UNIVERSITI MALAYSIA KELANTAN

Adoption of Drone Technology among Paddy Farmers In Perlis and Kedah

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A Thesis Submitted in Fulfillment of the Requirements for Degree of Bachelor of Applied Science (Agrotechnology) With Honours

Faculty of Agro Based Industry

University Malaysia Kelantan

2022

DECLARATION

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

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ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and the Most Merciful

Alhamdulillah, all praise is due to Allah for blessing me with the ability to complete my thesis. I am grateful to God for the opportunities, hardships, and strength given to me to complete the thesis. I went through a lot during this process, not just in academics but also in my personal growth.

In the first place, I'd like to convey my gratitude to everyone who has assisted me in finishing my final-year project successfully. The Faculty of Agro-Based Industry (FIAT) deserves special recognition for providing and coordinating final year projects for all final year students.

Next, I'd like to sincerely thank my supervisor, Madam Tengku Halimatun Sa'adiah Binti T Abu Bakar, for her guidance, understanding, patience, and, most importantly, for delivering positive encouragement a warm attitude that enabled me to complete this thesis. She taught me a lot about social science research. It has been a pleasure and an honour to have her as my supervisor.

I would like to express my gratitude to MADA, particularly Puan Surianie Binti Bakar, Head of the Research and Statistics Branch of the MADA Information Technology and Planning Department. They have let me conduct a study on paddy farmers in Perlis and Kedah and give information that aids in the completion of my research.

Then, I would like to give my parents and family a profound appreciation for their unwavering support and enthusiasm for completing my research, even though the time allotted to complete this project is short. Aside from that, I'd like to thank my friend for being there during my difficult time finishing this thesis. Last but not least, I'd like to express my gratitude to everyone who helped me finish my thesis. Hopefully, my research will be useful to others, and please wish me luck in the future.

Adoption of Drone Technology among Paddy Farmers in Perlis and Kedah

ABSTRACT

Today, a few issues that slow drone technology adoption among paddy farmers are not considered. Fewer paddy farmers adopted drone technology due to a lack of enthusiasm and understanding about using drones including farmers' age. Therefore, this study aims to determine the adoption of drone technology among paddy farmers in Perlis and Kedah. The independent variables in this study were facilitating condition, social influence, performance expectancy, and effort expectancy. Meanwhile, the dependent variable has been the adoption of drone technology. This study was used a quantitative research design, and the questionnaire was constructed based on the Unified Theory of Acceptance and Use of Technology (UTAUT). This study has been used simple random sampling to choose 150 paddy farmers that have been registered under Muda Agricultural Development Authority (MADA). The data was analysed using SPSS version 26.0, including reliability tests, descriptive, correlation, and t-test analysis. This study showed a medium mean score for all the variables. Then, the correlation analysis results presented a significant relationship between facilitating conditions, social influence, performance expectancy, and effort expectancy on the adoption of drone technology among paddy farmers in Perlis and Kedah. Besides that, for t-test results showed an insignificant difference between paddy farmers' age towards the adoption of drone technology in Perlis and Kedah. Hopefully, this study can increase the adoption of drone technology among paddy farmers, especially in Perlis and Kedah. Even though it is difficult to adapt technology to agricultural activities, it is worth it since the productivity and income of the farmers can be increased.

Keyword: *Drone technology, adoption, paddy farmers, Perlis, and Kedah, UTAUT*

Penerimaan Teknologi Dron di Kalangan Pesawah Padi di Perlis dan Kedah

ABSTRAK

Hari ini, terdapat beberapa masalah yang memperlambat penggunaan teknologi dron di kalangan pesawah padi yang tidak dipertimbangkan. Ini kerana sebilangan kecil pesawah padi kurang menggunakan teknologi dron kerana kurangnya semangat dan pemahaman tentang penggunaan dron termasuk umur petani. Oleh itu, kajian ini bertujuan untuk mengetahui penggunaan teknologi dron di kalangan pesawah padi di Perlis dan Kedah. Pemboleh ubah bebas dalam kajian ini adalah keadaan kemudahan, pengaruh sosial, jangkaan terhadap prestasi dan jangkaan terhadap usaha. Sementara itu, pemboleh ubah yang bergantung adalah penggunaan teknologi dron. Pada kajian ini, reka bentuk penyelidikan kuantitatif akan digunakan, dan soal selidik akan dibina berdasarkan Unified Theory of Acceptance and Use of Technology (UTAUT). Kajian ini telah menggunakan persampelan rawak mudah untuk memilih 150 petani padi yang telah didaftarkan di bawah Lembaga Kemajuan Pertanian Muda (MADA). SPSS versi 26.0 telah digunakan untuk menganalisis data dengan menggunakan ujian kebolehpercayaan, ujian kenormalan, deskriptif analisis, korelasi analisis, dan ujian-t. Keputusan kajian menunujukkan bahawa semua pemboleh ubah mempunyai skor min yang sederhana. Tambahan pula, keputusan ujian korelasi menunjukkan terdapat hubungan yang signifikan antara keadaan kemudahan, pengaruh sosial, jangkaan terhadap prestasi dan jangkaan terhadap usaha terhadap penggunaan teknologi di kalangan petani padi di Perlis dan Kedah. Manakala, hasil ujian-t tidak mempunyai perubahan hubungan di antara perbezaan umur pesawah padi dengan penggunaan teknologi dron di Perlis dan Kedah. Harapan, agar kajian ini dapat meningkatkan penggunaan teknologi dron di kalangan pesawah padi terutama di Perlis dan Kedah. Walaupun sukar untuk menyesuaikan diri dengan teknologi baru dalam kegiatan pertanian, tetapi sangat berbaloi kerana produktiviti dan pendapatan petani dapat ditingkatkan.

Keyword: *Teknologi dron, penerimaan, pesawah padi, Perlis, and Kedah, UTAUT*

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LIST OF ABBREVIATIONS

MADA	The Muda Agricultural Development Authority
FOA	Farmers' Organization Authority
USDA	United States Department of Agriculture
UAV	Unmanned Aerial Vehicles
GPS	Global Positioning System
UTAUT	Unified Theory of Acceptance and Use of Technology
IoT	Internet of Things
TAM	Technology Acceptance Model
IDT	Innovation Diffusion Theory
TPB	Theory of Planned Behavior
SPSS	Statistical Package for the Social Sciences
EFA	Exploratory Factor Analysis
KAP	Knowledge, Attitude, and Practice

LIST OF SYMBOLS

ha	hectares
mt	metric
&	and
N	sample sizes
%	percent
RM	Malaysian ringgit
M	mean
r	correlation coefficient
p	significance level
t	the difference between the population means

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter consists of the introduction, problem statement, scope of the study, and significance of the study. This chapter discusses the background of the study by focusing on the adoption of drone technology among paddy farmers in Perlis and Kedah.

1.1 Research Background

Oryza sativa L. is one of the most important plants planted in Malaysia. It can be split into two forms, paddy field and paddy Huma (hill paddy). The *Gramineae* family is made up of paddy trees. Paddy has 19 species; however, only two commonly cultivated species, namely *Oryza glaberima stend* and *Oryza sativa L*. In Africa is grown *Oryza glaberima* and in Asia, Australia, and America, *Oryza sativa L*. is grown. In the food subsector, Paddy has become Malaysia's main crop. In many developing countries, rice and paddy are critical components of food safety, socio-cultural development, and government strategic interventions (Omar, Shaharudin & Tumin, 2019)

Rice is the staple food of Malaysians. Malaysian adults consumed 2.5 plates of white rice per day on average (Kasim, Ahmad, Shaharudin, Naidu, Ying & Aris, 2018). Rice (*Oryza sativa L.*) is also one of the most valuable food crops for more than half of the world's population (Ahmed & Anang, 2019). It has a huge impact on food security in most countries (Ara, Lewis, & Ostendorf, 2017). Globally, approximately 160 million hectares are projected to be under rice cultivation, with an estimated annual production of approximately 500 million metric tonnes (Kirby, Mainuddin, Khaliq, & Cheema, 2017).

Perlis and Kedah are the states that are well-known for their paddy cultivation areas, which have earned them the moniker "national paddy granaries. The Muda Agricultural Development Authority manages the paddy cultivation areas of the two states (MADA). According to Mansor (2020), the Muda area is Malaysia's largest and most important paddy cultivation area because it involves a physical area of 130,282 hectares, while the paddy parcel area involves 100,685 hectares cultivated by about 57 635 farmers. The area is divided into four regions: Perlis (region 1), Jitra (region 2), Pendang (region 3), and Kota Sarang Semut (region 4). All the provinces supervise 27 Area Farmers Organizations (FAO).

Malaysia's self-sufficiency policy has focused on rice and paddy cultivation, the country's main staple food and food crop. Malaysia will continue its constructive and progressive efforts to support the growth of the paddy and rice sectors during National Agrofood Policy 2.0 (2021-2030). Table 1.1 below shows the data for the planted area (ha) and paddy production in each state from 2018 until 2020.

Table 1.1 shows that Kedah will produce the most paddy in 2020 (1,071,609 mt), with a planted area of 214,592 ha. Perlis is Malaysia's fifth-largest paddy producer, with a paddy production of 263,011 mt and a planted area of 51,612 ha. Even though Perlis and Kedah produce more paddy in Malaysia, they cannot compete with other countries such as China. It means Malaysia's productivity of paddy and rice is still low. It is important to remember that Malaysia has the smallest total paddy cropping area in Southeast Asia, at approximately 0.70 million hectares. The top three rice producers in Indonesia, Vietnam, and Thailand have allocated 11.50, 7.54, and 10.83 million hectares, respectively (USDA, 2020).

Table 1.1: Data of planted area (ha) and paddy production (mt) for all states in Malaysia from 2018 to 2020

State	2018		2019		2020	
	planted area (ha)	paddy production (mt)	planted area (ha)	paddy production (mt)	planted area (ha)	paddy production (mt)
Johor	2,866	9,424	2,555	7,704	2,866	10,582
Kedah	214,592	955,662	214,019	863,438	214,592	1,071,609
Kelantan	74,149	319,774	71,420	268,831	74,149	348,092
Melaka	3,135	9,352	3,360	9,323	3,135	12,970
Negeri Sembilan	1,896	7,504	1,943	7,721	1,896	9,370
Pahang	12,300	34,657	12,447	31,302	12,300	33,899
Perak	81,699	292,063	81,380	257,605	81,699	326,64 1
Perlis	51,612	240,615	51,612	209,828	51,612	263,011
Pulau Pinang	25,564	133,636	25,564	119,116	25,564	157,929
Selangor	36,868	174,432	36,602	174,088	36,868	206,456
Terengganu	17,431	74,335	18,341	71,915	17,431	79,312
Peninsular Malaysia	522,112	2,251,454	519,063	2,020,871	522,112	2,519,871
Sabah	42,442	122,390	43,546	112,569	42,442	128,634
Sarawak	135,426	265,358	109,261	215,491	135,426	279,372
Malaysia	699,980	2,639,202	671,870	2,348,931	699,980	2,927,877

Source: Ministry of Agriculture and Food Industries Malaysia (2020)

1.2 Drone Technology

The word ‘drone’ comes from the old English word, 'drān', which relates to a male bee searching for a mate and emitting a continuous monotonous sound (Syah, 2019). The drone is commonly referred to as UAVs, which are Unmanned Aerial Vehicles. It is a flying robot that can fly a pre-set course in its embedded system, using autopilot and global positioning system (GPS) coordinates (Earls & Lutkevich). The operation of drones is no longer as complicated due to the GPS. Nonetheless, behind the simple operation are several other complex technologies such as radio, main controller, and sensors that improve the smoothness of the drone flight mechanism.

