POLITEKNIK MALAYSIA

SULTAN SALAHUDDIN ABDUL AZIZ SHAH

MULTIFUNCTION SEED PLANTER PROTOTYPE

DEPARTMENT OF MECHANICAL ENGINEERING

JUNE 2019

FAREEZ BIN MOHD HASSAN AHARI 08DKM17F1172

ARIF AZHAR IRSYADUDDIN BIN IBRAHIM 08DKM17F1175

AMIR FIRDAUS BIN MAZLAN 08DKM17F1206

This report is proposed to the Department of Mechanical Engineering in fulfillment of the requirement of Diploma in Mechanical Engineering.

TITLE : MULTIFUNCTION SEED PLANTER PROTOTYPE

SESSION : JUNE 2019

1. We,

   FAREEZ BIN MOHD HASSAN AHARI (08DKM17F1172)

   ARIF AZHAR IRSYADUDDIN BIN IBRAHIM (08DKM17F1175)

   AMIR FIRDAUS BIN MAZLAN (08DKM17F1206)

   Are final year student of **Diploma in Mechanical Engineering, Department of Mechanical Engineering, Politeknik Sultan Salahuddin Abdul Aziz Shah** located at **Persiaran Usahawan, Seksyen U1, 40150 Shah Alam, Selangor.**

2. We acknowledge that the project above and the intellectual property contained therein are the originals of our original works/creation without taking or imitating any intellectual property from others.

3. We are agree to transfer the intellectual property of the project to Politeknik Sultan Salahuddin Abdul Aziz Shah to meet the requirement for the Diploma in Mechanical Engineering award to us.

Prepared and acknowledge by :

1) FAREEZ BIN MOHD HASSAN AHARI
(08DKM17F1175)
I/C No. : 990726-10-7225

2) ARIF AZHAR IRSYADUDDIN BIN IBRAHIM
(08DKM17F1175)
I/C No. : 990713-13-6457

3) AMIR FIRDAUS BIN MAZLAN
(08DKM17F1206)
I/C No. : 990624-10-6141

In front of me,

Asnizah Binti Sahekhaini
(780410-10-5404)
as a project supervisor on _____.

ACKNOWLEGDEMENT

Thank God Almighty because with His permission we can managed to complete our final year project successfully. Firstly, we want to express our appreciation and gratitude to our project supervisor, Puan Asnizah Binti Sahekhaini because helped us a lot in our process to complete this project by giving opinions, guidance and encouragement.

Thank you to all group members for their contribution in this project. Also, thank you to Politeknik Sultan Salahuddin Abdul Aziz Shah because giving us this opportunity to do this final year project. We end the appreciation with thank you.

ABSTRACT

Abstract

The project was implemented based on current methods of seed planting using by the small farmers. The present review provides brief information about the various types of innovations done in seed sowing equipment. The basic objective of this project is to create a tool with a combination of two different types of work. The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agro-climatic conditions to achieve optimum yields. Seed sowing devices plays a wide role in agriculture field. This project also uses water sprayer to water the seeds that have been planted. The most common forms of pesticides application, especially in conventional agriculture is the use of mechanical sprayers. The pesticides are generally mixed with water or any other liquid chemical carrier, such as fertilizer. The formulation is sprayed in the form of droplets, the droplets may be large or tiny. The droplets size can be varied by using different nozzles or by varying the pressure under which it is been forced out.

(179 words)

Keyword : Seed planter, water sprayer, plowing tool

CONTENTS

ITEM

CHAPTER 4

CHAPTER 5

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

There are many types for farmer to do seed planting. Such as using hands, using equipment and machine. In this era, farmer using equipment and machine to do seed planting, it is because using equipment and machine makes seed planting easier. It is also makes farmer to save their energy and time while do work.

Thus, agriculture machines were developed to simplify the human effort. In manual method of seed planting, we get results such as low seed placement, less spacing efficiencies and serious back ache for the farmer. This also limited the size of field that can be planted. Hence for achieving best performance from a farmer. The above limit should be optimized. So with this project, we can indirectly help solve the following problems. Because this project can plant seedlings and spray fertilizer, so we can save energy to work overtime and increase the quantity of seeds planted at any one time.

1.2 PROBLEM STATEMENT

Based on the research, there are some problems faced by small farmers on seed cultivation and fertilizer sprayers. Some of the farmers plant seeds by throwing the seeds to the soil and causing the seeds to grow irregularly. Besides, sowimg and spraying process will take a lot time because farmers need to done it one by one. Nowadays, small farmer do spraying process using a manual method which is they need to carry a sprayer bag that is heavy on their back. It will causes backache to the farmers.

1.3 OBJECTIVE

1. Created a project that combines two work in one time which is planting seedlings and spraying fertilizers.

2. Inspect and test the tool whether in good condition or not.

3. Save their energy and time while doing planting.

1.4 SCOPE AND LIMITATION

This is an innovation project to help planters who want to plant seeds and fertilizers spraying at one time. This project can help growers and save time and reduce burden on planters.

Seed sowing tool is a device which helps in the sowing of seeds in the desired position hence assisting the farmers in saving time and money. So considering these points related to spraying and seed sowing an attempt is made to design and fabricate such equipment which will able to perform both the operations more efficiently and also will result in low cost. Decrease the operational cost by using new mechanism.

- Making such a tool which can be able to perform both the operation.
- The tool can be operated in the small farming land (1 acre).
- The tool used on plants that using crop boundaries.
- Suitable for usage on well-drained soil.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Here are the different types of materials that are needed for this product. As stated, this product must follow the objective characteristics in order to solve the problem encountered compared to the existing product. We will also list the materials selected to produce the project. Each of the materials we choose is best suited to meet the requirements. We choose according to cost, good security conditions and design that meets what we've created.

2.2 IRON TYPE FOR FRAME

The shape of the selected frame should be according to the required features such as the mass, endurance of a product framework, reasonable cost, security level and others. The type of frame should be chosen correctly in order for the level of satisfaction according to the type of product that is designed.

a. Hollow iron

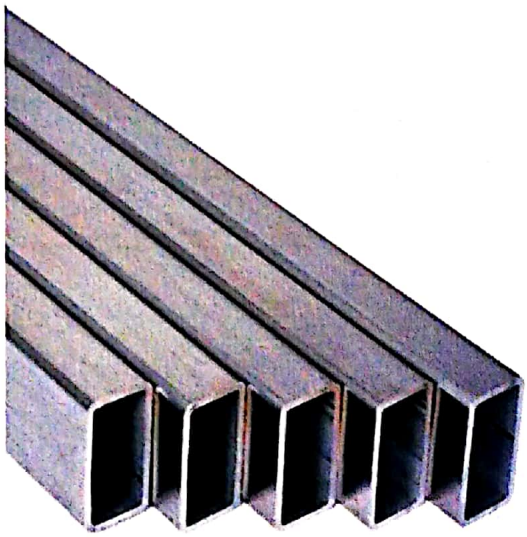


Diagram 2.1: Hollow iron

The hollow iron is a box made of iron by using galvanized iron, stainless steel or steel iron. Many advantages gained using hollow metal such as fireproof, anti-termite, anti-corrosion, process fast installation, and the price is quite affordable.

