



**POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ  
SHAH**

**FRUIT PICKER**

<b>NAME</b>	<b>MATRIX NO.</b>
MUHAMMAD SYAFIQ IZADI BIN JUMAT	08DKM18F1040
MUHAMMAD FIRDAUS BIN MOHD. MASROR	08DKM18F1038
ELISCIA EDNA ANAK TONY	08DKM18F1007

**MECHANICAL ENGINEERING DEPARTMENT**

**JUNE 2020**

**POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ  
SHAH**

**FRUIT PICKER**

<b>NAME</b>	<b>MATRIX NO.</b>
<b>MUHAMMAD SYAFIQ IZADI BIN JUMAT</b>	<b>08DKM18F1040</b>
<b>MUHAMMAD FIRDAUS BIN MOHD. MASROR</b>	<b>08DKM18F1038</b>
<b>ELISCIA EDNA ANAK TONY</b>	<b>08DKM18F1007</b>

**This report is submitted to the Department of Mechanical  
Engineering in partial fulfilment of the requirements for Diploma in  
Mechanical Engineering**

**MECHANICAL ENGINEERING DEPARTMENT**

**JUNE 2020**

## **DECLARATION OF ORIGINAL WORK AND INTELLECTUAL PROPERTIES**

TITLE : FRUIT PICKER

SESSION : JUNE 2020

1. We,
- |                                   |  |                |
|-----------------------------------|--|----------------|
| 1. MUHD. SYAFIQ IZADI BIN JUMAT   |  | (08DKM08F1040) |
| 2. MUHD. FIRDAUS BIN MOHD. MASROR |  | (08DKM08F1038) |
| 3. ELISCIA EDNA ANAK TONY         |  | (08DKM08F1007) |

are final year students in Diploma in Mechanical Engineering,  
Mechanical Engineering Department, Politeknik Sultan Salahuddin  
Abdul Aziz Shah, Persiaran Usahawan, 40150 Shah Alam, Selangor.  
(Hereafter referred to as “the Polytechnic”).

2. We acknowledge that the ‘Project above’ and its intellectual property are the original work/copy of our work without taking or imitating any intellectual property from others.
3. We agree to give up the intellectual property ownership of 'The Project' to the Polytechnic in order to meet the requirements for awarding us Diploma in Mechanical Engineering.

Made and truly recognized by

- |   |  |
|---|--|
| a) MUHD. SYAFIQ IZADI BIN JUMAT<br>(IC No.: 001017-01-1529),      | .....<br>MUHD. SHAFIQ IZADI BIN<br>JUMAT   |
| b) MUHD. FIRDAUS BIN MOHD. MASROR<br>(IC No.: 000707-10-0655) and | .....<br>MUHD. FIRDAUS BIN MOHD.<br>MASROR |
| c) ELISCIA EDNA ANAK TONY<br>(IC No.: 000222-13-0530)             | .....<br>ELISCIA EDNA ANAK TONY            |
- at ....., on .....

In front of me, MADYA MASTIKA BINTI AHMAD)

(811027-13-5140)

as the project supervisor on the date: .....

.....

MADYA MASTIKA BINTI  
AHMAD

## **ACKNOWLEDGEMENT**

The success and final outcome of this project required a lot of guidance and assistance from many people and we extremely fortunate to have this all along the completion of our project. Whatever we have done is only due to thanks Ms. Madya Mastika for giving we the opportunity to do this project and providing us all the support and guidance which made us complete the project on time, we gladly grateful to her for providing such a nice support and guidance. The project cannot be completed without effort and cooperation from the group members. We will finally like to express our gratitude with a high degree of appreciation to our friends and classmates for their love, care, concern and support morally, our gratitude knows no bound. All words most precious resources would not adequately compensate for love and sacrifice.

## **ABSTRACT**

Fruit pickers are examples of harvesting tools used to increase harvesting capacity and reduce damage brought about by fruit fall. The previous products had several disadvantages, such as longer time to complete the picking process and low efficiency. Also, there are limitations in term of height and portability. The objective of the research is to design and develop a user friendly fruit picker. It also aims to minimize time used in fruit harvesting. Fruit picker is an improvement of the traditional picker and other types of picker. Modification of the frame, cutter and handle was conducted to improve its efficiency. Hollow aluminium tube is used because it is very light considering that the product has to be a single person job. The cutter blade has a groove to prevent the pieces from sliding when picking the fruit and the triggering device is adjustable and accessible to the picker. The design is the combination of pull -type and trigger- type. The fabrication process comprises of a rod with a motor that act as machinery device. The fruit picker is tested and adjustments were made accordingly. In addition, this product has been proven to save time compared to traditional method. Based on the result, the analysis and discussion that have been carried out, it can be concluded that this fruit picker has achieved the objective discussed. Thus, it is hoped that in the future this product can be improved based on the relevance of situation.

Keywords: Fruit picker, user friendly, minimize time, adjustable, light

## **ABSTRAK**

Pemetik buah adalah contoh alat penuai yang digunakan untuk meningkatkan kapasitas penuaian dan mengurangkan kerosakan yang disebabkan oleh kejatuhan buah. Produk sebelumnya mempunyai beberapa kelemahan, seperti memerlukan masa yang lebih lama untuk menyelesaikan proses pengambilan dan kecekapan rendah. Juga, terdapat limitasi dari segi ketinggian dan mudah alih. Objektif penyelidikan adalah untuk merancang dan mencipta pemetik buah yang mesra pengguna. Ini juga bertujuan untuk meminimumkan masa yang digunakan dalam penuaian buah. Pemetik buah adalah peningkatan dari kaedah tradisional dan pemetik jenis lain. Pemetik buah mempunyai banyak ciri tambahan yang cekap dan meningkatkan kualiti hidup dari aspek pergerakan ergonomik manusia. Pengubahsuaian rangka, pemotong dan pegangan dilakukan untuk meningkatkan kecekapannya. Tiub aluminium berongga digunakan kerana sangat ringan memandangkan produk itu digunakan secara berseorangan. Pisau pemotong mempunyai alur untuk mengelakkan kepingan tergelincir ketika memetik buah dan alat pemicu boleh disesuaikan dan dapat diakses oleh pemetik. Reka bentuknya adalah gabungan antara jenis tarik dan jenis pemicu. Proses fabrikasi terdiri daripada batang dengan motor bertindak sebagai alat mesin. Pemetik buah diuji dan penyesuaian dibuat dengan sewajarnya. Pengubahsuaian dilakukan untuk menyelesaikan masalah semasa menguji produk. Di samping itu, produk ini telah terbukti dapat menjimatkan masa berbanding dengan kaedah tradisional. Berdasarkan hasilnya, analisis dan perbincangan yang telah dilakukan, dapat disimpulkan bahawa pemetik buah ini telah mencapai objektif yang dibincangkan. Oleh itu, diharapkan produk ini dapat ditingkatkan di masa hadapan berdasarkan kesesuaian keadaan.

Kata kunci: Pemetik buah, mesra pengguna, minimumkan masa, boleh laras, ringan

## TABLE OF CONTENTS

CHAPTER	CONTENTS	PAGE
	<b>DECLARATION OF ORIGINAL WORK AND INTELLECTUAL PROPERTIES</b>	<b>ii</b>
	<b>ACKNOWLEDGMENT</b>	<b>iv</b>
	<b>ABSTRACT</b>	<b>v</b>
	<b>ABSTRAK</b>	<b>vi</b>
	<b>TABLE OF CONTENTS</b>	<b>vii</b>
	<b>LIST OF TABLES</b>	<b>ix</b>
	<b>LIST OF FIGURES</b>	<b>x</b>
<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
	1.1 Introduction	1
	1.2 Research Background	1
	1.3 Problem Statement	2
	1.4 Research Gap	2
	1.5 Research Objectives	2
	1.6 Significance of study	2
	1.7 Scope and limitations	3
	1.8 Summary of Chapter	3
<b>2</b>	<b>LITERATURE REVIEW</b>	<b>4</b>
	2.1 Introduction	4
	2.2 Theory/Concept	4
	2.3 Existing concepts	5
	2.3.1 Pull- type Picker	5
	2.3.2 Trigger- type Picker	6
	2.3.3 Universal fruit picker	6
	2.4 Summary of Chapter	7



<b>3</b>	<b>METHODOLOGY</b>	<b>8</b>
3.1	Introduction	8
3.2	Flow Chart	10
3.3	Product design	12
	3.3.1 Material selection	12
3.4	Analysis	14
3.5	Prototype	15
3.6	Summary of Chapter	17
<b>4</b>	<b>RESULTS AND DISCUSSION</b>	<b>18</b>
4.1	Introduction	18
4.2	Fabrication and Installation	18
4.3	End product	19
	4.3.1 Verification	20
	4.3.2 Product testing	21
4.4	Component in Fruit Picker	21
4.5	Response Rate	22
4.6	Result Analysis of Questionnaire	23
4.7	Data Analysis	24
<b>5</b>	<b>BUSINESS PLAN OUTLINE</b>	<b>26</b>
5.0	Executive Summary	27
5.1	Introduction	27
	5.1.1 Factor in Selecting the Purpose Venture	27
	5.1.2 Future Prospect of the Business	27
5.2	Purpose of Preparing in Business Plan	28
5.3	Business Background	28
5.4	Background of Partner	29
	5.4.1 Partner 1	29
	5.4.2 Partner 2	30
	5.4.3 Partner 3	30
5.5	Organization/ Management/ Administration Plan	31
	5.5.1 Logo, Mission, Vision & Objective	31
	5.5.2 Manpower Planning	32

5.5.3	Organization Chart	32
5.5.4	Schedule of Task and Responsibilities	33
5.6	Marketing Plan	34
5.6.1	Target Market/ Market Segmentation	34
5.6.2	Competitors (Strengths/ Weaknesses)	35
5.6.3	Marketing Strategies	35
5.6.4	Operational Objective	37
5.6.5	Operational Process	38
5.7	Location of Operation	38
5.8	Conclusion	39
<b>6</b>	<b>CONCLUSION AND RECOMMENDATION</b>	<b>40</b>
6.1	Introduction	40
6.2	Conclusion	40
6.3	Recommendation	41
	<b>REFERENCES</b>	<b>42</b>
	<b>APPENDICES</b>	<b>44</b>

## **LIST OF TABLES**

<b>TABLE</b>	<b>TITLE</b>	<b>PAGE</b>
Table 4.1	Component in Fruit Picker	21
Table 4.2	Number of Fruit Harvest in 1 minute	25
Table 5.1	Logo, Mission, Vision & Objective	31
Table 5.2	Manpower in Company	32
Table 5.3	Responsibilities Description	33
Table 5.4	Strengths and Weaknesses of Competitors	35
Table 5.5	Marketing Strategy based on the 4P's	36
Table 1	Gantt Chart 1	45
Table 2	Gantt Chart 2	46
Table 3	List of Materials and Approximate Expenses	47

