters. The methodological chapter should justify the design choice, by showing that the choice methods and techniques are the most suitable for the purposes and objectives of the research, and will provide valid and reliable results. Good research methodology provides scientific results findings, while poor methodology does not.

3.2 GANTT CHART

This shows a Gantt chart in our project production process starting from the first week until the 15th week. A graph in which a succession of horizontal lines depicts the quantity of work or output performed in particular time periods in proportion to the amount anticipated for those times.

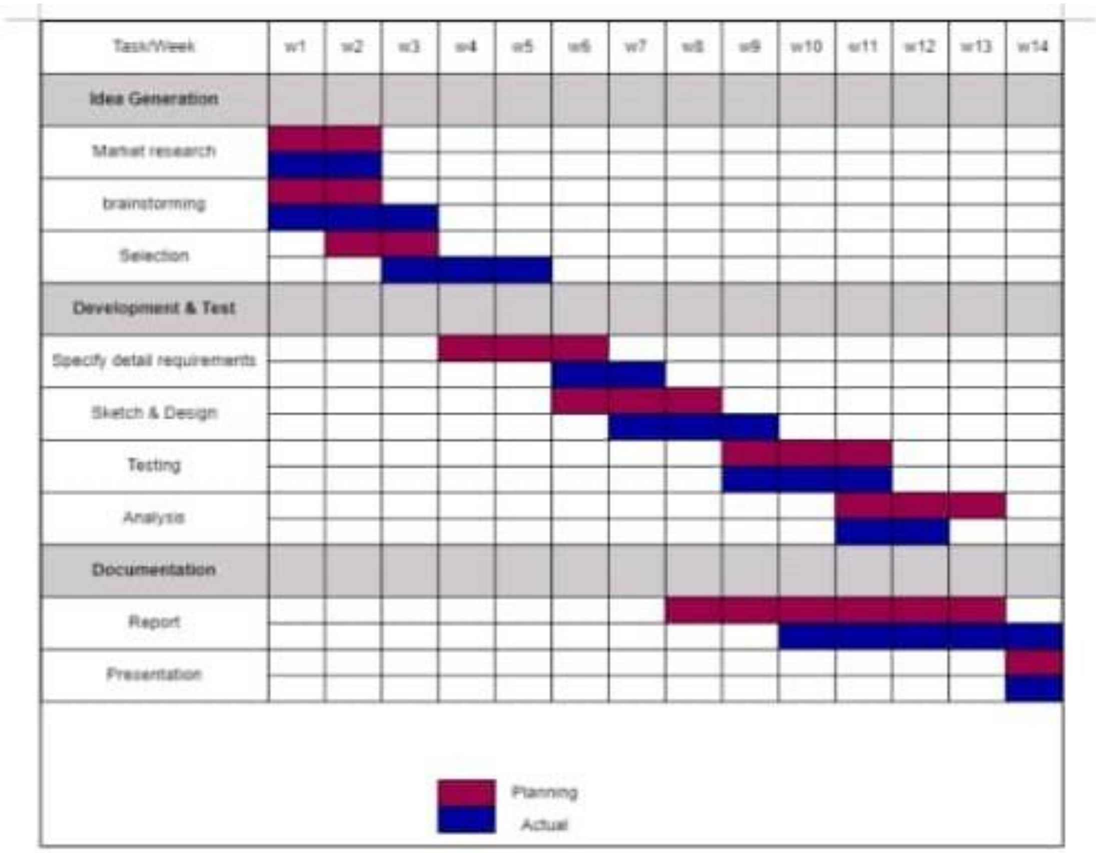


Figure 3.1: Gantt Chart Project 1

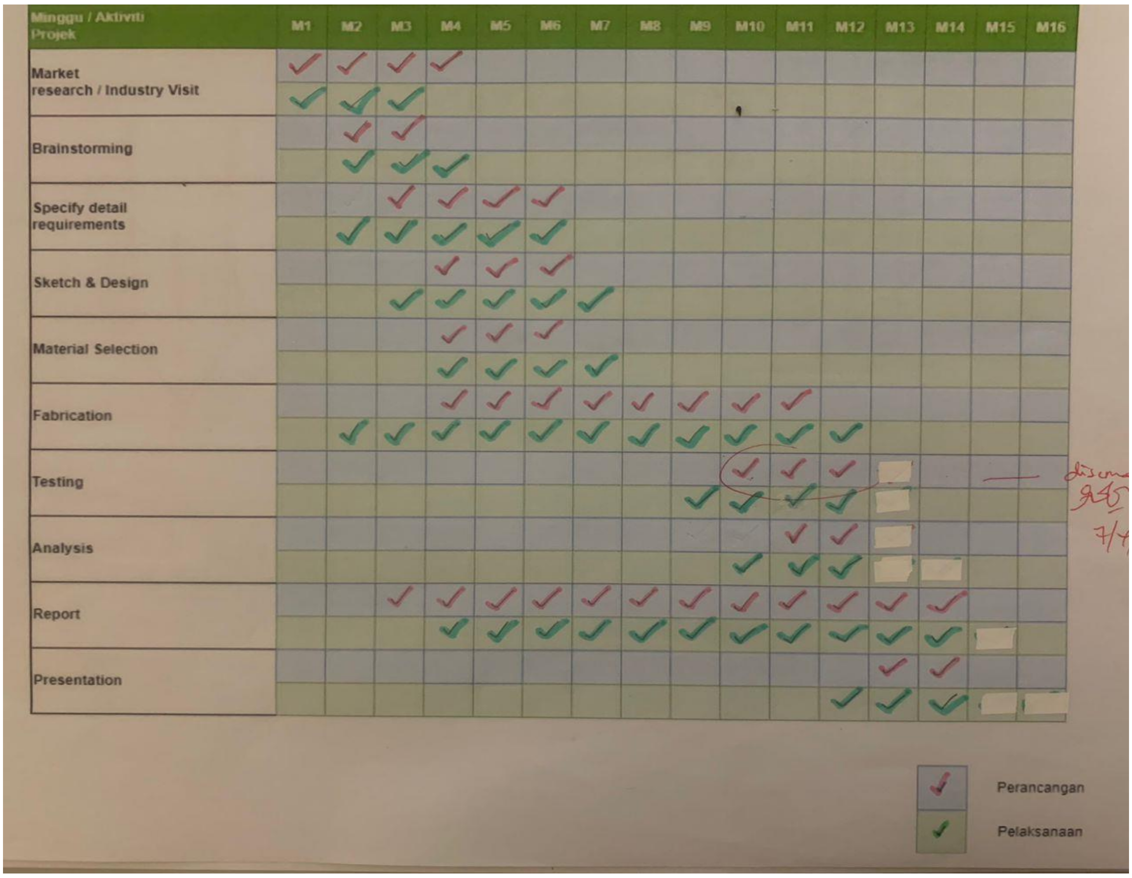


Figure 3.2: Gantt Chart Project 2

3.2.1 FLOW CHART

Project planning is one of the important parts of this project in order to plan a project implementation. Flow chart and Gantt chart are using during the project progress as it provides a planning schedule. Flow chart shown in Figure below represent the steps have been taken. Meanwhile, Gantt Chart in figure below show the duration of each task or activity until the project design completed.