In addition, in terms of installation or application it is not too difficult because it's easy and fast enough that the cost of working payments can be reduced. Currently most hollow iron is used for plafond frame and frame canopy. In addition it is sometimes also used as a fence by selecting hollow metal which is thick.

b. Stainless steel bar

Diagram 2.2: stainless steel bar

Stainless steel is a steel that contains alloy steel. Material consisting of two or more elements are used in various chemical applications. It has resistance which is excellent for stains or rust because of chromium content, usually from 12 to 20 percent of alloys. There are over 57 stainless steel certified as alloys standard.

These are many types of steel that are used in almost endless amounts applications and industries: bulk materials handling equipment, outdoors and roofing, car components (exhaust, decorative trim, engine, chassis, binders, tubes for fuel lines), chemical processing of plants (scrubber and heat exchanger), pulp and paper, petroleum refining, water supply pipes, consumer goods, marine and shipbuilding, pollution control, sporting goods (snow skiing), and transportation (trains).

c. Iron plate

Diagram 2.3: iron plate

Aluminum plates with a thickness of 0.2 mm or more and 500 mm or less, 200 mm or more wide, and 16 m or less. Aluminum material is 0.2 mm or less and 200 mm or less is used as a sequential material or strip material (Of course, With the development of large scale equipment, 600mm wide line can be achieved.

Aluminum plate refers to a rectangular plate launched by aluminum ingot, which is divided into pure aluminum plate, aluminum alloy plate, thin aluminum plate, thick aluminum plate aluminum aluminum plate.

Aluminum plates are widely used in construction, packaging, air conditioning, refrigerators, solar, cosmetics and other industries, also can be used in power plants, anti-corrosion-resistant petrochemical chemical plants.

2.3 PLANTING TOOLS

a. Digging wheel

Diagram 2.4: digging wheel

Wheels are made from bicycle rims consisting of 30 mm steel and 5 mm thick. It was modified and welded to form a circular shape measuring 56 cm. The periphery is equipped with 4 hole punters at a distance of 14 cm. Lugs are 30 mm cylindrical. It minimizes collapse when moving on the field. The distance between the holes in the seed gauge disk depends on the diameter of the soil wheel.

b. Seed release device

Diagram 2.5: seed release device

It is made up of round hollow iron, spring and seed guard. This material is combined with the welding method and unites the material into a functioning mechanism to control the quantity of seed reduction.

2.4 METHOD OF SEED PLANTING AND FERTILIZER SPRAY

DIFFERENCES OF SEED PLANTING METHOD

a. **Broadcasting**

Diagram 2.6 broadcasting

Ben G. Barija (May 2015) define that broadcasting is the process of random scattering of seed on the surface of seedbeds. It can be done manually or mechanically both. When broadcasting is done manually, uniformity of seed depends upon skill of the man. Soon after broadcasting the seeds are covered by planking or some other devices.

Advantages	Disadvantages
1. Quickest & cheapest method 2. Skilled labour is not uniform 3. Implement is not required, 4. Followed in moist condition.	1. Seed requirement is more, 2. Crop stand is not uniform. 3. Result in gappy germination & defective wherever the adequate moisture is not present in the soil. 4. Spacing is not maintained within rows & lines, hence interculturing is difficult.

b. **Dibbling**

Diagram 2.7

Dibbling is the process of placing and seeds in holes made in seedbed and covering them. In this method, seeds are placed in holes make at definite depth at fixed spacing. The equipment used for dibbling is called dibbler. This is very time consuming process, so it is not suitable for small seeds. Mostly vegetables are sown in this way.

Advantages	Disadvantages
1. Spacing between rows & plants is maintained. 2. Seeds can be dibbled at desired depth in the moisture zone. 3. Optimum plant population can be maintained. 4. Seed requirement is less than other method.	1. Laborious & time consuming method. 2. Require more labour, hence increase the cost of cultivation. 3. Only high value & bold seeds are sown. 4. Require strict supervision.

c. **Drilling**

Diagram 2.8

Drilling consists of dropping the seeds in furrow lines in a continuous flow and covering them with soil. Seed metering may be done either manually or mechanically. The number of rows planted may be one or more. This method is very helpful in achieving proper depth, proper spacing and proper amount of seed to be sown in the field.

Advantages	Disadvantages
1. Seeds are placed at proper & uniform depths. 2. Uniform row to row spacing is maintained. 3. Seed requirement is less than 'broadcasting'. 4. Sowing is done at proper moisture level.	1. Require implement for sowing. 2. Plant to plant (Intra row) spacing is not maintained

d. **Seed dropping behind the plough.**

Diagram 2.9

It is very common method used in villages. It consists of a bamboo tube provided with a funnel shaped mouth. One man drops the seeds through the funnel and other man handles the plough and the bullocks. This is a slow and laborious method.

Advantages	Disadvantages
1. The seeds are placed at desired depth covered by iron planks. 2. Except very small, very large seeds most of the seeds can be sown, e.g. maize, sorghum, millets, sunflower, etc.	1. Use a lot of time and energy to do works. 2. Irregular planting arrangement.

TYPES OF SPRAY FERTILIZER

a. Aerial Sprayer

Diagram 2.9.1

Aerial sprayer is another type of spraying it is beneficial for the farmers having large Farms. This technique by farmers is not affordable to farmers having small and medium farms. In aerial spraying the spraying is done with the help of small helicopter controlled by remote. On that sprayer is attached having multiple nozzles and sprayed it on the farm from some altitude.

Advantages	Disadvantages
1. It helps farmers in scouting their fields quickly and efficiently. This saves time in determining status of fields. 2. It helps in achieving more yields by using resources effectively. 3. It helps in monitoring environmental data which helps in smart farming.	1. Need to obtain government clearance in order to use it. 2. It is difficult to fly them in extreme conditions. 3. It requires basic knowledge and skills to operate the agriculture drones.

b. **Compressed Air Sprayer**

Diagram 2.9.2

The smallest sprayers are hand-carried, compressed air sprayers. They contain a 1- to 5-gallon tank with an air pump in the top and a wand with a nozzle for directing the spray. Their best use is for spot treatment of small areas. In operation, the tank has to be pumped up frequently to maintain pressure, and the tank must be shaken to agitate the chemical.

