Farmers Acceptance Towards Using Drone as Part of Mechanization for Paddy Cultivation in KADA Kelantan Granary Areas

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DECLARATION

I hereby declare that the work embodied in this report is the result of the original research except the excerpts and summaries that I have made clear of the sources.

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ABSTRACT

Drone technology for agriculture application is becoming a major trend for application among farmers and is one of the key technologies for agricultural industrial revolution 4.0 (IR4.0). Drone technology can help the yield of farmers and the productivity of a country. Many drone technology mechanizations are already being introduced to the farmer, especially the fertilizer and crop protection chemical spraying in Kemubu Agricultural Development Authority (KADA). However, spraying activities using the traditional method in a paddy field are regarded as the riskiest operations for operators since they are exposed and must deal with toxic chemicals and regularly expose them for an extended amount of time. Although the phenomenon of drone technology acceptance has been well appreciated, the increasing characteristics phenomenon of technology rejection is yet to be understood and studied. These research objectives are to identify farmers acceptance towards using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas. A structured questionnaire was designed based on combinations of the Knowledge, Attitude, Practice (KAP) model in this study. A purposive sampling technique was adopted, and 82 farmers in KADA was involved in this study to answer the questionnaire. The data collected were entered and analysed using SPSS version 26.0. The analysis used was Descriptive statistics, Spearman's Correlation and Reliability test. The independent variables in this study are knowledge, attitude, and practice, while the dependent variable is farmers acceptance towards using drones as part of mechanisation for paddy cultivation in KADA Kelantan granary areas. This study indicates that farmers in KADA accept the drone technology but slow adopt and apply it as the correlations are significant but negligible. As for the relationship of Knowledge, Attitude, and Practice towards the Acceptance of drone mechanization, all variables are significant at a level of 0.253, 0.866 and 0.69 respectively. This study will be necessary for researchers and farmers to understand the factors of drone technology acceptance in order to help produce paddy yield and improve Malaysia food security.

Keywords: Drone, Paddy, Acceptance, KAP Model, KADA

Penerimaan Petani Terhadap Penggunaan Drone Sebagai Sebahagian Daripada Mekanisasi Penanaman Padi Di Kawasan Jelapang Kada Kelantan

ABSTRAK

Teknologi dron sebagai aplikasi pertanian menjadi trend utama sebagai aplikasi dalam kalangan petani dan merupakan salah satu teknologi utama untuk revolusi industri pertanian 4.0 (IR4.0). Teknologi dron boleh membantu hasil petani dan produktiviti sesebuah negara. Banyak mekanisasi teknologi dron telah pun diperkenalkan kepada petani terutamanya penyemburan kimia baja dan perlindungan tanaman di Lembaga Kemajuan Pertanian Kemubu (KADA). Walau bagaimanapun, aktiviti penyemburan menggunakan kaedah tradisional di sawah padi dianggap sebagai operasi paling berisiko untuk pengusaha kerana terdedah dan mesti menangani bahan kimia toksik dan kerap mendedahkannya untuk jangka masa yang panjang. Walaupun fenomena penerimaan teknologi dron telah dihargai dengan baik, fenomena penolakan teknologi yang semakin meningkat masih belum difahami dan dikaji. Objektif kajian ini adalah untuk mengenal pasti penerimaan petani terhadap penggunaan dron sebagai sebahagian daripada mekanisasi bagi penanaman padi di kawasan jelapang KADA, Kelantan. Soal selidik berstruktur telah direka bentuk berdasarkan gabungan model Pengetahuan, Sikap, Amalan (KAP) dalam kajian ini. Teknik persampelan bertujuan telah diguna pakai, dan 82 petani di KADA terlibat dalam kajian ini untuk menjawab soal selidik. Data yang dikumpul telah dimasukkan dan dianalisis menggunakan SPSS versi 26.0. Analisis yang digunakan ialah statistik deskriptif, ujian Korelasi dan Kebolehpercayaan Spearman. Pembolehubah tidak bersandar dalam kajian ini ialah pengetahuan, sikap dan amalan, manakala pembolehubah bersandar ialah penerimaan petani terhadap penggunaan dron sebagai sebahagian daripada mekanisasi penanaman padi di kawasan jelapang KADA Kelantan. Kajian ini menunjukkan bahawa petani di KADA menerima teknologi dron tetapi perlahan menerima dan mengaplikasikannya kerana korelasinya adalah ketara tetapi boleh diabaikan. Bagi hubungan Pengetahuan, Sikap, dan Amalan terhadap Penerimaan mekanisasi dron, semua pembolehubah adalah signifikan masing-masing pada tahap 0.253, 0.866 dan 0.69. Kajian ini perlu bagi penyelidik dan petani untuk memahami faktor-faktor penerimaan teknologi dron bagi membantu menghasilkan hasil padi dan meningkatkan keselamatan makanan Malaysia.

Kata kunci: Dron, Padi, Penerimaan, Model KAP, KADA

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LIST OF ABBREVIATIONS AND SYMBOLS

GPS	Global Positioning System
ha	Hectare
IoT	Internet of Things
IR4.0	Fourth Industrial Revolution
KADA	Kemubu Agriculture Development Authority
KAP	Knowledge, Attitude, Practice
L	Litres
LM	Ladang Merdeka
M	Mean
mL	Milliliters
MADA	Muda Agricultural Development Authority
MAFI	Ministry of Agriculture and Food Industry
PKPNK	Perbadanan Kemajuan Pertanian Negeri Kelantan
SBPKP	Skim Baja Padi Kerajaan Persekutuan
SD	Standard Deviation
SIPP	Sistem Intensif Pengeluaran Padi
SSL	Self-Sufficiency Ratio
SMART SBB	Large Scale Smart Paddy Field Project
UAV	Unmanned Aerial Vehicle
ULV	Ultra-Low Volume
&	And
%	Percentage
r_s	Spearman Correlation Coefficient

CHAPTER 1

INTRODUCTION

1.0 Introduction

In this study, chapter one consists of background research, problem statement, hypothesis, research question, objective, the scope of the study, significance of study and organization of the study. This study focuses on the background on the farmer's acceptance towards using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.

1.1 Background Research

Agriculture and food production and distribution will be critical businesses by 2050 (Rosnani et al., 2016). Global food shortages are becoming more of a problem every year as the global population grows. Malaysia has made significant investments in these businesses because of the government's priority on the country's paddy and rice sectors for food security and sector preservation,

The government's economic transformation programme to transform the country into a high-income economy in 2020 has introduced and applied modern agricultural technologies in the paddy and rice industries to help them grow while increasing stakeholders' income in each paddy production value chain.

Farmers are the main part of the paddy chain. According to Rosnani et al. (2016), to ensure a long-term rice supply for the people, each link in the paddy sector has to play their role. Assessing the level of technology adoption to boost revenue, quality, and profitability to a more efficient level is crucial as a benchmark—for example, the use of drone technology as mechanisation in paddy granary areas.

In Malaysia, drone’s technology is being used in many ways. Agriculture is expanding at a rapid pace, particularly among young farmers. Due to its advantages, drone technology is predicted to be able to increase crop yields and revenue (Schmeitz, 2020). Drones can be utilised for various tasks, including watering crops, sowing seedlings, spraying both fertilizer and crop protection chemicals, assessing area capacity, and monitoring coastal weather conditions. This involves using drones to spray both fertilizer

and crop protection chemicals and Ultra-Low Volume (ULV) technology, which sprays a fine mist of liquid absorption into the paddy crop.

Drone technology users and operators, on the other hand, must be well-versed in their respective fields of expertise. IR4.0, also known as the Fourth Industrial Revolution, is adopted by Malaysian paddy farmers to produce better and higher-quality paddy (Su, Yahya, Mazlan, & Hamdani, 2016). It has even become a new standard for what it means to be a modern farmer.

Application of drone technology to spray fertilizer and crop protection chemicals on paddy fields is becoming increasingly popular among Malaysian farmers. The application drone technology in paddy farming is growing increasingly popular among Kelantan farmers in Kota Bharu, Bachok, Pasir Puteh, Pasir Mas, and Tumpat.

1.2 Problem Statements

Commonly, knapsack sprayers with a hand-operated pump and a nozzle are often being used to apply to spray crop protection chemicals. Knapsack sprayers come in two basic varieties: lever-operated and compression (Van der Meijden, 1998; Haula & Kruglikov, 2019). Spraying operations in a paddy field are considered the riskiest operations since the operator must deal with harmful chemicals and be exposed to them for an extended period of time regularly (Suhaizi, Azmi, Norida, & Saiful, 2018). As a dangerous chemical, pesticides have the potential to harmful pests and diseases as well as humans and other living creatures that come into contact with them. Spraying a large

farm with a knapsack requires a significant workforce, making it prohibitively expensive. Pesticide spraying consumes substantial valuable time (Rahman, Tarek, Dar & Hiekel, 2014; Haula & Kruglikov, 2019).

To present a systematic overview of the primary issue, farmers must continue to innovate in order to increase and preserve productivity. Farmers may take advantage of growth prospects and solve these problems by utilising advanced mechanization and digital technologies, which have significant potential to give them all of the information they need. Therefore, farmers are turning to agricultural drone technology to help them deal with these issues (Lee, Phang & Mun, 2021). Agricultural drones have come out with have a great deal of capabilities, which leads to an idea for how to solve the problems above (Haula & Kruglikov, 2019). Drone technology is said to uplift the agriculture sector to satisfy future demand and resolve humanity's food dilemma. Additionally, the drone is an efficient technique of conducting such operations, saving operation time by at least one-third compared to conventional methods. The drone is among the many technologies involved in Precision Farming.

The alternative strategy of this precision farming is environmentally friendly and has high economic potential. However, farmers' knowledge, attitude, and practice (KAP) regarding drone technology acceptance are merely assessed. Abdullah and Samah (2013) reveal that farmers' attitudes, education, knowledge, and physical state or practice all influence their acceptance of new technology. As a result, this study will identify the relationship of knowledge, attitude, and practice towards farmers' acceptance of drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.

1.3 Hypothesis of the Study

H_0: There is no significant value between the relationship of knowledge, attitude and practice towards farmers' acceptance using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.

H_1: There is a significant value between the relationship of knowledge, attitude and practice towards farmers' acceptance using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.

1.4 Research Question

1. How far is the acceptance level of drones used as part of mechanisation for paddy cultivation among farmers?
2. Based on farmer acceptance, what are the significant relationships of knowledge, attitude, and practice level among the farmers on the drone used as part of mechanisation for paddy cultivation?

1.5 Objective of Study

1. To determine the level of farmers' acceptance towards using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.
2. To identify the level of knowledge, attitude and practice towards farmers' acceptance towards the use of drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.
3. To study the relationship between knowledge, attitude and practices in relation to farmers acceptance towards using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.

1.6 Scope of Study

This study was be conducted in the Malaysian state of Kelantan. The drone acceptance in paddy granary areas was be studied in many KADA locations, and data will be collected in these areas. There was a total of 82 people took part in this investigation. This study looks into the level of knowledge and level acceptance of farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas. Next, the Knowledge, Attitude and Practice (KAP) Model was used as independent and dependent variables. The independent variables for this study are knowledge, attitude and

practice control while acceptance of the farmers in using drones as mechanisation for paddy cultivation in KADA Kelantan granary areas as dependent variables.

1.7 Significance of Study

The results of this study have a positive impact on paddy farmers and drone service technopreneur. Firstly, consumers; farmers can be more alert to drone mechanisation used in paddy granary areas before booking the services. Next, able to attract young people to be involved in drone spraying mechanisation services and engage more paddy farmers to use this method. Nowadays, the demand for drone mechanisation in paddy areas has increased globally, especially for both fertilizer and crop protection chemicals spraying that is more affordable and faster as drones are being utilised in precision agriculture to increase crop production monitor and improve efficiency crop growth (Su, Yahya, Mazlan, & Hamdani, 2018). The importance of this study is that the institution related to agriculture can educate and implement smart farming for the future agricultural specialist to be aware of this new way of doing agriculture.

This study will help increase farmers' acceptance of drones in precision agriculture, focusing on drones' knowledge, attitude, and practice. This research also learns why farmers prefer to use drones in farming instead of doing it manually, as they had performed manually for the spraying process before the drone was introduced.

1.8 Limitation of Study

Study findings revealed several limitations. In the first place, only farmers in the Kelantan area were included in the study's sample. Because this research was conducted in four districts in the same state, the data collected are only based on the same demographic groupings. Due to the short amount of time for the study, the sample size is limited. As a result, caution should be exercised when applying the findings to a larger population across the country.

Then the time frame for conducting the study was insufficient to complete the KADA area's targeted respondents in three weeks. Furthermore, the costs of transportation and printing are prohibitively expensive for students whose studies are entirely self-funded.

Lastly, responses from people with various backgrounds may tend to be biased. Some of the responders may take the honesty of the survey participants for granted, which may lead to bias in this study.

1.9 Organization of Study

Chapter 1: This chapter introduces the research background of the study, problem statements, research question, objectives, hypothesis, the scope of study and significance of the study.

Chapter 2: This chapter presents the literature review from the previous study regarding on acceptance of farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas. Besides, this chapter provides related information based on an understanding of this study.

Chapter 3: This chapter explains the theoretical framework and methodology method covering sampling techniques, research design, and data analysis.

Chapter 4: This chapter presents the findings from the data analysis, which cover the analysis from acceptance of farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas, statistical test and summary.

Chapter 5: This chapter focuses more on summarising the study's results, implementation and contribution, conclusion, and recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

The level of independent variable; Knowledge, Attitude, Practice, is one of three goals that have been established for this study. The focus of this study is to determine the level of knowledge, attitude, practice level and acceptance level among farmers toward using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas. For the sake of achieving the objectives of this study, past work has been evaluated and analysed in relation to the linked studies, the construction of a theoretical and conceptual framework, and methodological consideration.

2.1 Paddy in Malaysia

Malaysia has always been a relatively small paddy producer relative to its Southeast Asian neighbours. The government has focused on developing the agricultural sector from the past to the present to ensure food security, especially for paddy as the staple food. Malaysia's capability for staple food production must be strengthened in light of concerns about food security (Aris et al., 2018). All of these difficulties necessitate the development of new strategic methods and policies to enhance agriculture's growth and contribution to the national economy. The list of subsidies and other supports to paddy and rice shows how extensive the government's support has been (Kasim et al., 2018).

2.1.1 Paddy Cultivation Productivity

In Malaysia, paddy and rice policies are designed to achieve three goals: promoting fair farmers' incomes, ensuring market stability and providing consumer safety. As a result, Malaysia's consciousness policy has focused on rice and paddy production, its most important staple food and food crop. Malaysia continues to take constructive and progressive steps to support paddy and rice sector production in the Eleventh Malaysian Plan (2016–2020) and National Agro-Food Policy (2011–2020). The 2020 Budget also has focuses on the paddy cultivation sector, with RM855 million allocated for that purpose, including RM796 million for the Skim Baja Padi Kerajaan

Persekutuan (SBPKP) and the Sistem Intensif Pengeluaran Padi (SIPP). Nevertheless, the impacts of the covid-19 pandemic are however expected to intensify challenges in terms of rising paddy yields and potential food security (Firdaus, Tan, Rahmat, & Gunaratne, 2020).