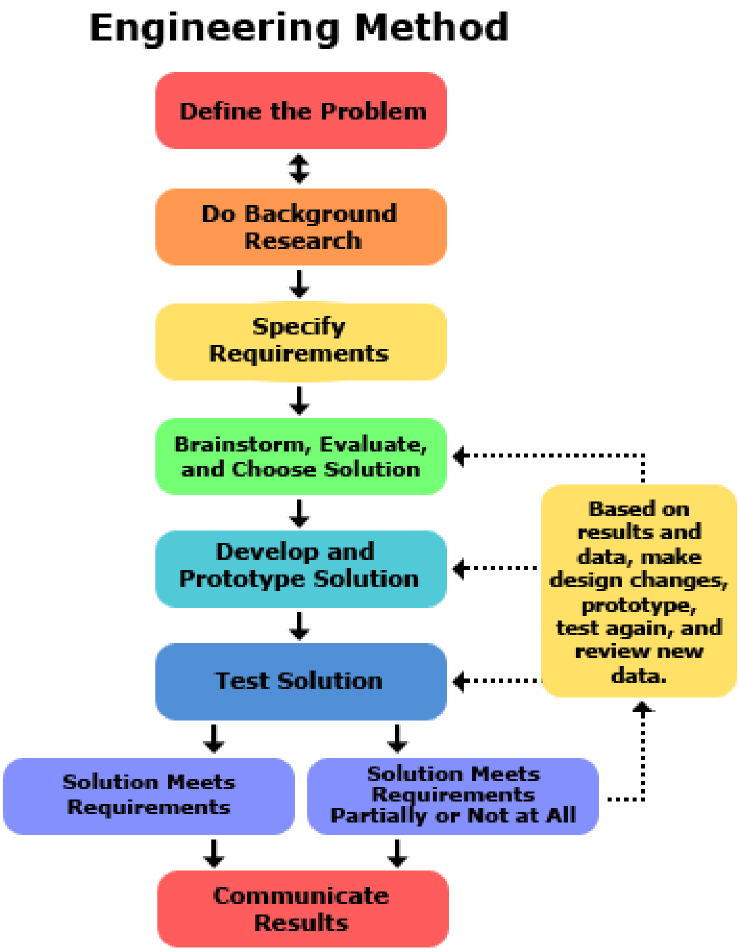


Figure 3.3: Flow Chart Project 1

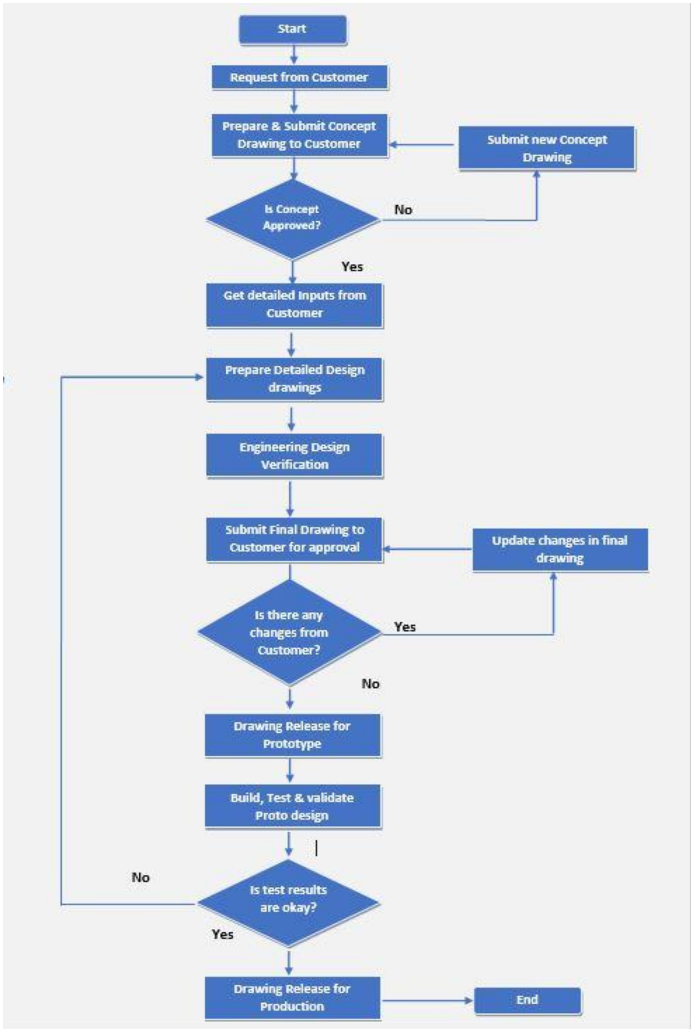


Figure 3.4: Flow Chart Project 2

3.3 REJECTED PROJECT DESIGN

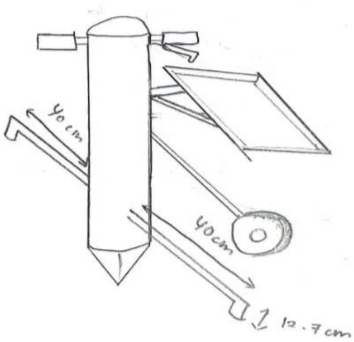


Figure 3.5: Rejected Project Sketch

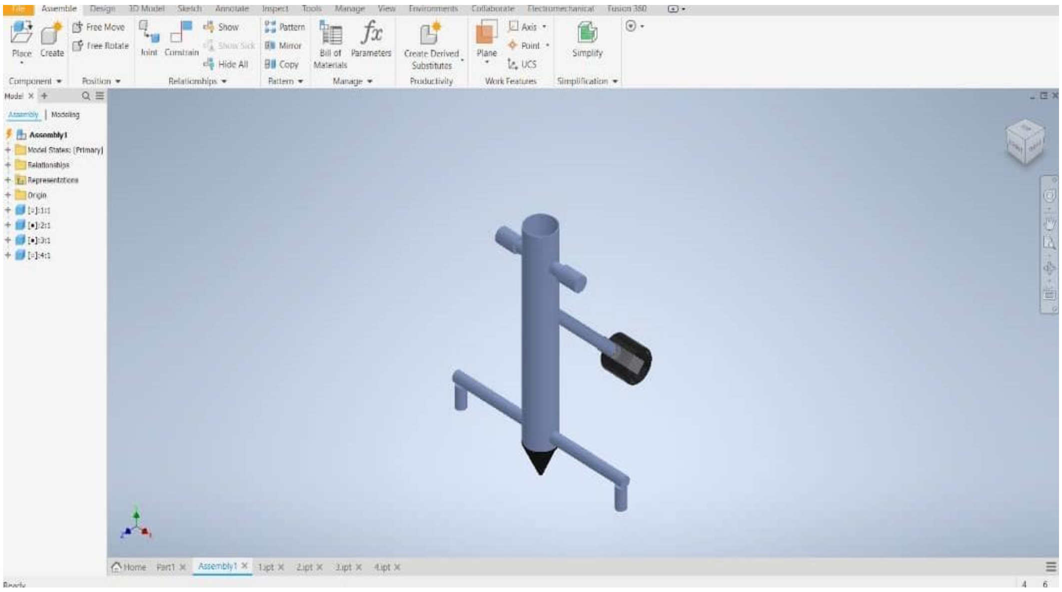


Figure 3.6: Rejected Project Drawing

3.4 PROJECT DESIGN SKETCH

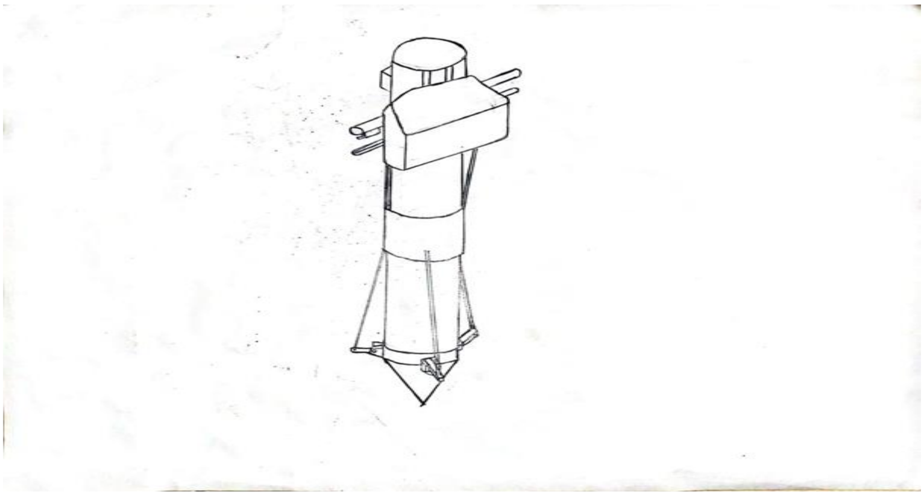


Figure 3.7: Project Sketch

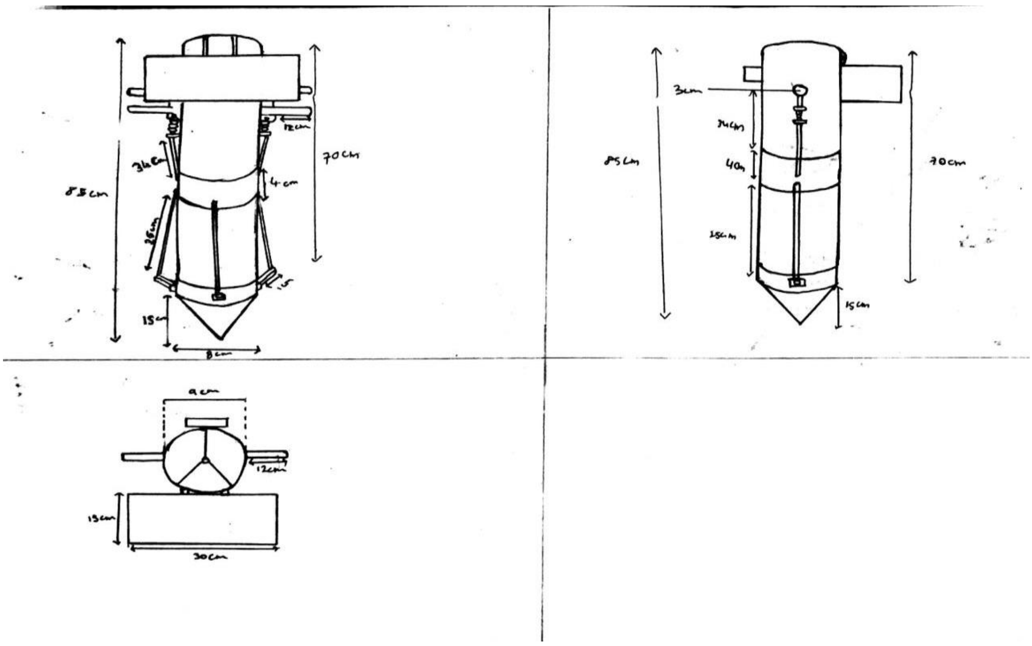


Figure 3.8: Project Sketch with Dimension

3.5 PROJECT PART DRAWING

3.5.1 Toughened Aluminium

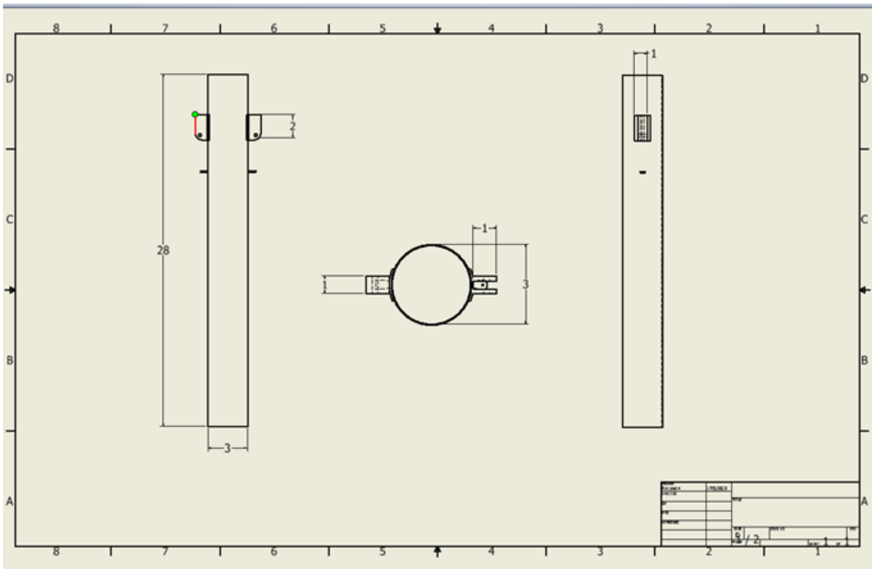


Figure 3.9: Toughened Aluminium

These alloying elements form solid solutions with aluminium, resulting in improved strength and hardness. We use toughened aluminium because Toughened aluminium has a high strength-to-weight ratio, making it strong does not