Advantages	Disadvantages
1. Good control ability. 2. Small amount of material used.	1. Slow transfer rate. 2. Poor transfer efficiency

c. **Backpack Sprayer**

Diagram 2.9.3

The tank in this sprayer holds about four gallons of material. A hand-operated pump pressurizes the spray material as the operator walks along, and the wand with nozzle directs the spray to the target. It use is limited to small areas that can be reached from a walkway.

Advantages	Disadvantages
1. Low cost. 2. Convenient maintenance.	1. High labor intensity is not suitable for large area operation. 2. Not environmental protection.

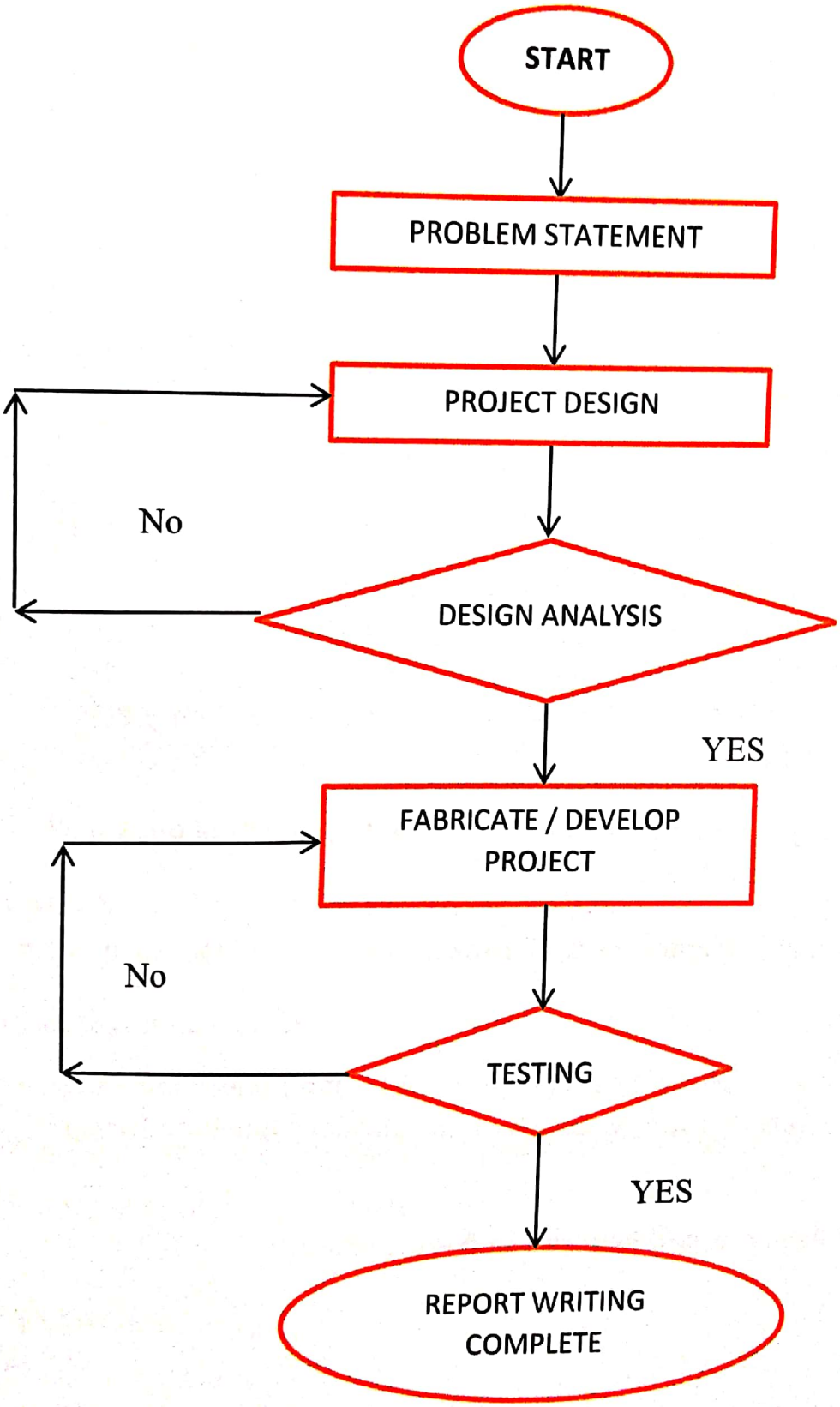
CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Methodology is defined as the systematic, theoretical analysis of the methods applied to a field of study/research/project. Methodology offers understanding which method, set of methods, or best practices that can be applied to the project that is being done.

3.2 DESIGN PROCESS FLOW CHART



3.3 WORKING PHASE

3.4 1st PHASE: PRODUCT NEED ANALYSIS

An online survey is conducted using an app called Survey Monkey to determine the needs of users that are required for a multifunction seed planter .

SURVEY QUESTIONS AND OPTIONS FOR RESPONDENTS

Question 1: Have you had any experienced in planting?

Question 2: How often you do planting activities in a month?

Question 3: Where are you usually doing a planting activities?

Question 4: Do you prefer the planting tool using the pushed way or pulled way?

Question 5: During planting activities, do you prefer to do two works at one time?

Question 6: Does the seed planter with fertilizer spray will facilitate your planting work?

Question 7: Do you think this tool can be used by others besides full-time farmer?

Question 8: Does using this tools will help you in doing planting?