Based on the Department of Statistics Malaysia (2020), the value of rice imports in 2019, was RM1,874.9 million, an increase of 14.5 per cent compared to RM1,637.0 million in 2018. Rice imports reached 969.4 thousand metric tons in 2019. Rice imports recorded the highest value in 2008 (RM2,712.0 million) and 2016 (RM2,828.4 million). For the period of January to April 2020, the main source of rice imports was Vietnam, with an import value reaching RM358.8 million (46.8%), followed by India (RM110.9 million, 14.4%) and Pakistan (RM102.4 million, 13.3%). The average rice price for January to April 2020 recorded an increase of 3.0 per cent of RM1,944 per ton compared to RM1,887 per ton for the same period last year.

Malaysia currently has a rice self-sufficiency ratio (SSL) of approximately 75%, imported from other countries. Malaysia's government has set a goal of producing 100% rice SSL to meet the country's rising population demand (Rahim, Hawari & Abidin, 2017). Rice production in Malaysia is extremely necessary to supply primary food to people based on increasing demand and population. It contributes to the social level, it also profits economically through the provision of employment and opportunities for farmers. In order to balance the social and economic sectors, it is necessary to sustain rice production. It is therefore imperative to maintain sustainable rice production in the region.

2.1.2 Precision Farming

An agricultural production method based on information and technology to identify, analyse, and manage variables like temporal and spatial variability in the field in order to maximise profit, sustainability and environmental protection is known as precision agriculture or precision farming (Smith, 2017).

In order to satisfy future demands, drone technology can help modernise the agriculture economy. Many drone applications have been developed, including military operations, search and rescue operations, traffic monitoring operations, agricultural monitoring and crop monitoring. For Precision Farming to be effective in the agriculture sector, drone technology is usually a good fit for the situation (Stehr, 2015). It serves as a perfect aerial platform for gathering the needed data. Crop yields and revenues are expected to rise as a result of drone technology application, which, it is said, will minimise the number of inputs required for cultivation, including soil, water, fertilisers, herbicides, and herbicides. Drones can assist farmers in ensuring that the proper farming techniques are being used and assisting them in making informed judgments about their crops (Ahmad Termizi, 2015).

In today's world, drone technology provides real-time data. It allows the agriculture business to execute different duties and improve various farming operations, such as crop health assessment, crop monitoring, crop spraying, and planting, by completely overhauling the entire industry (Ayaz et al., 2019).

2.1.3 Drone Application in Malaysia Agriculture

Malaysia is on its way to becoming a sophisticated country. Agriculture has served as a catalyst towards accomplishing this goal (Azman et al., 2013). The government has made a lot of efforts; still, it is constantly looking for new methods to be innovative and utilise new technologies in order to increase agricultural productivity and revenue for the country.

In Malaysia, drone technology is fast-growing, especially among young farmers. The increasing popularity of this drone technology in agriculture intrigues farmers and agriculture entrepreneurs (Ahmad Termizi, 2015). It is gaining a place in the hearts of farmers in this country. Drones may now be used to water crops, sow seedlings, spray pesticides, evaluate area capacity, study ocean water conditions, and monitor coastal weather conditions, among other things.

The Ministry of Agriculture and Food Industry (MAFI) has taken this transformation seriously. The Ministry of Economic Affairs has stated that the government will continually expand innovation. New technologies strengthen and increase the agricultural sector's productivity, thereby increasing income and the economy (Business Today Editorial, 2021).

Users and operators of drone technology, on the other hand, must be well-versed in their craft. Thanks to the results of the data collected, farmers can utilise this information to determine which agricultural practices will be used in their gardens or farms (Unpaprom, Ramaraj, & Dussadeeb, 2018). An infrared camera lets drones see ten

days before the naked eye can see them. Early detection of fungi and bacteria in the plants is possible with the help of the camera on the drone.

Spraying pesticides with drones and the Ultra-Low Volume (ULV) technology, a thin mist spraying, increases liquid absorption into the paddy crop (Kharim et al., 2019). Drone fan pressure provides a downward wind flow, which opens the paddy plant once spraying is finished, allowing chemicals to enter the plant base (Ayaz et al., 2019). This will result in increased crop yields while also saving farmers time. Additionally, this can help minimise reliance on foreign employees thus increasing employment prospects for young people.

Furthermore, agricultural drones can be used for a variety of plant-growing jobs, including creating electronic maps of fields, monitoring crop conditions, predicting crop yields, assessing the quality of ploughing, and maintaining environmental monitoring on agricultural land (Unpaprom, Ramaraj, & Dussadeeb, 2018). As a result, drones play an increasingly significant role in modern farming and agriculture.

2.1.4 Modern Paddy Farmers

The paddy farmers in Malaysia are moving forward in adapting the Industrial Revolution 4.0 or better known by the term IR4.0 to have a better and high quality of paddy production, even become a new norm as a good farmer. Among the other things found was the early adoption of Internet of Things (IoT) applications in the agricultural industry like the agricultural drone (Stehr, 2015). A primary goal of the current

government's agricultural policy is to produce more efficient modern farmers who do not rely on outdated technology techniques like hoeing and buffaloing.

In the meantime, the modern farmers' contemporary farmers are designed to connect agricultural workers and the latest technologies, such as drones, IoT, marketing, and quality. As a result, harvest quality and quantity will be several times greater than before the new approach was implemented. The term "modern farmer" is a way to include fishermen, breeders, and farmers using technology devices like drones (Ahmad Termizi, 2015).

The use of drones can lower the amount of labour and the amount of resources needed. Farmers can also use drones to get aerial photos of their land (Kharim et al., 2019). In the modern era of farming, agricultural drones provide enough assistance. This is because farmers will not know for sure until the end of the season whether or not the weather has harmed their crops. According to Wachenheim, Fan, & Zheng (2021), farmers who stick with the old system risk suffering double losses, increasing the virus's ability to spread to other crops. Another benefit of using drones in agriculture is saving time and energy and improving crop yields.

2.1.5 Kemubu Agriculture Development Authority

There are nine in the Ministry of Agriculture and Agro-based Industry and twelve in the Ministry of Primary Industries. The number of these players demonstrates the breadth of the government's involvement. From the World Bank Group (2019), research,

extension, production support, and marketing are just a few institutions that fall within the Ministry of Agriculture and Agro-based Industry's purview. Muda Agricultural Development Authority (MADA) and Kemubu Agricultural Development Authority (KADA) are in charge of these two granary lands.

More than half of the 82,900 hectares in the KADA area were mixed orchards, including rubber estates and water resources; paddy land accounted for the other 37,670 hectares. Hence, pesticides and liquid fertilisers are sprayed on paddy fields using drone technology, which is becoming increasingly popular in Kelantan and inspiring young people to pursue careers in agriculture and technopreneurship (Bernama, 2021). Now, farmers in Kota Bharu, Tumpat, Pasir Mas, Bachok, and Pasir Puteh are increasingly using drones for spraying of both fertilizer and crop protection chemicals on their paddy fields.

2.1.6 Large Scale Smart Paddy Field Project (SBB)

The Ministry of Agriculture and Food Industries has launched a large-scale smart paddy field project (SMART SBB) through the Kemubu Agricultural Development Authority (KADA).

The SMART SBB programme is one of the government's programmes to combine paddy land through contract farming or rental under one management, optimise resource utilisation, and increase the efficiency of cultivation activities and post-harvest production (Hazrol Zainal, 2021). The SMART SBB plan will contribute 75% toward

achieving the National Rice Self Sufficient Level (SSL) target set under the Twelfth Malaysia Plan (12MP) (Business Today Editorial, 2021).

The SBB SMART Program focuses attention on applying sophisticated technology or the Internet of Things (IoT) in paddy cultivation in accordance with the development of the Industrial Revolution 4.0 (IR4.0). Drones can be used to monitor and spray agricultural inputs like pesticides and fertilisers more efficiently. Paddy production can be made more profitable while also lowering the cost of production thanks to the use of cutting-edge technology. MAFI and all leading companies have agreed on a paddy cultivation cost of RM3,200 per hectare. Additional costs associated with this farming system include the usage of bio-fertilizers and mechanised machinery, drone pesticides, and online crop monitoring.

According to the Bernama report (2021), Nik Roslan Idris, general manager of KADA, indicated that the pilot project might boost paddy production enough to support the Self-Sufficiency Level (SSL) percentage objective of up to 75%. He stated that it will be implemented in the Ladang Merdeka (LM) Jelor and LM Meranti for six paddy planting seasons, commencing in 2/2021 and ending in 1/2024. One hundred fifty-nine farmers work LM Jelor's 38.52 hectares, averaging 4.66 tonnes of produce per hectare in the 2020 External Season. Meanwhile, LM Meranti covers 35.67 hectares and involves 134 landowners, yielding an average of 6.60 tonnes/hectare during the 2020 External Season.

KADA had also uncovered a 100-hectare idle paddy field in Mukim Bunut Susu, Pasir Mas. The site owned by the Perbadanan Kemajuan Pertanian Negeri Kelantan (PKPNK) was allocated for the project as part of the SMART SBB initiative. A total of

RM8.3 million is required to construct the land's infrastructure, including drainage and other utilities.

2.1.7 Smart Drone Farming

An unmanned aerial vehicle (UAV) or as known as a drone equipped with a camera, several sensors, and the ability to transport pesticides will perform better in pesticide spraying and field monitoring and therefore minimise labour expenses. In agriculture, drones can be used for various purposes, including surveillance, data collecting (Wi-Fi, 5G and RFID), path planning and navigation, pollution estimation and traffic monitoring, and emergency response (Manda & Kumar, 2021).

Not only vastness, but in some pesticide and fertiliser applications, drones must be able to carry large amounts of weight. According to Ayaz et al. (2019), optimal battery utilisation is essential in these conditions to lengthen the flight duration. Many things can be studied in order to maximise the efficiency of drones for this purpose.

The correct weather and air direction are important considerations when flying. The next step is to ensure that the payload is placed in the best possible location. In this case, attaching the payload close to the field and replenishing it instead of putting large volumes can be beneficial (Kharim et al., 2019). Furthermore, depending on the size of the area and the frequency of visits, the best path to take is crucial to success.

The efficiency with which a drone is used can be explained in terms of production efficiency. First and foremost, drone use can cut production losses by 10-15 per cent

(Sakata, 2020). Because the pesticides are being sprayed using labour, the labourers will wander through the field and harm the crops. On the other hand, using a drone does not result in the destruction of the crop.

Second, a drone can cut the amount of water required for chemical mixing by a tenth of a per cent. The amount of water required for every 2 litres (L) of chemical to be sprayed by manual labour is 20L. Using drones, on the other hand, the water use is 2L per 2L of chemicals and can have a maximum capacity from 10L to 20L. Additionally, the usage of a drone can help limit the amount of chemicals used. The water is sprayed with 100ml of the chemical, which is done by hand. When a drone is used, 60 millilitres (ml) of this chemical are dispensed (Sakata, 2020).

Additionally, drones avoid spraying the same chemical on the same area since a precise GPS signal guides them. Furthermore, because the labour does not have to come into touch with the chemicals, using a drone can save time while also being more comfortable and safer (Sakata, 2020). Further, because a drone can spray the pesticides evenly throughout a field, the quality of the paddy increases as a result of this method of increasing efficacy.

2.2 Theoretical Framework

2.2.1 Knowledge, Attitude and Practice Model

Knowledge, Attitudes and Practice (KAP) survey model is the theoretical framework employed in this study. For a specific demographic, a KAP survey gathers evidence on what is known, believed, and practiced for a specific topic (WHO, 2008). In the 1950s, family planning and population studies began using the KAP survey method. According to the KAP survey protocol, diverse demographics were asked to rate the extent to which they were hostile to the concept and implementation of family planning. Evidence of knowledge, attitudes, and practices in family planning that can be used for programme objectives around the world is also provided by KAP (Madi,2021). Among the things that make KAP surveys so appealing are that they are easy to use and interpret, generalise to a larger population, can be used across cultures, can be done quickly, and it's easy to train people to be number one numerator (Launiala, 2009). Figure 2.1 shows the KAP theoretical framework design.

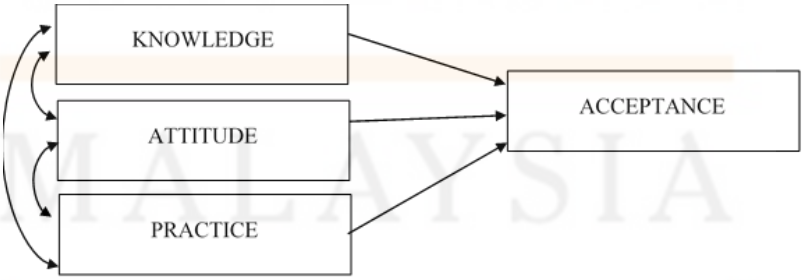

Figure 2.1: KAP Survey Model (Launiala, 2009)

2.3 Knowledge of farmers toward using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas

The word "knowledge" can be used to refer to a theoretical or practical understanding of a subject. This is very important in this difficult time. In some cases, it might be implicit (as in the case of practical competence or expertise). In other cases, it can be explicit (as in the case of knowledge or expertise in a specific field) (as with the theoretical understanding). As a result, it encompasses a variety of abilities such as the ability to learn and remember new information and the ability to apply knowledge and skills learned in other contexts (Bano, AlShammari, Fatima, & Al-Shammari, 2013). Carreón, René, Niels, & Rob (2011) said that knowledge could be one of the things that could hurt sustainability.

Farmers can be characterized as human information processing systems in and of themselves. Knowledge processes can be thought of as the process farmers have gone through to understand the information they have been given. Farmers can learn how to adopt effective agricultural techniques when they understand the subject. They will be unable to act unless they have sufficient knowledge. Extension officers are essential in disseminating information to farmers to give them knowledge; mass media is also required in this regard (Maddikunta et al., 2020).

In terms of knowledge, numerous farmers know that the knapsack was more affordable and readily available; its associated demerits encouraged farmers to consider other options. Farmers should be a person that knows about drone mechanisation,

especially in terms of application and how the effect of the service on their field. Production losses can be reduced by 15% to 20% when a drone is used in the production process. It can cut the amount of water used for chemical mixing by ten times and cut the amount of chemicals used by 40% (Sakata, 2020).

2.4 Attitude of farmers toward using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas

The positive or negative evaluation of an individual performing a specific behaviour is the definition of attitude towards a behaviour (Kim, Chun & Song, 2009). The adoption and continuous use of technology depend on the user; a more assertive favourable attitude towards technology would equal a higher chance of adopting it. A person who weakly holds a favourable attitude would be less likely to adopt the said technology (Kim, Chun & Song, 2009). Studies from different researchers such as Yang & Yoo (2004), he argues that attitude can be used to improve users' acceptance of new technology as it is a malleable factor that can be influenced through motivations, capability, experiences and education. A person's attitude directly impacts how beneficial and straightforward something is considered, which influences their behavioural intentions (Kim, Chun & Song, 2009).