## LIST OF FIGURES

<b>FIGURE</b>	<b>TITLE</b>	<b>PAGE</b>
Figure 2.1	Pull- type picker	6
Figure 2.2	Trigger- type picker	6
Figure 2.3	Universal fruit picker	7
Figure 3.1	Research Methodology	11
Figure 3.2	Hollow aluminium tube	13
Figure 3.3	Coated wire	13
Figure 3.4	Motor DC	14
Figure 3.5	Isometric view	15
Figure 3.6	Final design (a) side view and (b) top view	15
Figure 3.7	Final design (a) front view and (b) side view	16
Figure 4.1	Fabrication and Installation Process	19
Figure 4.2	Finished Product	20
Figure 4.3	Respondent Demographic	23
Figure 4.4	Percentage of Fruit Plucking Device	23
Figure 4.5	Percentage of using Fruit Plucking Device helped in Daily Life	24
Figure 4.6	Graph of The Number of Fruit Harvest in 1 Minute	25
Figure 5.1	Organization Chart of Green Forest	33
Figure 5.2	Marketing Strategy	36
Figure 5.3	Operational Process	38
Figure 5.4	Location of Green Forest Enterprise	39

# CHAPTER 1

## INTRODUCTION

(Prepared by Eliscia Edna Anak Tony)

### 1.1 Introduction

In agriculture, human resource plays a vital role especially in fruit cultivation, fruit counting for yield assessment and fruit plucking for marketing but the process is time consuming [1]. There are still many fruit farmers harvesting the fruit by climbing trees, making them tire easily, thus increasing safety risk and possibility of farmers falling from trees. To overcome the limitations or weaknesses of manual plucking, a fruit picker is made capable of picking fruit with high capacity and user friendly. Based on the problems described earlier, research is needed to design a fruit picking tool for people by paying attention to ergonomic aspects to increase the amount of fruit plucked and reduce fatigue.

### 1.2 Research Background

Malaysia is the country that is popular with diversity and its foods. Same goes to fruit. There are fruits that are seasonal and the one that come out all year round. Fruit harvesting occur during harvest time in areas with fruits grow wild that being farmed in the orchard. The conventional means for most effectively pluck fruit is a pair of scissors. To pluck the fruit with a pair of scissors, the plucking person grasps the fruit in his left hand, for example, and cuts the branch supporting the fruit with the scissors held in his right hand. It is necessary for him to use both of his hands. When a tree is tall, the plucking person has to climb the tree to pluck the fruits. In such a case, it is necessary for the plucking person to hold on to the tree with at least one hand to prevent himself from falling down. Therefore, the plucking person can freely use only one of his hands; he must then pluck the fruits with one hand and use the other hand holding on to the tree for grasping the scissors or the fruit. This results in the decrease in the efficiency

of plucking as well as increases the dangerousness of the work. Furthermore, when fruits are plucked by the picker on the ground, the fruits picked with a pair of scissors are placed into a basket or the like one by one by one hand, again lowering the efficiency of the plucking work. Therefore, in fruit culture, the process of plucking fruits requires remarkably much time and labour energy.

### **1.3 Problem Statement**

The earlier products had several disadvantages, such as harvesting process takes longer time. Besides, there is also limitation in manual plucking fruit. In addition, the previous product is heavier in weight and less portable contributes to fatigue.

### **1.4 Research Gap**

There are few researches that has not been touched which is the weight of the product is much heavier to handle that will make the process take more time to pluck and less portable without the mechanism used to pluck the fruit.

### **1.5 Research Objectives**

A few objectives have been highlighted:

- To design and develop a fruit picker with ease of use in mind
- To fabricate a fruit picker
- To minimize time used in picking fruit

## **1.6 Significance of study**

The research has been carried out and there were a few problems found which is to make a better product than before from specification aspect, to make the farmers and community works easier, to increase the profit of the product, to reduce the energy used by human and to make the work process more efficient.

## **1.7 Scope and limitations**

There are several scopes has been identified and will be used to complete the analytical research within the area of study. The scopes are the weight of the fruit that is limited to 400 per gram and the maximum tree height which is 2.5 meter.

## **1.8 Summary of Chapter**

In conclusion, this research study the performance of fruit harvesting using fruit picker. Hence, upgrading the fruit picker to the new version will greatly benefits all parties including small industries.

## **CHAPTER 2**

### **LITERATURE REVIEW**

**(Prepared by Muhammad Syafiq Izadi bin Jumat)**

#### **2.1 Introduction**

In the modern era, most of the farmer investor like to produce product by expanding their business widely. The mechanical technology used keep evolving and conventional method has been overtaken by the cutting-edge technology. Generally, humans can precisely and efficiently pick different sizes of fruits cultivated in an unstructured greenhouse environment without causing damage to the produce through the coordination of brain, eyes, and hands. From the viewpoint of bionics, the working performance of agricultural harvesting robots can be improved by creating a bionic design that is based on the human body structure and hand-grasping techniques [2]. The feeling of comfort is expected by workers in carrying out their work and with the presence of such comfort, the work productivity is expected to increase. Grasping is a highly complex movement that requires the coordination of several hand joints and muscles guided by the brain and vision [5]. To stimulate the grasping movement a pull-type picker used a sharp claw to pull fruit [6]. The same concept is applied to a trigger-type picker but limited to one fruit at a time [7]. Meanwhile a universal picker using a pair of vertically operating scissor for the operation [8]. By that mean is the method used to pluck has to be right and the tool used must suitable in process in a longer time.



## **2.2 Theory/Concept**

Nowadays, many technologies have been used in eateries but have not yet reached a satisfactory level. Increasing the quality of life and enhancing the existing design by innovating it to another level has been the generic objective for each and every one of them. Fruit are usually being plucked or using manual fruit picker. But using those techniques will consume a lot of time and also energy burn. People will mostly prefer:

- Less energy used
- Less time it took
- The condition of the fruit

## **2.3 Existing concepts**

Pull-type picker and trigger-type picker both using claw to pluck the fruit. The pull-type picker has a basket to hold the fruit from falling to the ground. The trigger-type only can pluck one fruit at a time which needs the attention for it. The motorised mechanism can be attached to the design.

### **2.3.1 Pull-Type Picker**

The first design is the pull-type picker. The concept of the first design is the fruit is pulled using a sharp claw and drops inside the basket. The fruit capacity is large using this picker which is 9-10 pieces per minute. Figure 2.1 shows the pull-type picker.



Figure 2.1 Pull-type picker

### 2.3.2 Trigger-Type Picker

The second design is the trigger-type picker. The concept of the second design of the fruit is the fruit is pulled by the three- hand claw one by one. The fruit capacity is small which will fit only one fruit at a time. Figure 2.2 shows the Trigger- type picker.



Figure 2.2 Trigger-type picker

### 2.3.3 Universal Fruit Picker

The present invention relates to a universal fruit picker for picking fruit. The conventional pickers are limited in use and can pick, for instance, only apples or only pears, and they cannot be used for picking other kinds of fruit without damaging them. Such devices mainly consist of a bag, made of light cloth, fixed to the lower edge of a toothed sheet frame, which is, in turn, fixed to the end of a wooden pole up to four meters long. A different type of picker consists of a bag the opening of which is held by a frame, which is fixed to the pole, with a pair of vertically operating scissors, positioned above the bag opening. The picker operator brings his pole, with the scissors on its upper end, to the selected fruit and aims the picker in such a direction as to position the bag opening below the fruit, and the tooth blades or scissors against the stalk. Figure 2.3 shows the image of Universal fruit picker.

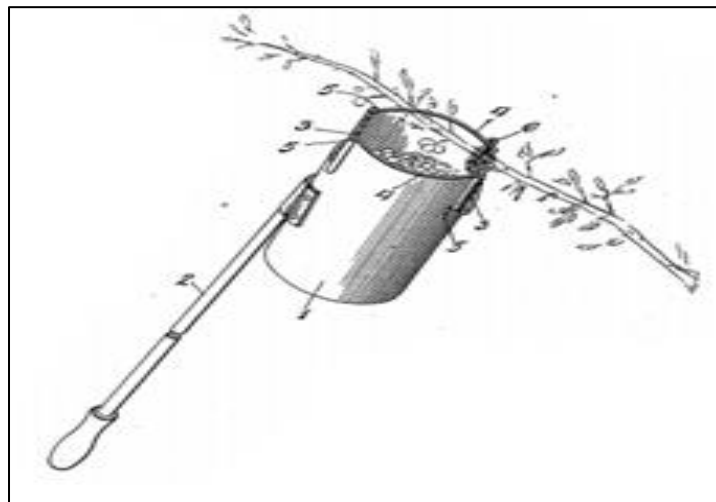


Figure 2.3 Universal fruit picker

### 2.4 Summary of Chapter

Summary focus of this chapter is to design and build a fruit picker for workers to pluck fruits. The current fruit picker is an improvement over the old one. Overall obtained from this chapter is an experiment that will be made referring to the sources of previous studies to complete the work done. Hence, by studying the past design and

synchronize with the needs and demands of the current will improve the new design or innovation of the engineers.

## **CHAPTER 3**

### **METHODOLOGY**

**(Prepared by Muhammad Firdaus Bin Mohd. Masror)**

#### **3.1 Introduction**

In this chapter the research method has been clarified to conduct this study. The research methodology is a thorough planning in terms of project progress this final semester. To smooth the journey of this final year project, the methodology must be structured as best as possible, the end result of the study will get the requirements of the problem to be solved. Therefore, it is very important to know and understand more each process found in the structure of the study methodology.

The purpose of this chapter is to design methodology of the research approach through mixed types of research techniques. The research approach also supports the researcher on how to come across the research result findings. In this chapter, the

general design of the research and the methods used for data collection are explained in detail. The first part gives a highlight about the dissertation design. The second part discusses data collection methods. The purpose of this section is to indicate how the research was conducted throughout the study periods.

Research methodology shows the path through which these researchers formulate their problem and objective and present their result from the data obtained during the study period. This research design and methodology chapter also shows how the research outcome at the end will be obtained in line with meeting the objective of the study. This chapter hence discusses the research methods that were used during the research process. It includes the research methodology of the study from the research strategy to the result dissemination.

A very significant decision in the research design process is the choice to be made regarding research approach since it determines how relevant information for a study will be obtained. The design used field observation at the selected industrial sites. The research methodology and design indicated the overall process of the flow of the research for the given study.