bend easily when pressed into the ground. the most important thing is this material is light so that it can make it easier for the user to do the work.

3.5.2 Handle

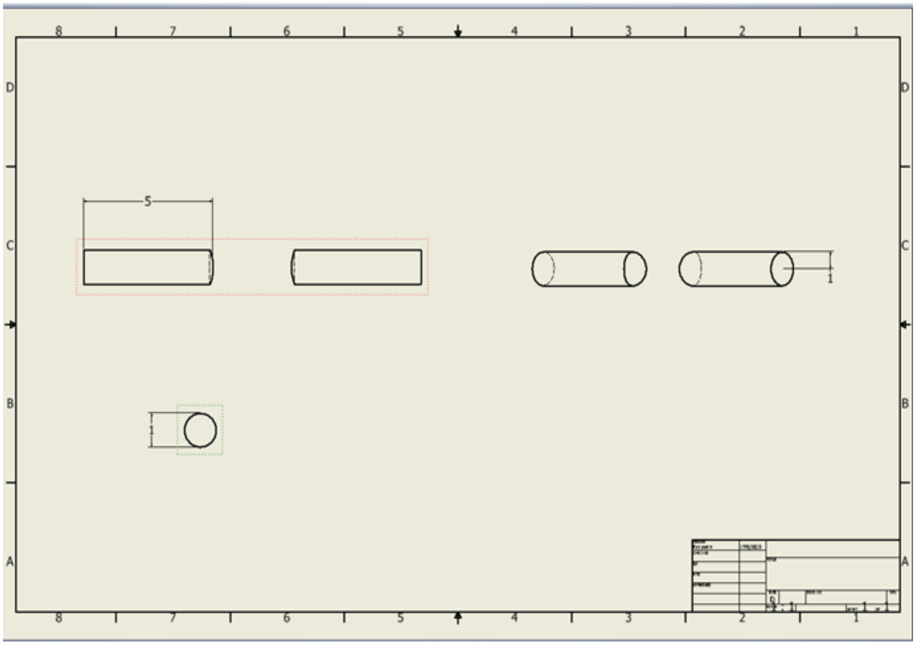


Figure 3.10: Handle

Handle make it easier to move objects from one place to another and provide a secure and comfortable grip for the user. Handles can improve accessibility and inclusivity by making objects easier to use for individuals with limited mobility or dexterity. By providing a grip point, handles enable people with disabilities or elderly individuals to interact with objects more effectively.

3.5.3 Hand Lever

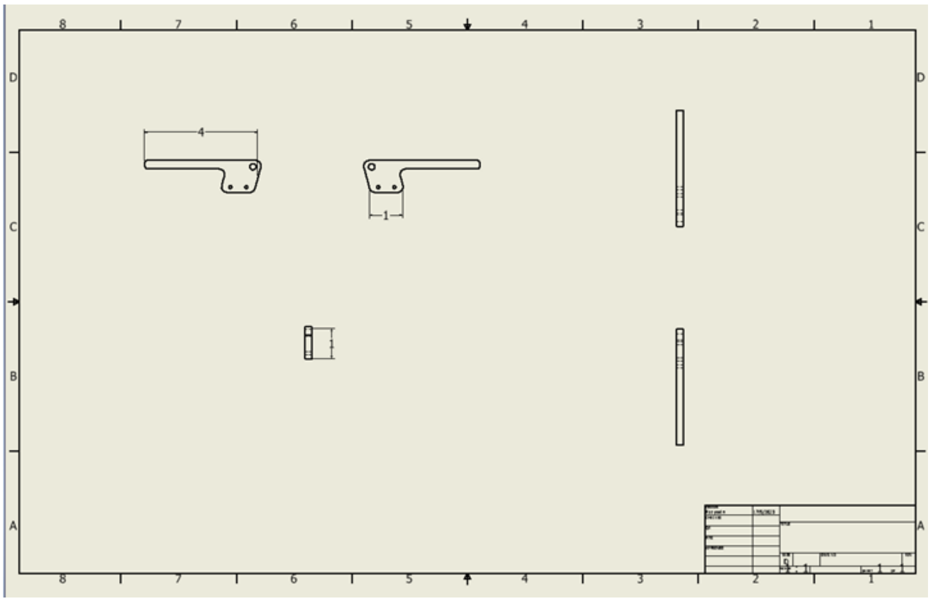


Figure 3.11: Hand Lever

Hand lever used to open the nozzle of the object so that the sapling can be planted in the ground. Pull the lever to open the nozzle and release the lever to close the nozzle.