The cost of paying is higher than the cost of using farm labour and the attitude. There is also a problem with the quantity of service providers, resulting in a long wait time, which is problematic for farmers (Sakata, 2020). As a result, when many drone

service providers can provide fast and quality service, the farmer will not hesitate to choose the drones for field operation and utilize drones. This attitude should be observed and looked up according to the farmer action to choose that is much related to the cost and benefits for their field operation.

2.5 Practice of farmers toward using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas

Practised is a term that refers to the act of possessing or displaying mastery of a particular ability. However, no less skilful composer, the effect was obtained by expert polishing. In this context, action is triggered by the application of rules and knowledge associated with them. Good practice is an art form that has been related to the development of new understandings and technological capabilities (Madi, 2020). A farmer's decision to employ a drone is influenced by the fact that a drone is a new technology, and they have seen successful outcomes from their colleagues. On the other hand, some farmers have never used a drone because they are sceptical of its effectiveness (Sakata, 2020).

Next, in terms of practices, when compared to knapsack spraying, farmers have found that drone technology has a greater impact on pest and disease control. In their opinion, drones were effective, easy, and efficient since they could administer pesticides accurately to kill the insect quickly, with little or no chemical waste, and with little or no chemical wastage (Annor-Frempong & Akaba, 2020). Suppose the proper education or

training to provide all significant information regarding the use of drone technology are in place for farmer. In that case, the advantages of the drone usage are much likely to result in high rates of technological adoption for this new technology.

2.6 Level acceptance of farmers toward using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas

The acceptance of drone uses as mechanisation for paddy cultivation in KADA Kelantan is still low. Getting involved in a new agricultural technology revolution, most farmers face financial and knowledge problems to practice drone mechanisation in their field.

Whatever the case, drone technology in the agricultural industry is becoming increasingly popular and is gaining acceptance among modern agricultural producers (Haula, & Kruglikov, 2019). This technique is critical for achieving one of the national development goals: to improve the income status of farmers, fishers, ranchers, and other Agri-entrepreneurs by ensuring sustainable agricultural economic growth.

A report by Maddikunta et al, (2020), the farmers expect a lot of acreages to be covered by drones, although their fly times range from a few minutes to an hour. Flights are also restricted to a particular distance per flight duration. Second, because they fly in the same airspace as any other humanly flown aircraft, agricultural drones are more likely to be mistaken for them. If an occurrence like this were to occur, the financial losses would be huge. On the other hand, traditional farmers are wary of adapting to new

technologies. Lastly, the images taken by drones need to be analysed by experts in order to yield useful information. Even after being trained, the common farmer may still be reluctant due to the post analytic process's complexity, which makes the farmer intimidated due to their lack of knowledge and complexity of the process.

In order to change from existing farming practises to a new one supported by new technology, a culture of adaptation and modifications in the current infrastructure that supports the old practises are required (Schmeitz, 2020). This is a gap that still remains among farmers, and particularly among those who sell their products to the public.

2.7 The relationship of knowledge, attitude and practice with farmers acceptance toward using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas

As a new agricultural service sector, several entrepreneurs currently offer drone technology services as it is to employ technological innovation to produce competitive professional farmers (Chuang, Wang & Liang, 2020). There are many benefits of drone technology, and one of them is it possible to acquire images of crops and count crops, and fresh crop emergence can be detected using aerial image acquisition through drone technology. Using a crop analytics technique, one may determine the number of seeds that have germinated and so on in locations that are difficult to access with the human eye. This data is beneficial in assessing whether or not the seeds should be re-planted. Drones also can be used to spray insecticides, reducing exposure to dangerous chemicals,

pesticides, and fertilisers for humans. It is also possible to use drones to determine how much spraying material is needed and how evenly it is applied to the crop.

Farmers' knowledge, attitudes, practice and financial, social, and educational support are important. In order to precision farming to remain viable, there must be constant support for agricultural practices. Agriculture technology is not available to all farmers; hence, the government's responsibility in encouraging farmers to adopt technology methods must be highlighted by competent agencies (Azman et al., 2013). Proper financial assistance for precision farming is one of the government's responsibilities. Further, for farmers to embrace new ideas and technologies, the system must be practical, simple to use, and economical (Chuang, Wang, & Liang, 2020).

2.8 Chapter Summary

This chapter discussed by the previous researcher about farmers toward using drones as part of mechanisation for paddy cultivation. The first section in this chapter shows some previous studies about drone applications. The second section was about the theoretical framework where it helps to analyse the result for this study. The KAP model was used in this thesis. Knowledge, attitude, and practice influence farmers toward using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas. The third section was indicated the relationship of knowledge, attitude, and practice toward farmers toward using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.

CHAPTER 3

METHODOLOGY

3.0 Introduction

This chapter discusses the approach utilised to achieve the study's objectives, as well as some important background information and the method used to analyse the data collected. The location of the study, the source of the data, the questionnaire, and the method used to analyse the data will all be covered in this chapter. There are three sections in this chapter where; the first section describes the conceptual framework used for this study. Then, the second section will explain the data and questionnaires used to distribute to farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas. Next, the third section explained the analysis used to achieve the objectives of descriptive analysis, reliability test, and Spearman correlation analysis.

3.1 Conceptual Framework

In order to gather the information from the respondent, the quantitative research design was used. The research framework was prepared to identify farmers' acceptance of using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas. The independent and dependent variables employed in this study are depicted in the figure. Knowledge, Attitude, and Practice are the independent variables that have been included in this study. Regarding the dependent variable, that would be the amount of level acceptance among farmers towards using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.

The questionnaire was created based on the respondents' knowledge of perception and quality, as well as their attitude toward acceptance and the practises of the farmers, among other things. According to the dependent variable, it was possible to identify consumer preference for acceptance of drone use in certain situations. Based on the independent variable, the demographic factor was utilised as an intermediary variable to examine the link between the dependent and independent variables.

The data collection process was done in the Malaysian state of Kelantan. Overall, the data gathering process took one month (it began on November 9th, 2021 and ended on December 9th, 2021) to complete. The respondents were chosen through the use of a straightforward random sampling process. The participants in this study totalled 82 farmers who answered the survey questions. An officer from the Kemubu Agriculture Development Authority was brought in to help speed up the data collection procedure.

The data collection method was carried out by specially trained enumerators, and the average time required to complete the questionnaire was 20-30 minutes on average. Data were analysed using SPSS 26.0 to perform data entry and analysis about the demographic profile, independent and dependent variables.

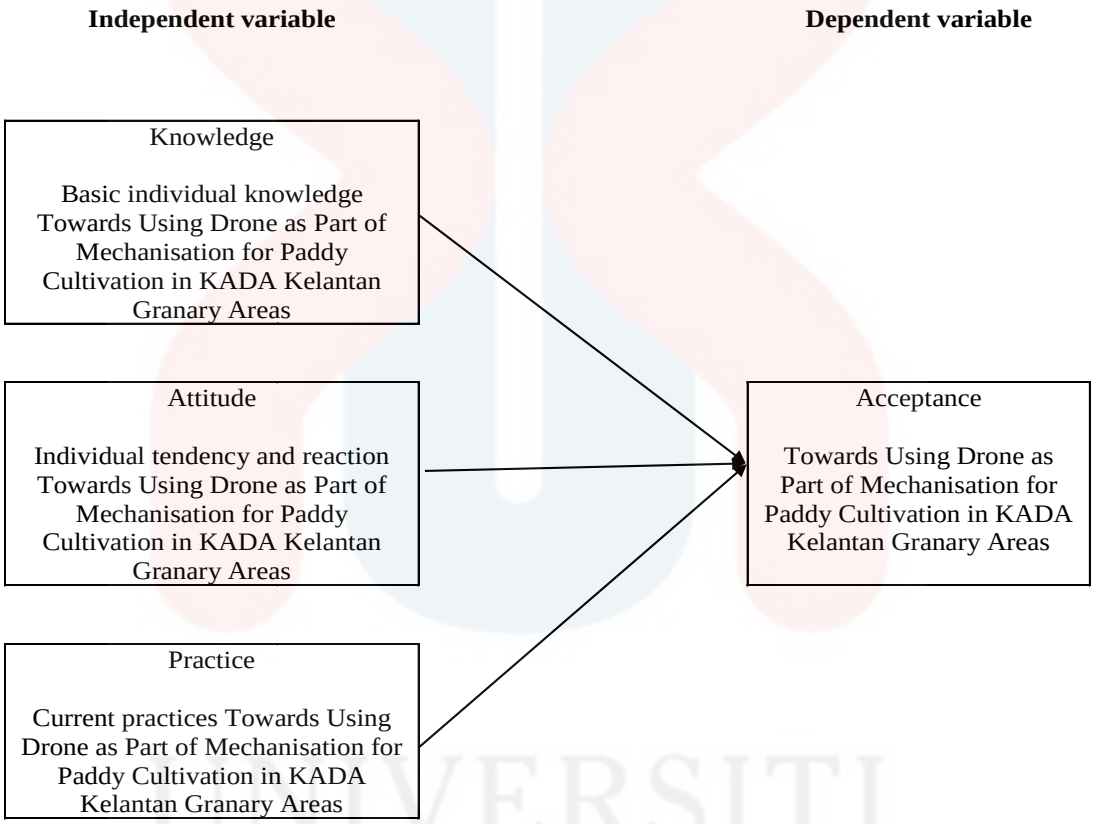

Figure 3.1: Diagram of conceptual framework

3.2 Description of Study area

The survey was carried out in the specified area of Kelantan that falls under the KADA authority. Using this region, a more appropriate and accessible survey may be conducted to determine the level of acceptance among farmers in the three most productive paddy producing regions.

3.3 Research procedure

The questionnaire served as the starting point for this study, and the conclusion was reached at the conclusion of the study. This questionnaire was created based on the problem statement and the previously stated objective of this project. For this study, the questionnaire used is based on the farmers' acceptance towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas. Furthermore, the entire questionnaire was simple and easy to understand by the targeted respondent from the paddy farmers. The main element on the questionnaire must be related to the environmental practises of drones in paddy plantations only, and it must be included in the questionnaire as the first item.

3.3.1 Early data collection

In order to get some data at an early stage, identifying the data collection method was carried out rather than analysing the data to make it suitable for the study. The data obtained will be utilised to develop the study's instrument. Data collection requires managerial skills in order to make the accurate interpretation of the data collected. The data collected must then be meaningful data from the start of the investigation, and the study must be completed from beginning to end. That questionnaire has already been addressed:

1. Determined the objective
2. Developed the specification
3. Make some reviewed the questionnaire depending on the past study
4. Develop the new questionnaire
5. Developed a process to be utilised in the analysis of information.
6. Obtained the author's confirmation of the content of the article

3.3.2 The questionnaire design

This survey question was prepared for farmers of paddy cultivation in KADA, Kelantan granary areas. The questionnaire was designed according to previous research related to this study. The questionnaire was constructed based on problem statements and a literature review involving socio-demographic characteristics of paddy farmers. Besides, knowledge, attitude, and practice influenced using a drone as mechanisation for paddy cultivation. These aspects were essential to evaluate the level of acceptance of farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas. In this research, the questionnaire was comprised into:

Section A: There were 11 questions in this section on demographic information on farmers' acceptance towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas related to the study, which includes sex, gender, age, education level, farming experience and family background.

In this section, the question divided into three parts which were knowledge, attitude and practice:

a) Section B: The knowledge questions have eight questions about farmers using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas.

b) Section C: The attitude consists of nine questions about using drones to mechanise paddy cultivation in KADA, Kelantan granary areas.

c) Section D: Includes ten questions on the practice of farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas.

d) Section E: Includes eight questions on farmers' acceptance towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas.

The question for knowledge, attitude and practice control of young entrepreneurs is designed based on a five-point Likert scale, Strongly Disagree – Disagree – Average – Agree – Strongly Agree.

3.3.3 Obtaining the content validity

To acquire the content of validity, it is necessary first to determine whether the instrument can be used effectively and whether the scope of content that has been evaluated may be included in the process. The validity level has been referred to the authority on that particular content. The other reason is that the officer of Kemubu Agriculture Development Authority makes processed in some specialise party that only

focuses on the study about the farmers' acceptance towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas.

3.3.4 Adjustment of the questionnaire

The questionnaire adjustment was carried out after the validity and verification had been established. The goal of the modification is to bring the validity of the questionnaire up to date based on the statements that have been associated or not associated with each other and that have been written on the questionnaire itself. The questionnaire must include a demographic profile of the farmer, which should include information about their gender, age, marital status, and other relevant factors. It also includes measurement based on farmer acceptance of drone mechanisation and items based on farmer knowledge, attitudes, and practices.

3.4 Data Collection

Data collection was a process for collecting and measuring information on relevant sources that stated the research question, hypothesis testing, and outcome evaluation. This research was conducted in KADA, Kelantan area. The sample size for this study was 82 respondents, where the question was distributed. It is to determine the level of acceptance of

farmers towards using drones as mechanisation for paddy cultivation and the relationship between knowledge, attitude and practice control towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas.

3.4.1 Sampling Methods

This research was designed for the respondent around KADA, Kelantan areas located at the Pasir Mas, Tumpat and Kota Bharu. That location was chosen because it was a popular with high usage of drone technology for drone mechanization in agriculture among paddy farmers in KADA.

3.4.2 Sample Size

The sample size for this study was 82 respondents of farmers in Kelantan. According to Allen Jr (2011), the sample size was determined using the rule of thumb. This rule was to select a sample size larger than 30 respondents and not more than 500 respondents (Sabir, Safdar, Khurshid, & Hafeez, 2014). Furthermore, excellent quality findings can be achieved even if the total sample is less than 50, and not very good results can be obtained if the sample size is too small (de Winter, Dodou, & Wieringa, 2009). This is because the data analysed are less accurate. However, Littler (2015) stated that the

larger the sample size, the more information will be gathered as it can help reduce sampling errors.

3.4.3 Source of Data

The primary data was collected from the respondents. In this research, 82 respondents were being interviewed directly.

Next, secondary data was gathered from the different sources of information like journals, books, websites and newspapers that the researcher has analysed. The statistical data was collected from the government departments' portal or relevant information related to this research.

3.4.4 Pilot Study

The questionnaire in this study was tested before use. The test was conducted by distributing the questionnaire to the farmers in KADA, Kelantan, in November 2021 to ensure responses and achieve the outcome. About 30 respondents have answered the questionnaire, and it is enough to measure the viability of the questionnaire. Statistical Package for Social Science Software (SPSS) 26.0 was used to analyse the data in order to determine whether or not the questionnaire was acceptable and easy to comprehend

before the questionnaire was delivered to the paddy farmers in KADA, Kelantan, Malaysia.

3.5 Data Analysis

Data analysis was the process to interpret or evaluating the data by using analytical and statistical tools to analyse and prove the accuracy of the data. The data cleaning has been done by examining the frequency and descriptive statistics and encoding and entering data. Statistical tools like the SPSS programme have been used to analyse data using descriptive statistics such as the mean, frequency, minimum, maximum, percentage, and standard deviation. The reliability test and Spearman correlation analysis were utilised for inferential statistical analysis in this study.

