



**UNIVERSITI PUTRA MALAYSIA**

***EFFECTS OF GRAFTING SKILLS AND DISCIPLINE ON BUDDER  
PERFORMANCE IN SELECTED ORCHARD NURSERY***

**ROZIAH BINTI ROSLI**

**FP 2022 48**



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PERFORMANCE IN SELECTED ORCHARD NURSERY**

By

**ROZIAH BINTI ROSLI**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in Fulfilment of the Requirements for the Degree of Master of Science**

**August 2021**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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**August 2021**

**Chairman : Professor Adam bin Puteh, PhD**  
**Faculty : Agriculture**

Food Industry based on the 8 Key Result Areas under the Agricultural Transformation Program indirectly became the prime mover for high demand on Jackfruit seedlings. Therefore, Department of Agriculture is responsible to produce Jackfruit seedlings. *Dasar Agromakanan Negara* (DAN) targeting 4630 ha landwere planted with Jackfruit on 2020. In 2019, only 2135 ha planted with Jackfruits. About 257,975 Jackfruit seedling need to produce to achieve this target. Considering that budders are different in terms of capability, expertise and crafts, more in-depth study needs to be done to address this issue. Thus, the general objective of this study is to investigate grafting skill and budder discipline in assuring successful in Jackfruit grafting. Specifically, the study was conducted to; (i) determine the level of softwood grafting skill, wedge grafting skill, budder discipline, and budder performance among nurseries, (ii) evaluate the relationship between softwood grafting skill, wedge grafting skill, discipline, and budder performance, (iii) find the most contribution factor in budder performance.

The questionnaire (five sections) was prepared and arranged properly according to the demographic profiles followed by independent and dependent variables. It was design to explore the grafting procedure applied to person responsible for Jackfruit grafting (budder) through a visit of Jackfruit nurseries in Malaysia. In this research, sample of all population of 21 respondents identified and data obtained from this survey were analyzed and presented with significant statistical and test statistics.

According to the study results, the level of softwood grafting skill, wedge grafting skill, budder discipline, and budder performance are same between all budders. All budders having high level of softwood grafting skill, wedge grafting skill, discipline and performance. Results from correlation show that budder discipline has very strong correlation with budder performance. The regression model output shows that budder discipline provides the highest contribution to budder performance. Budder discipline

has the highest Beta value 0.742 ( $t=3.658$ ,  $p<0.02$ ). It shows that for every 1% increase in budder discipline ( $X_1$ ), budder performance ( $Y_i$ ) will increase by 0.716 %. This study shows that budder discipline is the dominant contributing factor for a successful production and supply of Jackfruit seedlings. The results of this study will give a real picture as well as factors that can contribute in Jackfruit seedlings production therefore, Jackfruit planting area reached as targeted.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

## **KESAN KEMAHIRAN MENCANTUM DAN DISIPLIN KEPADA PRESTASI PENCANTUM DI TAPAK SEMAIAN TERPILIH**

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Industri Makanan berdasarkan 8 Bidang Hasil Utama di bawah Program Transformasi Pertanian secara tidak langsung menjadi penggerak utama untuk permintaan tinggi terhadap benih nangka. Oleh itu, Jabatan Pertanian bertanggungjawab untuk menghasilkan anak benih nangka. Dasar Agromakanan Negara (DAN) menasaskan tanaman nangka ditanam seluas 4630 ha pada 2020. Pada tahun 2019, hanya 2135 ha bertanam. Lebih kurang 257,975 anak benih nangka diperlukan untuk mencapai sasaran yang telah ditetapkan. Memandangkan pencantum berbeza dari segi kemampuan, kepakaran dan kerajinan, kajian yang lebih mendalam perlu dilakukan untuk mengatasi masalah ini. Oleh itu, objektif umum kajian ini adalah untuk menyiasat kemahiran mencantum dan disiplin pencantum dalam memastikan kejayaan cantuman anak pokok nangka. Secara khusus, kajian ini dilakukan untuk; (i) menentukan tahap kemahiran cantuman matatunas, kemahiran cantuman baji, disiplin pencantum, dan prestasi pencantum di antara tapak semaian, (ii) menilai hubungan antara kemahiran cantuman matatunas, kemahiran cantuman baji, disiplin, dan prestasi pencantum, (iii) mencari faktor sumbangan paling banyak dalam prestasi pencantum.