### **3.2 Flow Chart**

The research process begins with the identification of problem that consider the process and techniques of application in design. Next, clarify the objective in research to ensure the final product meet the expectation. Furthermore, planned the material purchase to match the need of product and to avoid unnecessary purchase. Thirdly, the method selection procedure underlying the tool is based on a set of criteria, categorized in a sequence that matches the practitioner's knowledge about a project

In addition, the fabrication is the act of taking raw stock material and turning it into a part for use in an assembly process. After that, runs test is a statistical procedure that examines whether a string of data is occurring randomly from a specific distribution. It also, analyses the occurrence of similar events that are separated by events that are different. Next, data analysis is the process of applying statistical or logical technique to describe and illustrate, and to evaluate data.

Last but not least, the discussion was made to connect results of research to meet the expected conclusion. Next, the researcher needed to archived all the data in report writing. Lastly, all the data that has been collected during the development of project are finalised to the conclusion section.

In conclusion, this chapter is crucial to this study and it should give the ready a clearer vision of the method behind this project. It also gives a researcher a guideline for their studies.

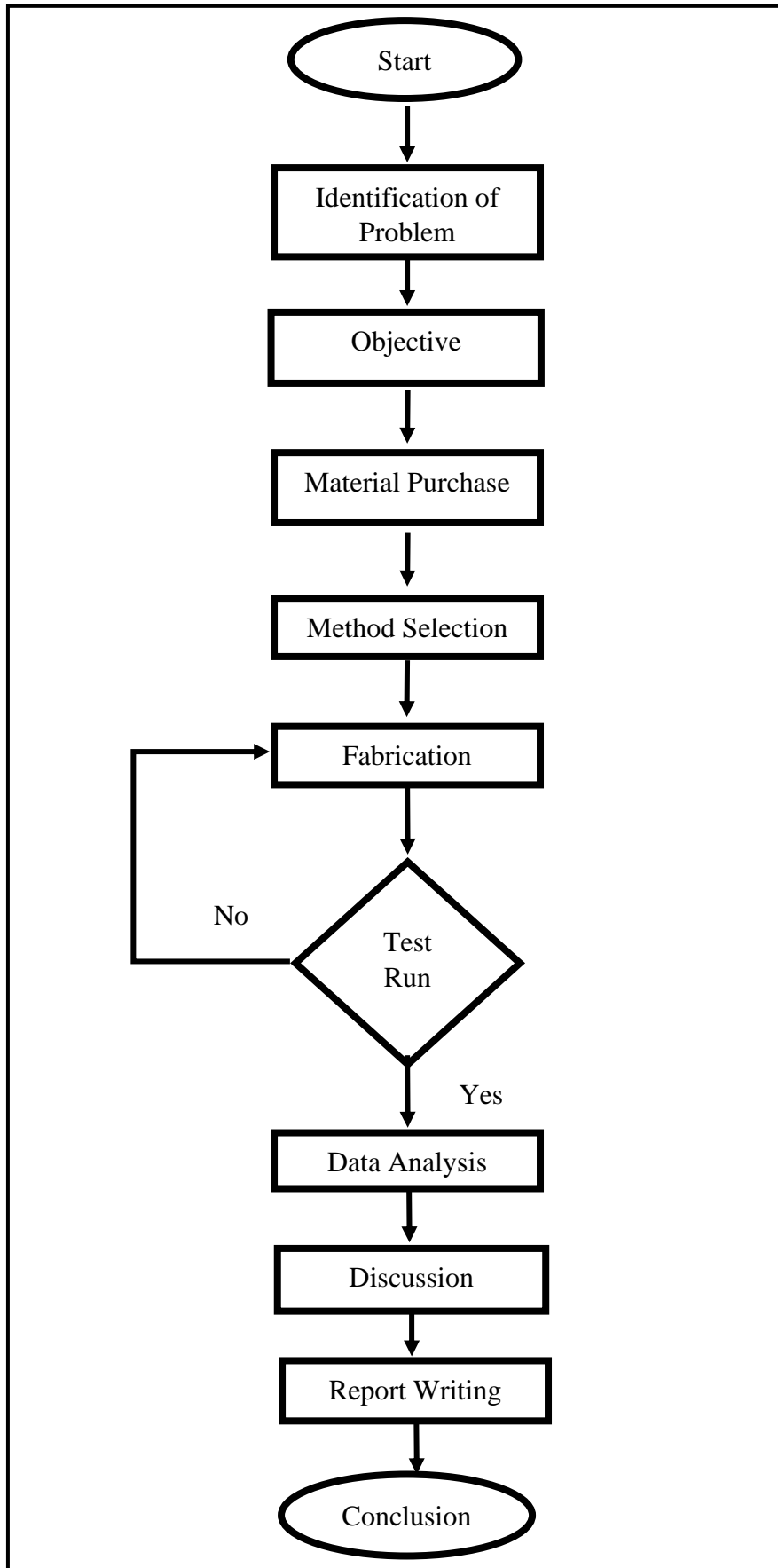


Figure 3.1 Research methodology

### **3.3 Product design**

Fruit picker is a vast improvement of the traditional pull-type picker and the other type of fruit picker with a low-cost and high-efficiency portable fruit picker [10]. Fruit picker has lots of additional features which are efficient and improve the quality of life in aspect of human ergonomic movements. This included the development of design consideration and concept based from the evaluation of the existing picker. The target harvesting capacity was 15 pieces per minutes. The highly efficient and portable fruit picker not only has high picking efficiency, small size, easy to carry, but also works stably and is suitable for picking a variety of fruits [10]. Modification of the frame, cutter and handle/pole was done to improve its efficiency.

#### **3.3.1 Material Selection**

i. Hollow Aluminium Tube

Hollow aluminium tube is used because it is very light considering that the product has to be a one person job. This item has the density of about  $\frac{1}{3}$  of steel ( $2.7g/cm^3$ ) [9]. That is why it is very easy to handle and also has a great stability. Aluminium also will increase strength with cold weather while retaining its toughness, something steel does not do [9]. Hollow aluminium tube is shown in Figure 3.2.





Figure 3.2 Hollow aluminium tube

ii. Coated Wire

Compared with other non-precious metals, copper wires can handle a wider load of electrical power, allowing it to use less insulation and armoring. They have high resistance to heat, eliminating most issues of overloading. Copper wire is also resistant to corrosion. Figure 3.4 below shows the coated wire.



Figure 3.3 Coated wire

### iii. Motor

DC motor has higher starting torque, quick starting and stopping, reversing, variable speeds with voltage input and they are easier and cheaper to control. Demand is growing for 12 and 24V motors to support solar, marine and portable (truck mounted) equipment which DC technology readily supports. DC technology is more cost in general for lower horsepower applications. Motor DC is shown in Figure 3.5.

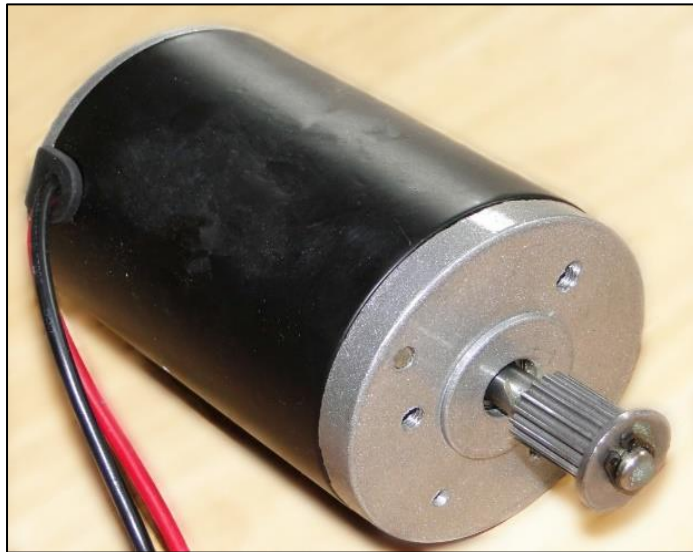


Figure 3.4 Motor DC

### 3.4 Analysis

By analysing the design, Fruit picker with a better version than the previous, based on how we redesign it. Current fruit picker usually depending on the sharpness of the picker. With only depending on the sharpness of the scissors, we have to use human energy more than the device itself. Also, the current fruit picker will be able to collect a few of the fallen fruits.

As most know, the fruit picker that is out there were made of material that is heavy weight such as wood to hold the load of the fruit. This will make the rod of the fruit picker that should support the weight of the fallen fruit unbalance. So, with the

combination of design, we build the rod with hollow aluminium tube which to handle the load.

Next, the current fruit picker that is in the market were just a long straight bar of rod. With the fruit picker, the rod could be adjustable according to the height of a tree. The 2m length rod can reach out every fruit tree with the suitable fruit to pluck.