3.5.1 Descriptive Analysis

In this study, descriptive analysis was used to describe the basic feature of the data. It provides simple summarisation data that is easy to interpret and understand. Descriptive data were required to calculate the mean of the nominal collected data during this inquiry. It's a tool for figuring out the frequency and percentage of farmers. The data

was analysed based on farmers' acceptance, knowledge, attitude, and practice towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas.

3.5.2 Reliability Test

Questionnaire validity and consistency are ensured by using a reliability test to evaluate systematic variation in a scale. In reliability testing, Cronbach's Alpha method was used in the study. It is acceptable to have an acceptable value of 0.7, but it is desirable to have an acceptable value of 0.8 (Shigoli, 2018). The following table summarises Cronbach's Alpha reliability.

Table 3.1: Reliability test

Constructs	**No of items**	**Pilot Study (Cronbach Alpha)**
Knowledge farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas	8	0.810
Attitude farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas	9	0.885
Practice farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas	10	0.884
Acceptance farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas	8	0.798

(Source: Survey, 2021)

3.5.3 Spearman Correlation Coefficient (r_s)

The Spearman correlation analysis was used to compute the statistical significance of the cross-tabulation table. In this study, the Spearman correlation coefficient was used to analyse the relationship related to the third objective, which was to identify the relationship between knowledge, attitude, and practises toward the acceptance of drones as mechanisation for paddy cultivation by farmers in KADA, Kelantan granary areas.

Table 3.2: Rule of Thumb for Interpreting the Size of a Correlation Coefficient (Mukaka, 2012)

Size of Correlation (%)	Interpretation
0.90 to 1.0 (-0.9 to -1.00)	Very high positive (negative) correlation
0.70 to 0.90 (-0.70 to -0.90)	High positive (negative) correlation
0.50 to 0.70 (-0.50 to 0.70)	Moderate positive (negative) correlation
0.30 to 0.50 (-0.30 to -0.50)	Low positive (negative) correlation
0.00% to 0.30 (0.00% to -0.30)	Negligible correlation

3.6 Chapter Summary

This chapter showed the methodology of this study has briefly explained it. In the research design, the quantitative method was demonstrated using SPSS 26.0. This is used to analyse the data according to the study objectives. The research framework indicates the dependent variable: farmers' acceptance of using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas, and three independent variables: knowledge, attitude, and practice. In the instrumentation, each part of the variables starts from the demographic profile, knowledge, attitude, practice and acceptance of farmers towards using drones as mechanisation for paddy cultivation in KADA, Kelantan granary areas. All items were measured using a Likert Scale that represents strongly disagree, disagree, average, agree, and strongly agree with the range of 1 to 5.

Other than that, the population and sample were explained the number of paddy farmers in KADA and the way that researcher used to determine the sample. On that, the data preparation was explained about the pilot study that involved 30 respondents from Tumpat. After the reliability test was conducted, the study was then studied on 82 respondents from KADA, Kelantan. Lastly, the data analysis is shown on the analysis by the researcher. The researcher used descriptive and correlation analysis to analyse the data for the study.

CHAPTER 4

RESULTS AND DISCUSSION

4.0 Introduction

For this study, this chapter explained the results and discussion of the study. The study was conducted with a convenience sampling method where 82 questionnaires were distributed among the farmers in KADA; targeted area are Tumpat, Pasir Mas and Kota Bharu, Kelantan. The analysis of data was done based on the study's objective, which covers the demographic of respondents, knowledge, attitude, practice, and acceptance of farmers toward drone mechanization in paddy granary areas. Descriptive analysis of respondents, descriptive analysis of independent variable, Pearson Correlation were discussed in the result of data analysis. The data in this study was collected through a self-answered questionnaire that consisted of a few sections such as demographic information, knowledge, attitude, practice, and acceptance of farmers towards using drones as part of mechanization for paddy cultivation in KADA.

4.1 Descriptive Analysis Result

4.1.1 Demographic Profile of Farmers

Descriptive analysis was used in this study to analyse the demographic profile of farmers in KADA, Kelantan, to describe their socio-demographic information. For instance, age, gender, marital status, race, educational level, father and mother involved in paddy planting, distance from house to paddy field, experience length planted paddy, area of planting paddy, estimation of paddy yield production per hectare, and price to use drone services.

Table 4.1 shows that the majority of farmers who participate in drone mechanization in KADA, Kelantan, are male, with 81 peoples (98.8%), while female farmers are only one people (1.2%). Next, the age of farmers is mostly 41-50 years old, which is 27 peoples (32.9%) while the remaining 6 peoples (7.3%) at the age of 20-30 years old, 14 peoples (17.1%) at the age of 31-40 years old, 26 peoples (31.7%) at the age of 51-60 years old and 9 peoples (11.0%) at the age of 61-70 years old. The marital status of farmers in KADA, Kelantan shows that 74 out of 82 people (90.2%) are married, followed by 7 peoples (8.5%) who are still single and only one farmer (1.2%) is widowed.

In this study, the educational level of most young entrepreneurs comes from SPM background, 48 peoples (58.5%). Then, followed by SRP/PMR/PT3 background which are 17 peoples (20.7%), and 6 people (7.3%) with STPM/STAM education. Meanwhile, people with no formal education and UPSR are 3 (3.7%). There is one farmer (1.2%)

having both vocational certification and diploma and 3 peoples (3.7%) have degree/master degree/philosophy degree background.

Table 4.1: The demographic profile of farmers

Variables		Frequency	Percentage (%)
Age	20 – 30 years	6	7.3
	31 – 40 years	14	17.1
	41 - 50 years	27	32.9
	51 - 60 years	26	31.7
	61 - 70 years	9	11.0
Sex	Male	81	98.8
	Female	1	1.2
Marital Status	Married	74	90.2
	Divorced	1	1.2
	Unmarried	7	8.5
Race	Malay	82	100.0
Level of Education	No Formal Education	3	3.7
	UPSR	3	3.7
	SRP/PMR/PT3	17	20.7
	SPM	48	58.5
	Vocational Certification	1	1.2
	STPM/STAM	6	7.3
	Diploma	1	1.2
	Degree/Master Degree/Philosophy Degree	3	3.7

(Source: Survey, 2021)

Table 4.2 shows that 60 (73.2%) farmers' parents are involved in the paddy planting, and 22 (26.8%) farmers' parents are not involved in the paddy planting. This showed that most of the farmers were raised in families that used to plant the paddy. Also,

in this study, 28 (34.1%) farmers already experienced 11-15 years in planted paddy, and 26 (31.7%) farmers experienced 6-10 years in this field. Followed by 16 (19.5%) farmers who planted paddy for more than 16 years, 10 (12.2%) 1-5 years and only 2 (2.4%) experienced less than a year in this field.

According to the farmers' house distance to the paddy field, most of the farmers live about 1 – 5km from their paddy field, which accounted 64 farmers (78%) from the total number of respondents. While the other 14 (17.1%) farmers live 6-10km from their paddy field, and 4 farmers (4.9%) are 11-15km. The farmers who live far from their paddy fields usually rent or are located in another district.

Apart from that, most of the farmers in KADA area, 23 (28.0%) peoples, have more than 10 acres of paddy planting area. Tailed by 21 (25.6%) farmers that have 9 to 10 acres, 15 (18.3%) farmers with 5 to 6 acres, 6 (7.3%) farmers with 3 to 4 acres, and 4 (4.9%) farmers have 1 to 2 acres of paddy planting areas. Regarding this, 53 (64.6%) farmers produce 4 to 5 ton/ha of paddy yield per season for each hectare. Followed by 14 (17.1%) farmers produce 3 to 4 ton/ha. 6 (7.3%) farmers produce more than 5 ton/ha and also 6 farmers (7.3%) 2 to 3 ton/ha, respectively. Meanwhile, only 3 (3.7%) farmers produce less than 2 ton/ha.

Drone services in the KADA were charged based on areas per acre. Based on the survey, 67 (81.7%) farmers pay about RM26 to RM50 per acre. The second highest is 10 (12.2%) farmers pay more than RM100 for the drone service per acre, and lastly 5 (6.1%) farmers only pay less than RM25 per acre.

Table 4.2: Details about the farmers

Variables		Frequency	Percentage (%)
Does your father/mother involve in planting paddy?	Yes	60	73.2
	No	22	26.8
Distance from your house to paddy field	1 - 5 KM	64	78.0
	6 - 10 KM	14	17.1
	11 - 15 KM	4	4.9
How long has your experience planted paddy?	Less than 1 year	2	2.4
	1 - 5 years	10	12.2
	6 - 10 years	26	31.7
	11 - 15 years	28	34.1
	More than 16 years	16	19.5
The area of planting paddy?	1 - 2 acres	4	4.9
	3 - 4 acres	6	7.3
	5 - 6 acres	13	15.9
	7 - 8 acres	15	18.3
	9 -10 acres	21	25.6
	More than 10 acres	23	28.0
Production of paddy yield per season for each hectare (ton/ha)?	Less than 2 ton	3	3.7
	2 - 3 ton	6	7.3
	3 - 4 ton	14	17.1
	4 - 5 ton	53	64.6
	More than 5 ton	6	7.3
How much does it cost to use drone services in your area per acre?	Less than RM25	5	6.1
	RM26 - RM50	67	81.7
	More than RM100	10	12.2

(Source: Survey, 2021)

4.1.2 Knowledge among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

The descriptive analysis was used to study the knowledge among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas. The result from data analysis was presented in Table 4.3.

Based on the analysis, the statement for "Drones are new technologies introduced by government agencies in paddy cultivation work, such as spraying pesticides/weeds, cultivating and sowing seeds", gives the mean score of is 4.12. The majority of respondents (54.9%) were agreed with it. Meanwhile the farmers that chose disagree is 6.1%, 7.3% either disagree or agree and strongly agree is 31.7%. Then 57.3% of farmers agree with the statement that "Drones ease fieldwork such as spraying pesticides, sowing fertilizers and seeds in the fields", 6.1% either disagree or agree, and 36.6% strongly agree with the statement stated that drones' benefits are to ease and fasten the fieldwork. According to Subramanian et al. (2021), drones are extremely successful in delivering pesticides to all kind's crops.

The finding also shows that about 1.2% of farmers are strongly disagree with the statement "The use of drones can increase production" and 18.3% of farmers either disagree or agree. Meanwhile, 51.2% are agree with the statement followed by 29.3% of farmers are strongly agree. It shows that majority of the farmers acknowledge the use of drone and are concerned with the drone technology to improve their production.

The results showed that 15.9% of farmers disagree with the statement "I acknowledge the risk when using drones, such as spraying drift, drone crash and safety distance when using a drone", 24.4% of farmers either disagree or agree, and 48.8% agree with this statement, and another 11.0% of farmers strongly agree with it. This statement shows that 15.9% of 82 farmers still do not know and lack understanding on the safety and precaution while using the drone. Therefore, proper training and education programs need to be carried out by the KADA to educate more farmers on the safety and precaution whilst using the drone for paddy field operation.

Response for strongly agree is the highest with 46.3% for the statement "The use of drones can save operating time and reduce manpower while doing paddy cultivation activities". Followed by 3.7% of farmers who either disagree or agree, and 50.0% of farmers agree with the statement. This shows that farmer is aware and accept the main benefits of drones as mechanization in paddy field operation to reduce the manpower requirement and time consumption for the field activities.

It is shown that in Table 4.3, the statement "The use of drones is an effective alternative to monitor the growth of paddy cultivation for a wider area" has 54.9% farmers agree followed by 32.9% farmers strongly agree, 7.3% farmers either disagree or agree, 3.7% farmers disagree, and another 1.2% farmers strongly disagree with this statement. This statement shows that most of the farmers acknowledge the uses of drones to help those having big paddy areas, especially in monitoring their field.

For the statement of "The herbicide/insecticide mixture for spraying using a drone should follow the dosage recommended by the pesticide manufacturer for effective spraying results in the field" has 54.9% of farmers agree, 26.8% of farmers strongly agree, 12.2% of farmers either disagree or agree, 3.7% farmers disagree, and another 2.4%

strongly disagree with this statement. Therefore, this shows that the farmers follow the instruction of pesticide use, even applying it using drone technology. However, some farmers still disagree with the instruction recommended by the pesticide manufacturer. The study from Shetty, Murugan, Hiremath & Sreeja (2010), farmers' misunderstanding of the use pesticides' gives harmful effects on soil, water, air, and other beneficial creatures in the ecosystem. That's why the farmers choose to apply either excessive doses or pesticides that are not appropriate for the crop even though it will be harmful to the environment.

The last statement for knowledge among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas is "Drone operation in paddy fields must be done by a qualified operator and obtain a license and permit to increase farmers' confidence (consumers)" has both the response 17.1% of farmers disagree and average with the statement. It is about 41.5% of farmers agree, and 24.5% of farmers strongly agree with the statement. Based on the responses, it is shown that farmers only trust and have confidence if the drone operation in the paddy field is only handled by the operator who has the qualification in-flying the drone certified by the agency.

In conclusion, the level of knowledge among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas is High. It is due to the percentage being 65% high and the mean being 4.04. The mean score for this study was categorized into three categories, which are low (1.00-2.33), moderate (2.34-3.67) and high (3.68-5.00). So, the mean score for this level from Table 4.4 is high. This result shows that the level of knowledge shows that farmers are well exposed to and aware of

the details required for drone operation in the paddy field. The farmers know the function and usability of the drone technology application for their paddy granary area.

The result in Table 4.4 explains the farmers has a significant effect on the knowledge of farmers acceptance toward using the drone as part of mechanization for paddy cultivation in KADA Kelantan granary areas. The mean score explains that the effect of knowledge is (M=4.04, SD= 0.472) that was categorised as the high mean value. This show the farmers have good knowledge about drone application. They were observant and could describe the drone's operation and several benefits of drone mechanization. Farmers can produce better yields using best practices in agriculture with good knowledge (Azman et al., 2012). In order to assist farmers in the use of drones, drone service providers might design training courses in their local area. They can also obtain information about drone technology from the mass media, extension agents, their colleagues, etc. According to Annor-Frempong & Akaba (2020), farmers would respond appropriately and retain information during drone use training if provided.