Soal selidik (lima bahagian) disediakan dan disusun dengan betul mengikut profil demografi diikuti oleh pemboleh ubah bebas dan bersandar. Reka bentuknya adalah untuk meneroka prosedur cantuman yang diterapkan kepada orang yang bertanggungjawab untuk mencantum nangka (pencantum) melalui lawatan ke tapak semaian nangka di Malaysia. Dalam penyelidikan ini, sampel dari semua populasi 21 responden yang telah dikenalpasti dan data yang diperolehi dari tinjauan ini dianalisis dan dipersembahkan dengan ujian statistik dan statistik yang signifikan. Menurut hasil kajian, tahap kemahiran cantuman matatunas, kemahiran cantuman baji, disiplin pencantum dan prestasi pencantum adalah sama antara semua pencantum. Kesemua pencantum mempunyai tahap kemahiran cantuman matatunas, kemahiran cantuman baji, disiplin dan prestasi yang tinggi.

Hasil dari korelasi menunjukkan bahawa disiplin pencantum mempunyai korelasi yang sangat kuat dengan prestasi pencantum. Hasil ujian regresi menunjukkan bahawa disiplin pencantum memberikan sumbangan tertinggi untuk prestasi pencantum. Nilai Beta bagi disiplin pencantum mencatatkan nilai tertinggi dengan nilai 0.742 ( $t=3.658$ ,  $p<0.02$ ). Keadaan ini menunjukkan bahawa peningkatan 1% dalam disiplin pencantum akan meningkatkan 0.742% prestasi pencantum. Kajian ini menunjukkan bahawa disiplin pencantum adalah faktor penyumbang yang dominan untuk kejayaan pengeluaran dan pembekalan benih nangka. Oleh itu, aktiviti mencantum nangka di tapak semaian haruslah memfokuskan pada pemboleh ubah ini agar dapat meningkatkan kejayaan dalam cantuman anak pokok nangka. Hasil kajian ini akan memberi gambaran sebenar serta faktor-faktor yang dapat menyumbang dalam pengeluaran benih nangka seterusnya keluasan penanaman tanaman nangka dapat dicapai seperti yang disasarkan.



## ACKNOWLEDGEMENTS

First and foremost, thanks to Allah S.W.T and my greatest gratitude to Him for giving me the chance, good health, strength and patience to complete this study.

I would like to express my heartfelt appreciation to my husband, Mohd Sauqi Bin Samsudin and my wonderful children, Furqaan, Farooq, Fateha and Fiyya for their patience and waiting for me all these long years. I am grateful for their ever-present support, unconditional love and experienced all of the ups and downs throughout completing my study. Without all of you this thesis would never be possible. Further thanks are extended to my beloved parents, Rosli Bin Md Sharif and Hasana Binti Sulaiman, my entire lovely siblings and family in law. I would also like to express my deepest appreciation to my family for their unended love, warmth and support.

I wish to express my appreciation to Prof. Adam Bin Puteh for patiently guiding me through the course of this project to its eventual end, enlighten me scientifically and resolving my many technical skills. Gratitude is also extended to my committee member Dr Salim Bin Hassan, Dr. Nur Bahiah Binti Mohamed Haris for so general sharing their technical expertise and for the many scientifically stimulating discussions. For my examiner, Prof. Abd Hair Bin Awang and Dr. Norsida Binti Man, I especially thank you for their critical remarks, valuable comments, and suggestions through suggestion of writing this master thesis.