The device has a main controller, which is a UAV's "brain" since it has a computer with software (reprogrammable) for controlling drones (Syah, 2019). Drones are getting smarter by incorporating open-source technologies, smart sensors, better integration, more flight time, monitoring offenders, forest detection, and other disaster areas (Earls & Lutkevich). It is most often associated with military, manufacturing, and other specialized operations. Still, with recent advances in sensors and information technology over the last two decades, the application of drones has been expanded to include other areas such as agriculture (Pinguet, 2021)

Using drone technology in the agricultural sector is increasingly common and gaining a position among modern farmers. Drones were designed to help farmers, especially those used to control crops, add fertiliser, and spray pesticides. Through a multi-spectral sensor, the drone's camera can get up close and track things that even the expert eye can't identify, such as moisture, plant health, stress level, and things like crop density, contour problems, and plant height (Corrigan, 2020)

Other than that, drones are also widely used to replace the manual application of herbicides, pesticides, and fertilizers. It is safer, efficient, and accurate and saves cost, energy, and time. For example, using drones to spray pesticides for an area of one hectare of paddy cultivation only takes about 20 minutes compared to the manual method, which is more than an hour for the same area (Mutalib, 2019). Adoption of agricultural technology is required to improve working efficiency and agricultural productivity.

1.3 Problem Statement

Drone technology is critical for sustainable agricultural development. That is one of the national development goals of improving farmers, fishermen, ranchers, and agro entrepreneurs' income status. Furthermore, Malaysia's government still aims to expand innovation and modern technology to improve and increase the productivity of the agricultural sector, thereby increasing income and the country's economy (Saad, 2020). When compared to the conventional approach, it will yield better results. The new developments of automated systems using agricultural robots and drones have contributed to the agro-based market (Liakos, G, PatriziaBusato, & DimitriosMoshou, 2018)

Although some studies have found benefits of using drone technology, the number of farmers using drone technology in Malaysia is low. Similar to this study, Nonvide (2021)

(2021) stated that agricultural technology adoption in Malanville remains very low, where only 32% of rice farmers use all agricultural technologies such as fertilizers, herbicides, better seeds, or a tractor. To support this study, several researchers claimed most developing countries are facing low adoption of agricultural technologies and farm conservation practices (Asfaw, McCarty, Lipper, Arslan, & Cattaneo, 2013; Ma & Abdulai, 2016). Some farmers have less belief in the innovation of technology compared to skills they have learnt for many years. Usually, it is felt that every time farming innovations are introduced to farmers, changes in production cause resistance among farmers (Adnan, Nordin, Bahruddin, & Tareq, 2019).

The issue of the adoption of drone technology is farmers' age. According to Zheng et al. (2019), older people are more traditional, less able to learn and master new skills, and less willing to embrace new technologies. Furthermore, several studies show that the likelihood of adoption decreases with increasing age, as older farmers are less interested in new technologies than younger farmers (Tamirat, Pedersen, & Lind, 2018).

As a result, this research aims to determine the adoption of drone technology among paddy farmers in Perlis and Kedah using the Unified Theory of Acceptance and Use of Technology (UTAUT). This study will benefit farmers, agricultural agencies, agricultural-based industry, and the government in the future. Furthermore, the use of drone technology in the agricultural sector is due to the existence of interest among young people in improving the quality and quantity of agricultural produce rather than simply following the trends of the revolution.

1.4 Research Questions

1) What is the level of a facilitating condition, social influence, performance expectancy, effort expectancy, and adoption of drone technology among paddy farmers in Perlis and Kedah?
2) What is the relationship significance of facilitating condition, social influence, performance expectancy with behavioural intention towards adoption of paddy farmers on drone technology in Perlis and Kedah?
3) How will the age of paddy farmers affect the adoption of drone technology in Perlis and Kedah?

1.5 Research Objective

This study was conducted to:

1) Determine the level of facilitating condition, social influence, performance expectancy, effort expectancy, and adoption of drone technology among paddy farmers in Perlis and Kedah.
2) Study the relationship between facilitating condition, social influence, performance expectancy, effort expectancy towards adoption of paddy farmers on drone technology in Perlis, and Kedah.
3) Identify the effect on the difference between the age of paddy farmers towards the adoption of drone technology in Perlis and Kedah.

1.6 Hypothesis of the Study

H1: There is a significant value relationship between facilitating conditions towards paddy farmers' adoption of drone technology in Perlis and Kedah.

H2: There is a significant value relationship between social influence towards paddy farmers' adoption of drone technology in Perlis and Kedah.

H3: There is a significant value relationship between performance expectancy towards paddy farmers' adoption of drone technology in Perlis and Kedah.

H4: There is a significant value relationship between effort expectancy towards paddy farmers' adoption of drone technology in Perlis and Kedah.

H5: There is the effect of the difference of age of paddy farmers towards the adoption of drone technology in Perlis and Kedah.

1.7 Scope of Study

The independent variable of this study was a social influence, facilitating conditions, performance expectancy, and effort expectancy. Meanwhile, the dependent variable was the adoption of drone technology among paddy farmers in Perlis and Kedah.

This study has covered paddy farmers in some regions of North Malaysia, which were Perlis and Kedah, that registered under MADA since they recorded higher paddy production than other states. The total target respondents will be 150 paddy farmers in both states.

1.8 Significant of Study

This study benefited farmers, who have been viewed as a group of people who are not entirely engaging in the current scene of drone adoption, particularly in the area. As a result, the study's findings were crucial to farmers because they would contribute to more participants in drone technology adoption.

Then, this study also contributed to the agricultural-based industry and government. More young people have been interested in participating or working in the paddy industry. When the number of farmers increases, this leads to the country's economic growth due to high productivity and the quality of paddy and rice. Besides, The National Agro-food Policy 2.0 (2021-2030) set a direction of accelerating modern technology applications such as drones, vertical farming, Internet of Things (IoT), and others to ensure national food security and sustainable food systems.

Furthermore, these findings may serve as a reference point for agricultural agencies to promote better adoption in all areas, particularly research. Ample supply and timely delivery of agricultural information on paddy plantations will improve farmers' knowledge, skills, and productivity.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This study aims to identify the level of facilitating condition, social influence, performance expectancy, effort expectancy, and adoption of drone technology among paddy farmers in Perlis and Kedah. Besides that, this study wants to determine the relationship between facilitating condition, social influence, performance expectancy, and effort expectancy towards the adoption of paddy farmers on drone technology in Perlis and Kedah. Then, this chapter also wants to determine the difference between the age of paddy farmers towards the adoption of drone technology in Perlis and Kedah. This chapter discusses the critical analysis of related studies and empirical findings that are critical to establishing the theoretical and conceptual structure and methodology to achieve the study's objective.

2.1 Concept of Adoption of Drone Technology

Adoption of technology is a term that refers to the acceptance, integration, and use in the society of new technology. Drone technology is an innovation of technology used in the agriculture sector to increase agricultural production and efficiency of agricultural activities. The drones can assist farmers in implementing appropriate agricultural techniques used to maximize their output (Marwah, 2020). Innovation was very efficient and competitive in Asia, allowing many farmers to use the technology (Sedem Ehiakpor, Apumbora, Danso-Abbeam, & Adzawla, 2017).

Agriculture technology provides numerous advantages to farmers, increasing crop production. However, the level of agriculture technology adoption among farmers is still low. According to Sheahan and Barrett (2017), and supported by Macours (2019), low adoption of technological developments that appear to be promising is a common and confusing phenomenon in Sub-Saharan Africa. Unless farmers are well understood and are a progress-by-step method of ongoing experiments and accumulation of experience, farmers would not implement completely new technology in previous studies on agricultural technology adoption (Takahashi, Muraoka, & Ōtsuka, 2019)

The concept of drone technology can be applied to all sectors regarding technology. According to (Lavison, 2013), technology adoption is a broad concept, explaining the application of technology in various life aspects and the technology adoption knowledge applied to improve means and methods of producing goods and services.

2.2 Theoretical Framework

The Unified Theory of Acceptance and Use of Technology (UTAUT) model was used to study the adoption of drone technology among paddy farmers in this study. UTAUT is a model formulated by Venkatesh, Morris, Davis & Davis in 2003. According to Tamilmani, Rana, and Dwivedi (2017), it refers to a conceptual framework for understanding users' intention and acceptance of technology in several contexts.

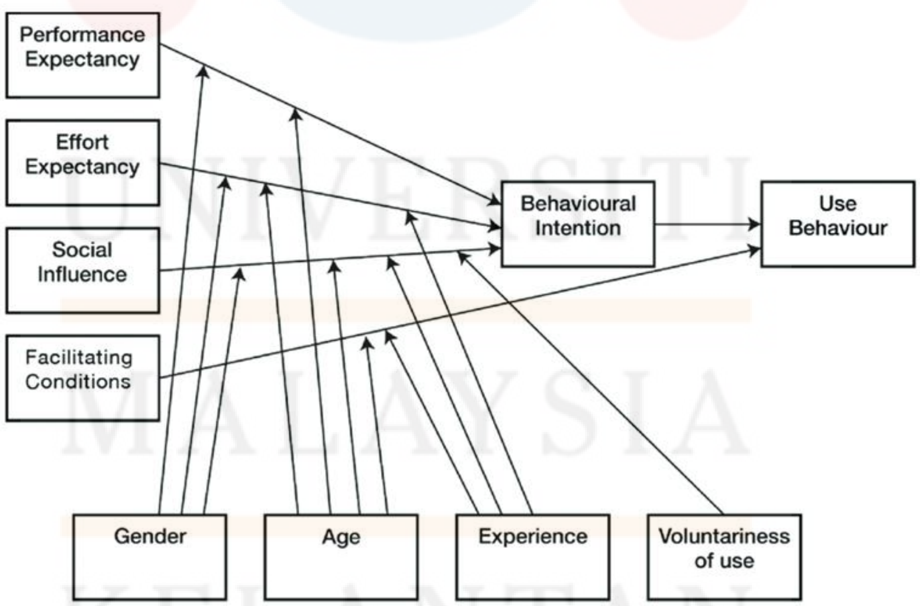
2.2.1 Theory of Unified Theory of Acceptance and Use of Technology (UTAUT)

Several technology adoption theories have often been used for research studies to forecast personal intentions to adopt new technologies. The Unified Theory of Acceptance and Use of Technology (UTAUT) comprises four factors that help predict an individual's behaviour intention. These factors include effort expectancy, performance expectancy, social influence, and facilitating conditions, as shown in Figure 2.1. The UTAUT model concerning technology acceptance is related to personal and social factors (Venkatesh, Morris, Davis, & Davis, 2003).

In this study, we use the Unified Theory of Acceptance and Use of Technology (UTAUT) to identify the relationship between social influence, facilitating conditions, performance expectancy, effort expectancy towards adoption of paddy farmers on drone technology in Perlis and Kedah. We expect that understanding these variables could help increase the adoption level of drone technology among farmers. Recent UTAUT uses for analysing rural farmers' adoption of new technology. For instance, farmers' uptake of solar water pump technology in Northern Pakistan (Zhou & Abdullah, 2017) and farmers' acceptance of pressurised irrigation technology (Nejadrezaei, Allahyari, Sadeghzadeh, Michailidis, & El Bilali, 2018)

UTAUT is one of the new models in technological acceptance and use. It takes a more inclusive approach, combining variables from other theories to predict how people will accept and use technology. This model is different from other generalised theories like the Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT), and Theory of Planned Behavior (TPB) (Nejadrezaei et al., 2018)

Figure 2.1: Unified Theory of Acceptance and Use of Technology (UTAUT)



Sources: Venkatesh et al., (2003).

2.3 Factors Explaining Adoption of Drone Technology among Paddy Farmers

This section explains facilitating conditions, social influence, performance expectancy, and effort expectancy as the factors that can influence the adoption of drone technology among paddy farmers.

2.3.1 Facilitating Condition

The facilitating conditions are the degree to which someone thinks there is an organisational and technological framework to help them use the system. Facilitating conditions may also help eliminate obstacles that prevent people from using a technology or method (Venkatesh et al., 2003). Then, as enabling conditions, access to financial support required skills and resources and access to professional consulting services were used because these have been identified as potential influencing factors in previous studies (Kendall et al., 2017). For example, government assistance in purchasing UAVs and encouraging industry-friendly growth would encourage the adoption of the technology (Xiongkui, Bonds, Herbst, & Langenakens, 2017).

The facilitating condition, including the presence of technological infrastructures such as knowledge and assistance, plays an important role in the intention and perception of users' to use technology and systems. Zheng et al. (2019), also stated that facilitating conditions as primary determinants of behavioural intent and subsequent behaviour of farmers technology adoption.