Table 4.3: Descriptive analysis of knowledge among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

Statement	**Percentage (%)**					**Mean**	**S.D**	**Level**
	1*	**2***	**3***	**4***	**5***			
Drones are new technologies introduced by government agencies in paddy cultivation work, such as spraying pesticides/weeds, cultivating and sowing seeds.	0	6.1	7.3	54.9	31.7	4.12	0.792	High

Drones facilitate fieldwork such as spraying pesticides, sowing fertilizers and seeds in the fields.	0	0	6.1	57.3	36.6	4.30	0.581	High
The use of drones can increase production.	1.2	0	18.3	51.2	29.3	4.07	0.766	High
I acknowledge the risk when using drones, such as spraying drift, drone crash and safety distance when using a drone.	0	15.9	24.4	48.8	11.0	3.55	0.891	Moderate
The use of drones can save operating time and reduce manpower while doing paddy cultivation activities.	0	0	3.7	50.0	46.3	4.43	0.567	High
The use of drones is an effective alternative to monitor the growth of paddy cultivation for a wider area.	1.2	3.7	7.3	54.9	32.9	4.15	0.803	High
The herbicide/insecticide mixture for spraying using a drone should follow the dosage recommended by the pesticide manufacturer for effective spraying results in the field.	2.4	3.7	12.2	54.9	26.8	4.00	0.875	High
Drone operation in paddy fields must be done by a qualified operator and obtain a license and permit to increase farmers' confidence (consumers).	0	17.1	17.1	41.5	24.5	3.73	1.019	High

*Indicator: 1. Strongly Disagree; 2. Disagree; 3. Average; 4. Agree; 5. Strongly Agree
Notes: mean values correspond to 1.0 - 2.33: Low; 2.34 - 3.66: Moderate; 3.67 - 5.0: High.
(Source: Survey, 2021)

Table 4.4: The mean score of knowledge among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

Factor	Frequency	Percentage (%)	Mean	Standard deviation
Knowledge			4.04	0.472
Low				
Moderate	17	20.7		
High	65	79.3		

(Source: Survey, 2021)

4.1.3 Attitude among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

Descriptive analysis was also used to describe farmers' attitudes in using drones as part of mechanization for paddy cultivation. It is important to measure the level attitude of farmers in acceptance of farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas in order to accomplish the objective of this study. The analysis result of farmers attitude towards using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas are presented in Table 4.5. The statement of “I recommend using the drone method instead of the old

method in spraying and sowing seeds/fertilizer operations" has 61.0% agree, 25.6% strongly agree, 9.8% either disagree or agree, and 3.7% disagree with this statement. This statement illustrates that most farmers find that using drone technology can increase the efficiency of their daily work.

"I prefer to use a drone because it is easy to manage and cost-effective" has 54.9% of farmers agree, 26.8% farmers strongly agree, 14.6% farmers either agree or disagree, and 3.7% farmers disagree. From this statement, most farmers agree that drone technology allows them to estimate the price of their expenses and the cost required for the paddy. According to Su, Yahya, Mazlan & Hamdani (2018), it's important to find a way to spray pesticides that is both cheap and effective because the cost of the pesticides and the amount of time it takes to spray them isn't clear in the coming days. Analysing both drones and knapsacks from a cost-benefit perspective shows that the drone is the more economical option (Annor-Frempong & Akaba, 2020).

Statement of "I will use a drone service if the drone service provider is abundant in the cultivation area and has a reasonable use cost" has 56.1% agree, 30.5% strongly agree, 12.2% either disagree or agree, and 1.2% disagree with this statement. This statement indicates that drone technology would be useful if the price service is affordable. "I will seek advice from KADA expansion officers or refer experts on using drones in paddy cultivation operations" is a statement that 53.7% of farmers agree, 28.0% farmers strongly agree, 17.1% farmers either agree or disagree, and 1.2% farmers with this statement. This shows that KADA is already becoming the main reference for advisory and help for the field operation, and farmers acknowledge the extension role of KADA.

Another statement is, “I will follow a training course on using drones in paddy fields to increase knowledge and better understand”. This statement shows that 41.5% farmers agree, 39.0% of farmers strongly agree, 17.1% of farmers either agree or disagree, and 2.4% of farmers disagree with this statement. Farmers in KADA are interested in knowing drone technology. Therefore, a proper training course can be conducted by KADA to the paddy farmer in increasing their knowledge and understanding of drone usage and application.

There are 43.9% of farmers in KADA who agree with the statement, “I found that drone service providers are limited in the KADA paddy granary area”. It was followed by 26.8% of farmers strongly agree, 15.9% of farmers either agree or disagree, and 13.4% farmers disagree with this statement. Farmers claim that drone service providers are still insufficient in order to satisfy demand in their area.

The statement of “I believe that exposure programs and courses on the use of technology such as drones should be expanded among young people in paddy cultivation areas to attract interest and open up opportunities for workers among the new generation” has 50.0% of farmers agree, 39.0% farmers strongly agree, 9.8% farmers either agree or disagree, and 1.2% farmers disagree with this statement. By encouraging young people to be involved in the drone service industry, the farmer believes that it will provide new job opportunities for the new generation and suit their era. The study from Chuang, Wang, & Liang (2020) shows that organisational support was the most important factor influencing young farmers' adoption of drone technology. The exposure program implies that agricultural administration agencies and drone operators should strengthen their ties to the young farmers.

Other statements, which are “I have found that drone service providers charge high charges for drones in the field, which has hindered my desire to use them”, has 30.5% of farmers agree, 13.4% farmers strongly agree, 25.6% of farmers either disagree or agree, 17.1% farmers disagree. Another 13.4% of farmers strongly disagree with this statement. This states how the farmer can leverage the demand and opportunity of drone service in the KADA granary areas.

Lastly, the statement of “I hope the government should introduce the subsidy for drone services to increase the use of drones among farmers” has 35.4 farmers agree, 43.9% of farmers strongly agree, 14.6% of farmers either disagree or agree, 3.7% farmers disagree and 2.4% fruit vegetables farmers strongly disagree with this statement. This shows that government subsidies are crucial in promoting more drone technology usage among the paddy farmer and reducing the farmer burden on the high fees related to the drone service.

Based on the results in Table 4.6, 82.9% of farmers in KADA, Kelantan, have a high level of attitude. Moreover, the mean score for attitude are (M=3.99, SD=0.526); since the mean value was categorized as high mean value, it can be said that farmers in KADA approximately have a good attitude toward using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas. This statement could be supported by Jambari et al. (2020); farmers attitudes in adopting a new technology depend on life experience or the training of the technology they attended. For example, in the case of drone technology, farmers attitude to use drone technology within their field operation mainly because of drone technology usefulness.

Farmer's that have excellent or positive views toward agriculture are more open to implementing sustainable agricultural approaches since they are already producing rice

yields using safe techniques to avoid any harm coming to their crops or their own health. Sadati, Fami, Asadi & Sadati (2010) found that attitude is to be a key factor in constructing acceptance of sustainable agriculture, which is consistent with this conclusion.

Table 4.5: Descriptive analysis of attitude among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

Statement	**Percentage (%)**					**Mean**	**S.D**	**Level**
	1*	**2***	**3***	**4***	**5***			
I recommend using the drone method instead of the old method in spraying and sowing seeds/fertilizer operations.	0	3.7	9.8	61.0	25.6	4.09	0.706	High
I prefer to use a drone because it is easy to manage and cost-effective.	0	3.7	14.6	54.9	26.8	4.05	0.752	High
I will use a drone service if the drone service provider is abundant in the cultivation area and has a reasonable use cost.	0	1.2	12.2	56.1	30.5	4.16	0.675	High
I will seek advice from KADA expansion officers or refer experts on using drones in paddy cultivation operations.	0	1.2	17.1	53.7	28.0	4.09	0.706	High
I will follow a training course on using drones in paddy fields to increase knowledge and better understand	0	2.4	17.1	41.5	39.0	4.17	0.798	High
I found that drone service providers are limited in the KADA paddy granary area.	0	13.4	15.9	43.9	26.8	3.84	0.975	High

I believe that exposure programs and courses on the use of technology such as drones should be expanded among young people in paddy cultivation areas to attract interest and open up opportunities for workers among the new generation.	0	1.2	9.8	50.0	39.0	4.27	0.686	High
I have found that drone service providers charge high charges for drones in the field, which has hindered my desire to use them.	13.4	17.1	25.6	30.5	13.4	3.13	1.245	Moderate
I hope the government should introduce the subsidy for drone services to increase the use of drones among farmers.	2.4	3.7	14.6	35.4	43.9	4.15	0.970	High

*Indicator: 1. Strongly Disagree; 2. Disagree; 3. Average; 4. Agree; 5. Strongly Agree
Notes: mean values correspond to 1.0 - 2.33: Low; 2.34 - 3.66: Moderate; 3.67 - 5.0: High.
(Source: Survey, 2021)

Table 4.6: The mean score of attitudes among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

Factor	Frequency	Percentage (%)	Mean	Standard deviation
Attitude			3.99	0.526
Low	1	1.2		
Moderate	13	15.9		
High	68	82.9		

(Source: Survey, 2021)

4.1.4 Practice among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

The practice of farmers can significantly impact drone mechanization acceptance for paddy cultivation. Table 4.7 shows the descriptive statistics of the practice of farmer acceptance using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas. The statement "I am confident that drones can save time, increase the yield of my paddy crop, and save labour costs for the long term" has the response of 46.3% farmers agree, 45.1% farmers strongly agree, and 8.5% of farmers either disagree or agree with this statement. That statement shows that using drones as part of mechanization for paddy cultivation gives ease for the farmers.

The statement of "I use drones as a precise farming method to increase crop yields and profits" has 53.7% farmers agree, 30.5% farmers strongly agree, 13.4% farmers either disagree or agree, and 2.4% of farmers disagree with this statement. It shows that drones as part of mechanization for paddy cultivation give ease to use and are user-friendly for farmers. This statement is supported by Abdullahi, Mahieddine & Sheriff (2015); precision agriculture using the drone is a reliable, timely, and cost-effective method of obtaining viable data on the farm in order to enhance yields and overall profitability in sustainable farming systems.

The statement of "I use drones to reduce the number of inputs needed for cultivation, such as water and pesticides" shows that 50.0% of farmers agree, 19.5% of

farmers strongly agree, 15.9% of farmers either disagree or agree, 12.2% farmers disagree and 2.4% farmers strongly disagree with this statement. The results show that drones as part of mechanization for paddy cultivation provide cost benefits to the farmer, especially in reducing the overall cost of field operation cost benefits.

About 59.8% of farmers agreed with the statement, “I make sure that the drone operation in my paddy granary area is done by a trusted and skilled party to prevent losses”. Followed by 32.9% of farmers who were strongly agreed, 13.4% of farmers either disagree or agree, and 1.2% of farmers that disagree with it. Drone technology as part of mechanization for paddy cultivation is easy to control the outcome when an expert does the service. This shows that farmer really matters on the qualification of the drone operator that provides drone service in their areas, which indicates farmer really understand and have high knowledge on the quality of the operation for the paddy field.

“I use drone mechanization for crop protection chemicals as cover for both pesticides and herbicide spraying because it can reduce the risk of pesticides to humans” is a statement that 53.7% of farmers agree, 32.9% farmers strongly agree, 9.8% farmers either disagree or agree, and 3.7% farmers disagree with this statement. This statement indicates that drone mechanization can minimize the effect of pesticides on the operator as previous human labour practices have a higher risk of toxicity while handling the crop protection chemical.

Other statement, which is “I am confident drone technology can determine the optimal amount of spraying material needed and ensure spraying is done evenly on the crop”, has 61.0% of farmers agree, 26.8% farmers strongly agree, and another 12.2% of farmers either disagree or agree with this statement. This shows drone technology as part

of mechanization in paddy cultivation will be used more often in the future because of high accuracy, efficiency, and efficacy to the crop.

Statement of “I always refer to KADA agricultural officers or experts on all problems related to the use of drones” has 48.8% farmers agree, 23.2% farmers strongly agree, 25.6% farmers either disagree or agree, and 2.4% farmers disagree with this statement. It shows the farmers have a high confidence level towards KADA agriculture officer in order to get drone service provider details. This is because most agriculture officers must have information and be aware when they are dealing with the regulation of drones. In order to make the most required of the data gathered in precision agriculture, experts in the field are frequently required (Tsouros, Bibi, & Sarigiannidis, 2019).

The statement, "Now I have used drones for all spraying activities in paddy fields”, shows that 43.9% of farmers agree, 25.6% of farmers strongly agree, 14.6% of farmers either disagree or agree, 9.8% of farmers disagree, and 6.1% farmers strongly disagree with this statement. The results show the comfortability of farmers when using drones as part of mechanization for paddy cultivation compared to the traditional spraying. Spraying with a drone is more efficient than using a knapsack sprayer because it requires less energy. It poses less risk to the operator's health, less stress on the operator's body applies pesticides more quickly per plot, and prevents pesticide leakage (Annor-Frempong & Akaba, 2020).

About 45.1% of farmers agreed with the statement, “I followed the procedures prescribed by the authorities in the use of drones for spraying activities in paddy fields”. Followed by 23.2% of farmers who were strongly agreed, 25.6% of farmers either disagree or agree, 2.4% of farmers that disagreed and 3.7% of farmers who strongly

disagree with it. This shows how farmers follow the orders and rules provided by the KADA authorities, like the important details of spraying pesticides for their paddy.

"I think drones for paddy cultivation are inappropriate because the field's input spray is uneven and does not cover the entire area" is a statement that 15.9% of farmers both agree and strongly agree, 39.0% of farmers either disagree or agree, 23.2% farmers disagree, and another 1.9% farmers strongly disagree with this statement. This statement indicates how farmers assured that drone applications give them a better quality of spraying to the field. According to Su, Yahya, Mazlan, & Hamdani (2018), the uniformity of spraying achieved through the use of drones is greatly influenced by the flying height. Other than the effects of environmental elements such as wind speed and temperature, the drone spraying efficiency is quite effective in delivering pesticides to a variety of crops (Subramanian et al., 2021)

The result in Table 4.8 explained that the farmers have a significant effect on the practice of farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas from a statistical aspect. The mean score explains that the effect of practice is (M = 3.85, SD = 0.529) that was categorized as the high mean value. So, it can be asserted that those farmers in KADA approximately agree to the practice towards using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas. This result was supported by Annor-Frempong & Akaba (2020) study that found precision agriculture; drone technology to be simple and easy to use when it is run by the service providers. Farmers were more likely to practice new technology and applications that increased the production of their paddy fields. In this study, the variable of practice shows there is a significant influence on drone technology acceptance during the field operation, such as spraying and monitoring the paddy planting among the farmers in

KADA granary areas. Other than that, the usage of drones for paddy cultivation field operations provides farmers with greater convenience.