I also would like to thank to Department of Public Service (JPA) for financing my study and for granting me to conduct this research. I also wish to thank to all staff Department of Agriculture (DoA) for their cheerful assistance and intelligent discussions. As well as my other friends who helped directly or indirectly throughout the progress of completing my master thesis. Thanks to all of you guys.

Lastly, thank you to staff of Agriculture Faculty, School of Graduate Study, library (PSAS) and University Putra Malaysia for providing me with numerous journal and other helpful data and information.



This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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## Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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## LIST OF ABBREVIATIONS

ATP	Agriculture Transformation Programmed
BH	<i>Berita Harian</i>
DAN	Dasar Agromakanan Negara
DoA	Department of Agriculture
DPN3	Third Nasional Agriculture Policies
IBM	International Business Machine
KPI	Key Performance Index
KRA	Key Result Area
MADA	Muda Agriculture Development Authority
MoA	Ministry of Agriculture
MAFI	Ministry of Agriculture and Food Industry
NAFP	National Agro-Food Policy
RBT	Research Based Theory
SPBT	<i>Sijil Pengesahan Bahan Tanaman</i>
SPSS	Software Package Statistical Analysis
TKPM	<i>Taman Kekal Pengeluaran Makanan</i>



# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

This chapter consist of sections on introduction, background of study, problem statement, research objectives, significant of the study, limitations of the study and definition of terms.

### 1.2 Fruit Industry in Malaysia

The fruit industry is one of the parts of the 3<sup>rd</sup> National Agricultural Policy (DPN3) that is focused on improving the country's economy. The main goal is to ensure that the fruits produced are of high quality, sufficient, and able to meet the country's demand for fresh fruits as well as the processing industry's demands. DPN3 also aims to develop the industry fruits depending on the sort of fruit chosen and who has international market potential.

**Table 1 : Increasing in Fruit Production**

<b>Fruits Industry in Malaysia</b>	<b>2010 (million tonnes)</b>	<b>2020 (million tonnes)</b>
Demand	2.7	3.4
Production	1.8	2.6
Export	0.83	1.24

(Source: 3rd National Agricultural Policy, DPN3)

Table 1 shows 80% increasing in fruits production from 2010 to 2020. Demand of fruits industry increase from 2.7 million n in 2010 and increase to 3.4 million tonnes in 2020. Also, the export of fruits production increased from 0.83 million tonnes in 2010 to 1.24 million tonnes in 2020. It also one of the main fruits focused on the 3<sup>rd</sup> National Agricultural Policy, DPN3. In line with increasing demand in Jackfruit, there also increasing in Jackfruit seedlings.

### 1.3 Policy Regarding Fruits Production in Malaysia

The Self-Sufficiency Level (SSL) is an important component of food security that serves as an indicator of a country's ability to meet its own food demands through domestic production. Malaysia's government has set SSL goals for essential food commodities that must be met by 2030. SSL targets must be continuously monitored and managed. In

tough circumstances, SSL works as a shield. If the supply chain is disrupted by a global crisis or a global food shortage caused by drought or climate change, the focus will usually shift to SSL, because the larger the SSL for a particular food commodity, the less it relies on international imports, reducing the impact of adverse events such as those mentioned. SSL targets can be anything.

**Table 2 : Targeted Self – Sufficiency (SSL) for fruit production by year**

Year	Self Sufficient Level (%)
2019	78.2
2025	80
2030	83

(Source: *Dasar Agromakanan Negara 2.0*)

Fruit production has recently been set a target of increasing 4.8 percent SSL from 78.2 percent in 2019 to 83 percent in 2030. Fruit productions are expected to increase by 83.0 percent between 2021 and 2030. This sub-sector will be able to attract more investment and contribute to the country's economic growth as a result of the higher export value target.