3.4.1 2nd PHASE: PRODUCT DESIGN

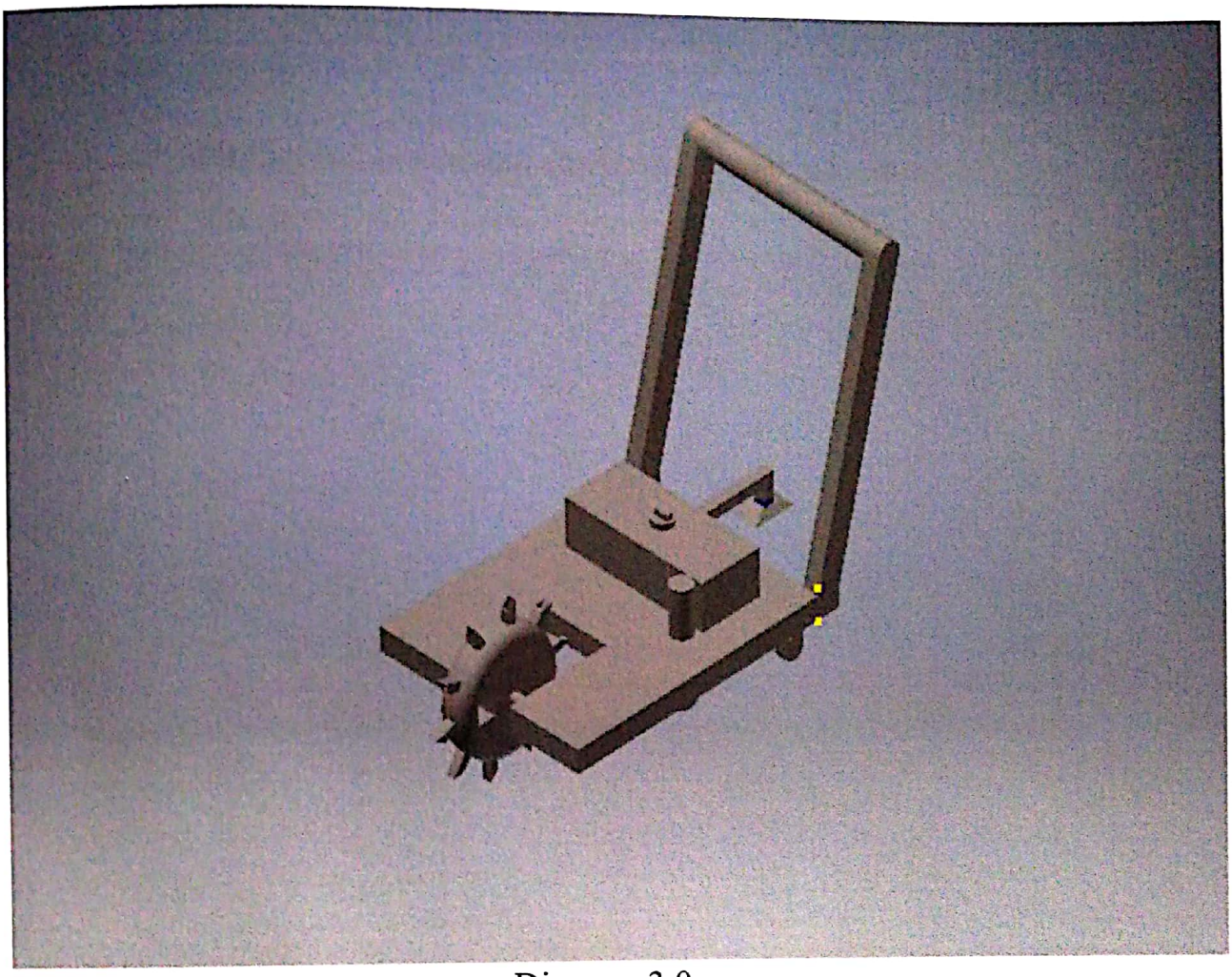


Diagram 3.0

ADVANTAGES

- Has an ergonomic shape
- The equipment found on this tool is not so high that makes this tool more balanced
- The width of this tool is roughly the same as that of the current wheelbarrows
- Has a roller to plowing the land.

DISADVANTAGES

- It is probable that the outflow of seed will be blocked by the soil.
- The chain used will be rusted.
- High maintenance cost.

3.3.3 3rd PHASE: DESIGN VERIFICATION

USER REQUIREMENTS

According to the survey done, our design meets the requirement of multifunction seed planter users. Based on the survey conducted we got to know the requirements that meet the needs of users. Requirements are as following:

i. Digging wheel
ii. Seed release device
iii. Water sprayer
iv. Ergonomic design to solve body pain issues

FINALISED DESIGN

The finalized idea of the multifunction seed planter prototype is drawn on the Inventor 2012 as shown in the diagram below.