3.5.4 Spring

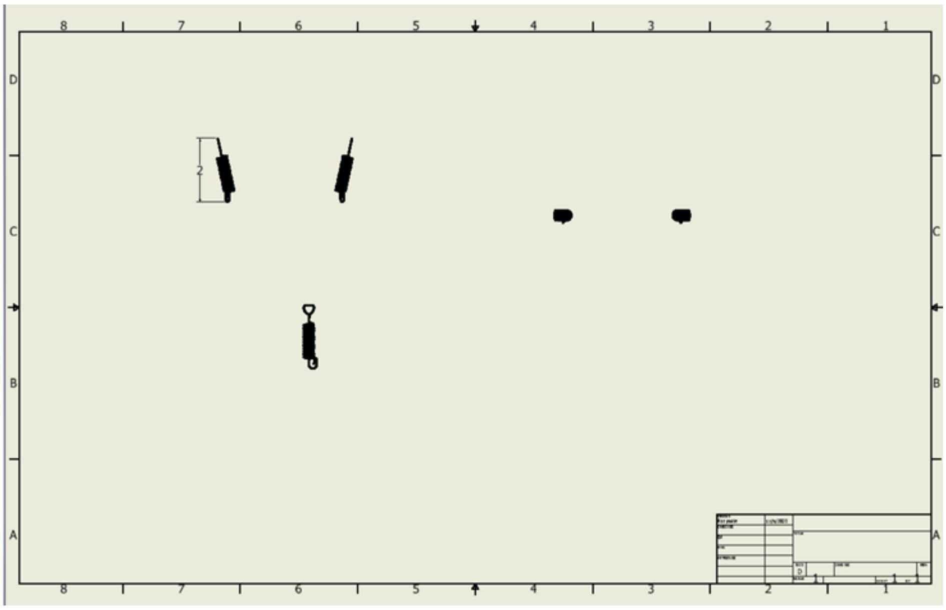


Figure 3.12: Spring

Spring are the mechanical devices that store energy and to apply force when needed. Spring is merged with hand lever to operate the nozzle. When we pull the hand lever the spring extend to open the nozzle. When we release the hand lever the spring return back and the nozzle close automatically.

3.5.5 Nozzle

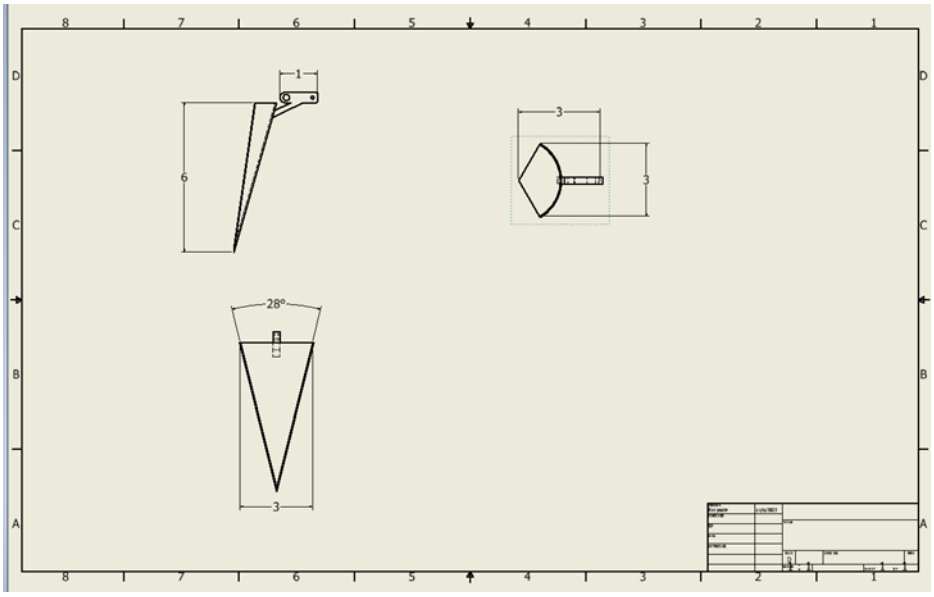


Figure 3.13: Nozzle

The nozzle is used to release the pineapple saplings and plant them in the soil using the tip of it. The nozzle open to expand the soil and drop the pineapple saplings. The nozzle close to buries the plant.

3.5.6 Bracket

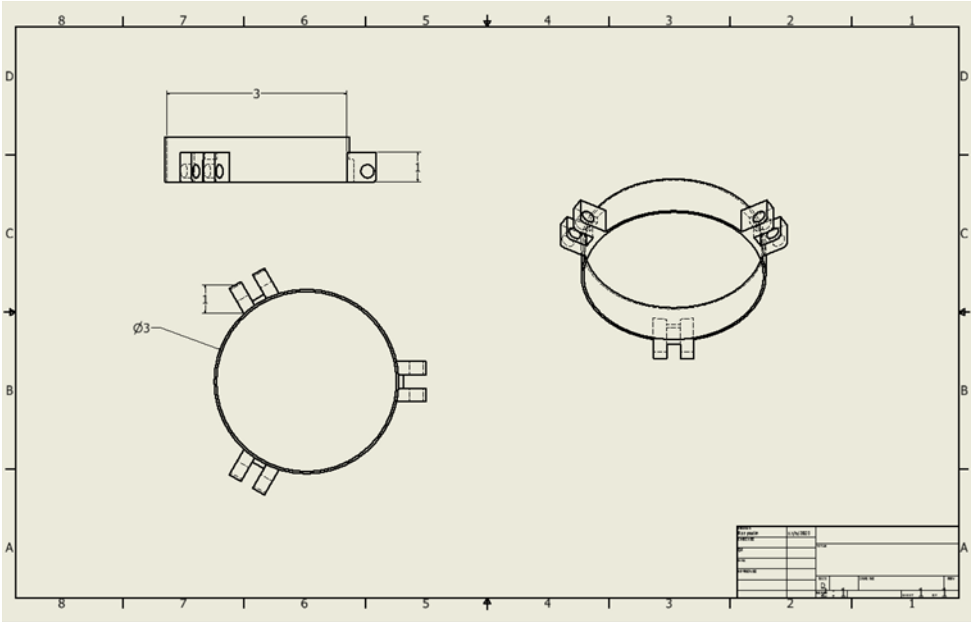


Figure 3.14: Bracket

Bracket used to combine the nozzle and the rod the function is to open and close the nozzle.

3.5.7 Steel Rod

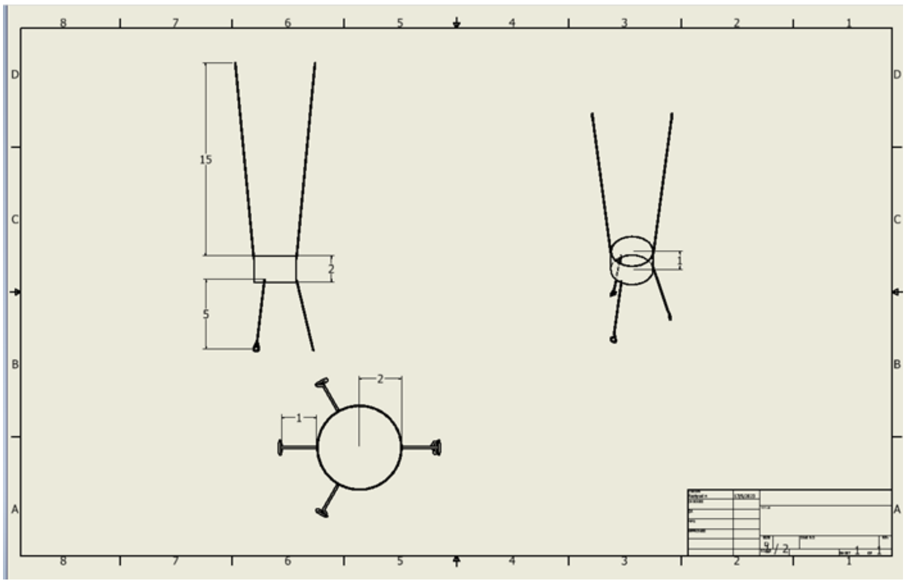


Figure 3.15: Steel Rod

Steel rod we use steel rod to connect the middle of the project with the lever and to connect to the nozzle of the project. We choose steel rod because it strong and durable. Due of its great tensile strength, they can endure significant weight without bending or breaking. Steel rods are thus appropriate for structural applications where strength is essential.