### 3.5 Prototype

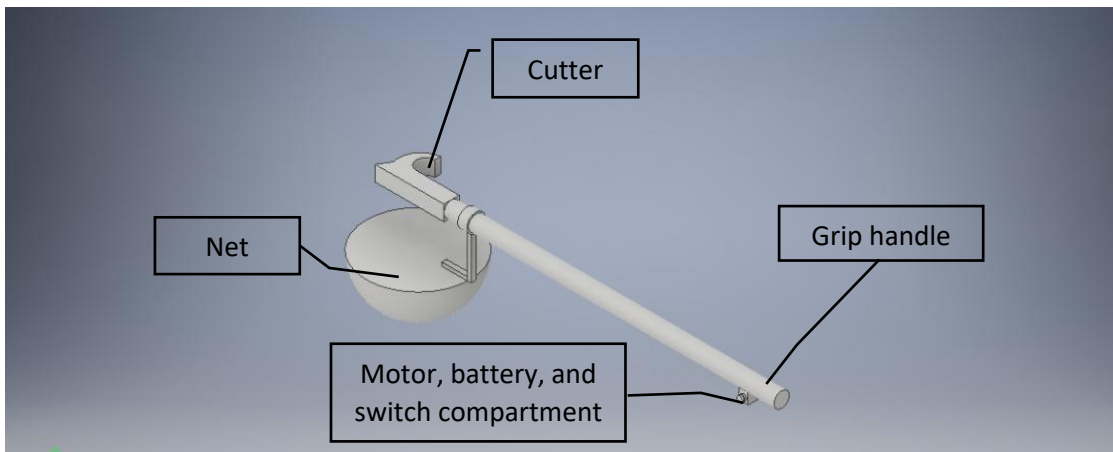
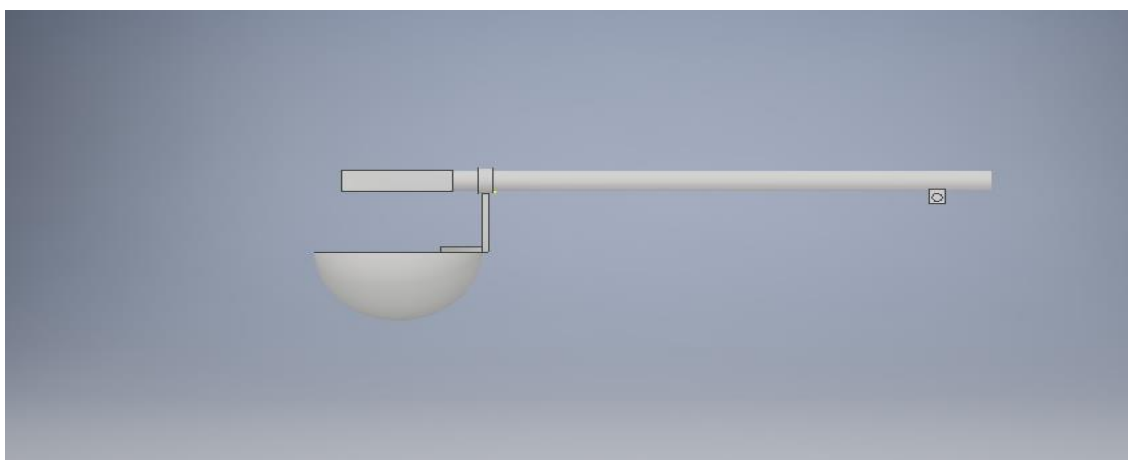
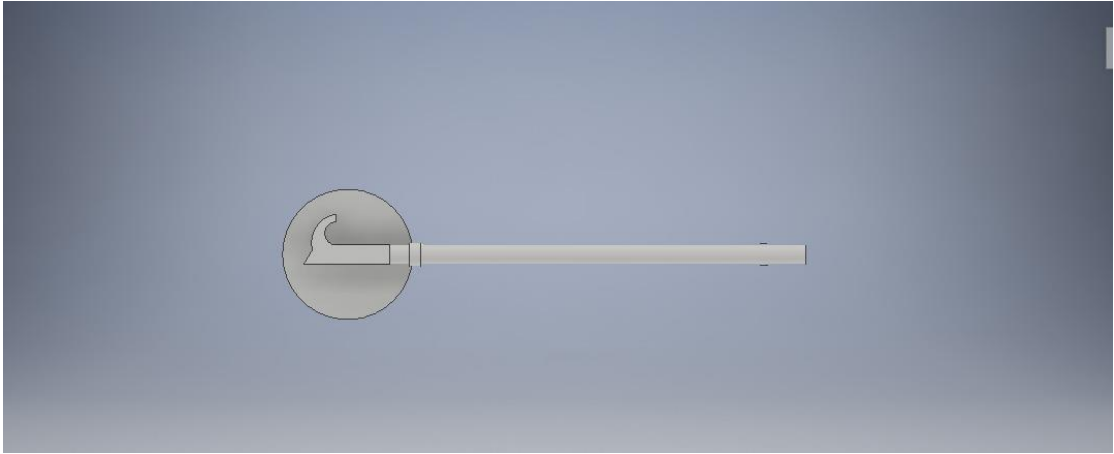


Figure 3.5 Isometric view

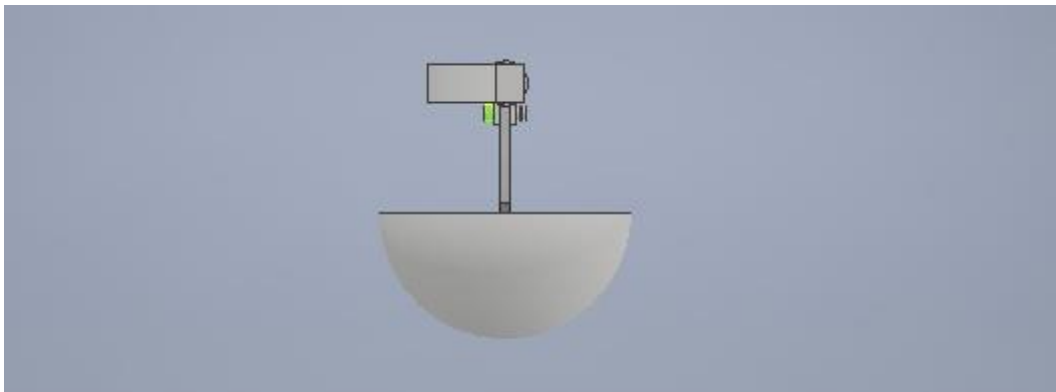


(a) Side view

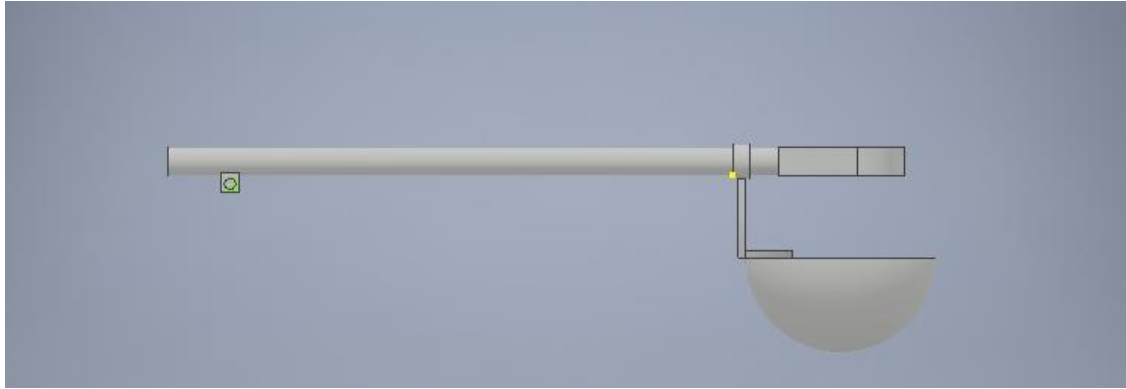


b) Top view

Figure 3.6 Final design (a) Side view and (b) top view



a) Front view



b) Side view

Figure 3.7 Final design (a) front view and (b) side view

### 3.6 Summary of Chapter

The chapter provides descriptive and in-depth discussion of the methods involved in the research of the current study. The current study is looking towards a quantitative approach that takes into account positivism as its philosophical undertaking, using deductive reasoning for its interpretive approach.

**CHAPTER 4**  
**RESULTS AND DISCUSSION**  
(Prepared by Eliscia Edna anak Tony)

**4.1 Introduction**

As it is indicated in the title, this chapter includes the result and discussion of the dissertation. After the device was built is as subjected to a series of specification. In addition, tests were also done to determine the maximum allowable weight the fruit picker could withstand which first functioning the way it was designed too.

**4.2 Fabrication and Installation**

The fabrication process comprises of assembling a rod with a motor that act as machinery device. Fabrication process start with attaching the pulley with pipe clamp at the top part of the rod. Then, the net is tied to a rope that is attached with the pulley. The bottom panel section such as the battery case, rope winder and DC motor is clamped with pipe clamp and glued together. The whole process is depicted in Figure 4.1.

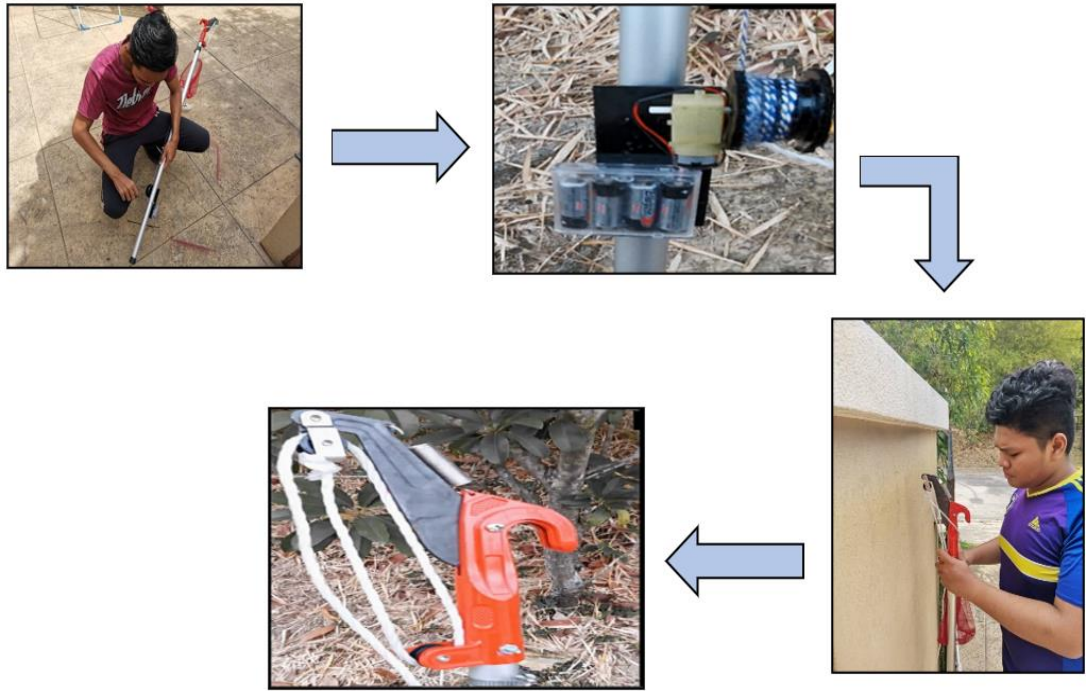


Figure 4.1 Fabrication and Installation Process

### 4.3 End Product

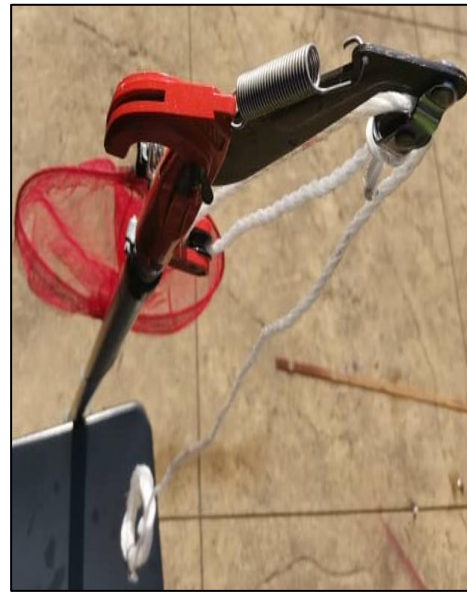
The functionality of the Fruit Picker is tested before adding finishing. The finished product is shown in Figure 4.2.