#### 1.4 Jackfruit Farming

Jackfruit is thought originated in Southwest India and been spread in ancient times through Southeast Asia, then to tropical Africa (Love, June 2011). Jackfruit (*Artocarpus heterophyllus*) was believed to have been brought into Malaysia from India in 1877. The Jackfruit was rolled into the Moraceae family. The Jackfruit area is concentrated in tropical countries between latitudes 12 ° N to 15 ° N and between longitude 95 ° T to 135 ° T. In the tropics, there are 60 genus and more than 1,000 species of trees from this family. There were 14 varieties of Jackfruit that have been registered by the Horticulture Division, Department of Agriculture (2013). The famous Jackfruit varieties are, Tekam Yellow, Subang, Hong, Mastura and Mantin (Horticulture Division, DOA, 2013).

Jackfruit is a high fiber fruit in which contain more than 70% of fruit component consists of water. It is also rich in Vitamin A, B, C, Calcium, Carbohydrate, and Iron. There are many benefits by consuming Jackfruit such as reducing blood pressure, prevent anemia, good bone, and strengthen antibodies, and more. Jackfruit is not only suitable to consume directly but it also can be processed into jam, chips, dried fruits, cake, and so on. Jackfruit is a crop that is gaining among farmers (Utusan, 2013). Thousands of value-added products can be made from Jackfruit seeds as well as ripe and half-ripe pulp (Love, June 2011).

**Table 3 : Data statistic about Jackfruit in Malaysia**

State	Jackfruit Production (Mt)
Johor	4,572.33
Kedah	1,257.55
Kelantan	954.89
Melaka	495.62
Negeri Sembilan	11,111.45
Pahang	8399.40
Perak	1996.76
Perlis	8.00
Pulau Pinang	72.49
Selangor	1,799.32
Terengganu	755.42
Sabah	2527.20
Sarawak	1643.10
Wp Labuan	30.62
Total	35624.16

(Source: Fruit Crops Statistic, 2020)

The ability of the Jackfruit to bear fruit throughout the year has triggered investors to invest in the agriculture sector. Jackfruit is one of the varieties of fruits that have been identified under the 3<sup>rd</sup> National Agriculture Policy (1992 - 2010) which has the potential to be developed to meet local demand, exports, and import substitutions. Also, Jackfruit is one of three fruit highlighted has big opportunities export to China (*Berita Harian*, 2018). Table 4 above shows Data statistic about Jackfruit in Malaysia. The main states of Jackfruit production (Mt) in Malaysia are Sabah, Johor, Pahang and Negeri Sembilan.

**Table 4 : Land used for fruit crops, 2011-2020 (Ha)**

JENIS BUAH	TAMBAHAN KAWASAN BARU (HA)	JENIS BUAH	PENGURANGAN KAWASAN (HA)
Nanas	7,120	Durian	16,960
Rambutan	5,300	Duku langsung	6,280
Nangka/ Cempedak	4,630	Dokong	5,120
Betik	1,460	Langsat	2,000
Manggis	1,190	Limau manis	430
Limau Besar	1,060		
Pisang	760		
Belimbing	470		
Ciku	440		
Jambu Batu	310		
Mangga	270		
Duku	160		
<b>JUMLAH KELUASAN</b>	<b>23,170</b>		<b>30,790</b>

(Adapted from 3<sup>rd</sup> National Agricultural Policy, DPN3)

According to Table 3, a new area of 23 thousand hectares developed and operated by the private sector to meet the demand of export market growing fruits. The fruit industry

potential expended by focusing on development of fruit variety and clone that meet the needs of global market and increasing efforts to produce high quality seeds and planting material. High demand of Jackfruit in line with the direction of the Ministry of Agriculture and Food Industry (MAFI) based on the 8 Key Result Areas (KRA) under the Agricultural Transformation Program (ATP) indirectly became the prime mover to high demand on Jackfruit seedlings.