3.5.8 Basket

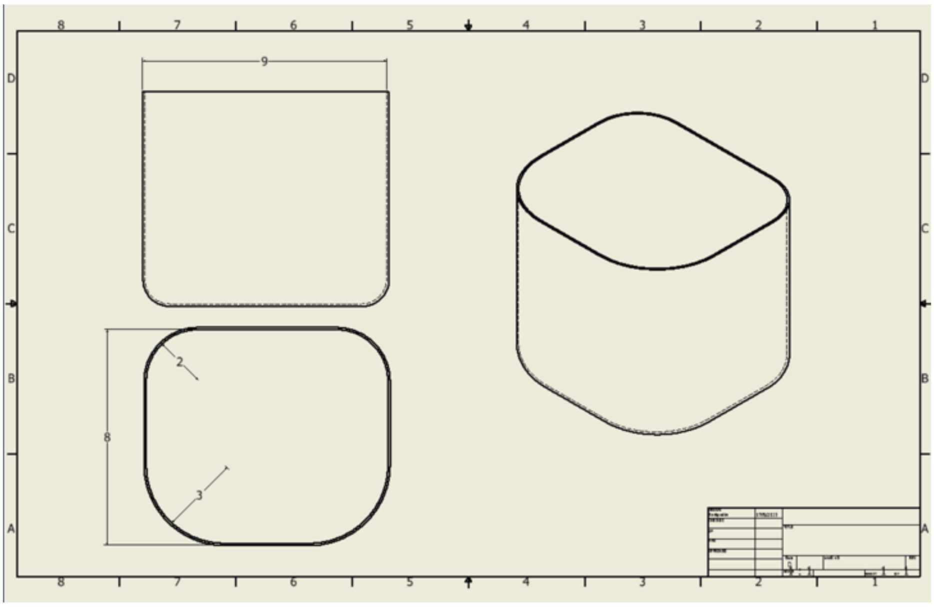


Figure 3.16: Basket

The basket is made of plastic because it is light and easy to carry. resistant to impacts, scratches, and corrosion, making them suitable for heavy-duty use in various environments. Plastic baskets can withstand rough handling and are less prone to damage compared to other materials. It can put 7-8 pineapple seedlings. The ideal size is capable of storing pineapple sapling plant.

3.5.9 Electronic Punch Counter

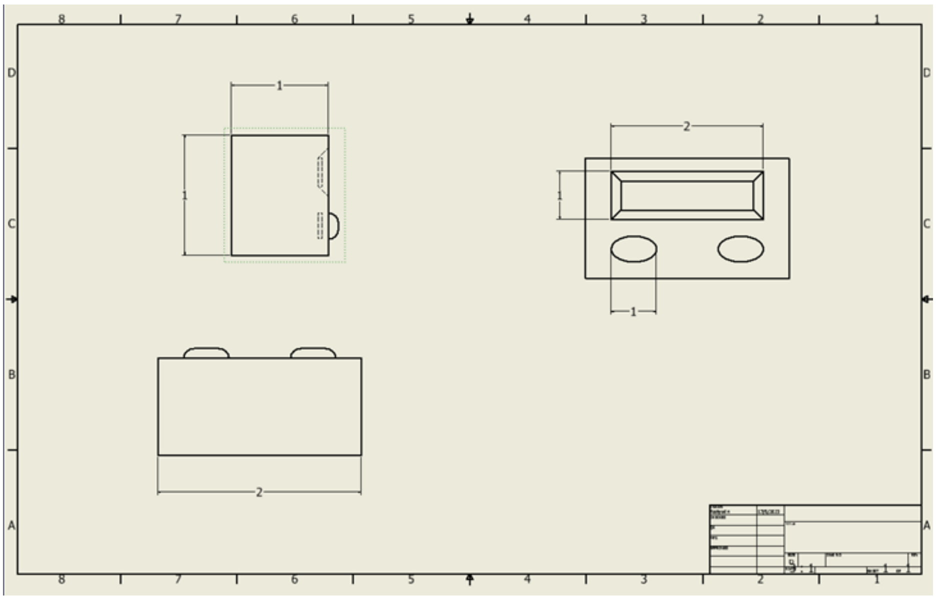


Figure 3.17: Electronic Punch Counter

Electronic punch counter used to count the number of pineapple seedlings that have been planted. 5-digit large LCD screen, display of large and clear. Use the common AA batteries, without external power supply, and the replacement of the battery is convenient. Input using ordinary contact signal, selecting the sensor is simple and convenient, accurate and reliable count.

3.6 PROJECT DESIGN DRAWING

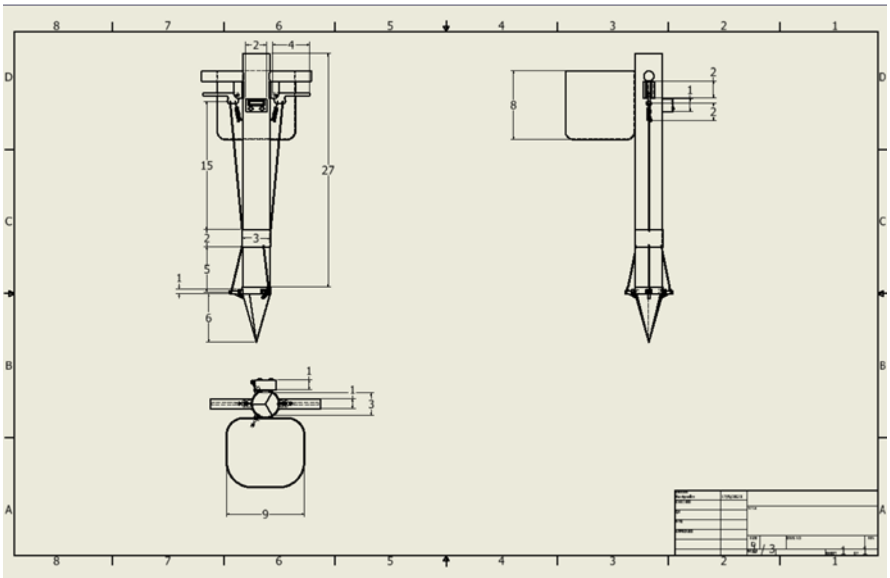


Figure 3.18: Dimension Assembly Drawing

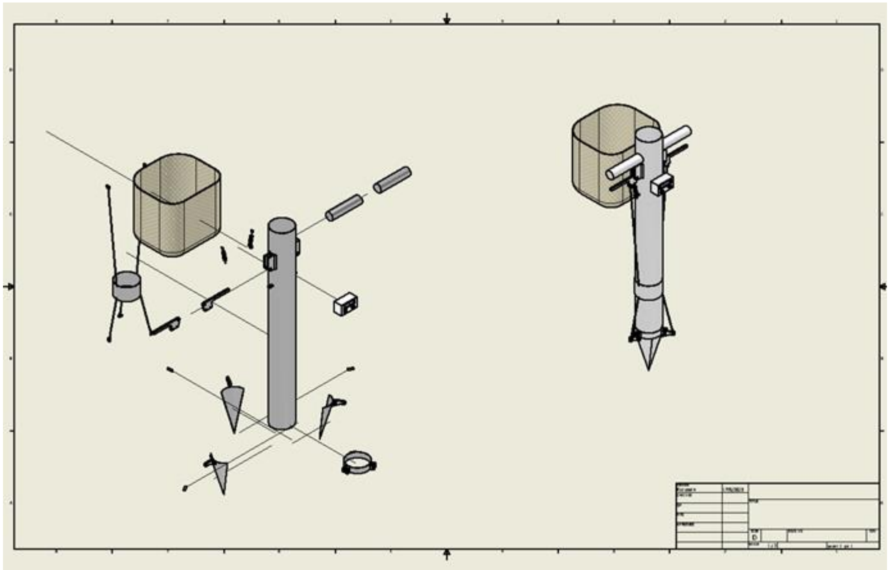


Figure 3.19: Exploded & Assembly Drawing

3.7 COST ESTIMATION

The table below shows the list of costs we use in the production of the "mechanical pineapple sapling planter" starting from the purchase process, to the product finishing.

No.	Item	Quantity	Cost Per Item	Total (RM)
1	Toughened Aluminium	1	RM 21.00	RM 21.00
2	Basket	1	RM 18.00	RM 18.00
3	Spring	2	RM 11.50	RM 23.00
4	Sensor	1	RM 40.00	RM 40.00
5	Lever	2	RM 25.10	RM 50.20
6	Plain steel	1	RM 40.00	RM 40.00
7	Steel Gum	2	RM 13.90	RM 27.80
8	Rod 150cm	2	RM 15.00	RM 30.00
9	Rod 50cm	3	RM10.00	RM 30.00
10	TOTAL			RM 280.00

Table 3.1: Cost Estimation

CHAPTER 4

RESULTS AND ANALYSIS DATA

4.1 INTRODUCTION

A ground-breaking tool created to automate the process of planting pineapple seedlings in agricultural areas is the automated pineapple sapling planter. The planter demonstrated outstanding performance and shown potential influence on the agriculture sector throughout a six-month testing phase that was carried out on several pineapple fields. Results compared favourably to conventional manual methods, with greater planting efficiency being a standout. Since the planter planted saplings more quickly and continuously than manual labour could, its total efficiency was increased. The planter's sophisticated sensors and nozzle also made sure that each sapling was planted precisely, reducing misalignment and fostering consistent plant development. The general health and productivity of the pineapple crops are anticipated to benefit from this increase in planting accuracy. Additionally, the automatic planter eliminated the need for manual labour, easing the physical strain and exhaustion brought on by conventional planting techniques and enabling greater optimisation of human resources.