(a)



(b)



(c)

Figure 4.2 Finished Product

### 4.3.1 Verification

After the product has been assembled correctly, it was tested in real life usage to measure the functionality of the product. The test was conducted and the result are



the fruit picker was passed all the checklist. In conclusion, the product had the testament to be properly working.


### 4.3.2 Product testing



After the Fruit Picker was assembled, it was subjected to a test. During the test, observations were made with respect to the load and its effects on the rod and the adjust the angle of the fruit picker.

After the device was built it was subjected to a series of vigorous testing to determine if it met the design specification/ requirements. In addition, tests was also done to determine the maximum allowable weight the fruit picker could withstand which 1<sup>st</sup> functioning the way it was designed.

### 4.4 Component in Fruit Picker

Table 4.1: Component in Fruit Picker

<p>i. Net and Pulley System</p> 	<p>The use of pulley to raise the net. The light net is used to minimized product weight. The net can be lowered slow and safely.</p>
<p>ii. Rod Adjuster</p>	<p>Hose clamp used to attach and seal the adjuster into the fitting.</p>

	
<p>iii. Bottom Panel Section</p> 	<p>The bottom panel section consists of battery case, switch and DC motor. Battery as a source of energy for the motor. Electronic components increase the level of efficiency product.</p>

#### 4.5 Response Rate

The survey conducted with 27 questionnaires given to Polytechnic students of four departments in Malaysia.

#### 4.6 Result Analysis of Questionnaire

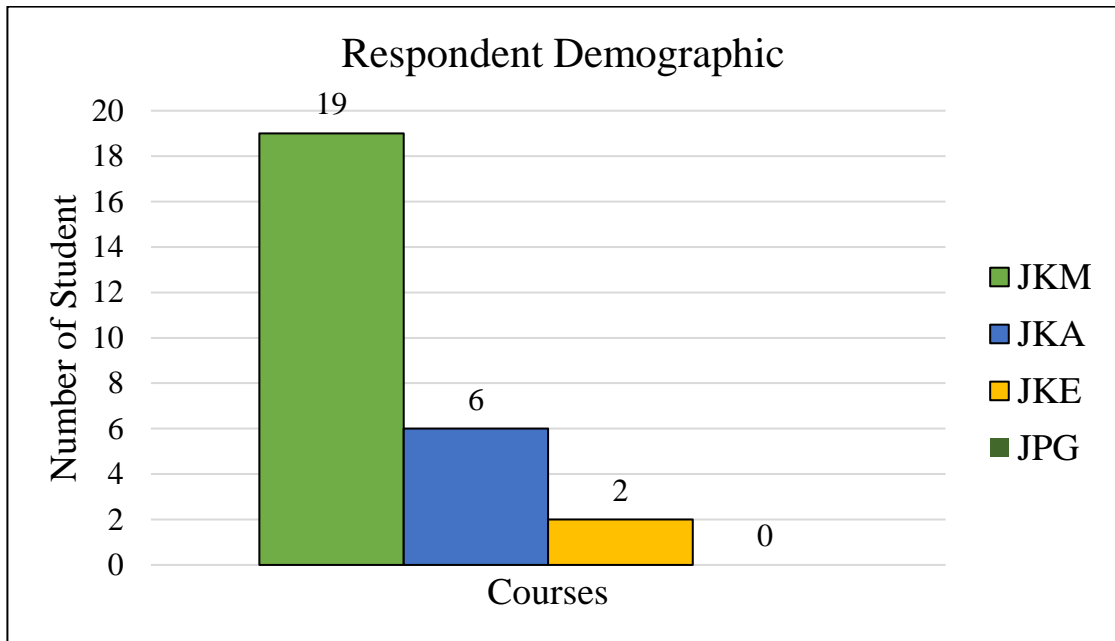


Figure 4.3 Respondent Demographic

There were total of 27 respondents with 19 (70.4%) from JKM department, 6 (22.2%) from JKA department, 2 (7.4%) from JKE department and 0 (0%) from JPG department of Polytechnic.

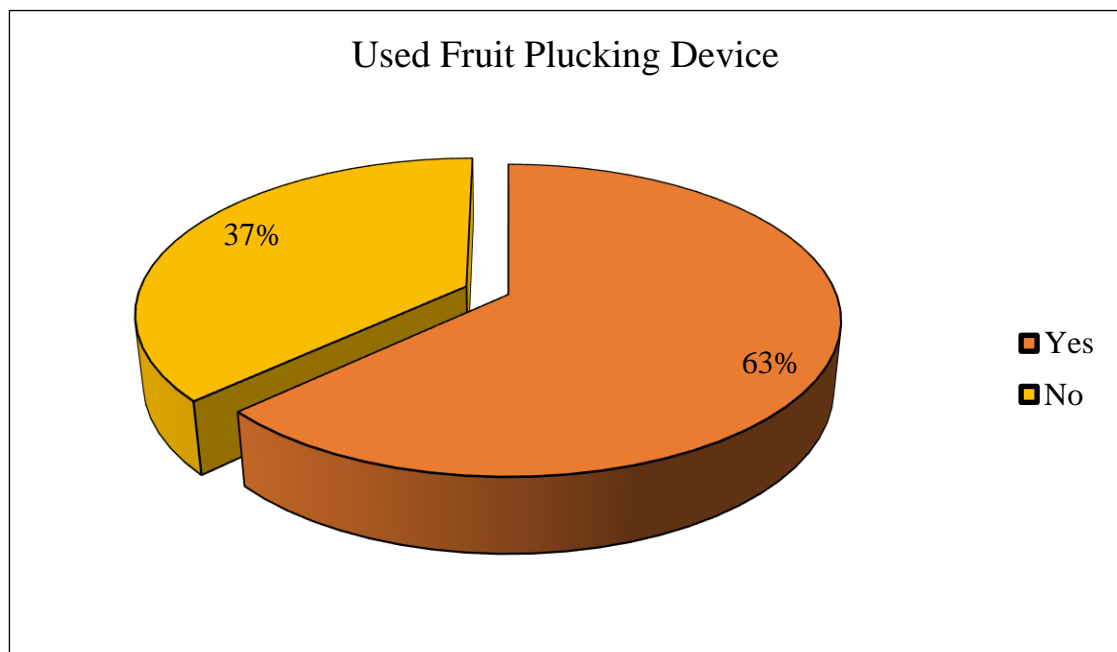


Figure 4.4 Percentage of Fruit Plucking Device

The chart above shows the usage of fruit plucking device. According to the chart, 17 (63%) respondents have once or more used fruit plucking device while 10 (37%) have not used fruit plucking device.

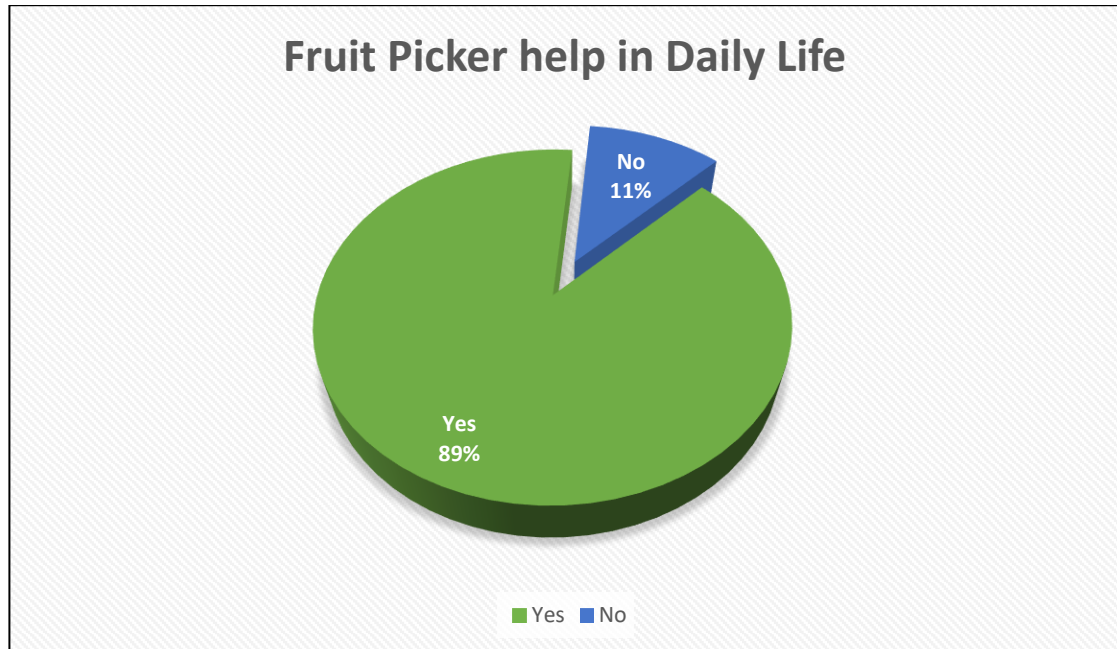


Figure 4.5 Percentage of using Fruit Plucking Device helped in Daily Life

The pie chart above ratifies the percentage of usage of fruit picker do help in daily life. Majority of the respondent were agreed that fruit picker does help in daily living with 89% and 11% disagreed with the statement.

#### 4.7 Data Analysis

The Fruit Picker has been tested by plucking fruit from a tree to assess the capability of the cutter. The common fruit picker took a bit longer time adjusted target while the Fruit Picker only took seconds. The basket was useful as it can filled most of the harvest product in one go without any damage. Table 4.2 shows the number of fruit harvest in 1 minute.