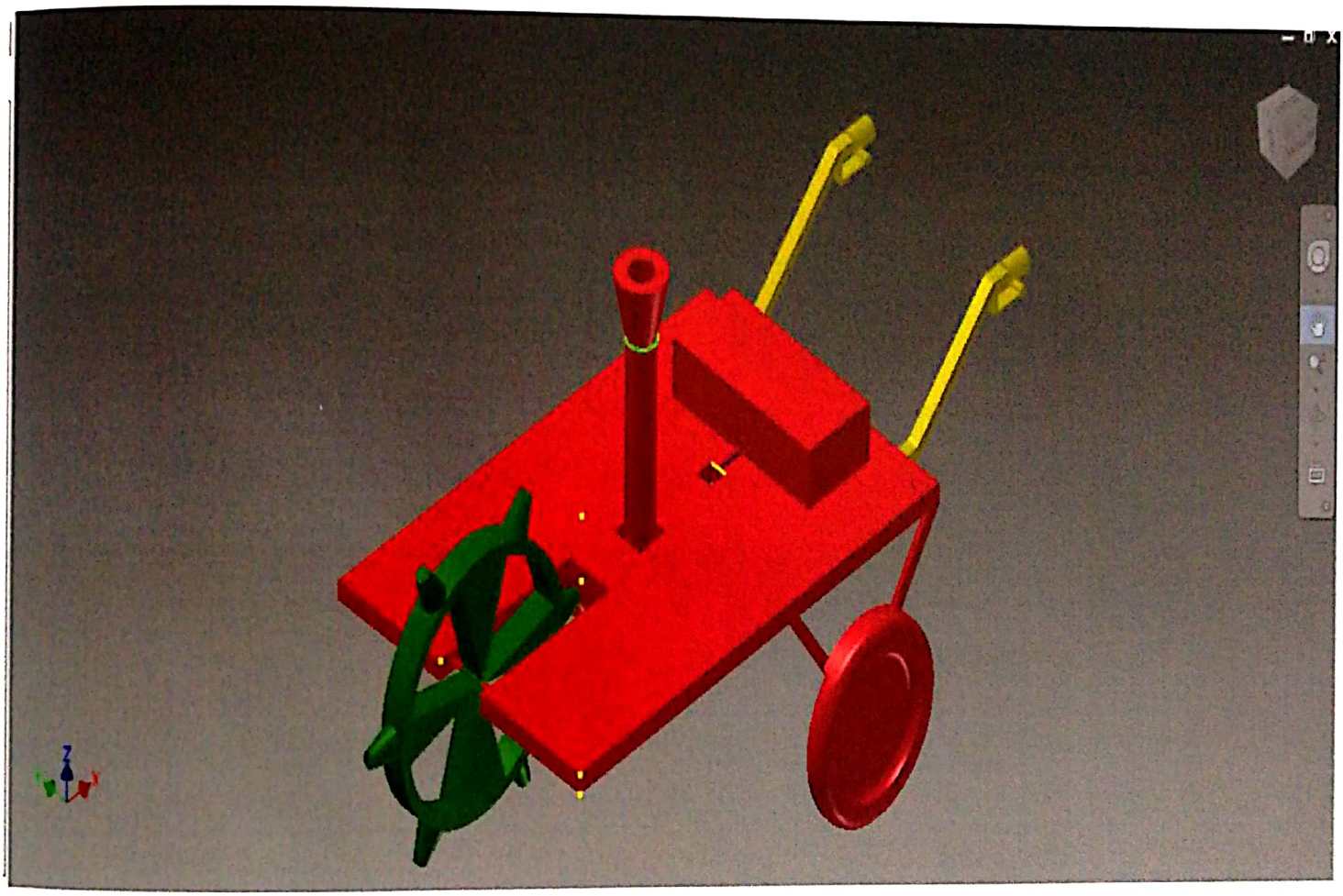


Diagram 3.1: final design on Inventor 2012 software

3.3.4 4th PHASE: PROTOTYPE FABRICATION/DEVELOPED

- **STEP 1: Choose material needs for the prototype**
  i. Tire

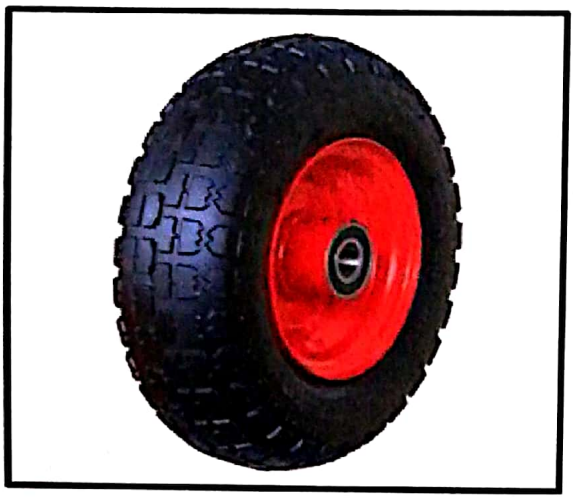


Diagram 3.2

ii. Seed planter devices

Diagram 3.2

iii. Water tank

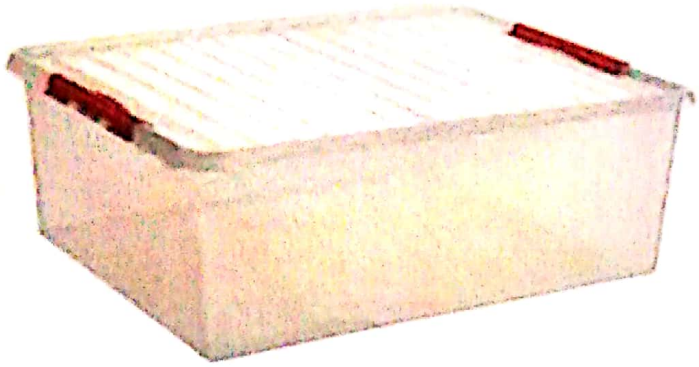


Diagram 3.3

iv. Metal plates- 0.36cm and 0.5cm thickness

Diagram 3.4

v. Welded digging wheel

Diagram 3.4

vi. Hollow iron

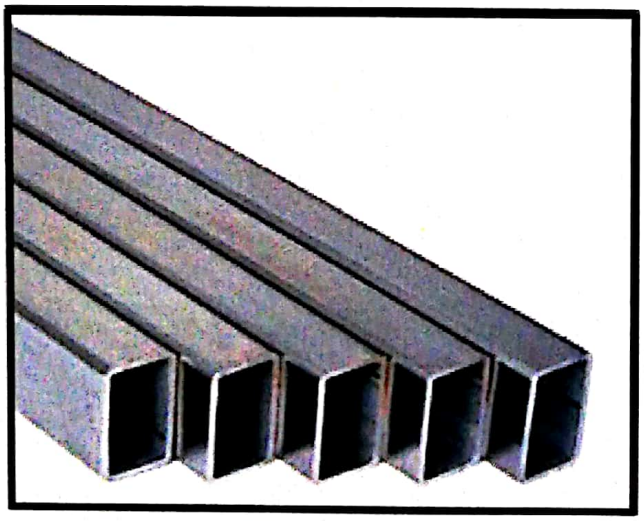


Diagram 3.5

vii. Bicycle break lever

Diagram 3.6

viii. Bicycle break cable

Diagram 3.7

ix. Washing machine tap

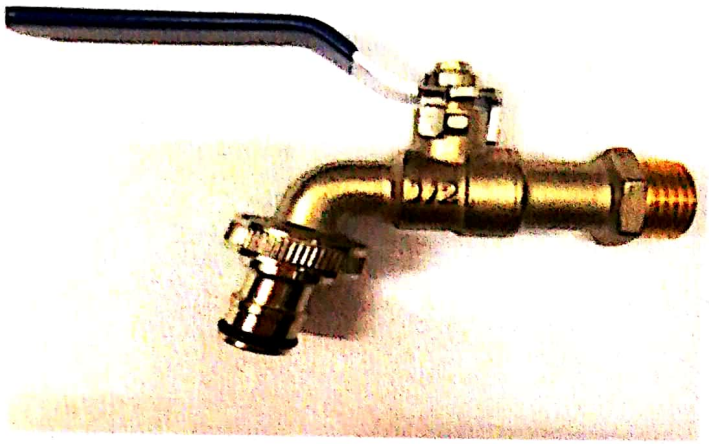


Diagram 3.8

- **STEP 2: Find source of material**

i) Online sources – Lazada and Shopee.

ii) Hardware store.

iii) Metal workshop.

- **STEP 3: Costing**

Material	Number	Price
Wheelbarrow tire	2	RM 50.00
Bicycle rim	1	RM 10.00
Hollow iron (1.5x1.6mm)	1	RM 100.00
Stainless steel rod	1	RM 82.00
Container box	1	RM 20.00
Stainless steel plate	1	RM 20.00
		Total = RM 282.00

Table 1: Costing

- **STEP 5: Add fixtures**

a) The iron is cut and welded into a frame

b) Additional items such as tires, digging wheel, seed planter devices are fitted and welded to the frame.

Diagram 3,9

- **STEP 6: Finishing and painting**

i) Sharp edges are grinded, and surface of the wheelbarrow is smoothened.

ii) The seed planter is painted to make it look elegant and as a corrosion prevention.