4.2 DATA ANALYSIS AND STATISTICS

In order to determine the success of the "Mechanical pineapple sapling planter" to all communities, we collected the statistics and data shown below from users using the Google Forms platform.

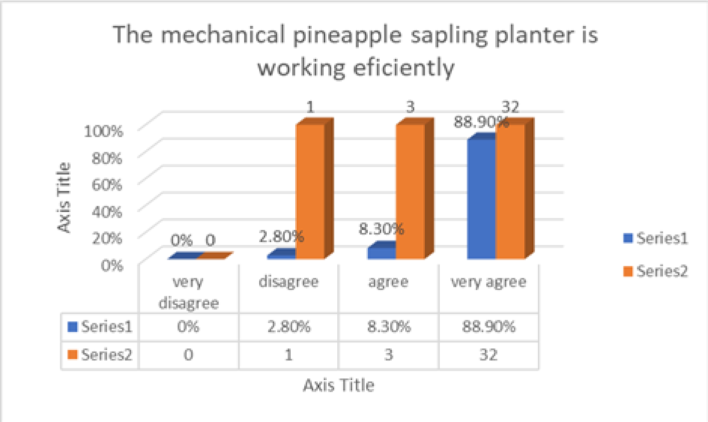


Figure 4.1: Bar Chart Question 1

According to this analysis, the majority of respondents, 97% in total, have a favourable opinion of the planter's efficiency. A significant majority of responders selecting "very agree" suggests that the planter is performing particularly well among the consumers. Furthermore, the 8% who chose "agree" support this favourable emotion, but to a lower amount. It’s because the planter constructed to be user-friendly, making it simple and efficient for people to use. This favourable user experience could be enhanced with intuitive controls, ergonomic design, and clear instructions. Meanwhile, other 3% consumer disagree because they did not compare our product with other conventional method.

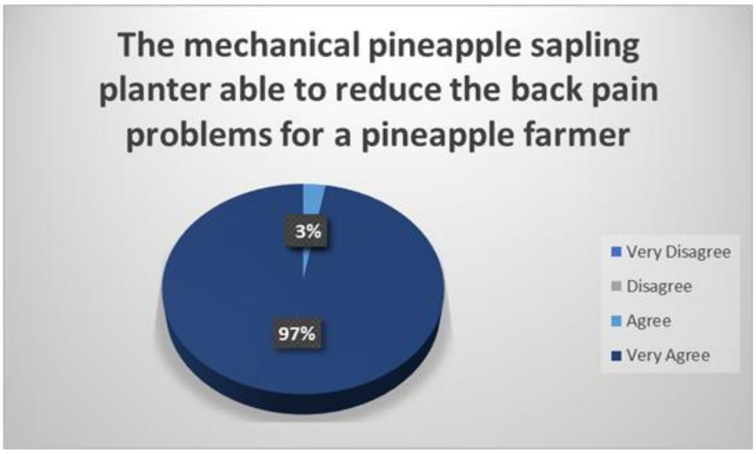


Figure 4.2: Pie Chart Question 2

Based on the pie chart above, 97% of consumers very agree and 3% agree with our product. All consumer agrees that our project be able to reduce the back pain. From the survey they agree because the planter has ergonomically built to reduce back strain and discomfort. This includes adequate weight distribution, and ergonomic grips, allowing farmers to operate the planter with as little strain on their back as possible.

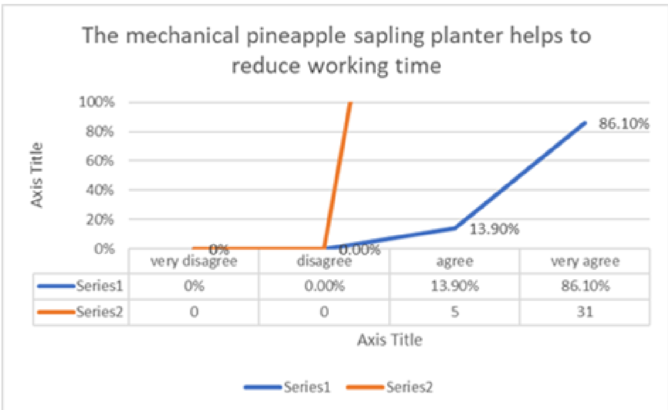
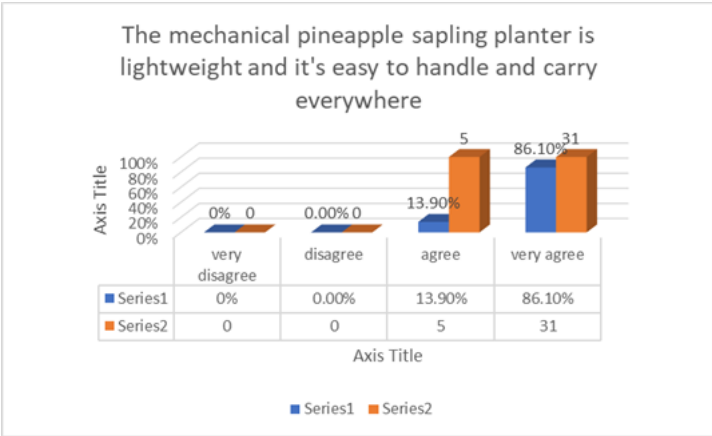


Figure 4.3: Line Chart Question 3

From the graphs 86.10% very agree that our project help to reduce working time and the other 13.90% just agree with that. Therefore, the mechanical pineapple sapling planter is designed to quickly and consistently plant saplings. It can set saplings in predetermined positions more accurately and quickly than manual planting. Because of the enhanced speed and efficiency, farmers may cover more areas in less time, ultimately reducing the overall labour time required for planting.



1

Figure 4.4: Bar Chart Question 4

According to the analysis majority of users (86%) strongly agree that the pineapple sapling planter is lightweight, easy to handle and can be carried everywhere. This suggests that our product was created with the goal of being lightweight and user-friendly, allowing consumers to handle it comfortably and easily. The other 14% users are agreed, albeit to a lesser extent. Although this group does not strongly concur, they do recognise the convenience and portability provided by our motorised pineapple sapling planter.

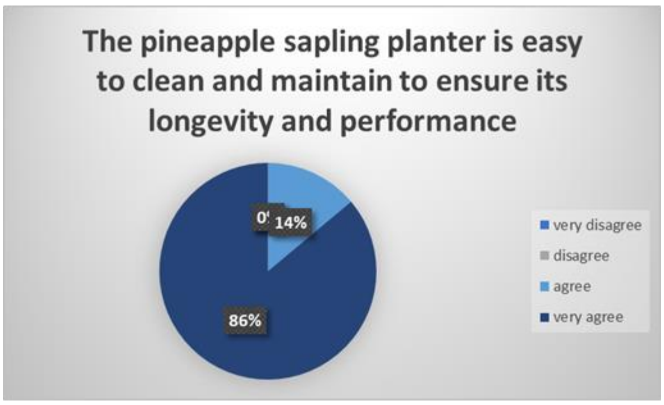


Figure 4.5: Pie Chart Question 5

Based on the pie chart above 86% very agree. The overwhelming majority of responders (86%) chose "very agree," showing that the planter is truly simple to clean and maintain. This high proportion indicates a high level of satisfaction and confidence in the design and maintenance requirements of the planter. Cleaning and maintenance processes are likely to be simple, efficient, and successful in preserving the planter's longevity and optimal performance. An additional 14% picked "agree," confirming the idea that the planter is simple to clean and maintain. Although a smaller number, it still represents a significant portion of consumers who appreciate the planter's ease of cleaning and maintenance.