Table 4.2: Number of Fruit Harvest in 1 minute

Type of Fruit Picker	Number of Fruit Harvest in 1 minute
Pull-type picker	9-10
Trigger-type picker	7-8
Universal picker	7-8
Fruit Picker	13-14

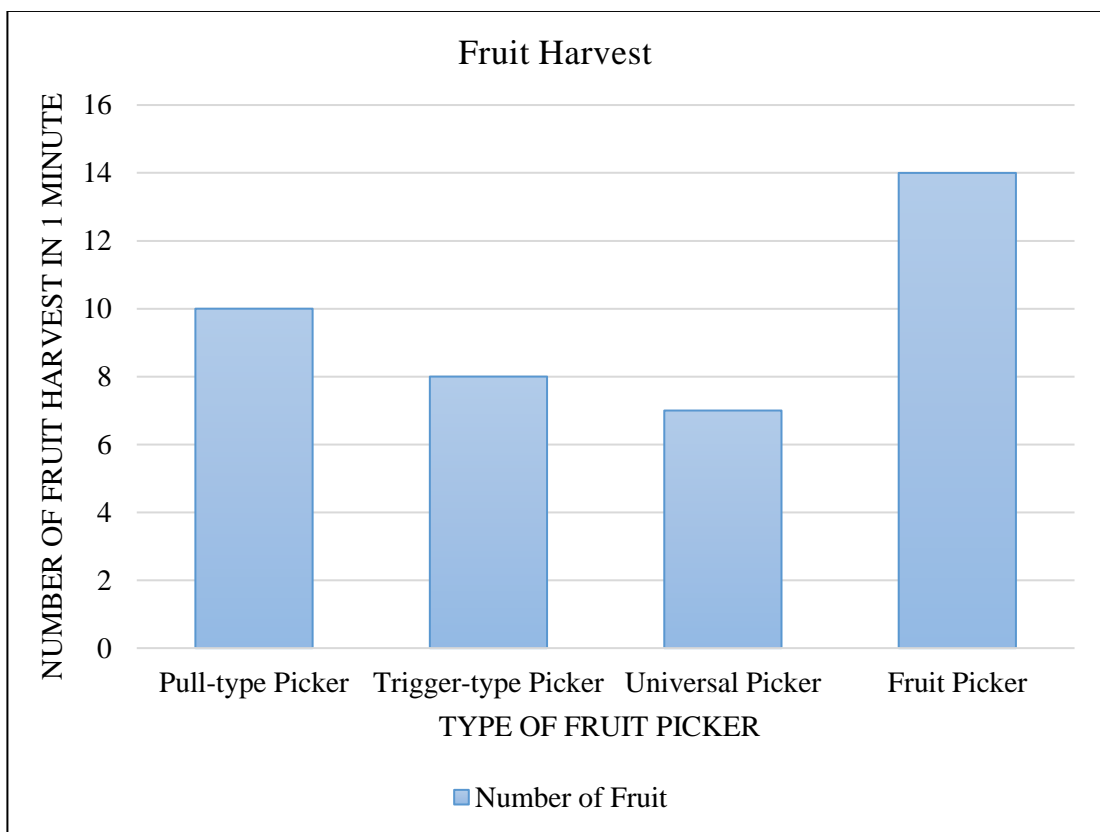


Figure 4.6 Graph of the Number of Fruit Harvest in 1 Minute

Figure 4.6 shows the graph of the number of fruit harvest in a minute. Existing fruit plucking device plucked lesser fruit than Fruit Picker which is the Pull- type pluck 10, the Trigger-type at 8, the Universal picker was 5 and the Fruit Picker 14. As above mentioned, there were several factors to be included which affected the number of fruits been plucked. The factor that affected as shown in the graph is the weight of the pole,

where the heavier the pole is the lesser fruit plucked by the picker device. The imbalance pole due to the weight of the pole causes the time taken for fruit plucked longer.

**CHAPTER 5**  
**BUSINESS PLAN OUTLINE**  
(Prepared by Eliscia Edna Anak Tony)

**5.0 Executive Summary**

Green Forest Enterprise is a company that produces innovation projects targeting Small Medium Industries (SMIs). Green Forest Enterprise selling fruit plucking device that is Fruit Picker. It is situated at Seksyen 9, Shah Alam, Selangor.

**5.1 Introduction**

Name of the company : Green Forest Enterprise

Nature of business : Sale Fruit Picker

Location of business : Seksyen 9

34 Jalan Ungu, U9/32A Sunway Kayangan, Seksyen 9,  
40150 Shah Alam, Selangor

Date of commencement : December 2019

**5.1.1 Factor in selecting the propose venture**

**a. Convenient**

Its is very light in weight and does not need a lot of space to keep.

**b. Promote Innovation Product**

Help to persuade local product and to promote TVET innovation.

**5.1.2 Future prospect of the business**

The company targeting the orchards, greenhouses and also nurseries.

## 5.2 Purpose of Preparing the Business Plan

Having a business plan minimizes your risk. It will help you set achievable goals and milestones. Share and explain business objectives with your management team, employees and new hires. Identify, describe and analyse a business opportunity and/or a business already under way, examining its technical, economic and financial feasibility.

## 5.3 Business Background

Name of business	: Green Forest Enterprise
Address of business	: 34 Jalan Ungu, U9/32A Sunway Kayangan, Seksyen 9, 40150 Shah Alam, Selangor.
Telephone number	: 018-2037650
E-mail address	: abutorres1234@gmail.com
Form a business ownership	: Partnership
Main business activities	: Mechanical/Electrical
Date of commencement	: 13 December 2019
Date of registration number	: 25 October 2020
Equity contribution (cash/asset)	: RM 330.00
Name of bank & account number	: <i>Maybank</i> 161163024125



## **5.4 Background of Partner**

### **5.4.1 Partner 1**

Name : MUHAMMAD SYAFIQ IZADI BIN JUMAT

Identity card number : 001017-01-1529

Address : No.21, Jalan Limau, Tama Paya Jaras Permai, 47000  
Sungai Buloh, Selangor

Telephone number : 018-2037650

Email address : abutorres1234@gmail.com

Date of birth : 17 / 10 / 2000

Age : 21 years old

Marital status : Single

Academic qualification : Diploma in Mechanical Engineering

Course attended : Project 2

Skills : Good in Autodesk, Autocad & Inventor

Present occupation : Student in Politeknik Sultan Salahuddin Abdul Aziz  
Shah

Capital contribution : RM 110.00

#### **5.4.2 Partner 2**

Name : MUHAMMAD FIRDAUS BIN MOHD. MASROR  
Identity card number : 000707-10-0655  
Address : No.21 Jalan Semarak 2 Bandar Utama, Batang Kali  
44300 Selangor.  
Telephone number : 014-9440363  
Email address : firdausmixs@gmail.com  
Date of birth : 07 / 07 / 2000  
Age : 21 years old  
Marital status : Single  
Academic qualification : Diploma in Mechanical Engineering  
Course attended : Project 2  
Skills : Good in maintenance  
Present occupation : Student at Politeknik Sultan Salahuddin Abdul Aziz  
Shah  
Capital contribution : RM 110.00

#### **5.4.3 Partner 3**

Name : ELISCIA EDNA ANAK TONY  
Identity card number : 000222-13-0530  
Address : LOT 1368, Goldhill Estate, Jalan Bidi,  
94000 Bau, Sarawak  
Telephone number : 012-8989028  
Email address : elcdn.2202@gmail.com  
Date of birth : 22/ 02/ 2000  
Age : 21 years old  
Marital status : Single

Academic qualification : Diploma in Mechanical Engineering

Course attended : Project 2

Skills : Good in financial management and business marketing

Present occupation : Student at Politeknik Sultan Salahuddin Abdul Aziz Shah

Capital contribution : RM 110.00

## 5.5 Organization/ Management/ Administration Plan

### 5.5.1 Logo, Mission, Vision & Objective

Table 5.1: Logo, Mission, Vision & Objective

Logo	
Mission	To provide better solution whilst creating better technology that benefit both customer and the environment.
Vision	Dedicated the making of positive difference towards the community.

Objective	<ul style="list-style-type: none"> <li>• To design and develop a fruit picker with ease of use in mind.</li> <li>• To fabricate a fruit picker.</li> <li>• To minimize time used in picking fruit.</li> </ul>
-----------	---

### 5.5.2 Manpower Planning

Currently, Company only have 3 workers as shown in Table 5.2;

Table 5.2: Manpower in Company

Position	Number of Personnel
Manager	1
Technician	1
Financial/ marketing Executive	1

### 5.5.3 Organization Chart

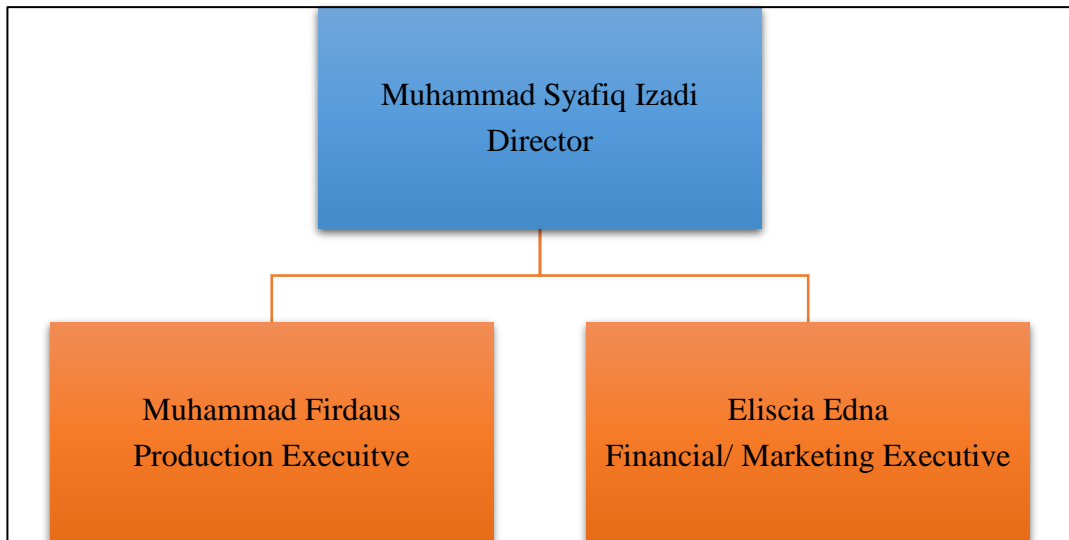


Figure 5.1 Organization Chart of Green Forest

#### 5.5.4 Schedule of Task and Responsibilities

Table 5.3: Responsibilities Description

Task	Responsibilities Description
Director	<ul style="list-style-type: none"> <li>Continually plan ways to increase the company's profitability and stay on top of progress.</li> <li>Sets policies and strategic direction for the business for the near term and the foreseeable future.</li> </ul>
	<ul style="list-style-type: none"> <li>Oversees the company's activities</li> </ul>

<p>Production Executive</p>	<ul style="list-style-type: none"> <li>• Responsible for managing its resources, developing and implementing an operational plan and ensuring that procedures are carried out properly.</li> <li>• Managing procurement and resource allocation</li> </ul>
<p>Financial Executive</p>	<ul style="list-style-type: none"> <li>• Playing a vital role in the company's strategic initiatives.</li> <li>• Controller, handling everything relating to cash flow and financial planning.</li> </ul>
<p>Marketing Executive</p>	<ul style="list-style-type: none"> <li>• Attract more customers to buy from the company and to raise brand awareness through creation of marketing.</li> <li>• Lead product promotion initiatives.</li> <li>• Managing the promotion and positioning of a brand or the products and services that a company sells.</li> </ul>

## 5.6 Marketing Plan

### 5.6.1 Target Market/ Market Segmentation

#### a) First segment

Personal employees in need of assistance of fruit plucking.