The level of facilitating conditions on the adoption of drone technology was projected to be high in this study. In a recent study by Wichean and Sungsanit (2022), the level of facilitating condition of the attitude of the broiler farmers on the use of poultry farm management systems is at a high level. It is due to having sufficient knowledge, financial and assistance. Meanwhile, a study by Li et al. (2020) discovered a poor level of facilitating condition of Chinese farmers on precision agriculture adoption due to restricted access in assistance whereby experts help them when confronting challenges. Other studies found that the medium level for facilitating the condition of farmers' perceptions of the organic agriculture system is recorded since the availability of production facilities like manure and vegetable pesticides is proper (Fuady & Sutarjo, 2021).

2.3.2 Social Influence

The mechanism by which the presence or action of others influences an individual's attitudes, values, or acts is known as a social influence (Macleod, 2021). The underlying assumption is that individuals tend to consult their social network about new technology and influence others' perceived social pressure, especially friends and family. According to Venkatesh et al. (2003) and Alraja (2015), social influence is characterised as the degree to which others (family, colleagues, peers, and others) assume (either positively or negatively) that someone will use the new method.

Few researchers stated that in social impact literature, farmers traditionally compare the "leading farmer" or "group leader" to other people in terms of wealth and education in the technology adoption phase (BenYishay & Mobarak, 2019; Shikuku, 2019). Social influence or individual farmer's view of the support of the closest person is essential to influence behavioural intention and decision to use technologies or practice farming. According to Rusere et al. (2020), farmers view social references such as compatibility with the socioeconomic environment as the most important indicators of social influence. They are essential variables in encouraging people to accept and employ ecological intensification choices.

Thus, the level of social influence on the adoption of drone technology among paddy farmers in Perlis and Kedah should be high. In a previous study by Lucy (2021), a high level of social influence on farmers' intention to use tissue culture banana seeds was recorded. Support from community leaders, religious leaders, and farmers' groups have convinced the farmers that tissue culture is better. Also, a high level of social influence was found towards attitude on poultry farm management systems in Thailand (Wichean & Sungsanit, 2022). Meanwhile, Fuady and Sutarjo (2021) showed a moderate social influence on perception and intention in organic agriculture cultivation in North Maluku Province. Social influence or individual farmer's view of the support of the closest person is essential to influence behavioural intention and decision to use technologies or practice farming.

2.3.3 Performance Expectancy

Performance expectancy is described by Venkatesh et al. (2003) as "the degree to which the consumer believes that using the system will assist him or her in achieving improvements in job performance." This suggests that people are more likely to adopt new technology if they believe it will help them perform better at work. A few studies claimed that performance expectancy is a fundamental construct determining the adoption and consequent use of the relevant technology. It has been justified as the strongest predictor of behavioural intention to use a technology (Venkatesh et al., 2003; Venkatesh, Thong, & Xu, 2012). Within this study's context, it is the extent to which paddy farmers believe that using drone technology will help them carry out their farming goals and improve their performance.

According to Mei-Ying, Pei-Yuan, and Weng (2012), performance expectancy is highly influenced by characteristics such as perceived usefulness, intrinsic and extrinsic motivation, job-fit, relative advantage, and information technology result expectancies. So, performance expectancy in agriculture technology adoption is an important variable. Khalid and Khairi (2018), stated that the performance expectancy of aquaculturists on the use of the Internet of Things (IoT) is at a high level since they believe they can do a task better using IoT.

Furthermore, Lucy (2021) discovered that farmers in Uganda believe that employing tissue culture seed as a banana planting material improves the performance and output of their banana plantation. Next, the level of performance expectancy towards farmers' perceptions of organic agriculture is also high when organic agriculture is conducted correctly and follows established standards (Fuady & Sutarjo, 2021). The resulting products sell much more than regular agricultural products.

2.3.4 Effort Expectancy

In this study, effort expectancy refers to the farmers' views or beliefs on the ease of using drone technology. Effort expectations are linked to how easily technology is used (Venkatesh et al., 2003) and to the degree to which one believes that technology is free of effort (Gwebu & Wang, 2011). Familiarity with similar technologies, education in information technology, and experience contribute to adopting emerging technologies (Rose & Bruce, 2018; Rose et al., 2016).

Then, the level of understanding could reflect farmers' confidence in technology beyond that in the ease-of-use variable and can also reflect an understanding of the benefits (Zheng et al., 2019). Effort expectancy plays a vital role in influencing intention to adopt technology or systems. Support by Zhou and Tao (2012) revealed that the more effort it takes to use technology, the less likely it is that people will use it.

Reported that Ugandan farmers' effort expectations for behavioural intentions to utilise mobile-based communication are high when farmers quickly learn how to use mobile applications for agricultural market information dissemination (Engotoit, Kituyi, & Moya, 2016). Other than that, a recent study also shows a high level of effort expectancy on intention to adopt the technology of broiler farmers (Wichean & Sungsanit, 2022). It means effort expectation relates to the amount of work required to operate the system is simple. Meanwhile, Rübcke von Veltheim, Theuvsen, and Heise (2021) found that the level of effort expectancy on the behavioural intention of German farmers to use autonomous field robots is moderate. To minimise the effort when handling new technologies must be experienced in dealing with technology.

2.4 The Effect of Facilitating Condition, Social Influence, Performance Expectancy, and Effort Expectancy on Drone Technology Adoption among Paddy Farmers

This section explained the effect of social influence, facilitating condition, performance expectancy and effort expectancy on drone technology adoption among paddy farmers.

2.4.1 The Effect of Facilitating Condition on Drone Technology Adoption among Paddy Farmers

The term "facilitating conditions" refers to how much a farmer assumes organisational and technological infrastructure exists to facilitate their plan to implement drone technology. According to Zhang, Sun, Ma, and Valentinov (2020), Farmers' cooperatives often act as intermediaries and forums to facilitate technology adoption by facilitating knowledge exchange between smallholder farmers and technology providers (e.g., universities, research institutes, agricultural extension agents, and technology companies). For example, a farmer who has trained household members or has access to favourable conditions, such as extension workers' assistance, is more likely to use it (Beza et al., 2018). Creating facilitating conditions would positively and significantly impact paddy farmers' adoption of drone technology.

In the past study by Koyu, Singh, and Singh (2021), there is a strongly positive and significant influence of facilitating conditions on behavioural intention to use an e-learning module on climate-smart horticulture. Other than that, facilitating condition of farmers on intention to adopt precision agriculture showed a significant positive effect (Li et al., 2020). It confirmed that facilitating conditions, including access to information, facilities, and financial resources, influence the intended behaviour of individuals to use technology. Similarly to this study, there is a positive relationship between facilitating conditions and behavioural intention to adopt the e-AgriFinance among Sarawak farmers (Omar, Yap, Ho, Keling, & William, 2021). So, the facilitating conditions such as availability of a smartphone and Internet connection, necessary knowledge in using a mobile app, and assistance available impacted the adoption of the systems.

2.4.2 The Effect of Social Influence on Drone Technology Adoption among Paddy Farmers

In the context of this study, social influence is defined as being persuaded (informed) to adopt drone technology by faith-based organisations, community members, and farmer groups. Family and friends are the trustful people that farmers can rely on upon regarding any information, especially technology adoption. Most farmers and buyers use informal market information sources, mainly from their families, friends, and neighbours (Msoffe & Ngulube, 2016). As a result, it is reasonable to expect that social influences will impact farmers' intentions to adopt drone technology. El-Gayar, Moran, and Hawkes (2011) claimed that social influence triggers behavioural intentions by individuals to employ new technologies.

In this study, the social influence will be significant towards paddy farmers' adoption of drone technology. A previous study found that social influence had a positive and significant influence on farmers' intentions to use tissue culture planting materials (Mulugo et al., 2020). Similar to this study, Ronaghi and Forouharfar (2020) claimed a positive effect of social influence on farmers' intention to use IoT technology when the correlation coefficient from the study was r = 0.68. According to the study's results, farmers work in groups, so community motivation to encourage the use of IoT technology could be quite beneficial. Also, in other studies, there was a direct positive path coefficient and significance between social influence and the intention to use mobile phones for agricultural market access of small-scale orange farmers (Mzomwe, Tambwe, Mapunda, & Kirumirah, 2021). Thus, social influence is thought to play an important role in the early stages of adoption as a factor influencing an individual's attitudes in the current context (Swinerd & McNaught, 2015).

2.4.3 The Effect of Performance Expectancy on Drone Technology Adoption among Paddy Farmers

Performance expectancy also affects the adoption of drone technology among paddy farmers. Performance expectancy is individuals' belief that increased use of technology will lead to improved performance. For example, past research found that the most important factors for farmers to adopt mobile SMS for data collection are performance expectancy, effort expectancy, price value, and trust (Beza et al., 2018). This study expects to significantly influence paddy farmers toward the adoption of drone technology. This was proved by past research that performance expectancy significantly predicts the intention to use a technology or system (Okumus, Ali, Bilgihan, & Ozturk, 2018).

Ronaghi and Forouharfar (2020), stated a positive relationship between performance expectation and behavioural intentions to use IoT. The higher farmers' expectations for their impact on IoT performance, the more common IoT equipment and equipment users they would be. Furthermore, a finding reported that performance expectancy significantly impacts behavioural intention to adopt the e-AgriFinance app. It is due to the farmers believing the e-AgriFinance app can help them complete commercial and financial transactions faster and make more money eliminating intermediaries (Omar et al., 2021). Meanwhile, there is a positive but not significant effect for the performance expectancy of rice farmers on the intention to adopt conservative agriculture practices. Appropriate policies are required to strengthen farmers' trust in extension and encourage conservative agricultural practices (Hayat et al., 2020).

2.4.4 The Effect Effort Expectancy on Drone Technology Adoption among Paddy Farmers

Effort expectancy will influence drone technology adoption. It is about the perception of farmers of the usability of technology. The determinant of effort expectation is understandable as the desired effort to use a system. The anticipated effort is often seen as higher in a new system (Schukat, Kuhlmann, & Heise, 2019). The effort expectancy is a critical predictor of technology adoption. It is because effort expectancy includes the amount of work required to operate the system, regardless of its complexity and users may readily embrace and implement user-friendly technologies (Catherine, Geofrey, Moya, & Aballo, 2018).

In this study, effort expectancy will be expected to positively influence the adoption of drone technology among paddy farmers. Similarly to this study, Ronaghi and Forouharfar (2020), discovered that effort expectancy on behavioural intention on the use of IoT was positive and significant. Effort expectancy, including farmers' views on using the technology or systems, affects technology adoption. Other study researchers found the effort expectancy had a positive and significant influence on the intention of paddy farmers to adopt conservative agriculture practices (Hayat et al., 2020). They found that through these practices would less the effort and work as paddy farmers. However, past studies found that effort expectancy on the behavioural intention of German farmers to use autonomous field robots had a significant negative relationship (Rübcke von Veltheim et al., 2021). This is because the farmer wants to avoid risk and losses on-farm decision-making.

2.5 Effect on Different between Age of Paddy Farmers towards Adoption of Drone Technology

Mostly farming was done by the older person. In MADA rice grenadiers, farmers in Kedah and Perlis have an average age of about 60 and are monopolised mainly by elderly and low-skilled farmers (Mokhzani, 2017). Also found in a study by Makate, Nelson, and Makate (2018), the age of farmers and farming experience could influence the adoption and perception of risks for new technology. A rise in technology use indicates that older persons are still falling behind the overall population (Anderson & Perrin, 2017). Because elderly farmers have less experience and knowledge of new technology, it is difficult to adopt it willingly. Zheng et al. (2019) claimed that older people tend to be more conservative, less able to learn and develop new abilities, and less ready to adopt new technology and practices. From that, this study assumed an effect on the different ages of paddy farmers on the adoption of drone technology.

This means age could have a different impact on technology adoption. A study by Michels, von Hobe, and Musshoff (2020), revealed that the age of German farmers has a statistically significant and negative effect on drone adoption. It means the higher age of farmers, the slower adoption of new technology. Furthertmore, Hu, Li, Zhang, and Wang (2019), discovered that the age of farmers on the adoption of technology is a negative and significant difference since elderly farmers are less exposed to drone technology information and rely on their skills and experience of working. Also, farmers' ages significantly affect the adoption of bioenergy crops. Farmers over the age of 50 are less likely than younger farmers to adopt innovative farming practices that entail big capital investments or offer more financial risk (Pathak, Brown, & Best, 2019).