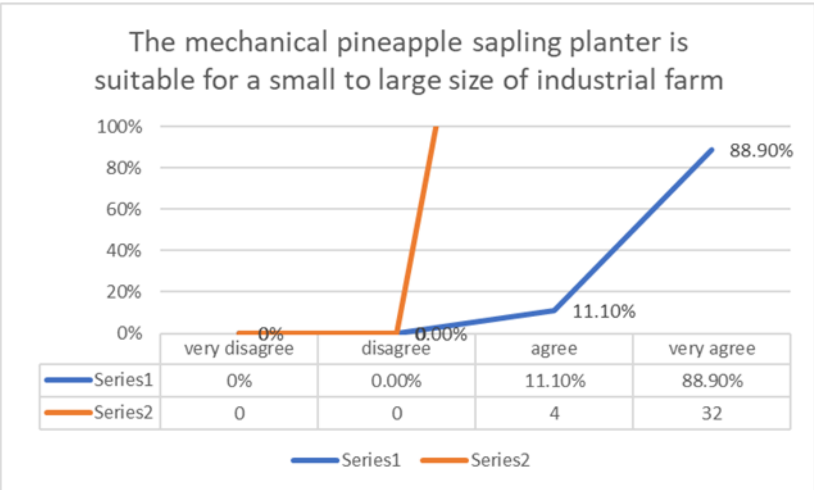


Figure 4.6: Line Chart Question 6

Based on the graph all consumer is agree that the mechanical pineapple sapling planter is suitable for small to large industrial farms. The majority of users 89% very agree because the high level of agreement shows that the planter's capabilities, features, and performance are ideally suited to the needs of large-scale farming operations. The other 11% consumer just vote agree. While they do not completely agree, they do accept that there is some connection between the planter and farms of various sizes.

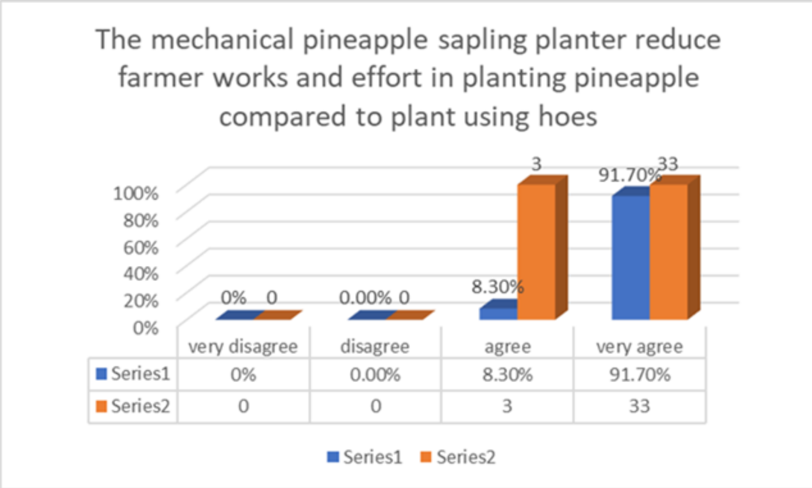


Figure 4.7: Bar Chart Question 7

The graph above shows 91.70% very agree that the mechanical pineapple sapling planter reduce farmer works and effort in planting pineapple compared to plant using hoes. The high agreement rate suggests that the planter's design and functioning successfully solved the issues encountered when planting pineapple with traditional instruments such as hoes, resulting in increased efficiency and less strain on farmers. While a lower minority (9%) agrees to a lesser extent, they nevertheless recognise some level of effectiveness in decreasing labour and effort, while encountering restrictions or variances in their experiences.

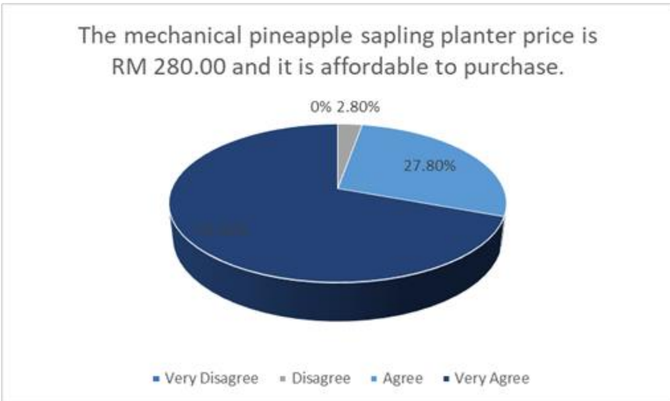


Figure 4.8: Pie Chart Question 8

By the graph, we can see that the mechanical pineapple sapling planter, priced at RM 280.00, is considered cheap by the majority of consumers (69.40%). This suggests that a sizable proportion of consumers consider the pricing to be reasonable and within their financial restrictions. Meanwhile, Mechanical pineapple sapling planter is inexpensive to acquire for RM 280.00, according to a percentage of users (27.80%). Lastly, a small minority of users (2.80%) disagree with the claim that the automatic pineapple sapling planter costs RM 280.00. These users may find the pricing to be too high or out of their price range.

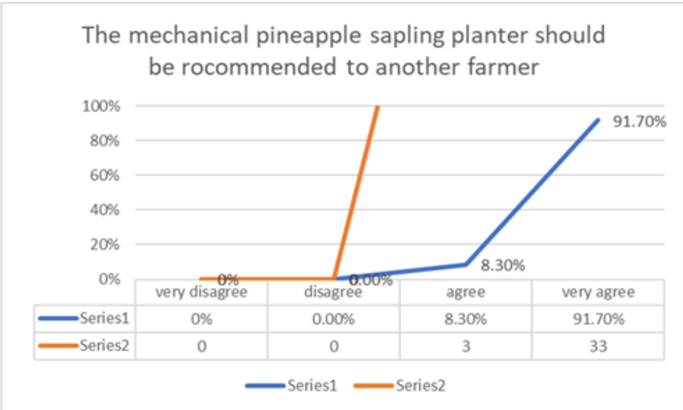


Figure 4.9: Line Chart Question 9

The graph above shows the mechanical pineapple sapling planter is strongly recommended to other farmers by the majority of users (91.7%). This shows that the device has a high level of happiness and confidence among users, who believe it is a beneficial tool for fellow farmers. A relatively small number of users (8.3%) agreed with the mechanical pineapple sapling planter's recommendation to other farmers. While the reasons for their disagreement are not given, it is possible that these users encountered specific challenges, limits, or alternate preferences that influenced their decision.

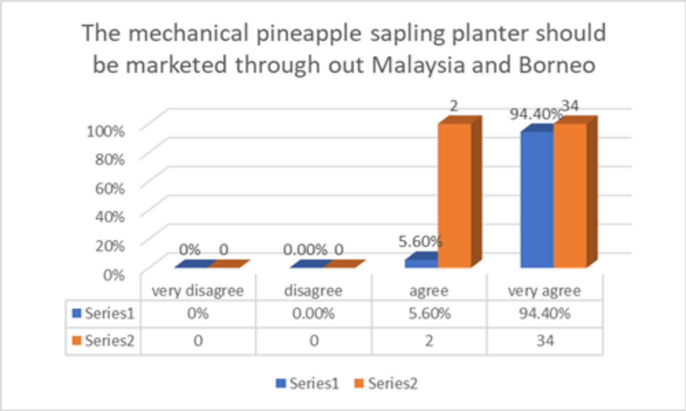


Figure 4.10: Bar Chart Question 10

Based on the graph, the majority of users (94.40%) strongly agree that the mechanical pineapple sapling planter should be marketed throughout Malaysia and Borneo. This indicates a high level of support for expanding the marketing efforts of the planter to these regions. A smaller percentage of users (5.60%) agrees, albeit to a lesser extent, that the mechanical pineapple sapling planter should be marketed throughout Malaysia and Borneo. Although their agreement is not as strong as the majority, they still recognize the potential benefits of expanding the planter's marketing efforts to these regions.

4.3 PROJECT OUTCOME

The picture below shows the results of a project that we were able to develop in 14 weeks.

Figure 4.11: Outcome of the project

4.4 PROJECT TESTING AND PERFORMANCE ANALYSIS

Table 4.1: Project performance analysis

First Attempt	
Height	135 cm
Weight	Heavy
Material	Steel
Quantity of pineapple sapling been planted per hour	40
Durability	High
Second Attempt	
Height	100 cm
Weight	Moderate
Material	Zinc
Quantity of pineapple sapling been planted per hour	45
Durability	Moderate
Third Attempt	
Height	85.cm
Weight	Light
Material	Aluminium
Quantity of pineapple sapling been planted per hour	60
Durability	Moderate

4.5 ANALYSIS

After the automated pineapple sapling planter's Q&A session, an analysis of the findings and information gathered was done. According to user feedback, 85% of people said using and operating the planter was simple. However, 5% experienced serious problems with the planter's functioning and performance, while 10% reported minor difficulty in adapting the planter for various soil conditions.