## **1.5 Jackfruit Seedlings Production**

Jackfruit is important in India and other Asian countries like Sri Lanka, Southern China, Malaysia, and Myanmar. There is limited production in Australia, Mauritius, Brazil, Surinam, Jamaica, Mexico, Hawaii, and South Florida. Jackfruit may be propagated by seed, grafting, and cuttings. In some areas, seed propagation is still used. Jackfruit from seed may be more precocious than many other fruit, and trees may begin production in the 3rd to 4th year. Seeds should be collected from trees that have regular, high yields and that also have good horticultural characters, such as insect, disease, and nematode resistance, proper fruit size and excellent pulp quality. Seeds are relatively short lived and may be stored up to about 30 days. In South Florida, seedlings and grafted trees are used.

In Malaysia, Jackfruit production focused more in Pahang State with 1859.49 hectares (ha) of planted area followed by Negeri Sembilan and Johor with 581.55 hectares and 574.87 hectares of planted area respectively (DoA, 2019). Jackfruit seedlings becomes most important plant to produce. *Taman Kekal Pengeluaran Makanan* (TKPM) is one of the following strategies 3<sup>rd</sup> National Agricultural Policy (DPN3) to encourage the implementation of the project large-scale, commercial and high-tech farming by entrepreneurs and private sectors. Development of TKPM involve cooperation between the Government Federation, State Government and employers (Department of Agriculture). TKPM focusing on food production and specifically on fruits and vegetables. Jackfruit is one of fruit listed under this scheme. In 2013, MoA recorded roughly 4903 hectares of Jackfruit did grow and expanded the amount to just 5097 hectares in 2017 with an annual production of 28042 metric tonnes (*Perangkaan Agromakanan*, 2018). Seed sources mainly come from Department of Agriculture which Pusat Pertanian Bukit Goh, Kuantan was assigned to produce this seeds. Seedlings production still not enough to cover all the demand from farmers. Alternatively, government need some support for seedlings production from private nursery. All nurseries must meet the term and condition with certificate declaration of seedlings from Crop Quality Control Division, DoA.

## **1.6 Role of Budders in Jackfruit Grafting**

Budders are farmers that is specifically doing graft on the plant. All budders are farmers but not all farmers will become a budders. Budders need knowledge, skill, and interest. These three elements are very important and always be with budders. We can choose budders to graft but we cannot choose them to assure they are doing their job perfectly.

As human beings, we make a mistake. Particularly, the same goes for budders. No specific budder's criteria in choosing budders. Generally, all budders hired based on their academic qualification and their interest to work for the salary. Most budders fall into a senior citizen. They are more experience in doing their job. They also make their job as their personal life where they still go on a job even during weekends and holidays. Different from young budders, they have less skill in grafting, and most of the young budders not ready to do the grafting. Generally, they are not interested in involved in the agriculture sector. This situation might be different from a private nursery. Private nurseries are business oriented. So, their expertise of doing grafting is high, even though they are still young.

## 1.7 Grafting Techniques

### 1.7.1 Softwood Grafting Skill

Softwood grafting skill is a simple breeding method and widely practiced by farmers as well as those operate fruit tree nurseries. The successful of this method higher which is can reach 80% up to 90% depend on the type of tree, grafting skills and monitoring. It needs deep care on plants before, while, and after the graft. Before graft, rootstock preparation will be focused and it involves selecting the high quality of rootstock and mother plant. The mother plant is a variety needed and these three need to maintain 6 months before we take the softwood. This is to assure only the healthy gene used. Also, for rootstock, it is important to choose the healthy seed and maintain watering, fertilize, and avoid insect attacks. The types of tree that can be propagated by this method are composed of hard-stemmed fruit trees such as Jackfruits, cempedak, durian, rambutan and mango. Flow chart for softwood grafting process as shown below:



**Figure 1 : Softwood grafting process in Jackfruit seedlings**  
(Source: Pusat Pertanian Bukit Goh, Kuantan)

### 1.7.2 Wedge Grafting Skill

In wedge grafting skills, it is almost 50% budders used in all nurseries. The same goes with softwood grafting, this type also needs the attention of rootstock and mother plant. Just a little bit different on how to graft. It used shoots as softwood and need to cover with transparent plastic after grafting. After grafting, the plant will leave under shading, and grafting results will know after a month later. This type of grafting also gives a big percentage of success rate but this type of grafting rarely used in Jackfruit. This might due to reason old farmers experience that Jackfruit's tree grows with this grafting type easily to fall at the grafting point. Flow chart for wedge grafting process as shown below:



**Figure 2 : Wedge grafting process in Jackfruit seedlings**  
(Source: Pusat Pertanian Bukit Goh, Kuantan)

### 1.8 Jackfruit Nursery

Jackfruit nursery is a nursery focused on the production of Jackfruit seedlings. There is no nursery just doing the only Jackfruit. Other fruits that always come together with Jackfruit s are cempedak, durian, rambutan, and mangosteen. In Malaysia, production on Jackfruit seedlings was 12,874 in 2018 (Horticulture Division, DoA). In line with government, Jackfruit is one of the target fruit for China exportation (MoA, 2010). Grafting of Jackfruit is different from other fruits grafting. For example, in cempedak grafting, even they come from the same family, cempedak quite sticky compared to Jackfruit. Sometimes, the percentage of success rate for cempedak higher than Jackfruit. Also, the way Jackfruits are grafted was different from durian which durian need to wrap all the softwood part (much easier) while Jackfruit must unwrap bud of the softwood.



## **1.9 Skim Pengesahan Bahan Tanaman (SPBT)**

List of nurseries registered under this scheme responsibility under the Crop Quality Division. This list can be checked through the website of the Department of Agriculture (DoA). Recently, there is a total of ninety-five nurseries listing under this scheme. By referring to this listing, we can get a full detail of nursery's address, phone, and name of the nursery's owner. From SPBT, the information on the target nursery can be easily detected, even though some nursery has changed their address and need some initiatives to reach that place. As we all know, most fruit's nursery located far away from town and it is not easy to find them. Overall, by using this scheme list, it will help the researcher save their time and energy because this survey needs to answer physically between researcher and budders. On the other hand, the nursery listed under this scheme produced a high quality of seedlings and declared it.

This is important for farmers to get the nursery with declaration certificate because farmer needs the original variety compared if we buy outside with no certificate, sometimes the varieties are not as what we want. Nursery under this scheme needs to get declaration and form of declaration of production of seedlings from the Crop Quality Division. An investigation will be conducted every batch of seedlings production followed by the form. The form of declaration needed as the main condition in supplying the seedlings.

### **1.10 Problem Statement**

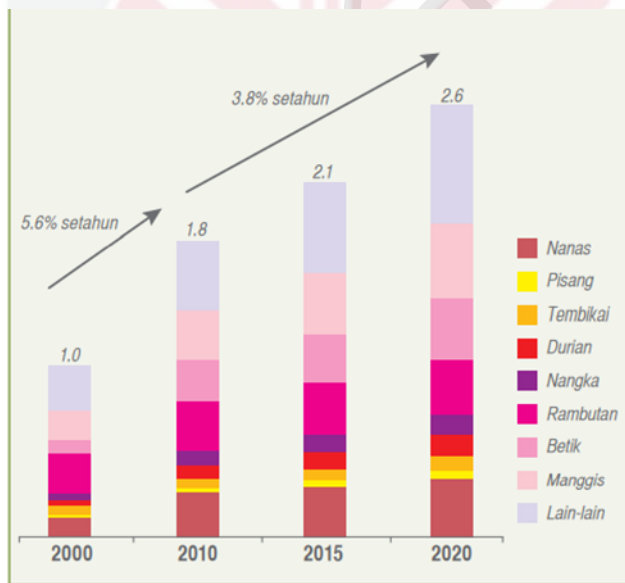
Previous research has found that many factors affected the success of production of Jackfruit seedlings. Among the main factors involved in successful Jackfruit grafting are temperature and relative humidity. It is necessary to provide congenial conditions for getting maximum graft success (Das, 2013). Veneer which is softwood grafting in Jackfruit has been recently tried with varying success (Harshavardhan et al., 2012). Other factors that can affect the success of grafting are also operation time of the grafting which is in India, the inarching method of propagation practiced in certain month of the year resulted in higher success with maximum field establishment (Gosh, 2015). The commonly used method to produce Jackfruit seedlings in Malaysia is through softwood grafting technique. Unfortunately, the success rate among the nurseries varies where the private nurseries outperformed the government nurseries.