**b) Second segment**

Someone in need of fruit plucking device with their greenhouses or nurseries.

**5.6.2 Competitors (Strengths/ Weaknesses)**

Table 5.4: Strengths and weaknesses of competitors

Competitors	Product	Strengths	Weaknesses
Palm King Marketing Sdn. Bhd	Loose Fruit Picker	<ul style="list-style-type: none"><li>• Light and convenience</li><li>• Suitable for all type of field conditions.</li><li>• Expedite the picking process.</li></ul>	<ul style="list-style-type: none"><li>• Unable to picker up many fruits at a time.</li></ul>

**5.6.3 Marketing Strategies**

The marketing strategy that used by Green Forest Enterprise are based on 4P's;

- i. Product
- ii. Price
- iii. Place
- iv. Promotion

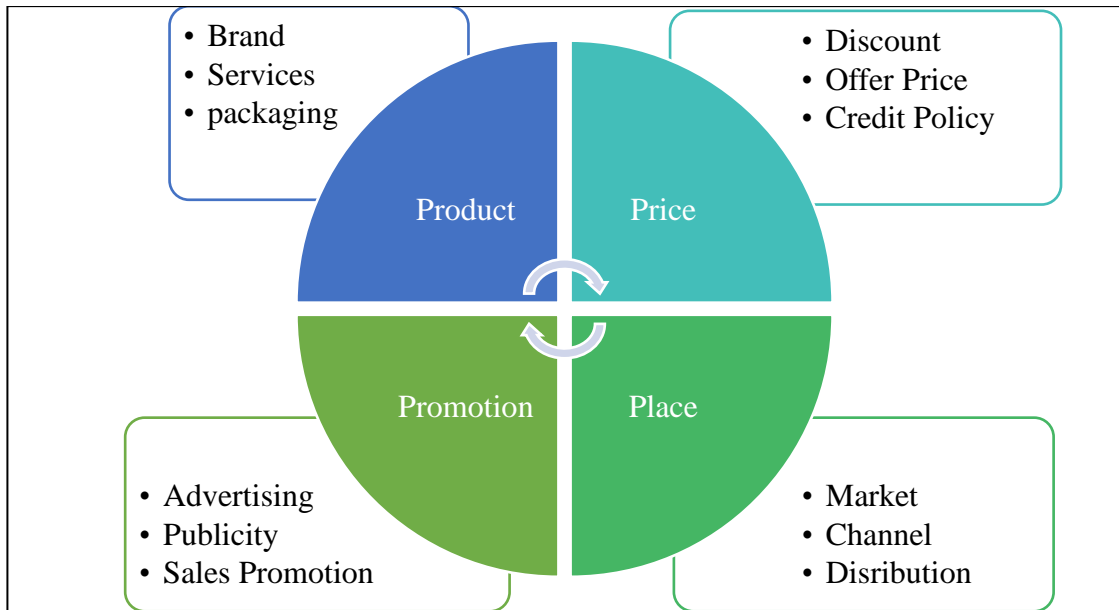


Figure 5.2 Market Strategy

Table 5.5 shown the marketing strategy by Green Forest Enterprise.

Table 5.5: Marketing Strategy based on the 4P's

Criteria	Description
Product and service strategy	<ul style="list-style-type: none"> <li>• Produce better qualities.</li> <li>• Provide delivery service for customer.</li> </ul>
Pricing strategy	<ul style="list-style-type: none"> <li>• Affordable price to guarantee maximum purchase.</li> <li>• Reasonable price for all community.</li> </ul>
Location strategy	<ul style="list-style-type: none"> <li>• Located in the city where there are development and industry.</li> <li>• Nearby the capital city.</li> </ul>



Promotion strategy	<ul style="list-style-type: none"> <li>• Using online platform like website advertisement promotion in Youtube and Google site.</li> <li>• Using social media such as Instagram and Facebook.</li> <li>• Using flyer/ news to promote product.</li> <li>• Will get warranty cashback if there is damage.</li> </ul>
--------------------	---

#### 5.6.4 Operational Objective

An operational objective is a measurable short-term goal that assists a company in obtaining long-term goal. Operational objectives are usually evaluated using performance measures that help a company determine whether it is on track or off course. It is important to a company which is a highly detailed plan that provides a clear picture of how a team, section or department will contribute to the achievement of the organisation's goals. It should be clear and well defined. It must be measurable if it is to be successful. Without an operational plan, team members can lose sight of their tasks, budgets can skyrocket and pandemonium can ensue. There are a few operational objectives has been highlighted:

##### **i. Cross-sell more Products**

The company have to focus on selling more products to more customers. The strategy acknowledges that the company already have the customer but can make money by selling the product more.

##### **ii. Attract and Retain the Best People**

The company need a good plan regarding who needed to hire, how many hires needed, and what the biggest challenges with regard to retention are.

### iii. Achieve the Quality of Product

Improving quality as an operational objective helps improve sales, strengthen a brand and decrease returns and the costs associated with repairs and make-goods. Introduction a quality control inspection to capture and fix defects.

### iv. Best service

The strategy indicates owner want the customers to consider the company easy to deal with. Customers may choose to work with the company even if the company have a product similar to the competitors—simply because the service is better.

## 5.6.5 Operational Process

Figure 5.3 shown operational process of business;

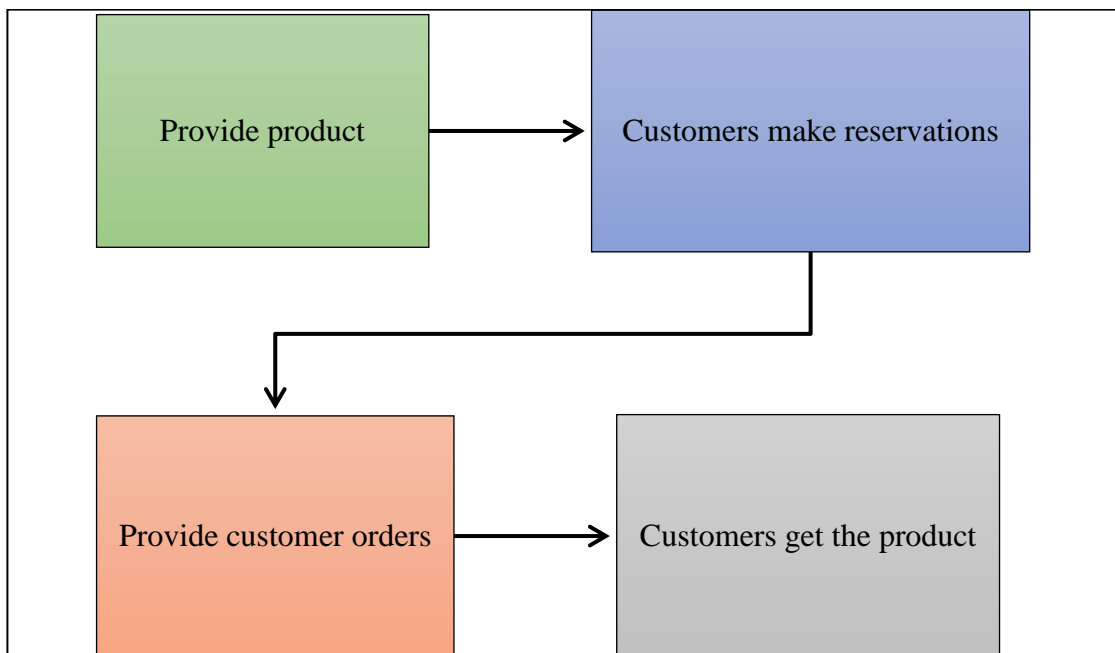


Figure 5.3 Operational Process

## 5.7 Location of Operation

34 Jalan Ungu, U9/32A Sunway Kayangan, Seksyen 9, 40150 Shah Alam, Selangor.

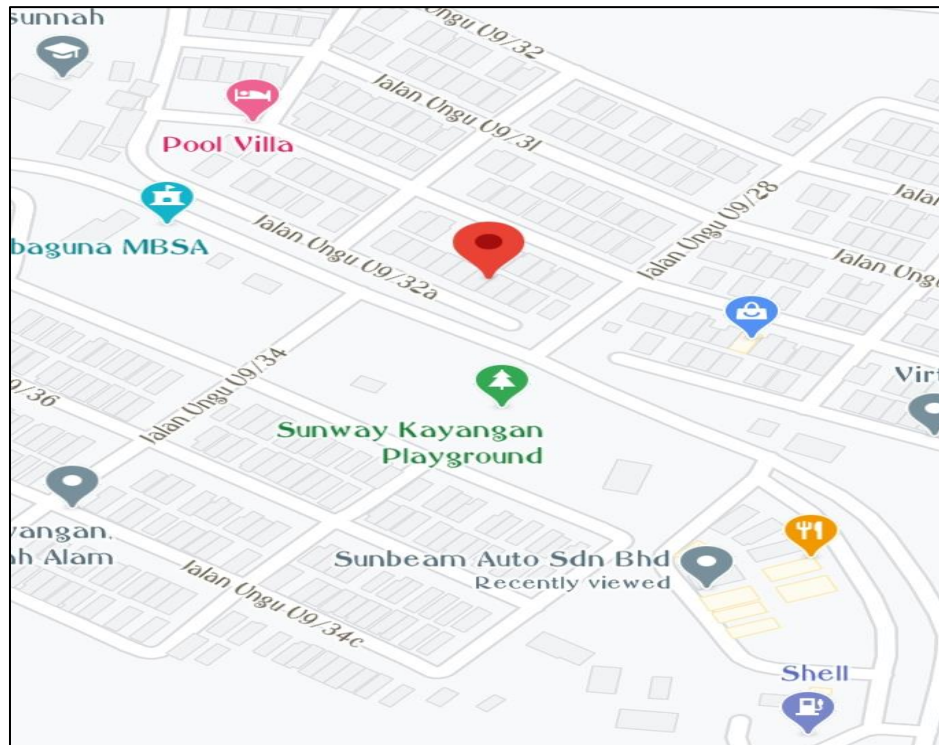


Figure 5.4 Location of Green Forest Enterprise

## 5.8 Conclusion

GREEN FOREST ENTERPRISE main product is a Fruit Picker and its main consumer's targets are orchard lander and household which is plucking fruit. Green Forest Enterprise can compete well with other similar business as well. In connection with that, the company are aiming to provide service according to the customers need and desire. The business will continuously make concentrate in the business strategies, especially in term of marketing to ensure that the business is well known to the costumers.