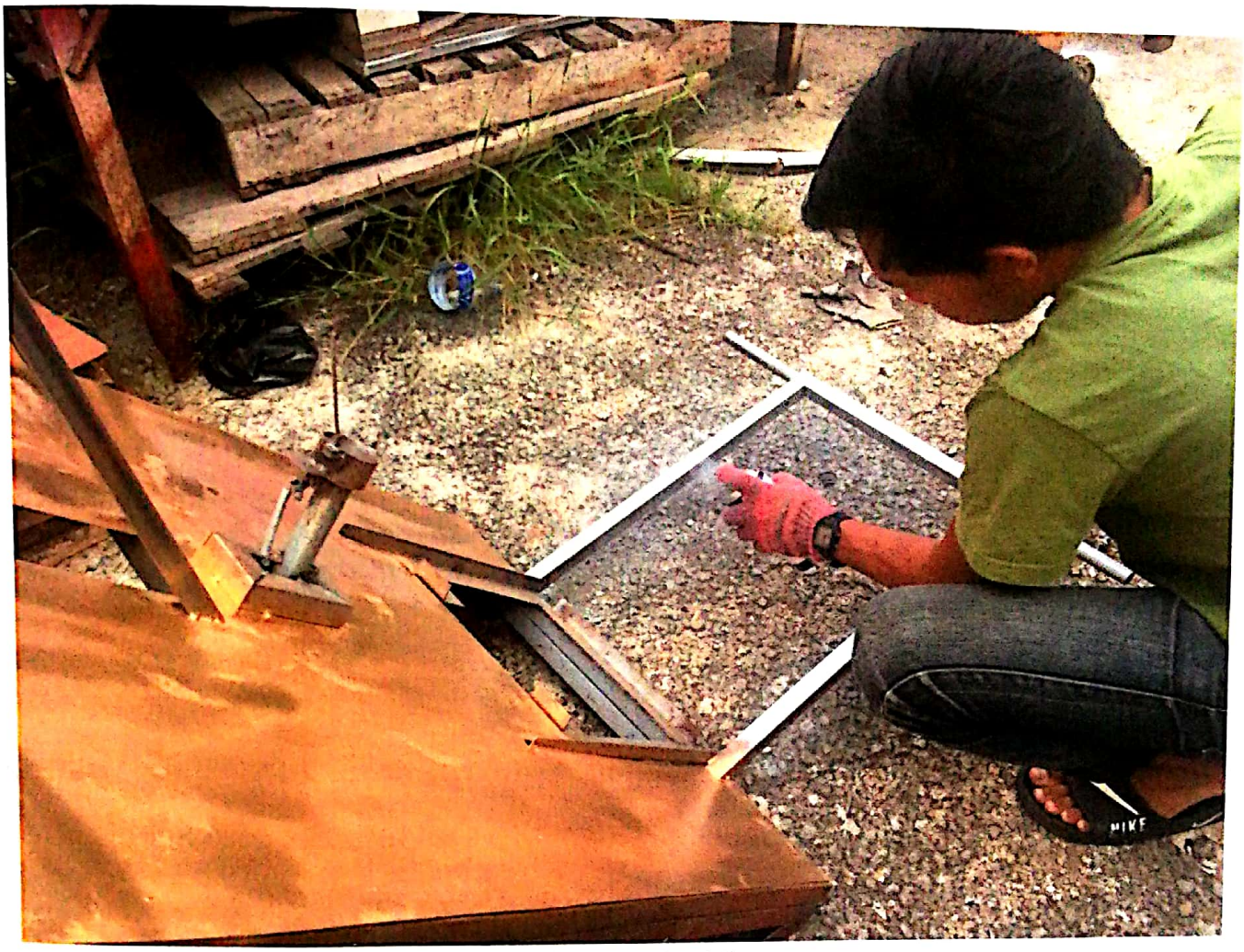


Diagram 3.9.1

3.5 PROTOTYPE TESTING

The multifunction seed planter prototype is put to a test to identify any flaws, its limits and full functionality.

Tests that are conducted are as following:

a) Digging wheel – This tool acts as a hole-making on the soil so that the seeds can be released into the hole. The depth of the hole made is 7cm. This is because length of the digging rod on digging wheel is 7cm. The digging wheel has 4 digging rods on it. The distance between the holes made by the digging wheel is fixed at 14 inches because the distance between the digging rods on the digging wheel is 14 inches.

b) Water spray system - Sprayer are used to spray water on the seeds that have been planted. The sprayer will spray water when the lever is pulled.

c) Seed release - This material is a tool that releases several seeds into one hole. So, we created a mechanism that acts as a stopper to prevent seeds from falling continuously. Seeds releases when the lever pulled. We test this tool to make sure it works or not.

The tests above are conducted in order to make sure the multifunction seed planter can function in a proper manner, safe to be use and will be able to satisfy the needs of its users by its ability to solve problems as stated in Chapter 1, subtopic 1.1. before it is further developed, and mass produced. The findings from these tests is explain in Chapter 4: Results and Findings.

CHAPTER 4

RESULT AND FINDING

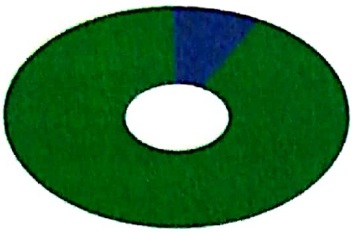
4.1 INTRODUCTION

In this chapter, the data of survey done, the final product of the prototype and the results of testing that was conducted towards the multi-functional seed planter prototype will be discussed in order to know its limitation in order to help in future development of this project. The test that are being done which are seed spacing test, seed depth test, seed release test and the findings of the test are provided in this chapter for future reference.

4.2 SURVEY DATA

Figures shown below are the data collected from each survey question.

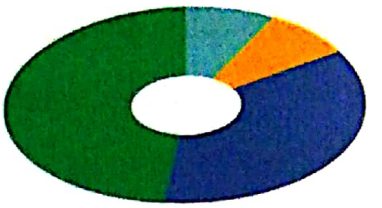
3. Have you had any experienced in planting?



Skipped: 0 Answered: 24

Yes	92%	22
No	8%	2

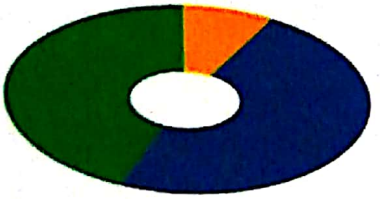
4. How often you do planting activities in



Skipped: 0 Answered: 24

Once	50%	12
2-4 times	38%	9
5-7 times	8%	2
Above 8	8%	2

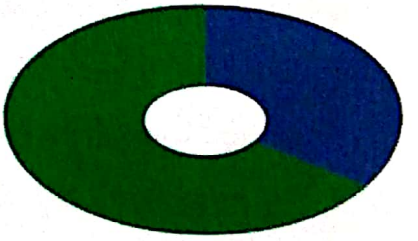
5. Where are you usually doing a planting activities?



Skipped: 1 Answered: 23

Garden	48%	11
Home	52%	12
Orchard	9%	2
Other (please specify)		1 >

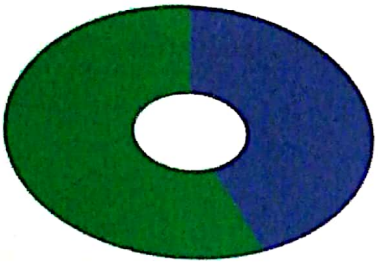
6. Do you prefer the planting tool using the pushed way or pulled way?