Table 4.7: Descriptive analysis of practice among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

Statement	**Percentage (%)**					**Mean**	**S.D**	**Level**
	1*	**2***	**3***	**4***	**5***			
I am confident that drones can save time, increase the yield of my paddy crop, and save labour costs for the long term.	0	0	8.5	46.3	45.1	4.37	0.639	High
I use drones as a precise farming method to increase crop yields and profits.	0	2.4	13.4	53.7	30.5	4.12	0.727	High
I use drones to reduce the number of inputs needed for cultivation, such as water and pesticides.	2.4	12.2	15.9	50.0	19.5	3.72	0.997	High
I make sure that the drone operation in my paddy granary area is done by a trusted and skilled party to prevent losses.	0	1.2	13.4	59.8	25.6	4.10	0.659	High
I use drone mechanization for crop protection chemicals as cover for both pesticides & herbicide spraying because it can reduce the risk of pesticides to humans.	0	3.7	9.8	53.7	32.9	4.16	0.745	High

I am confident drone technology can determine the optimal amount of spray material needed and ensure spraying is done evenly on the crop.	0	0	12.2	61.0	26.8	4.15	0.611	High
I always refer to KADA agricultural officers or experts on all problems related to the use of drones.	0	2.4	25.6	48.8	23.2	3.93	0.766	High
Now I have used drones for all spraying activities in paddy fields.	6.1	9.8	14.6	43.9	25.6	3.73	1.134	High
I followed the procedures prescribed by the authorities in the use of drones for spraying activities in paddy fields.	3.7	2.4	25.6	45.1	23.2	3.82	0.944	High
I think drones for paddy cultivation are inappropriate because the field's input spray is uneven and does not cover the entire area.	23.2	39.0	15.9	15.9	6.1	2.43	1.187	Low

*Indicator: 1. Strongly Disagree; 2. Disagree; 3. Average; 4. Agree; 5. Strongly Agree
Notes: mean values correspond to 1.0 - 2.33: Low; 2.34 - 3.66: Moderate; 3.67 - 5.0: High.
(Source: Survey, 2021)

Table 4.8: The mean score of practice among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

Factor	Frequency	Percentage (%)	Mean	Standard deviation
Practice			3.85	0.529
Low	1	1.2		
Moderate	24	29.3		
High	57	69.5		

(Source: Survey, 2021)

4.2 Level acceptance of farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

For this study, the first objective was to determine the level of acceptance of farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas. Table 4.9 shows the mean score and standard deviation of the level of participation of young entrepreneurs where the mean score was divided into three, namely low levels (1.0 - 2.33), moderate (2.34 - 3.66) and high (3.67 - 5.0).

First, the mean score for the statement “I know about the mechanism of drone technology in paddy granaries.” with (M=4.73, SD=0.545) with 4.9% either disagree or agree, 17.1% agree, and 78.0% strongly agree. This shows that farmers in KADA

acknowledge drone technology in the paddy industry as it is already getting acceptance from others. Next, the statement “I believe the mechanism of drone technology is effortless” shows a mean score (M=4.49, SD=0.892) with disagree 3%, either disagree or agree 15.9%, agree 8.5% and strongly agree 72.0%. That statement shows what farmers feel if they use drone mechanization, they can reduce manpower for sparing activities at the paddy fields. The Wachenheim, Fan, & Zheng (2021) study supports that there were good impressions of drone technology's value for pesticide application, including the cost- and reduced use of pesticides and time-saving.

Furthermore, the majority of farmers chose to either disagree or agree 30.5%, agree 39.0% and followed strongly agree 30.5% for the statement “I think drone technology in paddy granaries is a priority in improving the quality of my paddy crop”. This is because most farmers believe that drones can give them a better rice yield quality. Therefore, they are confident that their participation in drone technology is worth their paddy. Besides, farmers chose the disagree option 13.4%, either disagree or agree 37.8%, agree 26.8% and 22.0% voted strongly agree for the statement “I can take the time to learn about drone technology” with a mean score (M=4.59, SD=0.982) shows that farmer willing to learn about the drone technology and will practice within the paddy operation.

For the statement “I am interested in using drone technology for better paddy crop yields” with a mean score (M=4.59, SD=0.959) with 13.4% voted either disagree or agree, 14.6% voted agree followed by 72.0% voted strongly agree. Since farmer only showing interest in using drone due to better crop yield as mentioned by another farmer and observed from another farmer that has been adopted the technology. Meanwhile the lowest mean with 3.28 with the statement “I think the cost of using a drone in my paddy field is very affordable”, where the farmers chose strongly disagree 6.1%, disagree 9.8%,

either disagree or agree 41.5%, agree 35.4% and strongly agree 7.3%. This is because the fees for drone services in KADA, Kelantan are affordable and farmer-friendly. At the same time, the farmers disagree with the statement because some farmers may not be prepared to invest in technologies despite their potential benefits if they are regarded to be expensive in terms of application (Abegunde, Sibanda, & Obi, 2020).

The second highest mean value was 4.67 for the statement "I am interested in being exposed to the importance and benefits of drone technology to my paddy crop" where most farmers chose to either disagree or agree 11.0%, agree 11.0% and strongly agree 78.0%. Farmers in KADA find that using drone technology can increase the efficiency of their daily work. Raheem, Dayoub, Birech & Nakiyemba (2021) stated that farmers preferred employing drones to apply insecticides to insects over knapsack sprayers. With less or no chemical waste and a faster speed than a human, they found that drones might be used to kill the insect more effectively, making the usage of drones more efficient and effective.

Then, the statement "Financial factors caused me to use drone technology for my paddy granary area" represent a mean value (M=4.51, SD=0.805) where the respondents reacted to disagree (1.2%), either disagree or agree 15.9%, agree 13.4% and strongly agree 69.5% drone fees are compatible or similar to the human labour fees for spraying operation which much better in term of perceived benefits and much faster.

The results for this objective determine a high mean score with the total (M=4.23, SD=0.516). It shows a high mean level according to the mean level which is between 3.67-5.0. Thus, the first objective for this study was achieved due to the high-level acceptance of farmers towards using drones as part of mechanization for paddy cultivation in KADA, Kelantan granary areas.

The study clearly shows that farmer acceptance of drone technology for paddy field operation activities is high due to the high mean score obtained. This indicates that government initiatives and support are needed to provide initial capital/funding or subsidy to the farmer to expand further the drone technology application in the paddy cultivation due to high farmer acceptance towards drone technology through this study. As stated by Zheng, Wang & Wachenheim (2019), increasing subsidies from the government and assistance in purchasing drone technology and developing the business that facilitates their use would promote their general use.

Table 4.9: Descriptive analysis of level acceptance among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

Statement	**Percentage (%)**					**Mean**	**S.D**	**Level**
	1*	**2***	**3***	**4***	**5***			
I know about the mechanism of drone technology in paddy granaries.	0	0	4.9	17.1	78.0	4.73	0.545	High
I believe the mechanism of drone technology is effortless.	0	3	15.9	8.5	72.0	4.49	0.892	High
I think drone technology in paddy granaries is a priority in improving the quality of my paddy crop.	0	0	30.5	39.0	30.5	4.00	0.786	High

I can take the time to learn about drone technology.	0	13.4	37.8	26.8	22.0	3.57	0.982	Moderate
I am interested in using drone technology for better paddy crop yields.	0	0	13.4	14.6	72.0	4.59	0.719	High
I think the cost of using a drone in my paddy field is very affordable.	6.1	9.8	41.5	35.4	7.3	3.28	0.959	Moderate
I am interested in being exposed to the importance and benefits of drone technology to my paddy crop.	0	0	11.0	11.0	78.0	4.67	0.668	High
Financial factors caused me to use drone technology for my paddy granary area.	0	1.2	15.9	13.4	69.5	4.51	0.805	High

*Indicator: 1. Strongly Disagree; 2. Disagree; 3. Average; 4. Agree; 5. Strongly Agree
Notes: mean values correspond to 1.0 - 2.33: Low; 2.34 - 3.66: Moderate; 3.67 - 5.0: High.
(Source: Survey, 2021)

Table 4.10: The mean score of acceptance among farmers using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas

Factor	Frequency	Percentage (%)	Mean	Standard deviation
Acceptance			4.23	0.516
Low				
Moderate	16	19.5		
High	66	80.5		

(Source: Survey, 2021)

4.3 The relationship between knowledge, attitude and practices in relation to farmers acceptance towards using drones as part of mechanization for paddy cultivation in KADA, Kelantan granary areas

The analysis used to investigate the relationship of knowledge, attitude and practice of farmers towards acceptance on using drones as part of mechanization for paddy cultivation in KADA, Kelantan granary areas is Spearman's Correlation. In this study, the independent variables were knowledge, attitude, and practice, while the dependent variable was the farmers' acceptance towards using drones as part of mechanization for paddy cultivation in KADA, Kelantan granary areas.

The main purpose of this study was to investigate the hypothesis of the relationship of knowledge, attitude and practice in relation to farmers acceptance towards using drones as part of mechanization for paddy cultivation in KADA, Kelantan granary areas. The H_o shows that there was no significant value between the relationship of knowledge, attitude, and practice towards farmers' acceptance using drones as part of mechanization for paddy cultivation in KADA, Kelantan granary areas, whereas the H_1 shows that there was significant value between significant value between the relationship of knowledge, attitude, and practice towards farmers' acceptance using drones as part of mechanization for paddy cultivation in KADA, Kelantan granary areas. The strength of the correlation between the variables can be determined based on Table 4.11.

According to Table 4.11, the results of Spearman correlation analysis are applied to measure the relationship for all independent variables with the dependent variable. The correlation between knowledge and farmers' acceptance of using drones as part of mechanization for paddy cultivation in KADA, Kelantan granary areas is significant at the level of 0.128. Based on the table rule thumb, the interpretation of correlation for this relationship is a negligible correlation, meaning that they have a correlation or do not have a correlation. Knowledge has consistently been a strong determinant of the usage of technology. But some farmers may lack some knowledge. Barnes et al. (2019) stated that farmers tend to be more confident in their knowledge, more sceptical of technology, or more convinced that structural limits, such as land geography and population growth, cannot be addressed through technological means nonadopters.

The attitude relationship towards acceptance indicates the result of correlation analysis for attitude is also significant at level of 0.019. It is a negligible correlation between attitude and farmers' acceptance of using drones as part of mechanization for

paddy cultivation in KADA, Kelantan granary areas. The study by Adnan, Nordin, Rahman, and Noor (2017) observing the adoption of Green Fertiliser Technology among Malaysian paddy farmers reveals that a positive attitude is the most crucial determinant in influencing the farmers' intention to use the technology. According to the findings of this study, attitudes are one of the elements that influence farmers' adoption of drone technologies. In some cases, their attitude can be influenced by the training they received as well as by their personal life experiences.

Nevertheless, people who have no intention of adopting believe that technology has a long return period. In contrast, those who have adopted but do not desire to spend further are more uncertain about the outcomes (Barnes et al, 2019). The farmers may find it difficult to determine the genuine economic benefits and return on investment.

Based on table 4.11, the result of correlation analysis for practice is also significant at 0.202. There is a negligible correlation between practice and farmers' acceptance using drones as part of mechanization for paddy cultivation in KADA Kelantan granary areas. The relationship is only a negligible correlation. According to the study by Hailu, Mammo, & Ketemu (2016), consumers may perceive that technology is valuable but also difficult to use and that the benefits of usage do not exceed the effort required to use the technology. Therefore, the practice level does not influence the farmers' acceptance of using drones as part of mechanization for paddy cultivation in KADA, Kelantan granary areas.

Therefore, from the correlation analysis of the relationship between knowledge, attitude and practice towards the farmers' acceptance of using drones as part of mechanization for paddy cultivation in KADA, Kelantan granary areas is a negligible correlation. The mean score of the farmers' acceptance using drones as part of

mechanization for paddy cultivation in KADA, Kelantan granary areas are high, which is 4.23. The acceptance means are too high compared to other independent variables; knowledge, attitude, and practice. That show they are negligible correlate and do not have a correlation. So, the hypothesis is rejected, and the null hypothesis is accepted.

This result of low acceptance may influence by the age level. From this study, only 7.3% of farmers are actually young, aged between 20 to 30. Most of the farmers with a high percentage are considered old, aged between 41 to 60 years old. As a result, as people aged, they were less likely to accept a transformation in their agriculture habits (Ronaghi & Forouharfar, 2020). Then, 11.0% of farmers aged 61 to 70 years old, when the farmers are over 65-year-old farmers have a strong belief in their traditional farming methods and are unwilling to use modern technology. Then, when they pass on the farm to the next generation, they do so in the same way. They still practice similar methods that have been taught by their parent and continue to do so as they believe it is the best method to perform the paddy cultivation. According to Organisation for Economic Co-Operation and Development (OECD), to change from an existing set of agricultural practices to a new one supported by new technologies, a culture of adaptation, and modifications to the current systems that support the old practices are required. This barrier still remains among farmers, particularly those who are old-ages. This result shows that farmers in KADA accept the drone technology mechanization, but they were slow adoption of the technology.

Table 4.11: Result of Spearman Correlation Analysis

			Knowledge	Attitude	Practice	Acceptance
Spearman's rho	**Knowledge**	Correlation	1.000	.320**	.390**	.128
		Coefficient Sig. (2-tailed)	.	.003	.000	.253
		N	82	82	82	82
	Attitude	Correlation	.320**	1.000	.486**	.019
		Coefficient Sig. (2-tailed)	.003	.	.000	.866
		N	82	82	82	82
	Practice	Correlation	.390**	.486**	1.000	.202
		Coefficient Sig. (2-tailed)	.000	.000	.	.069
		N	82	82	82	82
	Acceptance	Correlation	.128	.019	.202	1.000
		Coefficient Sig. (2-tailed)	.253	.866	0.69	.
		N	82	82	82	82

**Correlation is significant at the 0.01 level (2-tailed)
(Source: Survey, 2021)

4.4 Chapter Summary

This finding of the study is based on the Knowledge, Attitude, and Practice (KAP) Model, which studies farmers' willingness to use drones as part of mechanisation for paddy farming in KADA granary areas. According to this result, KADA farmers embrace drone technology mechanization, but they slowly adopt it.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter reviews the determinants found in this study that influence the farmers' acceptance toward using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary area. The study focused on the relationship of three factors: knowledge, attitude, and practice in relation to the farmers' acceptance toward using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary area. This chapter covers the conclusion of the results of the research questions. Besides that, this chapter also discussed the recommendations of the study.

5.1 Conclusion

To determine the level of farmers' acceptance towards using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas. Second, to identify the level of knowledge, attitude and practice towards farmers' acceptance towards using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.

Next is to study the relationship between knowledge, attitude and practices in relation to farmers acceptance towards using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.

The questionnaires were distributed to 82 farmers in KADA to determine farmers acceptance towards using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas. In general, the findings show they were high in drone technology acceptance level with the mean value of M= 4.23; however, the high of acceptance is not correlated with the independent variable. The farmers in KADA agree with drone knowledge with mean value M=4.04, attitude on drones with mean value M=3.99 and practice with the mean value M=3.85. As for the relationship of Knowledge, Attitude, and Practice towards the Acceptance of drone mechanization, all variables are significant at a level of 0.253, 0.866 and 0.69, respectively.

Generally, the results indicate that the knowledge, attitude, and practice were negligible, which is the farmers are accepted technology but slow in adopting and applying it. This result will help investigate the technology acceptance among the farmers

in KADA. Based on the results of the Spearman correlation, the farmers accept drone technology as part of mechanization in the paddy granary areas. Still, they do not want to take the risk of using these technologies due to the availability of drone service, which is lacking or expensive. In some cases, farmers might not be willing to invest in many new technologies even though they could be good for them if they are thought expensive to implement. However, the farmers had not used the drones, so they didn't have all the information they needed to decide which technology was great for them. Drone service providers should hold training and demonstration sessions with farmers in order to educate them about drone technology and help them make an informed decision about which technology is most suited to their needs.

In conclusion, drone technology facilitated the paddy farmer's mechanization work in the paddy granary areas. Moreover, this research study helps increase farmers' acceptance of drone technology and enhance farmers' knowledge in using the technology. Thus, this study indicates that all factors such as knowledge, attitude, and practice influence farmers' acceptance towards using drones as part of mechanisation for paddy cultivation in KADA, Kelantan granary areas.