2.6 Summary

This chapter describes the adoption of drone technology among paddy farmers, and the theory that will be used in this study has been explained. This chapter also briefly describes the adoption of drone technology among paddy farmers based on independent variables such as facilitating conditions, social influence, performance expectancy, and effort expectancy by using the Unified Theory of Acceptance and Use of Technology (UTAUT). Other than that, the effect of facilitating conditions, social influence, performance expectancy, and effort expectancy on the adoption of drone technology among paddy farmers are clearly explained, which shows the significance of two relations between the independent variable and dependent variable.,

CHAPTER 3

METHODOLOGY

3.0 Introduction

This chapter discusses the study's research design and the method used. It begins with the description of the research design that was used. The second section explained the research framework then follow by instrumentation. The next section outlines the population and sample, sampling method. After that, discusses the questionnaire measures and the next section explains data preparation, data analysis, and a summary of the chapter.

3.1 Research Design

This study's design is categorized as quantitative research or survey research. This design is appropriate for the study because it aims to provide insights and understanding of drone technology adoption among paddy farmers in Perlis and Kedah. This study aims to get information about the adoption of drone technology among paddy farmers in Perlis and Kedah. To gather the information or data about the adoption of drone technology among paddy farmers in Perlis and Kedah, the researcher conducts survey research to determine what it is and describe and interpret it. It is frequently in the form of a self-administered questionnaire or interview. This study also aims to test specific hypotheses and investigate the relationships between the research objectives. SPSS was used to enter data and analyze demographic profiles, independent and dependent variables. While in section 3, explain instrumentation. Next, the section will be followed by population and sample, data preparation, data analysis, and chapter summary.

3.2 Research Framework

Research framework prepared to identify adoption towards drone technology among paddy farmers in Perlis and Kedah. Unified Theory of Acceptance and Use of Technology (UTAUT) was applied to explain the level of adoption and the relationship between independent variables towards dependent variables. The dependent variable of this study would be drone technology adoption. The Unified Theory of Acceptance and Use of Technology (UTAUT model) recommended four conceptually independent variables of paddy farmers in Perlis and Kedah: social influence, facilitating condition, performance expectancy, and effort expectancy (Figure 3.2).

Independent Variables **Dependent Variable**

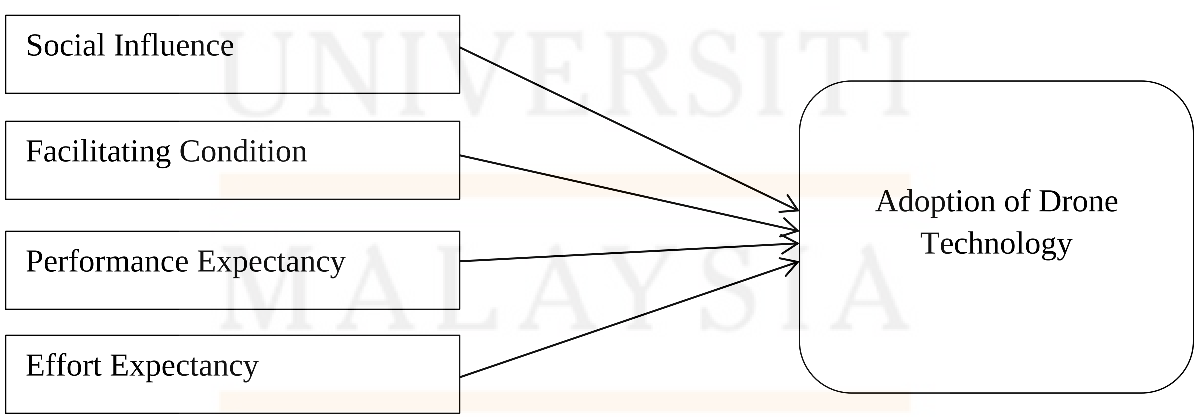


Figure 3.1: The conceptual framework

(Source: Adapted from Venkatesh, 2003)

3.3 Research Instrumentation

A questionnaire form was built and distributed to paddy farmers in Perlis and Kedah. It consisted of six sections in which a particular heading headlined each section. All the headings are supplemented by explicit instructions to suit the convenience of the respondents. These six sections were classified into four main parts in a questionnaire which consists of thirty-two questions. The first part of the questionnaire known as Section A started with demographic questions. Section B's second part contained questions about the adoption of technology. Next, section Parts C, D, E, and F were independent variables, including facilitating conditions, social influence, performance expectancy, and effort expectancy. It is the main component of paddy farmers adoption of drone technology. Every section contains eight questions.

The questionnaires applied in this study were open-ended and close-ended. These open-ended questions enable the respondent to express themselves freely in their own belief and experiences without the researcher's expectation (Story & Tait, 2019). The closed-ended questionnaire employed a rating scale using a five-point Likert scale that presents strongly disagree, disagree, slightly agree, agree, and strongly agree on a scale of 1 to 5 respectively. The rating scale is a subset of a multiple-choice question intended to obtain relative information on the topic since it correlates a qualitative measure with different product or service characteristics.

3.3.1 Section A: Socio-demographic profile

In section A, the question was answered for this section consisted of socio-demographic profiles of the paddy farmers in Perlis and Kedah. The questions in these sections included age, gender, race, religion, marital status, educational level, and income.

3.3.2 Section B: Dependent Variable

Section B consisted of questions on the adoption of drone technology among paddy farmers in Perlis and Kedah. The questions in this section were designed to measure paddy farmers' adoption of drone technology.

3.3.3 Section C, D, E and F: Independent Variables

In this section, the respondents answered the questions based on independent variables. Section C, D, E and F consisted of questions about facilitating condition, social influence, performance expectancy, and effort expectancy respectively.

3.4 Population and Sample

The paddy farmers in the state of paddy cultivation in the North of Malaysia which is Perlis and Kedah was selected as population and samples for this study. It is because the states of Kedah and Perlis are so famous for their paddy cultivation and the main contributor to rice production in Malaysia. According to Zulkifli (2021), Kedah and Perlis contribute to around 43 % of the country's rice production. The total target respondents were 150 paddy farmers in Perlis and Kedah.

3.4.1 Sample Size

This research was designated for paddy farmers that are already registered under MADA. This study was conducted in selected districts which were Perlis and Kedah. Paddy areas are not concentrated but spread through states. The sampling technique used for this analysis is a simple random sampling, randomly select from the paddy farmers in Perlis and Kedah who registered under MADA. The sample size was 150 respondents, all have been responded to the prepared questionnaires. The rational absolute minimum for large sample sizes is N=50, commonly considered as a technique by Exploratory Factor Analysis (EFA). However, good quality results can be obtained for N below 50 (Kyriazos & Theodoros, 2018). In addition, larger sample sizes minimize sampling error but at a decreased rate

(Madanchian, Hussein, Noordin, & Taherdoost, 2018). The sample size is suggested to be over 100. Thus, 150 samples can be properly classified and relevant.

3.4.2 Sampling Procedure

This analysis has been used simple random sampling under the probability sampling method. Probability sampling refers to that every item within a population has an equal chance of being included in the sample population. The responders of this study are MADA-registered paddy farmers from Perlis and Kedah. Probability sampling is a sampling method that involves chance or randomness in selecting samples (Thomas, 2020). The basis for statistical measurement of the possible error associated with an estimate of a population parameter formed from sample data is probability sampling (Barone, 2021).

3.5 Data Preparation

The complete questionnaire has been tested by the pilot study to check the questionnaire. The results of the pilot test were evaluated by using the reliability test.

3.5.1 Pilot Study

The questionnaires have been pre-tested. Pre-testing was carried out by distributing it to paddy farmers to ensure their potential reactions, significant outcomes, and level of understanding. A sample size of 30 respondents was used, which was sufficient to assess the feasibility of the study that determine whether the questionnaire provided was suitable and easy to understand. A pilot study's primary purpose is not to answer specific research questions, but to discourage researchers from implementing a large-scale study. And without adequate awareness of the methods proposed; in essence, a pilot study is carried out to avoid the occurrence of a fatal error in a study, which is costly in terms of time and money (Polit & Beck, 2008). Other than that, a thorough examination of the methodology and outcomes of the pilot research enables the identification of potential shortcomings (Malmqvist, Hellberg, Möllås, Rose, & Shevlin, 2019).

3.5.2 Reliability Test

According to Mugenda (2003), instrument reliability is a measure of how well a test instrument produces reliable results or data after repeated trials in the sample. This protocol exposed the ambiguous questions, which may lead to respondents interpreting them differently, and changes will be made accordingly. A generalizability analysis is conducted to assess the validity and precision of the observation instrument as well as the observers' reliability (Morillo, Reigal, Hernández-Mendo, Montaña, & Morales-Sánchez, 2017). Along with establishing the instrument's validity, each scale was evaluated for its reliability.

After piloting, the internal consistency procedure has been used to determine the reliability of the instruments. It provides details about the Cronbach's alpha relationship between individual items used in this research. An alpha value of between.00 and 1.0 is commonly used. No measurement consistency at all at .00, excellent measurement consistency at 1.0. Depending on the research, the acceptable range is 0.70 to 0.90. A Cronbach's Alpha of 0.7 or higher indicates good internal consistency for all categories of variable values (Adeniran, 2019).

The results of the reliability test are shown in Table 3.1, which includes the adoption technology, social influence, facilitating condition, performance expectancy and effort expectancy towards the adoption of drone technology of paddy farmers in Perlis and Kedah. All variables were good when Cronbach's alpha was over 0.9. UTAUT is suitable for this investigation since the outcome indicates consistency between UTAUT factors and important variables.

Table 3.1: Reliability test

Variable	Cronbach's alpha	Number of items
Drone Technology Adoption	0.979	7
Social influence	0.959	8
Facilitating condition	0.959	8
Performance expectancy	0.970	8
Effort expectancy	0.967	8

3.6 Data Analysis

Data analysis is used to assess data using analytical and statistical methods to identify important information and aid in decision making. The data gathered from the respondents were then analyzed and proven to be accurate. The frequency and descriptive statistics and the coding and data entry would be reviewed as part of the data cleaning process. The descriptive statistics such as mean, minimum, maximum, frequency, percentage, and standard deviation were calculated using the SPSS program to analyze and interpret the data. The data were analyzed using reliability analysis, descriptive analysis, correlation analysis, and t-test analysis.

3.7 Summary

The methodology of this study was briefly detailed in this chapter. The quantitative method was exhibited in the researched design using the SPSS program. The SPSS is used to analyze the data by the research objectives. The research framework identifies the dependent variable as drone technology adoption among paddy farmers in Perlis and Kedah and four independent variables as social impact, enabling condition, performance expectancy, and effort expectancy. Aside from that, 150 paddy farmers are chosen as the sample size.

CHAPTER 4

RESULT AND DISCUSSION

4.0 Introduction

This chapter presents the research findings from the data obtained, including the study's findings and discussion. The main source of data is from the case study samples whose 150 paddy farmers in Perlis and Kedah. Due to the limitations, a simple random sampling method was used to interview paddy farmers using Excel. Several of them were interviewed directly in person and by telephone. Additionally, this chapter discusses data analysis, including descriptive analysis, normality test, correlation test, and t-test. The analysis interpreted each question. This section will describe the analyzed data in further detail.

4.1 Descriptive Analysis

Descriptive analysis is one of the analyses used to understand the respondent's profile. Descriptive analysis is based on data collected through reviews. It covers the level of adoption, facilitating condition, social influence, performance expectancy, and effort expectancy of drone technology among paddy farmers in Perlis and Kedah including, respondents' demographic background, percentage, and frequency. The percentage and mean were calculated for each question on the Likert Scale questionnaire, such as the adoption of drone technology, facilitating condition, social influence, performance expectancy, and effort expectancy.

4.1.1 Demographic Background

This study's descriptive analyses are carried out to estimate the demographic profile of paddy farmers in Perlis and Kedah who have used drone technology. The demographic details included the farmers' age, gender, education level, farmer's experience in paddy cultivation, the area of cultivated land, estimation of income per season, experience in using the drones, and reason for using drones. The farmers' demographic information is shown in the following table.