Skipped: 1 Answered: 23

Push	65%	15
Pull	35%	8

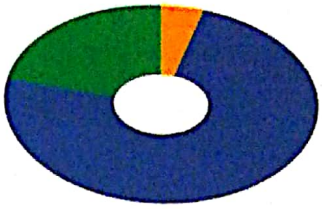
7. During planting activities, do you prefer to do two works at one time?



Skipped: 1 Answered: 23

Yes	57%	13
No	43%	10

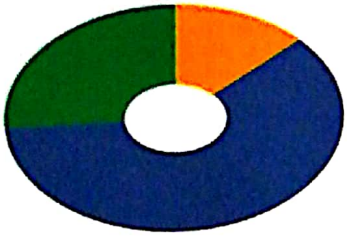
8. Does the seed planter with fertilizer spray will facilitate your planting work?



Skipped: 1 Answered: 23

Fully agree	22%	5
Agree	74%	17
Disagree	4%	1
Fully disagree	0%	0

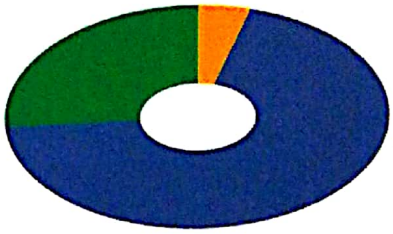
9. Do you think this tool can be used by others besides full-time farmer?



Skipped: 1 Answered: 23

Fully agree	26%	6
Agree	61%	14
Disagree	13%	3
Fully disagree	0%	0

10. Does using this tools will help you in doing planting?



Skipped: 1 Answered: 23

Fully agree	26%	6
Agree	70%	16
Disagree	4%	1
Fully disagree	0%	0

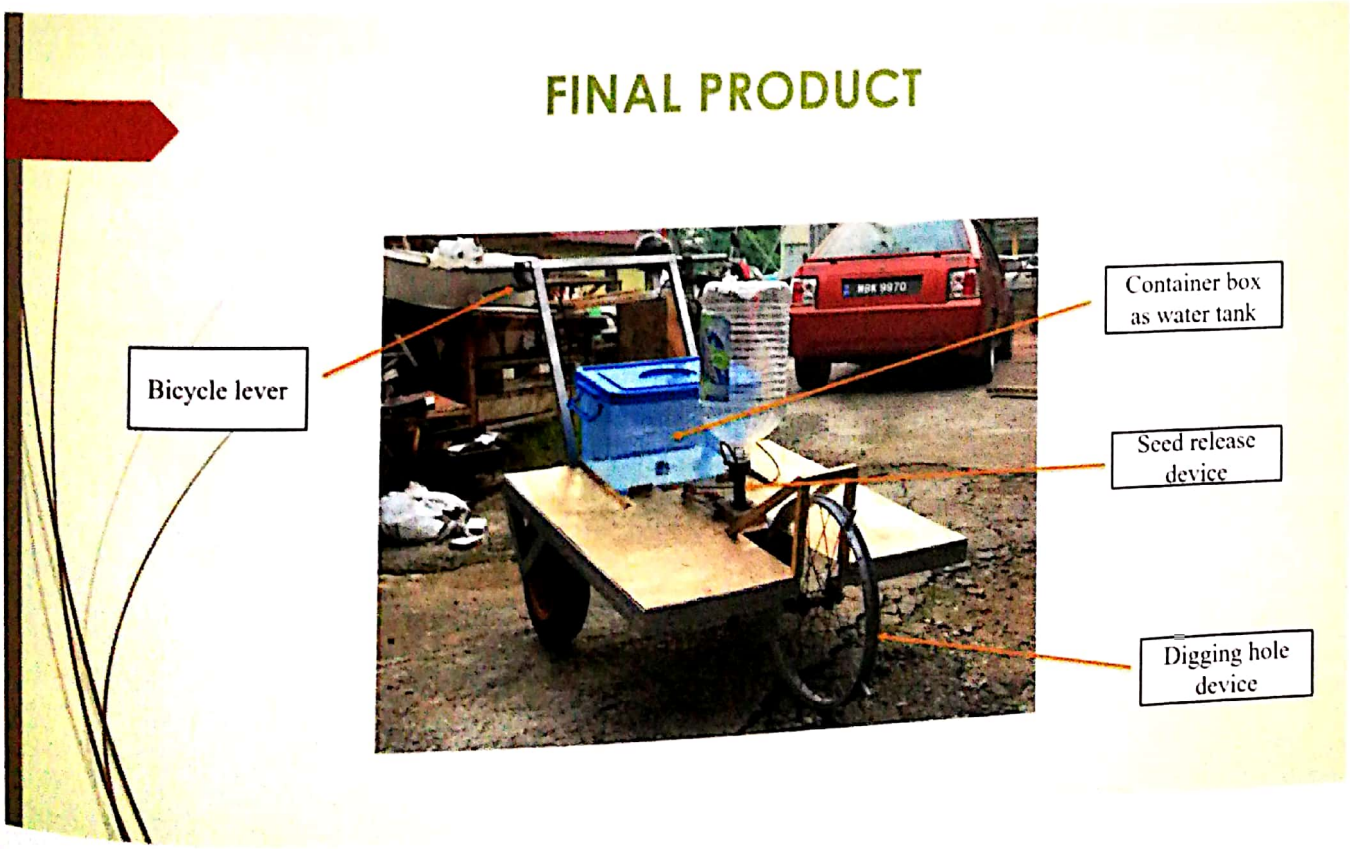
Conclusion

Agriculture has benefited a lot of people around the world. Therefore, the project we build is a tool that can help in agriculture. Although there are some problems however, the objective of the project was achieved.

As a result of our analysis and analysis, this project can assist a small number of farmers during their work. They can less their time and energy while using this tool.

Last, we hope this project can benefit, accepted and be used by the small farmers as it progresses through the ages.

4.3 FINAL PRODUCT OF PROTOTYPE



4.4 TESTING

4.4.1 Seed Release Device

This material is a tool that releases several seeds into one hole. So, we created a mechanism that acts as a stopper to prevent seeds from falling continuously. Seeds releases when the lever pulled. We test this tool to make sure it works or not.

4.4.2 Digging Wheel

This tool acts as a hole-making on the soil so that the seeds can be released into the hole. The depth of the hole made is 7cm. This is because length of the digging rod on digging wheel is 7cm. The digging wheel has 4 digging rods on it. The distance between the holes made by the digging wheel is fixed at 14 inches because the distance between the digging rods on the digging wheel is 14 inches.