Previous studies on the problem of the production of Jackfruit seedlings are frequently associated with the plant itself and field environments. However, no previous study has investigated the grafting procedure and the budder itself. How they applied the procedure given, frequency applied, and the extent to which honesty in performing the task. In addition, there is no quantitative analysis of the grafting procedure applied in Jackfruit seedlings in Malaysia. Until recently, there is no reliable evidence to show that grafting procedures by different budders influence the success rate of Jackfruit grafting. Since there is an increase in demand for Jackfruit's supply in Malaysia, this is the time to

highlight this study in which this study will be able to contribute to the development Government's Policies.

Considering that budders are different in terms of skill, expertise, and crafts, so a more in-depth study needs to be undertaken to address this issue at the grassroots level where the budders will be questioned on how seedlings are grafted. The major objective of this study was to investigate the grafting procedure applied and budders attitude in assuring success in Jackfruit grafting.

This study provided an important opportunity to advance the understanding to increase the percentage of success of the Jackfruit grafting as well as increasing the production of Jackfruit seedlings in Malaysia. From that perspective, this study has the potential to go further where it becomes an avenue for the researcher to explore more closely the grafting procedure as well as human factors associate with the success of grafting. These findings would be an important contribution to the Ministry of Agriculture and Food Industry generally in formulating the future focus on the crops and determining the seedlings requirement and budget in developing the Jackfruit plant industry policy in Malaysia.



**Figure 3 : Fruits production achievement 2000-2020 (million tonnes metric)**  
(Sumber: Dasar Agromakanan Negara, 2010-2020)

Demand for fresh and processed tropical fruits such as frozen, juices, functional and high-fiber foods is expected to increase which will provide an opportunity for the expansion of processing activities of tropical fruit products. Local fruit demand is



expected to increase from 2.7 million tonnes in 2010 to 3.4 million tonnes in 2020 with a growth of 2.3% per annum. Fruit production is expected to increase from 1.8 million tonnes in 2010 to 2.6 million tonnes in 2020 with an annual growth rate of 3.8% (Figure 3).

The export market of fruits especially Starfruit, Papaya, Pineapple, Watermelon, Banana And Jackfruit has the potential to expand into new markets such as China and the Middle East while increasing existing market share in Singapore, Hong Kong, Indonesia and the Netherlands. Fruit exports are expected to increase from 830 thousand metric tonnes in 2010 to 1.04 million metric tonnes in 2020. (DAN 2010-2020)

### **1.11 Objective of the Study**

The objective of this study is to investigate grafting skill and budder discipline in assuring successful in Jackfruit grafting. Specifically, the study was conducted to;

- (i) identify the level of softwood grafting skill, wedge grafting skill, budder discipline, and budder performance among nurseries,
- (ii) determine the relationship between softwood grafting skill, wedge grafting skill, discipline, and budder performance,
- (iii) Examine the most contribution factor affecting budder performance in Jackfruit seedlings in Malaysia.

### **1.12 Significant of Study**

The findings that related to the factors that influence budders performance will create awareness among budders in all nurseries that better discipline at work will contribute to successful Jackfruit seedlings production. The outcome of this study may provide solutions and alternatives to enhance budders performance and potential towards increasing Jackfruit production. Also, the administrators or nursery management team should focus more on budder discipline as it a critical factor for Jackfruit seedlings production. This research may also will give a new insight and ideas for government to serve as a platform for managing human resources as an effort to improve the level of work attitude in the organization.