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5.2 Recommendations

According to the results, some recommendations will be suggested to improve future research. Drone technology is a newly emerging technology in Malaysia, and this is our future in the agriculture sector. In order to alert those farmers in Malaysia and

indirectly to obtain data on how they will accept this new technology, future research needs to be more comprehensive, and data should be collected all around Malaysia.

In addition, must distributing questionnaires include all districts in KADA areas. The results of future research will be different and accurate if research is done on all farmers who use drone technology in different areas of KADA.

Last but not least, to avoid bias from respondents while answering the questionnaire due to their background, keep your question short and clear. In the future, the study can focus on drone technology at the level of the others important to ensure continuity of food security in Malaysia.

REFERENCES

Abdullah, F., & Samah, A. (2013). Factors impinging farmers' use of agriculture technology. *Asian Social Science*, 9(3), 120.

Abdullahi, H. S., Mahieddine, F., & Sheriff, R. E. (2015, July). Technology impact on agricultural productivity: A review of precision agriculture using unmanned aerial vehicles. In *International conference on wireless and satellite systems* (pp. 388-400). Springer, Cham.

Abegunde, V. O., Sibanda, M., & Obi, A. (2020). Mainstreaming Climate-Smart Agriculture in Small-Scale Farming Systems: A Holistic Nonparametric Applicability Assessment in South Africa. *Agriculture*, *10*(3), 52.

Adnan, N., Nordin, S. M., Rahman, I., & Noor, A. (2017). Adoption of green fertilizer technology among paddy farmers: A possible solution for Malaysian food security. *Land use policy*, *63*, 38-52.

Ahmad Termizi, A.T. (2015). Baik dan buruk Dron. Retrieved from Utusan Online: http://www.utusan.com.my/sains-teknologi/gajet/baik-dan-buruk-dron-1.80229.

Allen Jr, J. C. (2011). Sample size calculation for two independent groups: a useful rule of thumb. *Proceedings of Singapore Healthcare*, *20*(2), 138-140.

Annor-Frempong, F., & Akaba, S. (2020). Socio-economic impact and acceptance study of drone-applied pesticide on maize in Ghana. *CTA Technical Report.*

Aris, N. M., P.Rameli, M. F., Mohamed, N., Abas, S. A., & Man, N. C. (2018). Prestasi Tanaman Padi Di Malaysia. *Journal of Islamic, Social, Economics and Development*. 3 (11), 51-61.

Ayaz, M., Ammad-Uddin, M., Sharif, Z., Mansour, A., & Aggoune, E. H. M. (2019). Internet-of-Things (IoT)-based smart agriculture: Toward making the fields talk. *IEEE access*, *7*, 129551-129583.

Azman, A., D'Silva, J. L., Samah, B. A., Man, N., & Shaffril, H. A. M. (2013). Relationship between attitude, knowledge, and support towards the acceptance of sustainable agriculture among contract farmers in Malaysia. *Asian Social Science, 9*(2), 99-105.

Bano, R., AlShammari, E., Fatima, S. B., & Al-Shammari, N. A. (2013). A comparative study of knowledge, attitude, practice of nutrition and non-nutrition student towards a balanced diet in Hail University. *Journal of Nursing and Health Science*, *2*(3), 29-36.

Barnes, A. P., Soto, I., Eory, V., Beck, B., Balafoutis, A. T., Sánchez, B., ... & Gómez-Barbero, M. (2019). Influencing incentives for precision agricultural technologies within European arable farming systems. *Environmental Science and Policy*, *93*, 66-74.

BERNAMA. (2021). SMART SBB pioneer programme can boost paddy output. Retrieved from BERNAMA https://www.bernama.com/en/general/news.php?id=2026430

Business Today Editorial. (2021, February 24). SMART SBB To Improve Malaysia's Large-Scale Agriculture Programmes - BusinessToday. Retrieved from BusinessToday. https://www.businesstoday.com.my/2021/02/24/smart-sbb-to-improve-malaysias-large-scale-agriculture-programmes/

Carreón, J. R., René, J. J., Niels, F., & Rob, V. H. (2011). A Knowledge Approach to Sustainable Agriculture. Retrieved from http://www.springer.com/978-94-007-0889-1

Chuang, J. H., Wang, J. H., & Liang, C. (2020). Implementation of Internet of Things depends on intention: Young farmers' willingness to accept innovative technology. *International Food and Agribusiness Management Review*, *23*(2), 253-266.

de Winter, J. C., Dodou, D., & Wieringa, P.A. (2009). Exploratory factor analysis with small sample sizes. *Multivariate Behavioral Research, 44(2)*, 147-181.

Department of Statistics Malaysia. (2020). Malaysia Trade Statistics Review VOL. 1/2020.

Economic Impacts, BRC Research Report, Bangkok Research Center, JETRO Bangkok / IDE-JETRO.

Firdaus, R. R., Leong Tan, M., Rahmat, S. R., & Senevi Gunaratne, M. (2020). Paddy, rice and food security in Malaysia: A review of climate change impacts. *Cogent Social Sciences, 6(1)*, 1818373.

Hailu, M., Mammo, Y., & Ketema, M. (2016). Internet Acceptance and Use Model in Ethiopian Agriculture Education and Research: the case of two universities. *International Journal of Science and Technology Educational Research Vol. 7(4)*, 35-48.

Harun, R., Ariff, E. E. E., Suhaimee, S., Sobri, A. A., Ahmad, B., & Sufian, F. H. (2016). Economic assessment for inbred paddy in MADA and IADA Pulau Pinang. *Economic and Technology Management Review*, *11*, 127-141.

Haula, K., & Kruglikov, S. (2019). FARMERS'UNION AS A MECHANISM TO ADOPT AGRICULTURAL DRONES IN SUB-SAHARAN AFRICA. In *Book of Proceedings* (p. 71).

Jambari, N. S. A., Samad, N. I. A., Anua, S. M., Ruslan, R., & Hamzah, N. A. (2020). Knowledge, attitude and practice (KAP) on pesticide exposure among farmers in Kota Bharu, Kelantan. *Malaysian J. Med. Health Sci*, *16*, 56-62.

Kasim, N. M., Ahmad, M. H., Shaharudin, A. B., Naidu, B. M., Chan, Y. Y., & Aris, T. (2018). Food choices among Malaysian adults: Findings from Malaysian adult nutrition survey (MANS) 2003 and MANS 2014. *Malaysian Journal of Nutrition, 24(1),* 63–75.

Kharim, M. N. A., Wayayok, A., Shariff, A. R. M., Abdullah, A. F., & Husin, E. M. (2019). Droplet deposition density of organic liquid fertilizer at low altitude UAV aerial spraying in rice cultivation. *Computers and Electronics in Agriculture, 167,* 105045.

Kim, Y., Chun, J., & Song, J. (2009). Investigating the role of attitude in technology acceptance from an attitude strength perspective. *International Journal of Information Management 29(1),* 67–77.

Launiala, A. (2009). How much can a KAP survey tell us about people's knowledge, attitudes and practices? Some observations from medical anthropology research on malaria in pregnancy in Malawi. *Anthropology Matters, 11*(1)

Lee, C. H. S., Phang, S. K., & Mun, H. K. (2021). Design and Implementation of an Agricultural UAV With Optimized Spraying Mechanism. In *MATEC Web of Conferences* (Vol. 335, p. 02002). EDP Sciences.

Littler, S. (2015, October 27). The Importance and Effect of Sample Size. Retrieved from Statistical Services: https://select-statistics.co.uk/blog/importance-effect-sample-size/

Maddikunta, P. K. R., Hakak, S., Alazab, M., Bhattacharya, S., Gadekallu, T. R., Khan, W. Z., & Pham, Q. V. (2021). Unmanned aerial vehicles in smart agriculture: Applications, requirements, and challenges. *IEEE Sensors Journal*, *21*(16), 17608-17619.

Madi, Y. I. (2020). The knowledge, attitude, and practice toward green fashion innovation adoption (Order No. 28148562). (2555659194). Retrieved from https://www.proquest.com/dissertations-theses/knowledge-attitude-practice-toward-green-fashion/docview/2555659194/se-2?accountid=51152

Manda, R., & Kumar, P. R. (2021). Role of IoT in sustainable farming. In *Smart Agriculture: Emerging Pedagogies of Deep Learning, Machine Learning and Internet of Things* (pp. 101-117). CRC Press.

Mukaka, M. M. (2012). A guide to appropriate use of correlation coefficient in medical research. *Malawi medical journal, 24*(3), 69-71.

Organisation for Economic Co-Operation and Development (OECD). (2001). Adoption of Technologies for Sustainable Farming Systems. In *Wageningen Workshop Proceeding* (Vol. 259). Paris, France: Organisation for Economic Co-Operation and Development (OECD).

Raheem, D., Dayoub, M., Birech, R., & Nakiyemba, A. (2021). The Contribution of Cereal Grains to Food Security and Sustainability in Africa: Potential Application of UAV in Ghana, Nigeria, Uganda, and Namibia. *Urban Science, 5*(1), 8.

Rahim, F. H. A., Hawari, N. N., & Abidin, N. Z. (2017). Supply and demand of rice in Malaysia: A system dynamics approach. *Int. J Sup. Chain. Mgt, 6*, 1-7.

Rahman, A. E., Tarek, A., Dar, R. A., & Hiekel, N. S (2014). Comprehensive Assessment of Two Compounds and Spraying Equipment for Controlling Citrus Brown Mite Eutetranychus orientalis (Klein) (Acari: Tetranychidae). On Citrus Trees at Qalubia Province. Egyptian Academic Journal of Biological Sciences, F. *Toxicology & Pest Control, 6*(1), 25-33.

Ronaghi, M. H., & Forouharfar, A. (2020). A contextualized study of the usage of the Internet of things (IoTs) in smart farming in a typical Middle Eastern country within the context of Unified Theory of Acceptance and Use of Technology model (UTAUT). *Technology in Society, 63*, 101415.

Sabir, R. I., Safdar, M., Khurshid, N., & Hafeez, I. (2014). Influence of factors in green advertising upon purchase intentions-a study of Pakistani University Students. *International Review of Management and Business Research, 3(4)*, 2131.

Sadati, S. A., Shaabanali Fami, H., Asadi, A., & Sadati, S. A. (2010). Farmer's attitude on sustainable agriculture and its determinants: A case study in Behbahan County of Iran. *Research Journal of Applied Sciences, Engineering and Technology, 2(5*), 422-427.

Sakata, Shozo ed. 2020. *Structural Changes of Agriculture in the CLMTV Countries and their SocioEconomic Impacts*, BRC Research Report, Bangkok Research Center, JETRO Bangkok / IDE-JETRO

Schmeitz, A. H. L. (2020). The application of drones in precision agriculture (Bachelor's thesis, University of Twente).

Shetty, P. K., Murugan, M., Hiremath, M. B., & Sreeja, K. G. (2010). Farmers' education and perception on pesticide use and crop economies in Indian agriculture. *Journal of Experimental Sciences, 1(1)*, 3-8.

Shigoli, T. (2018). *Factors that influence strategic implementation of donor-funded projects in non-governmental organizations in Kenya: A case of the International Rescue Committee-Kenya* (Doctoral dissertation, United States International University-Africa).

Smith, K. (2017). Elevating Precision Agriculture to New Heights. *Natural Sciences Education, 46*(1), pp. 1-3.

Stehr, N. J. (2015). Drones: The newest technology for precision agriculture. *Natural Sciences Education, 44*(1), 89-91.

Su, A. M., Yahya, A., Mazlan, N., & Hamdani, M. A. (2018, February). Evaluation of the spraying dispersion and uniformity using drone in rice field application. In *MSAE Conference Feb*.

Subramanian KS, Pazhanivelan S, Srinivasan G, Santhi R and Sathiah N (2021) Drones in Insect Pest Management. *Frontiers in Agronomy, 93*, 3:640885.

Suhaizi, M. A., Azmi, Y., Norida, M., & Saiful, A. M. (2018, February). Evaluation of the Spraying Dispersion and Uniformity Using Drone in Rice Field Application. *In Proceedings of the MSAE Conference, Serdang, Malaysia* (pp. 7-8).

Tsouros, D. C., Bibi, S., & Sarigiannidis, P. G. (2019). A review on UAV-based applications for precision agriculture. *Information*, *10*(11), 349.

Unpaprom, Y., Dussadeeb, N., & Ramaraj, R. (2018). Modern Agriculture Drones the Development of Smart Farmers 2018. *Maejo University*, *7*, 13-19.

Van der Meijden, G (1998). Pesticide application techniques in West-Africa.

Wachenheim, C., Fan, L., & Zheng, S. (2021). Adoption of unmanned aerial vehicles for pesticide application: Role of social network, resource endowment, and perceptions. *Technology in Society*, *64*, 101470.

World Bank Group. (2019). Agricultural Transformation and Inclusive Growth: The Malaysian Experience.

World Health Organization. (2008). *Advocacy, communication and social mobilization for TB control: a guide to developing knowledge, attitude and practice surveys* (No. WHO/HTM/STB/2008.46). World Health Organization.

Yang, H., & Yoo, Y. (2004). "It's all about attitude: revisiting the technology acceptance model. *Decision Support Systems* (38:1), 19-31.

Zainal, M.H. (2021, February 23). Dr Ronald Kiandee Saksi MOU Smart Sawah Berskala Besar. Retrieved from MalaysiaGazette. https://malaysiagazette.com/2021/02/23/dr-ronald-kiandee-saksi-mou-smart-sawah-berskala-besar/

Zheng, S., Wang, Z., & Wachenheim, C. J. (2019). Technology adoption among farmers in Jilin Province, China: the case of aerial pesticide application. *China Agricultural Economic Review*.

APPENDICES

APPENDIX A

Dear respondent,

I am doing academic research entitled:

Farmers Acceptance Towards Using Drone as Part of Mechanization for Paddy Cultivation in KADA Kelantan Granary Areas

Congratulations, you have been selected as a respondent for this research. Your sincere cooperation is crucial in determining the success of this study. In this study, I would like to assess your acceptance towards using the drone as part of mechanization for paddy cultivation in KADA Kelantan granary areas. Please read all the instructions carefully in every section and answer every question sincerely. There is no right or wrong answer.

All responses provided will be treated strictly confidential and will be used for this academic research only.

Thank you very much for your cooperation.

Sincerely,

……
Wan Nurul Atiqah binti Wan Rosdi
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PENERIMAAN PETANI TERHADAP PENGGUNAAN DRONE SEBAGAI SEBAHAGIAN DARIPADA MEKANISASI PENANAMAN PADI DI KAWASAN JELAPANG KADA KELANTAN

FARMERS ACCEPTANCE TOWARDS USING DRONES AS PART OF MECHANIZATION FOR PADDY CULTIVATION IN KADA KELANTAN GRANARY AREAS

SOALAN
QUESTIONS

BAHAGIAN A: INFORMASI DEMOGRAFI
SECTION A – DEMOGRAPHICAL INFORMATION

Mohon tanda (/) dalam ruangan yang diberi dalam jawapan anda.
Please mark (/) in the space provided in your answer.