4.4.3 Water Spray System

Sprayer are used to spray water on the seeds that have been planted. The sprayer will spray water when the lever is pulled.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 INTRODUCTION

For this chapter, the decisions made are based on all the results obtained from the experiments conducted and the discussion in the preceding chapters. In this chapter also, the relevant matters pertain to the objectives of the study as well as the recommendations of the research undertaken. In addition, conclusions have been drawn for this experiment.

5.2 DISCUSSION

For this *Multifunction Seed Planter Prototype*, components such as seed release device, digging wheel, and water spray system was created to facilitate small farmer work. Each components can be easily install and remove to conduct maintenance easily. The design of this project also played a big role. We have created this design based on the farmers way to plant the seed. Most farmers have to squat or bend their bodies to plant seeds that will cause pain in the knees and back bone. So we also designed this project to reduce the pain that farmers face. Throughout this process, we have tested the effectiveness of each tool in this project. Tests are performed to ensure that each component's function is in good condition.

5.3 CONCLUSION

From this project, our objectives that we have set are to create a project that combines two work in one time which is planting seedlings and spraying fertilizers, inspect and test the tool whether in good condition or not and to save the farmers energy and time while doing planting. We believe that *Multifunction Seed Planter Prototype* has a potential to simplify the work of farmers especially small farmers to do planting process. It also solves the problem faced by farmers while doing planting. The ergonomic design of this tool helps users to maintain their body posture when doing planting and spraying the plant.

Besides, the effectiveness of the seed planter further depends on the quantity of seed released by the seed release device and the sprayer. Different seed sizes by type are a challenge to create a seed release device. The depth of the holes made by the digging wheel also has an impact because if the depth of hole is not suitable, the seeds will be difficult to grow. The use of sprayer also be focus because every farmer regularly sprays their plants. So, the sprayer created by us must meet the needs of farmers.

5.4 RECOMMENDATION

In the future, various improvements can be made to improve the use of seed planter better than existing seed planter.

- Add a solar power or using electric motors to help ease the burden on users.
- Use high speed planting seeds meter to ensure accurate placement and similarity of seed in each hole.
- Add a hilling and plow tool to make planting process easier.
- Making adjustable seeding devices and digging holes for other seeds at appropriate planting distances.
- Create folders on this tool to save storage space.

END

GHAN CHART

WEEK/ ACTIVITY	2	4	6	8	10	12	14	16	18	20	22	24
Problem Statement • Literature Review												
Prototype Design • Design Drawing • Features and Function • Identify Cost												
Design Analysis • Survey • Premilinary Result												
Fabricate/Develop Prototype												
Testing												
Report Writing												

REFERENCES

[1] " METHOD OF SEED PLANTING | FM 1+1 Sowing and method of sowing" http://ecoursesonline.iasri.res.in/mod/page/view.php?id=101087

[2] 'Seed Planting Test'- Google - LABORATORY AND FIELD TESTING OF SEED SPACING UNIFORMITY FOR SUGARBEET PLANTERS - https://pdfs.semanticscholar.org/8edb/f8cd852ca4ee59f0ab14736d1277c7adb45e.pdf

[3] 'Final Year Project Report Example – SlideShare' – Google - https://www.slideshare.net/Muiz1994/final-year-project-report-example

[4] "Hollow Steel | Hollow Structural Section"

https://en.wikipedia.org/wiki/Hollow_structural_section

[5] "AERIAL SPRAYER | Aerial-Agroliquid"

https://www.agroliquid.com/agronomics/delivery/aerial/

[6] Planter (farm implement) – Wikipedia
https://en.wikipedia.org/wiki/Planter_(farm_implement)

[7] Calvin Hung, Juan Nieto, Zachary Taylor, James Underwood and Salah Sukkarieh, "Orchard Fruit Segmentation using Multi-spectral Feature Learning" ,IEE/RSJ International Conference on Intelligent Robot System Tokyo, Japan , 37, November 2013.

[8] Shrinivas R. Zanwar, R. D. Kokate, "Advanced Agriculture System", International Journal of Robotics and Automation (IJRA), Vol. 1, No. 2, pp. 107~112 ,ISSN: 2089-4856, June 2012

[9] Mahesh.R.Pundkar, a seed-sowing machine a review, IJESS Volume3, Issue3 ISSN: 2249.

[10] Ed Dager, "Proper Equipment for Small Farms" Kaitlin D'Agostino, Economics, SAS '13, Rabin, 12/03/09

[11] Sankaranarayanan M, "Development Of A Push Type Seed Drill For Sowing Maize In Rwanda". Institut Supérieur d'Agriculture et d' Elevage, ISAE, Busogo, Post Box No. 210, Musanze, Rwanda.

[12] Roshan V Marode, Gajanan P Tayade1 And Swapnil K Agrawal, "Design AndImplementation Of Multi Seed Sowing Machine".International Jouranl of Mechanica Engineering and Robotics Research.ISSN2278-0149Vol.2,No.4,October 2013 Pp.422-429.

[13] Vaibhav Thorat, Badal Autade, Tushar Jagtap, Krishna Abhale, Kishor Kumbharde "Study Of Multiple Seed Planting Machine". International Research Journal of Engineering and Technology (IRJET) E-ISSN: 2395-0056Volume: 05 Issue: 01 | Jan-2018 Pp.1146-1149.

[15] Senthilnathan N, Shivangi Gupta, Keshav Pureha and Shreya Verma. "FABRICATION AND AUTOMATION OF SEED SOWING MACHINEUSING IOT"International Journal Of Mechanical Engineering And Technology (IJMET) Volume 9, Issue 4, April 2018, Article ID:IJMET_09_04_103 Pp. 903

[16] Raut Madhuri, Prof. P.S.Gorane, Pawar Ganesh, Patil Shubham4, Patil Nikhil, "Multipurpose Seed Sowing Machine". International Journal of Advanced Technology in Engineering and Science Volume, No.4 Issue No.12 December2016 Pp521-529.[5].

[17] D.Ramesh, H.P. Girishkumar, "Agriculture Seed Sowing Equipments: AReview" International Journal Of Science,Engineering And TechnologyResearch (Ijsetr), Volume 3, Issue 7, July 2014 Pp .1987-1992.

[18] M.W. Andure, Rajiv Indani, Nikesh Jadhav, Vaibhav Kawde, Rahul Khamankar. "Design And Fabrication Of Manual Seed Sowing Machine WithFertilizer". International Journal For Research In Applied Science & Engineering Technology (Ijraset) Issn: 2321-9653; Ic Value: 45.98; Sj ImpactFactor: 6.887 Volume 6 Issue Ii, February 2018 Pp.515-519