According to the responses gathered, the vast majority of paddy farmers, 95.3%, were men, while 4.7% were women. In general, men do more heavy work in paddy cultivation, such as preparing land, manuring, and harvesting, than women, who hire help. Suvi, Shimelis, and Laing (2021) found that the proportion of males involved in paddy production in Tanzania is higher than that of females because males are typically the head of the household, taking the lead in farm planning deciding on crops to grow. However, Table 4.1 demonstrates that paddy cultivation in Kedah and Perlis is not limited to men, with the participation of some female paddy farmers.

The next considered demography was the age when the majority is 38.6%, of the respondents were aged between 50 to 59 years. 26.0% of the respondents were aged 60 to 69 years, whiles 13.4% were aged between 40 to 49 years. The minority of the respondents are from the age groups, 30-39 years, 70-79 years, and 20-29 years, with 15, 12, and 6 respondents representing 10.0%, 12.0%, and 4.0%, respectively. It indicated that most farmers are mature individuals who work in agriculture full-time since it is their primary source of income. Agriculture is also performed by those above 60. Even after retirement, farming is a source of income for the elderly. The existence of farmers under the age of 35 suggests that young people's interest in agriculture has the potential to grow. Next, 98.7% of respondents are married, and only 1.3% o single respondents.

From the data collected, the table below shows that the highest percentage of paddy farmers educated up to the high or secondary school level is 96.0%. Most of them only complete secondary school due to the need to support their families and continue working as farmers to help and replace their fathers and inherit the land that was produced paddy. Following that is the level of education at the primary school level, which is 2.0%, then 1.3% of paddy farmers who have no formal education, and 0.7%, or one educated at diploma level.

In this demographic part, also conducted paddy farmers of farming experience. The highest percentage was recorded for paddy farmers who experienced paddy cultivation for 11 to 15 years with 28.7%. Next, 23.3% of respondents have farming experience for 6 to 10 years, while 12.0% of paddy farmers had less than five years of farming experience. Following that is the paddy farmers whose farming experience is 36 to 40 years with 6.0%, share the same percentage with 5.3% of respondents whose farming experience is in 26 to 30, 41 to 45, and 46 to 50 years. 4.0% were owned by paddy farmers who experienced 16 to 20 years. Then, 2.7%, 2%, 1.3%, and 0.7% for paddy farmers that experience in farming for 51-55 years, 31-35 years, 56-60 years, and 60 years above. Higher output can be aided by more experience. The average rice farming experience in the Southwest, East-North, and Central regions are 22 years, 20 years, and 19 years, respectively. This impacts farmers' abilities, skills, and knowledge, which in turn has an impact on production (Baihaqi et al., 2021).

The following demographic considered is the paddy cultivation area, where the majority is 84.0% of the respondents are paddy cultivation in Kedah, while 16.0% of respondents are Perlis farmers. Most questionnaires for paddy farmers in Kedah are completed in person, whereas for farmers in Perlis, questionnaires are conducted via phone calls. It is due to the ongoing transmission of covid-19 disease and the fact that the number of people receiving the vaccine was still low at the time.

Additionally, Table 4.1 indicates that the respondents, 84%, have less than 5 hectares of paddy cultivation land. Meanwhile, 14.0% of respondents have between 6 to 10 hectares of cultivable land. The rest of the farmers who owned 11 to 15 hectares of land is 2.0%. According to the findings, most farmers earn between RM 10,000 to RM 16,000, with 37.3% of respondents. This was followed by 34.7% of paddy farmers earning between RM 3,000 and RM 9,000 per season. 13.3% of respondents earned RM 17,000 to RM 23,000 whereas, 2.0% of respondents earn below RM 31,000-RM 37,000, RM 38,000-RM 44,000 and RM 45,000-RM 51,000. While only a few farmers with incomes higher than RM 52,000 and less than RM 3,000 were represented by 1.3% and 0.7% of respondents, respectively.

In this section, most paddy farmers in Perlis and Kedah have used a drone before, with 72%. Meanwhile, for non-adopters of drone technology in paddy cultivation located at Perlis and Kedah are 28.0% are. Following that, Table 4.1 shows the percentage of farmers using drones in paddy cultivation. There are several reasons why paddy farmers use drones. In this section, paddy farmers can choose more than three reasons for adopting drones in their crops. The Majority vote was 66.0% of paddy farmers decided to use drones in their crops since it reduces labour dependence. Next, 62.67% of paddy farmers have a reason to use a drone, saving cost and time on spray material and its process. Then, 56.67 % of Perlis and Kedah farmers choose spraying pesticides and fertilizer evenly and at the right amount as a reason to use drones. 38.00% of paddy farmers agree to adopt drones because other farmers and relatives influenced them. Other than that, 28.67% of paddy farmers agree that using a drone could increase profitability and paddy yields. The minimum percentage was 23.33% because they got encouragement from agriculture agencies. Meanwhile, 28.0% of paddy farmers who are non-adopters have no reason to adopt drones in their crops.

Table 4.1: Demographic background of paddy farmers

	Character	Frequency	Percent
Gender	Male	143	95.3
	Female	7	4.7
Age	20-29 years old	6	4.0
	30-39 years old	15	10.0
	40-49 years old	20	13.4
	50-59 years old	58	38.6
	60-69 years old	39	26.0
	70-79 years old	12	8.0
Marital status	Married	148	98.7
	Single	2	1.3
Education level	Graduated from high education level (Diploma/Degree/Master)	1	0.7
	Graduated from high school (SRP/SPM/STPM)	144	96.0
	Graduated from primary school	3	2.0
	Not schooling	2	1.3
Farmer's experience in paddy cultivation	< 5 years	18	12.0
	6-10 years	35	23.3
	11-15 years	43	28.7
	16-20 years	6	4.0

	21-25 years	5	3.3
	26-30 years	8	5.3
	31-35 years	3	2.0
	36-40 years	9	6.0
	41-45 years	8	5.3
	46-50 years	8	5.3
	51-55 years	4	2.7
	56-60 years	1	0.7
	>60 years	2	1.3
Paddy cultivation area	Kedah	126	84.0
	Perlis	24	16.0
The area of land cultivated	<5 ha	126	84.0
	6-10 ha	21	14.0
	11-15 ha	3	2.0
Estimation of income per season	<RM 3,000	1	0.7
	RM 3,000-RM 9,000	52	34.7
	RM 10,000-RM 16,000	56	37.3
	RM 17,000-RM 23,000	20	13.3
	RM 24,000-RM 30,000	10	6.7
	RM 31,000-RM 37,000	3	2.0
	RM 38,000-RM 44,000	3	2.0
	RM 45,000-RM 51,000	3	2.0
	>RM 52,000	2	1.3

Experienced in using drone	Yes	108	72.0
	No	42	28.0
Reason for using drone	Spraying pesticide and fertilizer evenly at the optimum amount	85	56.67
	Reducing labour dependence	99	66.00
	Influenced by other farmers and relatives	57	38.00
	Got encouragement from agriculture agencies	35	23.33
	Saving cost and time on spray material and its process	94	62.67
	Increase profitability and paddy yields	43	28.67
	Have no reason	42	28.0

4.1.2 The level of Drone Technology Adoption among Paddy Farmers in Perlis and Kedah.

The descriptive analysis result for drone technology adoption among paddy farmers in Perlis and Kedah is shown in Table 4.2. The highest percentage was scored with 38.7% for paddy disagree with the statement "I am frequently adopting drone technology in paddy cultivation.". Followed by 28.7% of paddy farmers either agree or disagree, 26.7% of paddy farmers agree, and 4.0% of paddy farmers strongly agree that they commonly use drones in paddy cultivation. And the lowest is 2.0% of paddy farmers who strongly disagree with the statement. Some paddy farmers have only used drones a few times since they began to utilize them, not for an extended period. Some of them employ drones because the procedure of pesticide application is faster than using a backpack sprayer, especially for large areas.

For this statement, "I am adopting drone technology on a regular basis," 35.3% of paddy farmers either agree or disagree, 34.7% of paddy farmers agree, 27.3% of paddy farmers disagree, and 2.0% of paddy farmers strongly disagree with the statement. Meanwhile, only 0.7% of paddy farmers strongly agree that they use drones daily. This is because farmers utilize drones to spray pesticides and spray fertilizer on paddy, but this is rarely done.

As stated in Table 4.2, the statement "Drone technology should be adopted regardless of costs" has 36.7% of paddy farmers agree followed by 29.3% of paddy farmers either agree or disagree and 26.0% disagree with the statement. And sharing the exact percentage is 4.0% of paddy farmers who strongly agreed and strongly disagreed with the statement that drone technology should be used regardless of cost. Thus, most paddy farmers feel that drone technology should be adopted regardless of price. It is because drones can be rented, purchased, or used cooperatively. Most respondents rented drones from their farmers' cooperatives and used them because the cost was reasonable, and they were willing to spend money on the process.

For the statement “Adopting drone technology in paddy cultivation is needed,” 44.7% of paddy farmers agree, 31.3% of paddy farmers either agree or disagree, and 18.0% of paddy farmers disagree with it. The least was 4.0% of paddy farmers who strongly agree and 2.0% strongly disagree with the statement. Therefore, most respondent paddy farmers believe that, with the passage of time and technology, drones would be necessary for paddy farming.

“I adopt drone technology because it can facilitate work, especially when spraying pesticide” is a statement with majority response was 55.3% of paddy farmers agree. Followed by, 24.0% of paddy farmers disagree, 11.3% of the paddy farmers either agree or disagree, and 5.3% of paddy farmers strongly agree with the statement. Lastly, only 4.0% of paddy farmers strongly disagree that using drones help the works of spraying of pesticides. Based on the response, most paddy farmers agree that drone technology can facilitate work, especially when spraying pesticides. The time required for pesticide dispersal with a drone is shorter and more accurate than with a backpack sprayer. Farmers believed backpack sprayers could be used in any state or condition. but eventually, its dispersal of pesticide is slow, and the atomization is low, leading to high levels of pesticide residue (Wachenheim, Fan, & Zheng, 2021).

For the statement of “I am adopting drones because of technology's efficacy,” 40.0% of paddy farmers agree, 26.7% of paddy farmers either agree or disagree, and 24.0% of paddy farmers disagree. Meanwhile, 5.3% of paddy farmers strongly agree, and 4.0% strongly disagree that they adopt drones due to the efficacy of the technology. Some respondents assume drones spray crops carefully, and better pesticide targeting saves pesticides in the right amount, reducing input waste.

"Adopting drone in paddy cultivation is due to my willingness to accept innovation and being open-minded" is a statement with the response 40.0% of paddy farmers agree, 28.0% of the paddy farmers either agree or disagree, and 26.0% of paddy farmers disagree. The lowest percentage recorded with 4.0% of paddy farmers who strongly agree and 2.0% of paddy farmers strongly disagree with the statement, respectively. According to the responses, most rice farmers are eager to accept innovation and are willing to adapt and employ new technology that functions and benefits them well.

Based on Table 4.3, the mean score of drone technology adoption among paddy farmers is a medium mean score (M= 3.1944, SD=0.90227). It proves that paddy farmers in Perlis and Kedah have a moderate level of adoption of drone technology. Part of them are open to new ideas and recognize that drone technology can help in paddy cultivation by making their work easier. To support this study, Abu Bakar et al. (2021)stated that fruit farmers in Johor also have a moderate level in adopting organic farming practices since they recorded a moderate mean score with M= 2.597. In Malaysia, the adoption of agricultural technology or farming practices, an alternative type of technology, is still in the adaptation phase. Meanwhile, Mao, Zhou, Ying, and Pan (2021), discovered that the level of adoption of green agriculture technology is high when the number of adopters is greater than the number of non-adopters of the technology. In contrast to this study, Nonvide (2021) said that adopting agricultural technology such as tractors, improved seed, and others is still relatively low in Benin.