BAHAGIAN A – Maklumat Demografi *Sila Tandakan (/) pada pernyataan pilihan anda* *SECTION A –* ***Demographical Information*** *Please Tick (l) to your statement choice*		
1.	Umur/Age	□ 20 – 30 tahun/*years* □ 31 – 40 tahun/*years* □ 41 – 50 tahun/*years* □ 51 – 60 tahun/*years* □ 61 – 70 tahun/*years*
2.	Jantina/*Sex*	□ Lelaki/*Male* □ Perempuan/*Female*
3.	Taraf Perkahwinan/*Marital Status*	□ Berkahwin/*Married* □ Duda/Janda/*Divorced* □ Belum Berkahwin/*Unmarried*
4.	Bangsa/*Race*	□ Melayu/Malay □ Cina/*Chinese* □ India/*Indian* □ Siam/*Siamese* Lain lain, Sila nyatakan *If others, please state* _____

5.	Tahap Pendidikan/ *Level of Education*	☐ Tidak Pernah Bersekolah/*No Formal Education* ☐ UPSR ☐ SRP/ PMR/PT3 ☐ SPM ☐ Sijil Kemahiran/Teknikal/ *Vocational Certification* ☐ STPM/STAM ☐ Diploma ☐ Ijazah/Sarjana/PhD/
6.	Adakah bapa/ibu anda atau kedua-duanya terlibat dalam penanaman padi? *Does your father/mother involve in planting paddy?*	☐ Ya/*Yes* ☐ Tidak /*No*
7.	Jarak kediaman dari sawah padi yang diusahakan *Distance from your house to paddy field.*	☐ 1 – 5 KM ☐ 6 - 10 KM ☐ 11 - 15 KM ☐ 16 - 20 KM ☐ Lebih daripada/*More than* 20 KM
8.	Berapa lama pengalaman anda dalam penanaman padi? *How long has your experience planted paddy?*	☐ Kurang dari 1 tahun/ *less than 1 year* ☐ 1-5 tahun /*years* ☐ 6-10 tahun /*years* ☐ 11-15 tahun /*years* ☐ 16 tahun keatas */More than 16 years*
9.	Keluasan padi yang diusahakan? *The area of planting paddy?*	☐ 1-2 ekar/ 1-*2 acres* ☐ 3-4 ekar/ *3-4 acres* ☐ 5-6 ekar/ *5-6 acres* ☐ 7-8 ekar/ *7-8 acres* ☐ 9-10 ekar/ *9-10 acres* ☐ Lebih daripada 10 ekar/*More than 10 acres*
10.	Pengeluaran hasil padi semusim untuk setiap hakter (tan/ha)? *Production of paddy yield per season for each hectare (ton/ha)?*	☐ Kurang dari 2 tan / *Less than 2 ton* ☐ 2 – 3 tan / *ton* ☐ 4 – 5 tan / *ton* ☐ Lebih daripada 5 tan / *More than 5 ton*

11	Berapakah kos penggunaan perkhidmatan dron di kawasan anda bagi setiap ekar? *How much does it cost to use drone services in your area per acre?*	☐ Kurang dari RM25/ *Less than RM25* ☐ RM26-RM50 ☐ RM51-RM75 ☐ RM76-RM100 ☐ Lebih dari RM100/*More than RM100*

Arahan: Untuk soalan-soalan **BAHAGIAN B, C dan D**, sila baca setiap item dan beri jawapan anda dengan menandakan pada pilihan jawapan yang bersesuaian dengan mengikut:

*Instructions: For the questions in **SECTIONS B, C and D,** please read each item and give your answer by ticking the appropriate answer option according to*:

1	2	3	4	5
Sangat Tidak Setuju / *Strongly Disagree*	Tidak Setuju / *Disagree*	Purata / *Average*	Setuju / A*gree*	Sangat Setuju / S*trongly Agree*

BAHAGIAN B/ *SECTION B*:

BAHAGIAN B: PENGETAHUAN PETANI TERHADAP PENGGUNAAN DRON SEBAGAI SEBAHAGIAN DARIPADA MEKANISASI PENANAMAN PADI DI KAWASAN JELAPANG KADA KELANTAN ***PART B: KNOWLEDGE OF FARMERS TOWARDS USING DRONES AS PART OF MECHANIZATION FOR PADDY CULTIVATION IN KADA KELANTAN GRANARY AREAS***	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
1. Dron adalah teknologi baru yang diperkenalkan oleh agensi kerajaan dalam kerja penanaman padi seperti semburan racun serangga/rumpai, membaja dan menabur biji benih. *Drones are new technologies introduced by government agencies in paddy cultivation work, such as spraying pesticides/weeds, cultivating and sowing seeds.*					
2. Dron memudahkan kerja di lapangan seperti penyemburan racun, menabur baja dan biji benih disawah. *Drones facilitate fieldwork such as spraying pesticides, sowing fertilizers and seeds in the fields.*					
3. Penggunaan dron mampu meningkatkan hasil pengeluaran. *The use of drones can increase production.*					
4. Saya tahu risiko penggunaan dron seperti semburan tersasar, dron terbabas dan jarak selamat semasa operasi penerbangan drone dilapangan. *I acknowledge the risk when using drones, such as spraying drift, drone crash and safety distance when using a drone.*					

5. Penggunaan dron dapat menjimatkan masa operasi,dan mengurangkan tenaga kerja semasa melakukan aktiviti penanaman padi. *The use of drones can save operating time and reduce manpower while doing paddy cultivation activities.*					
6. Penggunaan dron adalah alternatif yang efektif untuk memantau pertumbuhan penanaman padi untuk kawasan yang lebih luas. *The use of drones is an effective alternative to monitor the growth of paddy cultivation for a wider area.*					
7. Bancuhan racun rumpai/serangga untuk penyemburan menggunakan drone perlu mengikut sukatan yang disyorkan oleh syarikat pengeluar racun untuk hasil penyemburan yang berkesan di sawah. *The herbicide/insecticide mixture for spraying using a drone should follow the dosage recommended by the pesticide manufacturer for effective spraying results in the field.*					
8. Pengoperasian dron di sawah padi hendaklah dilakukan oleh pengendali yang berkelayakan dan mendapat lesen serta permit untuk meningkatkan keyakinan pesawah (pengguna) *Drone operation in paddy fields must be done by a qualified operator and obtain a license and permit to increase farmers' confidence (consumers).*					

BAHAGIAN C/ *SECTION C*:

1	2	3	4	5
Sangat Tidak Setuju / *Strongly Disagree*	Tidak Setuju / *Disagree*	Purata / *Average*	Setuju / *Agree*	Sangat Setuju / *Strongly Agree*

BAHAGIAN C: SIKAP PETANI TERHADAP PENGGUNAAN DRON SEBAGAI SEBAHAGIAN DARIPADA MEKANISASI PENANAMAN PADI DI KAWASAN JELAPANG KADA KELANTAN ***SECTION C: ATTITUDE OF FARMERS TOWARDS USING DRONES AS PART OF MECHANIZATION FOR PADDY CULTIVATION IN KADA KELANTAN GRANARY AREAS***	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
1. Saya menyarankan menggunakan kaedah dron berbanding kaedah lama dalam operasi penyemburan dan menabur benih/baja. *I recommend using the drone method instead of the old method in spraying and sowing seeds/fertilizer operations.*					
2. Saya lebih suka menggunakan dron kerana mudah diurus dan kosnya lebih menjimatkan. *I prefer to use a drone because it is easy to manage and cost-effective.*					
3. Saya akan menggunakan servis dron sekiranya penyedia perkhidmatan dron adalah banyak dikawasan penanaman dan kos penggunaan adalah berpatutan. *I will use a drone service if the drone service provider is abundant in the cultivation area and has a reasonable use cost.*					
4. Saya akan mendapatkan nasihat daripada pegawai pengembangan KADA atau merujuk mereka yang pakar berkenaan penggunaan drone dalam operasi penanaman padi. *I will seek advice from KADA expansion officers or refer experts on using drones in paddy cultivation operations.*					

5. Saya akan mengikuti kursus berkenaan penggunaan dron disawah padi sekiranya diberi peluang untuk menambah ilmu pengetahuan dan pemahaman yang lebih baik. *I will follow a training course on using drones in paddy fields to increase knowledge and better understand*					
6. Saya mendapati penyedia perkhidmatan dron masih terhad di kawasan jelapang padi KADA. *I found that drone service providers are limited in the KADA paddy granary area.*					
7. Saya berpendapat program pendedahan dan kursus penggunaan teknologi seperti dron perlu diperluaskan dikalangan golongan muda dikawasan penanaman padi untuk menarik minat dan membuka peluang pekerja dikalangan generasi baru. *I believe that exposure programs and courses on the use of technology such as drones should be expanded among young people in paddy cultivation areas to attract interest and open up opportunities for workers among the new generation.*					
8. Saya dapati penyedia perkhidmatan dron mengenakan cas yang tinggi untuk penggunaan dron di sawah dan ini telah membantut hasrat saya dari menggunakannya. *I have found that drone service providers charge high charges for drones in the field, which has hindered my desire to use them.*					
9. Saya berharap subsidi penggunaan servis dron perlu diperkenalkan oleh pihak kerajaan untuk meningkatkan penggunaan dron dikalangan petani. *I hope the government should introduce the subsidy for drone services to increase the use of drones among farmers.*					

BAHAGIAN D/ *SECTION D*:

1	2	3	4	5
Sangat Tidak Setuju / *Strongly Disagree*	Tidak Setuju / *Disagree*	Purata / *Average*	Setuju / *Agree*	Sangat Setuju / *Strongly Agree*

BAHAGIAN D: AMALAN PETANI TERHADAP PENGGUNAAN DRON SEBAGAI SEBAHAGIAN DARIPADA MEKANISASI PENANAMAN PADI DI KAWASAN JELAPANG KADA KELANTAN ***SECTION D: PRACTICAL KNOWLEDGE OF FARMERS TOWARDS USING DRONES AS PART OF MECHANIZATION FOR PADDY CULTIVATION***	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
1. Saya yakin penggunaan dron dapat menjimatkan masa, meningkatkan hasil tanaman padi saya serta menjimatkan kos buruh bagi tempoh jangka panjang. *I am confident that drones can save time, increase the yield of my paddy crop, and save labour costs for the long term.*					
2. Saya menggunakan dron sebagai kaedah pertanian tepat bagi meningkatkan hasil dan keuntungan tanaman. *I use drones as a precise farming method to increase crop yields and profits.*					
3. Saya menggunakan dron untuk mengurangkan jumlah input diperlukan untuk penanaman seperti air dan racun. *I use drones to reduce the number of inputs needed for cultivation, such as water and pesticides.*					
4. Saya memastikan bahawa pengendalian dron dikawasan jelapang padi saya dilakukan oleh pihak yang dipercayai dan mahir untuk mencegah kerugian. *I make sure that the drone operation in my paddy granary area is done by a trusted and skilled party to prevent losses.*					

5. Saya menggunakan mekanisasi dron untuk penyemburan racun perosak kerana dapat mengurangkan risiko racun perosak terhadap manusia *I use drone mechanization for pesticide spraying because it can reduce the risk of pesticides to humans.*					
6. Saya yakin teknologi dron dapat menentukan jumlah optimum bahan semburan diperlukan serta memastikan semburan dibuat secara rata pada tanaman. *I am confident drone technology can determine the optimal amount of spray material needed and ensure spraying is done evenly on the crop.*					
7. Saya sentiasa merujuk kepada pegawai pertanian KADA ataupun pakar mengenai segala permasalahan berkaitan penggunaan dron. *I always refer to KADA agricultural officers or experts on all problems related to the use of drones.*					
8. Kini saya telah menggunakan dron bagi semua aktiviti-aktiviti penyemburan di sawah padi. *Now I have used drones for all spraying activities in paddy fields.*					
9. Saya mengikuti prosedur yang telah ditetapkan oleh pihak berkuasa dalam penggunaan dron untuk aktiviti penyemburan di sawah padi. *I followed the procedures prescribed by the authorities in the use of drones for spraying activities in paddy fields.*					
10. Saya berpendapat penggunaan dron untuk penanaman padi adalah tidak sesuai kerana semburan input ke sawah tidak rata dan tidak meliputi keseluruhan kawasan. *I think drones for paddy cultivation are inappropriate because the field's input spray is uneven and does not cover the entire area.*					

BAHAGIAN E/ *SECTION E*:

1	2	3	4	5
Sangat Tidak Setuju / *Strongly Disagree*	Tidak Setuju / *Disagree*	Purata / *Average*	Setuju / A*gree*	Sangat Setuju / S*trongly Agree*

BAHAGIAN E: PENERIMAAN PETANI TERHADAP PENGGUNAAN DRON SEBAGAI SEBAHAGIAN DARIPADA MEKANISASI PENANAMAN PADI DI KAWASAN JELAPANG KADA KELANTAN ***SECTION D: ACCEPTANCE OF FARMERS TOWARDS USING DRONES AS PART OF MECHANIZATION FOR PADDY CULTIVATION***	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
1. Saya tahu mengenai mekanisma teknologi dron di jelapang padi. *I know about the mechanism of drone technology in paddy granaries.*					
2. Saya yakin mekanisma teknologi dron adalah sangat memudahkan. *I believe the mechanism of drone technology is effortless.*					
3. Saya beranggapan teknologi dron di jelapang padi adalah keutamaan dalam meningkatkan kualiti tanaman padi saya. *I think drone technology in paddy granaries is a priority in improving the quality of my paddy crop.*					
4. Saya boleh meluangkan masa untuk mengambil tahu teknologi dron. *I can take the time to learn about drone technology.*					
5. Saya berminat untuk menggunakan teknologi dron bagi hasil tanaman padi yang lebih baik. *I am interested in using drone technology for better paddy crop yields.*					

6. Saya beranggapan kos untuk menggunakan drone dijelapang padi saya sangat berpatutan. *I think the cost of using a drone in my paddy field is very affordable.*					
7. Saya berminat untuk didedahkan dengan kepentingan dan kebaikkan teknologi dron kepada tanaman padi saya. *I am interested in being exposed to the importance and benefits of drone technology to my paddy crop.*					
8. Faktor kewangan menyebabkan saya menggunakan teknologi dron untuk kawasan jelapang padi saya. *Financial factors caused me to use drone technology for my paddy granary area.*					

Soal selidik ini merupakan salah satu medium dan metodologi kajian terhadap kajian penerimaan petani terhadap penggunaan dron sebagai sebahagian daripada mekanisasi penanaman padi di kawasan jelapang KADA Kelantan.

This questionnaire is one of the medium and research methodologies towards the study on the farmers acceptance towards using a drone as part of mechanization for paddy cultivation in KADA Kelantan granary areas.

SOAL SELIDIK TAMAT/*QUESTIONNAIRE ENDS*

TERIMA KASIH ATAS KERJASAMA YANG DIBERIKAN
THANK YOU FOR YOUR PARTICIPATION IN THIS RESEARCH AS A RESPONDENT

APPENDIX B