### **1.13 Limitations of the Study**

There are scopes and limitation which should be taken into account and should be seen as important gap for this research. Focus of this study is to investigate the technique and management used by government and private nursery. The scope of this study is limited on grafting procedure applied by both agencies since the main problem is aspect come

from here. Another limitation is the limitation of data where it is only limited to nursery registered under *Skim Pengesahan Bahan Tanaman* (SPBT) and produced Jackfruit.

While Malaysia is towards moving rapidly to increase fruit production especially commercial fruits for export (Basic Agro Food 2011-2020). This research also in line with Ministry of Agriculture and Food Industry and Food Industry where it based on the 8 Key Results Area (KRA) under the Agriculture Transformation Program (ATP). The finding of this research is useful not only to Government worker, but it also will help others who are planning running a nursery business. Not only increase the percentage of Jackfruit production, also will supply high Jackfruit demand from abroad such as China and Australia.

Furthermore, it will help budders especially in Government agencies in improving their skill and also will help government officer as well to make a future planning on the production or planting strategies on Jackfruit in Malaysia and creating job opportunities and attracting youth to the interests of agriculture. In addition, it will also serve a future reference for researcher who are interested in studying grafting procedure, nursery management or another related field. Finally, the significant of this finding will provide valuable input to Government policies maker. There are a few scopes and limitation which should be taken into account and should be seen as important gap for research under the same theme. Focus of this study is to investigate the technique and management used by government and private nursery.

#### **1.14 Definitions of Terms**

Jackfruit - Jackfruit is referring to *nangka*.

Grafting skill - The skill of budders to join a tissue of plant to produce new or desired varieties according to a suitable environment.

Softwood Grafting Skill - Type of plant propagation (*cantuman matatunas*) to produce new variety or desired plant which cambium from mother plant (desired) combined with rootstock. This technique quite easy compared to other technique which can achieve 70-90% successful rate of grafting depends on budder skill and environment. This technique can be applied to fruit plant such as Jackfruit, Durian, Manga, Rambutan, Cempedak and more.

Wedge Grafting Skill - A grafting process (*cantuman baji*) in which shoots from mother plant (desired plant) combined with rootstock. This technique easier compare with softwood grafting which can achieve 80-99% successful rate of grafting. This technique rarely applied at nursery because of difficulties to get shoots for grafting.

Discipline - Budder behaviour (attitude) to make sure successful of Jackfruit grafting. This is a pattern of actions in which farmers want to do what needs to be done during a specific cycle of development. This is one of the unique qualities that you can build that will guarantee you greater success in production. This one standard or practice will do more to ensure that you achieve high sustainable job efficiency (Peerlings and Polman, 2009).

Performance - Achievement by budders on Jackfruit seedlings. It reflects the entire process that farmers are effectively using the leading output. These are the attitude dimensions of what people do when they are at work. (Sonntag and Frese, 2002).

### **1.15 Organization of Thesis**

In this thesis, there are five chapters, which is the content of this study starting with an introduction, literature review, research methodology, results and lastly is a conclusion. Chapter 1, is about the introduction of the study. The chapter covers the research background, problem statement, objective of the study, limitation of the study, definition of terms and finally the thesis organization. In chapter 2, previous research on a related topic was used as references to get a view of this study. The chapter started with an introduction, model used, Jackfruit grafting and both dependent and independent variables. The topic then has been summarized after the previous research on theoretical framework. Chapter three is the methodology of this study. Started with the introduction, this chapter answers the entire question about how this study was done, with the flow chart, a design used in this study, where is the location of study, the respondent selection and sampling, techniques, justification of chosen study area, questionnaire design, and explains how the data collected is analyzed. Chapter four represents the results of the study. The results obtained from the data were collected and analyzed. Last but not least was chapter five, which started with the summary of the study. Yet, the conclusion followed by limitations of the study and recommendation for future research all have been discussed in the final chapter. Finally, all the references were included after this last chapter.

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