Table 4.2: Descriptive analysis for drone technology adoption

Statement	Percentage (%)					SD	Mean
	1	2	3	4	5		
I am frequently adopting drone technology in paddy cultivation	2.0	26.7	28.7	38.7	4.0	0.935	3.16
I am adopting drone technology on a regular basis	2.0	27.3	35.3	34.7	0.7	0.854	3.05
Drone technology should be adopted regardless of costs	4.0	26.0	29.3	36.7	4.0	0.970	3.11
Adopting drone technology in paddy cultivation is needed	2.0	18.0	31.3	44.7	4.0	0.882	3.31
I adopt drone technology because can facilitate work, especially when spraying pesticide	4.0	24.0	11.3	55.3	5.3	1.029	3.34
I am adopting drones because technology's efficacy	4.0	24.0	26.7	40.0	5.3	0.992	3.19
Adopting drones in paddy cultivation is due to my willingness to accept innovation and being open minded	2.0	26.0	28.0	40.0	4.0	0.935	3.18

**Indicator: 1. Strongly Disagree 2. Disagree 3. Either Agree or Disagree 4. Agree 5. Strongly Agree*

Table 4.3: Mean score of drone technology adoption

Variable	Frequency	Percentage (%)	Mean	SD
Drone technology adoption			3.1944	0.90227
Low (1.00-2.33)	42	28.0		
Medium (2.34-3.67)	46	30.7		
High (3.68-5.00)	62	41.3		

4.1.3 The Level of Facilitating Condition of Drone Technology among Paddy Farmers in Perlis and Kedah.

The descriptive analysis result for facilitating the condition of drone technology among paddy farmers in Perlis and Kedah is shown in table 4.4. About 36.7% of paddy farmers either agree or disagree, and 35.3% of paddy farmers agree with the statement, "I have the facilities to implement drone technology in paddy cultivation ."Followed by 20.0% of paddy farmers disagree, and 4.0% of paddy farmers strongly agree and strongly disagree with that statement. The majority shows that paddy farmers either agree or disagree that they can implement drone technology in paddy cultivation. According to one respondent, farmers' income is insecure, and it may be their good fortune to generate high yields, in which case they can hire drones for pesticide applications. However, if low yields affect their income and prohibit them from saving, they must manually spray pesticides.

For the statement "The authorities provide facilities in terms of loans to me in adopting drone technology," 58.7% of paddy farmers either agree or disagree, 17.3% of paddy farmers disagree, and 16.0% of paddy farmers agree with the statement. And the lowest percentage scored with 4.0% for paddy farmers who strongly agreed and strongly disagreed that they could get loans for adopting drones from authorities. Therefore, most paddy farmers either agree or disagree that the rules provide loans for adopting drone technology facilities. The government needs to provide financial facilities to farmers to use drones and improve crops.

"I can easily obtain consultation services for using drone technology" is a statement with the response 38.7% of the paddy farmers either agree or disagree, and 29.3% of paddy farmers agree with the statement. Next is followed by 26.0% of paddy farmers disagree, 4.0% of paddy farmers strongly agree, and 2.0% of paddy farmers strongly disagree that they could reach consultation services using drones. From this, many paddy farmers in Perlis and Kedah either agree or disagree with the statement that they can get consultation services in using drones for their paddy cultivation. It means that farmers place a high value on consultation services such as advice, equipment, and supplies. Some indicated that they could obtain it through agricultural authorities to adopt and use drone technology.

According to Table 4.4, the statement "If I have any doubts about how to adopt the drone, there will be professionals to help me" has 37.3% of paddy farmers either agree or disagree, 31.3% of paddy farmers agree, and 26.0% disagree with the statement. Lastly, for paddy farmers who strongly agree is 3.3%, while strongly disagree is 2.0% with the remark that if they have any concerns about the drone, they can consult with professionals. It reveals that if some of the paddy farmers had any questions about operating, maintaining, or using other drone functions, there were professionals on hand to help them.

“I have enough information on the latest types of methods or technologies suitable for my paddy crop,” is a statement with the response 44.7% of the paddy farmers either agree or disagree, and 30.7% of paddy farmers agree with the statement. Next, 16.0% of paddy farmers disagree, and 4.7% of paddy farmers strongly agree with the remark that they have adequate input on new technologies and practice farming in paddy crops. Lastly, only 4.0% of paddy farmers strongly disagree with the statement. According to this, most rice farmers in Perlis and Kedah either agree or disagree with the statement that they have sufficient information about the latest methods or technologies suitable for paddy production. It is due to the desire to know more about how it works, what it is, and what benefits it provides.

The result shows that 67.3% of paddy farmers either agree or disagree with the statement “MADA's guidance is adequate for the use of new technology (drones) in paddy cultivation,” 43.3% of paddy farmers in Perlis and Kedah strongly agree with the statement. Meanwhile, 14.7% of paddy farmers disagree, 10.0% of paddy farmers agree, and 4.0% of paddy farmers strongly agree with the statement that sufficient guidance from MADA in terms of handling new technology. As a result, many farmers agree or disagree with MADA's appropriate advice for using the latest technology, particularly drones. Some respondents claimed that MADA's guidance might also aid in improving farming techniques and increasing yields to some extent.

According to Table 4.4, the statement “I have many colleagues who are willing to help and share drone technology facilities for my paddy crop” has 38.0% of paddy farmers agree followed by 36.0% of paddy farmers either disagree or agree with it. Next, 21.3% of paddy farmers disagree, and 2.7% strongly agree with the statement. Lastly, 2.0% of paddy farmers strongly disagree with the statement. Most paddy farmers received assistance and shared technology facilities in their paddy production by hiring drone service from their farmer's friends since it is expensive to purchase the equipment.

"Government agencies provide necessary drone technology workshop and training to me in adopting drone technology" is a statement with the response 56.0% of the paddy farmers either agree or disagree and 26.0% of paddy farmers disagree. About 13.3% of paddy farmers agree, and 2.7% strongly agree with that statement. Lastly, 2.0% of paddy farmers strongly disagree with the statement. From this, most paddy farmers in Perlis and Kedah either agree or disagree with the statement that the government agencies had provided them with workshops or training for adopting drones. For example, MADA has been supported paddy farmers by holding programs related to drones, such as training and workshop. Aziz and Zaharudin (2021) said that (MADA) was one of the first authorities in Malaysia to deploy drones in agriculture, particularly for pesticide spraying in rice fields.

Based on the result in Table 4.5, the mean score of facilitating condition of Drone Technology among Paddy Farmers in Perlis and Kedah is considered as medium mean score (M= 3.0592, SD=0.78987). From this, the level of facilitating condition of drone technology among paddy farmers is moderate. It is because support such as infrastructure and technical support from government and agricultural agencies influences drone technology in paddy cultivation. A study found facilitating conditions to be at a moderate to a low level of the adoption of precision agriculture among Chinese farmers. One of the reasons is they were having difficulties in reaching professionals to help them encounter issues associated with precision agriculture (Li et al., 2020). Also, the past study discovered that the mean score for facilitating condition is at a medium value (M=3.02), indicating that the level of facilitating condition of farmers using tissue culture banana seed in Central Uganda is moderate. Most respondents gave a medium score for each question of facilitating condition, which includes tissue culture seed sources being within reach and the nursery operator being willing to provide information on how to grow tissue culture seed (Lucy, 2021). Meanwhile, a high level of facilitating conditions of the boiler farmers' attitude on the use of poultry farm management systems (Wichean & Sungsanit, 2022). Thus, the level of facilitating condition is at a high level when most broiler farmers have adequate knowledge of financial resources and are updated with new technology.

Table 4.4: Descriptive for facilitating condition

Statement	Percentage (%)					SD	Mean
	1	2	3	4	5		
I have the facilities to implement drone technology in paddy cultivation	4.0	20.0	36.7	35.3	4.0	0.925	3.15
The authorities provide facilities in terms of loans to me in adopting drone technology	4.0	17.3	58.7	16.0	4.0	0.811	2.99
I can easily obtain consultation services for using drone technology	2.0	26.0	38.7	29.3	4.0	0.891	3.07
If I have any doubts about how to adopt the drone, there will be professionals to help me	2.0	26.0	37.3	31.3	3.3	0.886	3.08
I have enough information on the latest types of methods or technologies suitable for my paddy crop	4.0	16.0	44.7	30.7	4.7	0.891	3.16
MADA's guidance is adequate for the use of new technology (drones) in paddy cultivation	4.0	14.7	67.3	10.0	4.0	0.754	2.95
I have many colleagues who are willing to help and share drone technology facilities for my paddy crop	2.0	21.3	36.0	38.0	2.7	0.868	3.18
Government agencies provide necessary drone technology workshops and training to me in adopting drone technology	2.0	26.0	56.0	13.3	2.7	0.756	2.89

**Indicator: 1. Strongly Disagree 2. Disagree 3. Either Agree or Disagree 4. Agree 5. Strongly Agree*

Table 4.5: Mean score of facilitating condition

Variable	Frequency	Percentage (%)	Mean	SD
Facilitating condition			3.0592	0.78987
Low (1.00-2.33)	36	24.0		
Medium (2.34-3.67)	85	56.7		
High (3.68-5.00)	29	19.3		

4.1.4 The level of Social Influence of Drone Technology among Paddy Farmers in Perlis and Kedah

The descriptive analysis result for the social influence of drone technology among paddy farmers in Perlis and Kedah is shown in Table 4.6. The highest percentage recorded is 50.0% of paddy farmers who either agree or disagree with the statement "My relatives influence my decision to use drone technology," and 26.0% of paddy farmers disagree. Followed by 16.7% of paddy farmers who agree, 4.0% of paddy farmers strongly disagree, and 3.3% of paddy farmers who strongly agree with the statement. It demonstrates that most paddy farmers either agree or disagree that decisions to adopt drone technology in paddy cultivation were influenced by their relatives. Family members and relatives are among the closest persons who can influence and drive them in their decision-making and intention-behaviour.

For the statement "Other paddy farmers (fellow farmers and friends) effected my decision to adopt drone technology," 38.0% of paddy farmers either agree or disagree, 31.3% of paddy farmers agree, and 26.0% of paddy farmers disagree with the statement. Next, 2.7% of paddy farmers strongly agree, and only 2.0% strongly disagree with the statement. As a result, most paddy farmers agree that the decision to adopt drone technology was influenced by other paddy farmers who are either fellow farmers or friends. Part of them begins to use drones because they trust and follow their friend in adopting the technology for pesticide spraying.

"MADA encouraged me to explore new agricultural technologies, such as the use of drones for fieldwork," is a statement with the response 51.3% of the paddy farmers either agree or disagree, and 21.3% of paddy farmers agree with the statement. About 20.7% of paddy farmers disagree, followed by 4.0% of paddy farmers strongly disagree, and 2.7% of paddy farmers strongly agree with the statement that they got encouraged by MADA to explore new technology in the agriculture sector. From this, most paddy farmers in Perlis and Kedah either agree or disagree with the statement that they got encouraged to explore new agricultural technologies by MADA. It shows that MADA needs to improve the availability and quality of information on the technologies and the availability of adequate infrastructure and extension support.

As shown in Table 4.6, the statement "I was influenced by media information such as newspaper to adopt drone instead of a conventional method" has the response from 56.7% of paddy farmers either agree or disagree. Followed by 26.0% of paddy farmers disagree, 12.0% of paddy farmers agree, and 3.3% of paddy farmers strongly agree with it. Lastly, 2.0% strongly disagree with the statement. It demonstrates that the majority of paddy farmers either agree or disagree that media information such as newspapers influenced them to use drones instead of traditional methods.

The following statement, "The Agriculture Officer's approach has encouraged me to adopt innovations and technologies of drones in the paddy industry," 52.7% of paddy farmers either agree or disagree, 24.0% of paddy farmers disagree, and 16.7% of paddy farmers agree. Meanwhile, 4.0% of paddy farmers strongly disagree, and 2.7% strongly agree with the statement. The statement reveals that most paddy farmers either agreed or disagreed with the statement that they were encouraged by the agriculture officers to adopt the innovation and technologies of drones in the paddy industry.

According to Table 4.6, the statement "My adoption of drone technology is influenced by the organized campaign, programs and workshop related to agricultural technology, especially drone," has the response from 51.3% of paddy farmers either agree or disagree. Followed by 26.0% of paddy farmers disagree and 17.3% of paddy farmers agree. Next, 3.3% of paddy farmers strongly agree, and 2.0% strongly disagree with the statement. The statement shows that most paddy farmers either agree or disagree that organized campaigns, programs, and workshops related to agricultural technology, especially drones, influenced my adoption of drone technology.