## **CHAPTER 6**

### **CONCLUSION AND RECOMMENDATION**

**(Prepared by Muhammad Firdaus bin Mohd. Masror)**

#### **6.1 Introduction**

Fruit Picker are the result of various research and development that has been managed to pursue the project goal and become most polished product of it legacy. The end project was targeted to meet it purpose to bring convenience to people. More detail explained in this chapter regarding the structure of the product.

#### **6.2 Conclusion**

In a nutshell, all the objectives in this project are obtained. Through this project, it helps develop creativity in creating a project and modify existing project to be more energy efficient working with new method of fabrication. The fruit picker provided also

a positive impact to users with time saving and more efficient. The effectiveness of the project used during harvesting fruit indicates that the project has the potential to be expanded to an external agency to further enlarge its usage. It is recommended that the promotion to be carried out for commercialization purposes. In a nutshell, the objective of this project has been achieved as a user friendly fruit picker has been designed and fabricated. The design also has been proven to be comfortable and user friendly. The time used to harvest fruit also has been minimized.

### **6.3 Recommendation**

Fruit Picker is based from discussion from three people. Based on the review, it is evident that there are gaps in the previous researches which should be contemplated. Below are few further researches recommended to improve this project, which are:

- i. Attached the powerful motor
- ii. Make the rod more light and friendly user
- iii. Safety element on the cutter section

## REFERENCES

- [1] Graichen et al., 2015. The influence of component alignment on patellar kinematics in total knee arthroplasty. Available at:  
<<https://www.tandfonline.com/doi/full/10.3109/17453674.2015.1005907#>>
- [2] Hodson, 2018; Stern, 2015. Factor Affecting Human Hand Gasp Type in Tomato Fruit- picking. Available at :  
<https://www.sciencedirect.com/science/article/abs/pii/S0168169918315394>
- [3] indiamart.com. 2020. Copper Coated Steel Wire. [online] Available at:  
<<https://www.indiamart.com/proddetail/copper-coated-steel-wire-19240998497.html>>  
[Accessed 27 February 2020].

- [4] Johnson, S., 2018. Copper Wire Advantages & Disadvantages. [online] Sciencing. Available at: <<https://sciencing.com/copper-wire-advantages-disadvantages-8152803.html>> [Accessed 13 March 2018].
- [5] K. Saran Kumar et al., 2018. Optimal Conceptual Design and Vision- based Control of a Fruit Harvesting Robot. Available at : <<https://www.inderscienceonline.com/doi/abs/10.1504/IJIMR.2018.090944>
- [6] Montepio, R. and Tuyogen, R., 2020. Development of The Mechanical Fruit Picker. [online] Available at: <[https://www.academia.edu/27766157/DEVELOPMENT\\_OF\\_A\\_MECHANICAL\\_FRUIT\\_PICKER?auto=download](https://www.academia.edu/27766157/DEVELOPMENT_OF_A_MECHANICAL_FRUIT_PICKER?auto=download).
- [7] Nove, C., 2020. US1480825A - Fruit Picker - Google Patents. [online] Patents.google.com. Available at: <<https://patents.google.com/patent/US1480825A/en>.
- [8] Zhang, Z., 2020. Design, Test, And Improvement of a Low-Cost Apple Harvest-Assist Unit. [online] Etda.libraries.psu.edu. Available at: <<https://etda.libraries.psu.edu/catalog/26275>.
- [9] Sangster, N. (2017, August). *The Design of a Fruit Picking Device*. ResearchGate. [https://www.researchgate.net/publication/326301454\\_The\\_Design\\_of\\_a\\_Fruit\\_Picking\\_Device](https://www.researchgate.net/publication/326301454_The_Design_of_a_Fruit_Picking_Device)
- [10] Wei, X. (2019, February). *An Efficient Portable Fruit Picker*. ResearchGate [https://www.researchgate.net/publication/331677414\\_An\\_efficient\\_portable\\_fruit\\_picker](https://www.researchgate.net/publication/331677414_An_efficient_portable_fruit_picker)

## **APPENDICES**

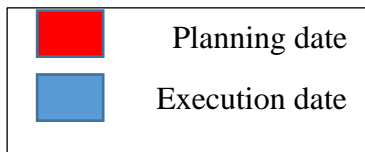
APPENDIX A1	Gantt Chart 1
APPENDIX A2	Gantt Chart 2
APPENDIX B	Cost and expenses
APPENDIX C	PITEX Poster
APPENDIX D	Questionnaire Survey Form



## TIMEFRAME FOR FINAL YEAR PROJECT 1

Table 1: Gantt Chart 1

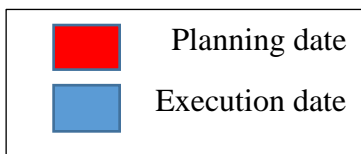
Activity	Week	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
Final project briefing by lecturers and coordinator		Red														
Ideas and initial sketches brainstorming with chosen supervisors/lecturers		Red	Red													
Objective				Red	Red											
Theoretical studies						Red	Red									
Detailed hand sketches							Red	Red	Red	Red						
3D model with Autodesk Inventor								Blue	Blue	Blue	Red					
Material and costing survey/Buying/Collecting											Red	Blue				
Fabricate/Modifying the project												Red	Blue			
Project presentation/exhibition														Red	Red	Blue
Proposal report submission															Red	Red
																Blue



## TIMEFRAME FOR FINAL YEAR PROJECT 2

Table 2: Gantt Chart 2

Activity	Week	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
Abstract		Planning	Planning													
Finishing Product		Execution	Execution	Execution	Planning	Planning										
						Execution	Execution	Execution								
Product testing						Planning	Planning									
							Execution	Execution	Execution							
Registration MyIpo								Planning	Planning							
								Execution	Execution							
Innovation Report and PITEK Video									Planning	Planning	Planning					
										Execution	Execution	Execution				
Report submission												Planning	Planning	Planning		
													Execution	Execution	Execution	Execution
Project presentation/exhibition															Planning	Planning
																Execution



## APPENDIX B

### Budget Calculation

Table 3: List of Materials and Approximate Expenses

<b>No.</b>	<b>Materials</b>	<b>Price /unit (RM)</b>	<b>Quantity</b>	<b>Total (RM)</b>
<b>1.</b>	Metal Hanging Basket (300mm)	10.50	1	10.50
<b>2.</b>	Coated Wire	3.30	2	6.60
<b>3.</b>	Hose Clamp (12pcs)	2.90	2	5.80
<b>4.</b>	Tree Pruner Pole (3m)	123.00	1	123.00
<b>5.</b>	Pulley (12mm)	9.00	1	9.00
<b>6.</b>	Hollow Aluminium Tube	12.00	1	12.00
			<b>Grand Total</b>	<b>166.90</b>

## APPENDIX C



# FRUIT PICKER

Nama Ketua Kumpulan : Muhd. Shafiq Izadi Jumat  
Nama Ahli Kumpulan 1 : Muhd. Firdaus Mohd. Masror  
Nama Ahli Kumpulan 2 : Eliscia Edna Tony  
Institusi : Politeknik Sultan Salahuddin Abdul Aziz Shah



### PENERANGAN INOVASI

- harvesting tools used to increase harvesting capacity and reduce damage
- lots of additional features which are efficient and improve the quality of life
- proven to save time
- adjustable and accessible

### IMPAK INOVASI

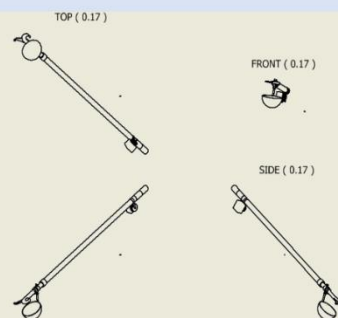
- Can be used by anyone
- Use small space to store
- Affordable

### OBJEKTIF



A few objectives have been highlighted:

- To design and develop a fruit picker with ease of use in mind
- To fabricate a fruit picker
- To minimize time used in picking fruit

### BLOK DIAGRAM / CARTA ALIR OPERASI



## APPENDIX D

<h3>Fruit Picker</h3> <p>Final Year Project Survey. Kami daripada kelas DKM5A telah melaksanakan projek fyp FRUIT PICKER dan kami memerlukan maklum balas dari anda.</p> <p><b>*Required</b></p>	<p>Kumpulan kami menjalankan satu projek untuk menambah baik ciri fruit picker sedia ada, sebagai pengguna adakah anda menyokong produk ini ? *</p>
<p><b>JABATAN PENGAJIAN *</b></p> <p><input type="radio"/> IKM</p> <p><input type="radio"/> IPG</p> <p><input type="radio"/> IKE</p> <p><input type="radio"/> IKA</p>	 <p><input type="radio"/> Ya</p> <p><input type="radio"/> Tidak</p>
<p><b>KELAS *</b></p> <p>Your answer _____</p>	<p>Adakah anda sebagai pengguna, berminat untuk mencuba alat ini jika diberi peluang ? *</p> <p><input type="radio"/> Ya</p> <p><input type="radio"/> Tidak</p>
<p>Pernahkan anda melihat alat pemetik buah (fruit picker) ? *</p>  <p><input type="radio"/> Ya</p> <p><input type="radio"/> Tidak</p>	<p>Jika anda mempunyai kebun buah-buahan, adakah alat fruit picker ini membantu pekerjaan anda ? *</p> <p><input type="radio"/> Ya</p> <p><input type="radio"/> Tidak</p>
<p>Pernahkan anda mempunyai pengalaman menggunakan alat fruit picker ? *</p> <p><input type="radio"/> Ya</p> <p><input type="radio"/> Tidak</p>	<p>Tahukah anda, produk fruit picker ini mempunyai motor untuk membolehkan jaring penangkap buah diturun &amp; dinaikkan tanpa menggunakan tenaga fizikal. Batang galah juga boleh dilaras supaya dapat meningkatkan tahap mudah alih</p> <p>Sebagai pengguna adakah anda mempunyai sebarang cadangan berkaitan produk ini ? jika ada isikan ruangan dibawah.</p>

Tahukah anda, produk fruit picker ini mempunyai motor untuk membolehkan jaring penangkap buah diturun & dinaikkan tanpa menggunakan tenaga fizikal. Batang galah juga boleh dilaras supaya dapat meningkatkan tahap mudah alih

Sebagai pengguna adakah anda mempunyai sebarang cadangan berkaitan produk ini ? jika ada isikan ruangan dibawah.

Your answer

---

**TERIMA KASIH UNTUK RESPON  
ANDA**

Soalan Tamat.

Submit