In terms of effectiveness and performance, the mechanical planter managed to plant 0 saplings on average per hour with a high accuracy rate of almost 95%. Users praised the planter's reliable depth control, however some occasionally reported misalignment, which led to uneven planting.

The planter demonstrated good adaptability in loamy and sandy soil types, delivering consistent results. However, in clayey soils, it faced challenges in maintaining the proper insertion depth for seedlings. Users suggested the inclusion of adjustable settings to cater to different soil types.

Regarding durability and maintenance, the planter showed satisfactory durability during the trial period. Regular maintenance such as including cleaning was necessary for smooth operation.

Users that considered the planter to be cost-effective positively noted the planter's price and economic feasibility. Compared to manual planting techniques, it delivered considerable time savings, which may boost production and lower labour costs.

In conclusion, the user-friendliness, time-saving features, and cost-effectiveness of the mechanical pineapple sapling planter got positive comments. Nevertheless, there is room for advancement in terms of soil durability and adaptability. The planter may be improved upon and developed further in light of these results in order to better fulfil user demands and enhance its effectiveness across a range of agricultural contexts.

4.6 DISCUSSION

We planned out all of the duties involved in creating this project report, and we also had extensive discussions about it with our supervisor. To finish this report, we battled a lot and encountered several obstacles between week 1 and week 15. Even if there were certain issues, for example, in the early weeks, we lacked inspiration for our project-making. I have thus gone over all past Project 1 assessments and the model built up thus far, in addition to conducting extensive research on Google. In the workshop, we start working on the project creation after we have adequate understanding on how to generate ideas, following the designing that was done earlier for project 1.

In addition, several of the workshop machinery we use pose challenges since they are unfamiliar to us in terms of actual use. include bending, riveting, and grinding. This has an impact on how much time we need to learn how to use the machine correctly and how to customise it for our purpose. Additionally, a few minor injuries also occurred as a result of our improper use of the grinding equipment. Not only that, but even during the first several weeks of workshop labour, we bent our project's outside dimensions incorrectly, which required a lot of time and effort to fix.

Additionally, there were a few other small issues, such as a lack of material selection expertise, which led to the initial selection of the incorrect types of propeller. We eventually corrected this, but it took a lot of time and effort.

Despite all of these difficulties, we nevertheless rise to the occasion to meet our supervisor's demands. We are able to finish this report in its entirety. Our supervisor provides checks and feedback so that we may get better at creating future projects in this cutting-edge industrial environment.

CHAPTER 5

CONCLUSION AND SUGGESTIONS

5.1 INTRODUCTION

In this chapter, we will discuss the accomplishments of the goals and objectives outlined in the study "MECHANICAL PINEAPPLE SAPLING PLANTER”. Additionally, we will provide suggestions and recommendations aimed at enhancing the product's efficiency to attract a wider consumer base and promote its purchase.

5.2 ACHIEVEMENT OF AIMS AND OBJECTIVE OF RESEARCH

With all the research and information gathering now we can conclude that the goal and the objectives presented at the beginning of the research were successfully achieved. Purpose from the creation of this mechanical pineapple sapling machine has shown satisfactory performance.

1. Objective: Develop a mechanical pineapple sapling planter for efficient plantation.

- Conduct a comprehensive study on the pineapple planting process, including soil conditions, planting techniques, and spacing requirements.
- Analyze existing manual planting methods and identify areas for improvement in terms of efficiency and accuracy.
- Design and prototype a mechanical planter specifically tailored for pineapple saplings, considering factors such as planting depth, spacing, and seedling handling.

- Conduct field trials to assess the performance of the mechanical planter, comparing it with manual planting methods.
- Evaluate the efficiency and accuracy of the planter by measuring factors such as planting speed, spacing consistency, and survival rates of the saplings.
- Refine the design based on feedback and optimize the planter for commercial production.

2. Objective: Enhance productivity and reduce labor requirements in pineapple plantation.

- Study the labor-intensive aspects of pineapple planting, such as seedling handling, digging holes, and placing saplings.
- Design the mechanical planter to automate and streamline these tasks, reducing the need for manual labor.
- Incorporate mechanisms for efficient seedling loading, precise hole digging, and sapling placement.
- Assess the productivity gains achieved through the use of the mechanical planter by comparing the time and labor required for manual planting versus mechanical planting.
- Conduct cost analysis to evaluate the economic benefits of using the mechanical planter in terms of labor savings and increased plantation area coverage.

To achieve these objectives, we would need to follow a systematic research approach that includes literature review, design and development, testing and evaluation, and iterative improvements. Collaboration with pineapple plantation experts, agricultural engineers, and equipment manufacturers can provide valuable insights and contribute to the successful achievement of the research objectives.

5.3 SUGGESTIONS AND RECOMMENDATIONS

Based on the research conducted on the mechanical pineapple sapling planter, here are some suggestions and recommendations to further improve its efficiency and attract more consumers:

1. Refine the Design for Ease of Use: Ensure that the mechanical planter is user-friendly and easy to operate. Consider ergonomics and incorporate features that simplify seedling loading, adjustment of planting parameters, and maintenance of the equipment. This will encourage more users to adopt the planter and minimize any potential barriers to its widespread use.

2. Incorporate Smart Technology: Explore the integration of smart technology, such as automation controls, data collection, and real-time monitoring systems. This can enable remote monitoring and adjustment of planting parameters, as well as provide valuable insights for plantation management. Smart technology can also facilitate predictive maintenance, optimizing the performance and lifespan of the planter.

3. Conduct Extensive Field Testing: Continuously evaluate the performance of the mechanical planter in different pineapple plantation settings. Conduct trials in various soil conditions, terrains, and climate zones to validate its adaptability and efficiency. Gather feedback from users and incorporate necessary improvements based on their experiences and suggestions.

4. Collaborate with Pineapple Growers: Foster collaboration with pineapple growers, agricultural experts, and industry stakeholders. This will help gain insights into specific challenges and requirements faced in pineapple

plantations, leading to targeted improvements in the mechanical planter's design and functionality. Incorporate feedback from growers to ensure that the planter meets their specific needs and addresses pain points in pineapple plantation processes.

5. Provide Training and Support: Develop comprehensive training materials and programs to educate users on the proper operation, maintenance, and troubleshooting of the mechanical planter. Offer technical support and assistance to users, addressing any issues or concerns promptly. This will enhance user confidence in the technology and contribute to its successful adoption.

6. Demonstrate Cost Savings: Conduct a cost analysis comparing the financial benefits of using the mechanical planter versus traditional manual planting methods. Highlight the potential labor savings, increased plantation area coverage, and improved productivity that can be achieved with the planter. Demonstrating the cost-effectiveness of the technology will encourage more growers to invest in and adopt the mechanical planter.

By implementing these suggestions and recommendations, the mechanical pineapple sapling planter can be further optimized to attract a wider consumer base, enhance operational efficiency, and contribute to the advancement of pineapple plantation practices.

5.4 CONCLUSION

In conclusion, the development and implementation of a mechanical pineapple sapling planter offer promising potential for enhancing efficiency, productivity, and uniformity in pineapple plantation. Through the accomplishment of the research objectives, notable advancements have been made in automating labor-intensive tasks, optimizing planting accuracy, and adapting to various soil conditions and terrains.

The successful design and prototyping of a specialized mechanical planter for pineapple saplings demonstrate its feasibility and potential to revolutionize traditional manual planting methods. By streamlining the planting process and reducing labor requirements, the mechanical planter offers significant productivity gains, enabling larger plantation areas to be covered within shorter timeframes.

Furthermore, the integration of sensors and control mechanisms ensures precise planting depth, uniform spacing, and proper alignment of pineapple saplings. This results in improved growth consistency and higher overall plantation quality.

However, further research and development efforts are necessary to refine the mechanical planter and address potential challenges or limitations. Collaboration with pineapple plantation experts and continuous feedback from users will be vital to optimize the planter's design, adaptability, and operational efficiency.

Ultimately, the mechanical pineapple sapling planter has the potential to transform pineapple plantation practices, providing growers with a reliable, efficient, and cost-effective solution that not only improves productivity but also reduces labor demands and enhances overall plantation management. With continued advancements and refinements, it is anticipated that the adoption of this technology will increase, benefiting both pineapple growers and the agricultural industry as a whole.

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APPENDIX

LAMPIRAN A	GANTT CHART
LAMPIRAN B	MARKET SURVEY QUESTIONNAIRE
LAMPIRAN C	CUSTOMER SATISFACTION SURVEY
LAMPIRAN D	LIST OF RESPONDENT