"I adopt drone technology because there are many agencies or banks that provide loan assistance to me in adopting drone technology," is a statement with the response 2.7% of paddy farmers strongly agree and 14.0% of paddy farmers agree with the statement. About 55.3% of the paddy farmers either agree or disagree with that statement, and only 24.0% disagree. Lastly, 4.0% of paddy farmers strongly disagree with the statement. From this, most paddy farmers in Perlis and Kedah either agree or disagree with the statement that they adopt drones because agencies or banks provide loan assistance for them in adopting drone technology such as Agrobank.

"The government sectors encourage me in adopting drone technology by providing sufficient facilities and training to me," is a statement with the response 62.0% of the paddy farmers either agree or disagree, and 18.0% of paddy farmers disagree with the statement. Next, 13.3% of paddy farmers agree that the government supports using drones by providing adequate facilities and training. Lastly, 4.0% of paddy farmers strongly disagree, while 2.7% strongly agree with that statement. From this, most paddy farmers in Perlis and Kedah either agree or disagree with the statement that they embrace drones due to government sectors encouraging them with adequate facilities and training. The government should prioritize mechanizing and improving agriculture by offering extension and training services to farmers on using drones.

Based on the result in Table 4.7, the mean score of social influence of drone technology among paddy farmers in Perlis and Kedah is considered a medium mean score (M= 2.9333, SD=0.76422). From this, the level of social influence of drone technology among paddy farmers is moderate. Rübcke von Veltheim et al. (2021) found that the level of social influence of the German farmers towards intention to use autonomous field robots is average when obtained a moderate mean. Like this study, Li et al. (2020) stated that Chinese farmers' level of social influence on the use of precision agriculture is moderate when a medium mean score is achieved (M=3.64). It shows that social influence such as government, communities, and other agencies influence farmers' adoption of technology or farming practices. Furthermore, another study found that social influence is high (M= 3.80) for farmers to use tissue culture banana seeds (Lucy, 2021). It is high because community leaders, faith-based leaders, and farmer groups persuade people that tissue culture is better.

Table 4.6: Descriptive for social influence

Statement	Percentage (%)					SD	Mean
	1	2	3	4	5		
My relatives influence my decision to use drone technology	4.0	26.0	50.0	16.7	3.3	0.845	2.89
Other paddy farmers (fellow farmers and friends) effected my decision to adopt drone technology	2.0	26.0	38.0	31.3	2.7	0.872	3.07
MADA encouraged me to explore new agricultural technologies, such as the use of drones for fieldwork	4.0	20.7	51.3	21.3	2.7	0.831	2.98
I was influenced by media information such as newspapers to adopt drone instead of a conventional method	2.0	26.0	56.7	12.0	3.3	0.764	2.89
The Agriculture Officer's approach has encouraged me to adopt innovations and technologies of drone in the paddy industry	4.0	24.0	52.7	16.7	2.7	0.817	2.90
My adoption of drone technology is influenced by organised campaign, programmes and workshop related to agricultural technology, especially drone	2.0	26.0	51.3	17.3	3.3	0.805	2.94
I adopt drone technology because there are many agencies or banks that provide loan assistance to me in adopting drone technology	4.0	24.0	55.3	14.0	2.7	0.797	2.87
The government sectors encourage me in adopting drone technology by providing sufficient facilities and training to me	4.0	18.0	62.0	13.3	2.7	0.761	2.93

**Indicator: 1. Strongly Disagree 2. Disagree 3. Either Agree or Disagree 4. Agree 5. Strongly Agree*

Table 4.7: Mean score of social influence

Variable	Frequency	Percentage (%)	Mean	SD
Social influence			2.9333	0.76422
Low (1.00-2.33)	42	28.0		
Medium (2.34-3.67)	90	60.0		
High (3.68-5.00)	18	12.0		

4.1.5 The level of Performance Expectancy of Drone Technology among Paddy Farmers in Perlis and Kedah

The descriptive analysis result for performance expectancy of drone technology among paddy farmers in Perlis and Kedah is shown in Table 4.8. About 40.7% of paddy farmers agree, " Drone technology would be useful in my job as a paddy farmer", and 40.0% of paddy farmers either agree or disagree with it. Then, 12.0% of paddy farmers disagree, followed by 5.3% of paddy farmers who strongly agree and 2.0% strongly disagree with the statement. It shows that most paddy farmers agree that drone technology is helpful for their job. Some respondents feel that drones will help their farming, and the farmer is likely to prefer their use.

For the statement “Drone technology would be better and more efficient than knapsack sprayer”, 41.3% of paddy farmers agree, 28.7% of paddy farmers either agree or disagree and

24.0% of paddy farmers disagree with the statement. The lowest percentage recorded is 4.0% of paddy farmers that strongly agree and 2.0% who strongly disagree with the statement. Therefore, many paddy farmers agree that drone technology is way better and more efficient than a knapsack sprayer.

"Drone technology will improve operational performance by speeding up the spraying process" is a statement with the response 51.3% of paddy farmers agree with the statement. About 22.0% of the paddy farmers either agree or disagree with that statement, and 20.0% disagree. And 6.7% of paddy farmers strongly agree that drones speed up the spraying process. From this, most paddy farmers in Perlis and Kedah agree that the operational performance will improve with drone technology by speeding up the spraying process. Drones can cover a larger area more quickly than knapsack or backpack sprayers, which take more time to apply pesticide.

According to Table 4.8, the statement "Drone technology will increase my profitability in paddy cultivation" has 39.3% of paddy farmers either agree or disagree, followed by 28.7% of paddy farmers agree with it. Next, 26.0% of paddy farmers disagree, and 4.0% strongly agree that using a drone could increase their profit. Lastly, 2.0% strongly disagree with the statement. It shows that many paddy farmers either agree or disagree that drone technology will increase their profitability in paddy cultivation.

The result shows that 56.7% of paddy in Perlis and Kedah farmers agree with the statement, "With drone technology, I will be able to reduce the dangers of pesticides to my health", 23.3% of paddy farmers either agree or disagree, and 14.7% of paddy farmers disagree with it. Meanwhile, 5.3% of paddy farmers strongly agree with the statement. The statement reveals that most paddy farmers agreed that they would reduce pesticide effects on their health with drone technology. Furthermore, some paddy farmers claim that drones help them apply pesticides safely since they minimise pesticide exposure to humans. It protects them from poisoning and heatstroke when spraying the pesticide on paddy.

The statement "Drone technology allows me to effectively counter paddy disease and pests" has 43.3% of paddy farmers agree and 27.3% of paddy farmers either agree or disagree with it. Next, 22.7% of paddy farmers disagree, followed by 4.0% of paddy farmers that strongly disagree with the statement. Lastly, 2.7% of paddy farmers strongly agree with it. The statement shows that most paddy farmers agree that drone technology effectively counters paddy disease and pests. Some respondents stated that a drone might assist them in pest control since the droplet of pesticide would be constantly compared to a conventional sprayer.

"Using drone technology increases my chances of producing higher and quality paddy yields" is a statement with the response 37.3% of paddy farmers agree, and 30.7% of the paddy farmers either agree or disagree with that statement. About 24.0% of paddy farmers disagree, 4.0% of paddy farmers strongly agree, and 4.0% of paddy farmers strongly disagree with the statement that their chances of producing higher and quality paddy can be increased using drone technology. Most paddy farmers believe that drones can be used to optimise crop treatment, resulting in higher quality and higher yields.

"Using drone technology to spray pesticides and fertiliser could save money, time, and energy" is a statement with the response, and 44.0% of paddy farmers agree, 25.3% of paddy farmers disagree and 22.7% of the paddy farmers either agree or disagree with it. Lastly, 6.0% of paddy farmers strongly agree, and 2.0% strongly disagree with the statement. From this, the majority of paddy farmers in Perlis and Kedah agree with the statement that using drone technology to spray pesticides and fertilisers could save money, time and energy. The majority of farmers claimed that using drones could reduce the number of pesticides they use for spraying and be more cost-effective. They could also do important things in a short amount of time and help farmers, most of whom are old.

Based on the result in Table 4.9, the mean score of performance expectancy of paddy farmers towards adoption of the drone is a medium mean score (M= 3.2733, SD=0.83901). It proves that paddy farmers in Perlis and Kedah have a moderate performance expectancy. According to Rübcke von Veltheim et al. (2021), the level of performance expectancy for German farmers' intention to use autonomous field robots is high. Another study also found that the level of performance expectancy on farmers intention to use tissue culture banana seed in Central Uganda is high since the mean scored high value (M=4.10). It demonstrates that the banana farmer believes that using tissue culture seed as a banana planting material improves their banana plantation's performance and output (Lucy, 2021). In Malaysia, the level of performance expectancy of aquaculturists on using the Internet of Things (IoT) is also high (Khalid & Khairi, 2018). A person's performance expectancy is determined by their confidence in their capacity to use IoT better.

Table 4.8: Descriptive for performance expectancy

Statement	Percentage (%)					SD	Mean
	1	2	3	4	5		
Drone technology would be useful in my job as a paddy farmer	2.0	12.0	40.0	40.7	5.3	0.837	3.35
Drone technology would be better and more efficient than a knapsack sprayer	2.0	24.0	28.7	41.3	4.0	0.924	3.21
Drone technology will improve operational performance by speeding up the spraying process		20.0	22.0	51.3	6.7	0.886	3.45
Drone technology will increase my profitability in paddy cultivation	2.0	26.0	39.3	28.7	4.0	0.887	3.07
With drone technology, I will be able to reduce the dangers of pesticides to my health		14.7	23.3	56.7	5.3	0.808	3.53
Drone technology allows me to effectively counter paddy disease and pests	4.0	22.7	27.3	43.3	2.7	0.949	3.18
Using drone technology increases my chances of producing higher and quality paddy yields	4.0	24.0	30.7	37.3	4.0	0.960	3.13
Using drone technology to spray pesticides and fertiliser could save money, time, and energy	2.0	25.3	22.7	44.0	6.0	0.974	3.27

**Indicator: 1. Strongly Disagree 2. Disagree 3. Either Agree or Disagree 4. Agree 5. Strongly Agree*

Table 4.9: Mean score of performance expectancy

Variable	Frequency	Percentage (%)	Mean	SD
Performance expectancy			3.2733	0.83901
Low (1.00-2.33)	34	22.7		
Medium (2.34-3.67)	54	36.0		
High (3.68-5.00)	62	41.3		

4.1.6 The level of Effort Expectancy of Drone Technology among Paddy Farmers in Perlis and Kedah

The descriptive analysis result for effort expectancy of drone technology among paddy farmers in Perlis and Kedah is shown in Table 4.10. About 44.7% of paddy farmers either agree or disagree "Using drone technology requires less physical effort", and 36.0% of paddy farmers agree with it. Then, 12.0% of paddy farmers strongly agree, followed by 7.3% of paddy farmers who disagree with the statement. It shows that most paddy farmers either agree or disagree that using drone technology requires less physical effort. According to the respondents, most use drones to reduce labour dependence on spraying operations.

For the statement "The drone is easier to use compared to other technologies in paddy cultivation", 41.3% of paddy farmers agree, 34.0% of paddy farmers either agree or disagree, and 18.7% of paddy farmers disagree with the statement. Meanwhile, only 4.0% of paddy farmers strongly disagree, and 2.0% strongly agree. Therefore, the majority of paddy farmers agree that it is drone is easier to use compared to other technologies in paddy cultivation.

"I can easily adapt myself to the new agriculture technology especially drone that used for spraying pesticide and fertilizer", is a statement with the response 47.3% of paddy farmers agree, 25.3% of the paddy farmers either agree or disagree, and 22.0% of paddy farmers disagree with the statement. Lastly, 4.0% of paddy farmers strongly agree, and 3.3% of paddy farmers strongly agree. From this, most paddy farmers in Perlis and Kedah agree with the statement that they can easily adapt to new agriculture technology for spraying pesticides and fertilizers.

According to table 4.10, the statement "I believe in the perceived ease of use of drones, which reflects my level of comfort with agricultural technology in the pesticide and fertilizer spraying process" has 55.3% of paddy farmers agree followed by 20.0% disagree with it. Next, 16.7% of paddy farmers either agree or disagree, 4.0% of paddy farmers strongly agree, and 4.0% strongly disagree with the statement. It shows that majority of paddy farmers agree that they believe in the perceived use of a drone which indicates their level of comfort with agricultural technology for pesticide and fertilizers spraying process.

The result shows that 36.7% of paddy farmers in Perlis and Kedah either agree or disagree with the statement "It would be quick and easy for me to become skilled in the spraying process if I used drone technology", 36.0% of paddy farmers agree, and 20.0% of paddy farmers disagree with it. For strongly disagree with a statement only 4.0% of paddy farmers recorded followed by 3.3% of paddy farmers strongly agree that it takes less time for them to be skilled using a drone when spraying pesticide. The statement reveals that most paddy farmers either disagreed or agreed with the statement that for them to be skilled in the spraying process would be quick.

According to Table 4.10, the statement "It is easy for me to get information about drone technology" has 36.7% of paddy farmers either agree or disagree by 31.3% of paddy farmers agree with it. Then, 26.7% of paddy farmers disagree, while 3.3% of paddy farmers strongly agree and 2.0% of paddy farmers strongly disagree with the statement. The statement shows that the majority of paddy farmers either disagree or agree with the statement that the information about the drone is easy to get.

"Government easily providing financial assistance to me for adopting drone technology" is a statement with the response that 52.0% of the paddy farmers either agree or disagree, and 25.3% of paddy farmers disagree with it. Next, 16.7% of paddy farmers agree with the statement that the government easily provides financial assistance to adopt drones, followed by 4.0% of paddy farmers strongly disagree and 2.0% of paddy farmers strongly agree with it. From this, most paddy farmers in Perlis and Kedah either agree or disagree with the statement that easy for them to get financial assistance from the government to adopt drones. One type of financial assistance from the government could be an incentive, subsidies for output, and tax reductions for increased productivity.

"It is easy for me to get facilities assisting for drone technology from government" is a statement with the response 56.0% of the paddy farmers either agree or disagree and 21.3% of paddy farmers disagree. Then, 15.3% of paddy farmers agree, 4.0% of paddy farmers strongly disagree, and 3.3% of paddy farmers strongly agree with the statement. From this, most paddy farmers in Perlis and Kedah either agree or disagree with the statement that easy for them to get facilities assisting for drone technology from the government.

Based on the result in Table 4.11, the mean score of effort expectancy of drone technology among paddy farmers in Perlis and Kedah is considered as a medium mean score (M= 3.1708, SD=0.81221). The level of effort expectancy of drone technology among paddy farmers is moderate. To support this study, according to Rübcke von Veltheim et al. (2021), the level of effort expectancy on German farmers' behavioural intention to use autonomous vehicles field robots is moderate. From this, the farmers need to be experienced in handling technology so that less effort is needed to operate the new technology. Other than that, the level of effort expectancy on behavioural intentions to use mobile-based communication for agricultural market information dissemination in Uganda is high (Engotoit et al., 2016). It is easy for them to learn how to access or use the mobile application for agricultural marketing. Also found in a recent study, a high level of effort expectancy was recorded (M=4.03) on intention to adopt the technology in livestock Region 3, Thailand on the poultry farm (Wichean & Sungsanit, 2022).

Table 4.10: Descriptive for effort expectancy

Statement	Percentage (%)					SD	Mean
	1	2	3	4	5		
Using drone technology requires less physical effort		7.3	44.7	36.0	12.0	0.800	3.53
The drone is easier to use compared to other technologies in paddy cultivation	4.0	18.7	34.0	41.3	2.0	0.900	3.19
I can easily adapt myself to the new agriculture technology especially drone that used for spraying pesticide and fertilizer	2.0	22.0	25.3	47.3	3.3	0.913	3.28
I believe in the perceived ease of use of drones, which reflects my level of comfort with agricultural technology in the pesticide and fertiliser spraying process	4.0	20.0	16.7	55.3	4.0	0.977	3.35
It would be quick and easy for me to become skilled in the spraying process if I used drone technology	4.0	20.0	36.7	36.0	3.3	0.915	3.15
It is easy for me to get information about drone technology	2.0	26.7	36.7	31.3	3.3	0.891	3.07
Government easily providing financial assisting to me for adopt drone technology	4.0	25.3	52.0	16.7	2.0	0.805	2.87
It is easy for me to get facilities assisting for drone technology from the government	4.0	21.3	56.0	15.3	3.3	0.812	2.93

**Indicator: 1. Strongly Disagree 2. Disagree 3. Either Agree or Disagree 4. Agree 5. Strongly Agree*

Table 4.11: Mean score of effort expectancy

Variable	Frequency	Percentage (%)	Mean	SD
Effort expectancy			3.1708	0.81221
Low (1.00-2.33)	36	24.0		
Medium (2.34-3.67)	62	41.3		
High (3.68-5.00)	52	34.7		

4.2 Normality Test

This analysis is carried out to determine whether the entire data set obtained from the respondents is "well-modelled," that is, whether it is distributed in a normal distribution or not. The Normality Test is performed on the entire data set of the respondents to obtain the results for this analysis. Because there were more than 50 respondents, normality tests were performed on this data set using the Kolmogorov–Smirnov test to determine the normality of the data distribution. According to Mishra et al. (2019), the Shapiro–Wilk test is better for small sample sizes, which is less than 50 samples, but it can also be used for larger sample sizes, but the Kolmogorov–Smirnov test is better for larger sample sizes (n ≥50). The test indicates that the adoption of drone technology among paddy farmers in Perlis and Kedah does not follow a normal distribution (P=0.000). The variable of adoption of drone technology among paddy farmers in Perlis and Kedah is not significant as the value is <0.05.

Table 4.12: Normality test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistics	df	Sig	Statistics	df	Sig
Adoption of drone technology	0.279	150	0.000	0.772	150	0.000

a. Lilliefors Significance Correction

4.3 Correlation Analyse

In this section, correlation analysis was used to analyse the relationship between facilitating condition, social influence, performance expectancy, and effort expectancy with the adoption of drone technology among paddy farmers in Perlis and Kedah. The Spearman correlation was chosen to analyse these relationships.

4.3.1 Spearman Correlation

According to Schober, Boer, and Schwarte (2018), the Spearman rank correlation can be used as monotonic unity size for non-normally distributed continuous data, ordinal data, or data with associated outliers. In this study, the spearman's correlation is used to identify the relationship between facilitating condition, social influence, performance expectancy and effort expectancy with the adoption of drone technology among paddy farmers in Perlis and Kedah. A correlation analysis is used to determine the strength of the relationship between two variables (Senthilnathan, 2019).

Next, the correlation coefficient has an absolute value ranging from -1 to +1. The higher the absolute value, the stronger the relationship between the two variables, and vice versa if the value decreases (Ratner, 2009). A correlation between 0.0 does not indicate a relationship between (Wang et al., 2019). For the direction of the relationship, stated by Moran, Glase, Dsouza & Lani (2021), when the coefficient has a + sign, the relationship is positive, while a – sign indicates that the relationship is negative. The table below followed the rule of thumb to interpret the correlation coefficient's size (Hinkle et al., 2003) to estimate the strength of the relationship between the relative movements of two variables.

Table 4.13: Rule of Thumb for Interpreting the Size of a Correlation Coefficient

Size of correlation Interpretation	Size of correlation Interpretation
0.90 to 1.00 (-0.90 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

(Source: Hinkle, Wiersma, and Jurs, 2003)

4.3.1.1 The Relationship between Facilitating Condition with Adoption of Drone Technology among Paddy Farmers in Perlis and Kedah

In Table 4.14, the correlation coefficient between facilitating conditions with the adoption of drone technology among paddy farmers in Perlis and Kedah is significant at (r=0.801, p=0.000). Based on the rule of thumb shown in Table 4.13, the role in facilitating conditions scored a very high positive correlation between the adoption of drone technology among paddy farmers in Perlis and Kedah. Thus, the facilitating condition is very high positive and significantly correlated with paddy farmer adoption of drone technology.

According to Koyu et al. (2021), facilitating conditions has very large effects (r=0.716) on the behavioural intention of Arunachal Pradesh's farmers to use an e-learning module on climate-smart horticulture compared to others. Next, Omar et al. (2021) stated that facilitating conditions positively influence the behavioural intention of Sarawak farmers to adopt the e-AgriFinance apps. The availability of resources such as mobile phones, Internet access, and information on the apps influences the adoption of the systems, especially for rural places.

Found in a study that the path "facilitating conditions of Chinese farmers towards intention to adopt precision agriculture" had significant positive effects. This confirmed that a farmer's intention to adopt specific agricultural technologies would increase when they can find the resources and knowledge. Farmers are more likely to adopt technology that meets their perceived needs (Li et al., 2020). Therefore, the result is accepted Hypothesis 1, which predicted that facilitating condition has significant value relationship between adoption of drone technology among paddy farmers in Perlis and Kedah.

4.3.1.2 The Relationship between Social Influence with Adoption of Drone Technology among Paddy Farmers in Perlis and Kedah

The correlation coefficient between social influence and drone technology adoption among paddy farmers in Perlis and Kedah is significant (r=0.883, p=0.000) as in Table 4.14. The rule of thumb for interpreting the size of a correlation coefficient in Table 4.13 shows a very high positive correlation social influence with the adoption of drone technology among paddy farmers in Perlis and Kedah. To support this study, previous research discovered a direct positive path coefficient and a significance level of $p \leq 0.05$ of social influence on the behaviour intention to use mobile phones for agricultural market access of small-scale orange farmers in Muheza, Tanzania (Mzomwe et al., 2021).

According to (Ronaghi & Forouharfar, 2020), there was a positive and significant relationship (r=0.68) between social influence and farmers' intention to use technology. This shows that social influence such as groups work and community motivation is enough to encourage technology among them. Meanwhile, in contrast to this study, (Li et al., 2020) stated that the social influence of Chinese farmers had no significant effect on precision agriculture adoption. This study indicated that Hypothesis 2, which predicted social influence, has a significant relationship with the adoption of drone technology among paddy farmers in Perlis and Kedah.

4.3.1.3 The Relationship between Performance Expectancy with Adoption of Drone Technology among Paddy Farmers in Perlis and Kedah

The relationship between performance expectancy and drone technology adoption among paddy farmers in Perlis and Kedah is estimated based on the correlation coefficient. The relationship between performance expectancy and drone technology adoption among paddy farmers in Perlis and Kedah shows a significant value (r=0.972, p=0.000). Based on the rule of thumb, performance expectancy with the adoption of drone technology among paddy farmers in Perlis and Kedah has a very high positive correlation shown in Table 4.13.

Similarly, past studies were done by Abu (2020) show that the coefficient correlation between performance expectations and post-harvest practices adoption has a low positive correlation (r=0.311). It means that performance expectancy can influence fruit farmers in Johor towards the adoption of post-harvest practices since the hypothesis was achieved.

Besides that, other findings revealed that performance expectancy has a statistically significant positive relationship with the behavioural intention of adopting the e-AgriFinance among the farmer (Omar et al., 2021). It impacts the adoption of the system since farmers believe that this mobile app could help them in the financial transaction of farming activities quicker.

However, in another study from Hayat et al. (2020), the effect of performance expectancy on the intention to adopt conservative agriculture practices of rice farmers is positive but not significant to the study as the path coefficient for performance expectancy on intention to adopt. As a result, it stated that appropriate policies are needed to increase farmers' trust in extension and promote social and performance expectations for conservative agricultural practices. Hypothesis 3, that predicted performance expectancy has a significant relationship with the adoption of drone technology among paddy farmers in Perlis and Kedah, was accepted by the results of correlation analysis as shown in Table 4.14.

4.3.1.4 The Relationship between Effort Expectancy with Adoption of Drone Technology among Paddy Farmers in Perlis and Kedah

In Table 4.14, the correlation coefficient between effort expectancy with the adoption of drone technology among paddy farmers in Perlis and Kedah is significant (r=0.900, p=0.000). In Table 4.13, the role in effort expectancy for interpreting the size of the correlation coefficient shows a very high positive correlation between effort expectancy and adoption of drone technology among paddy farmers in Perlis and Kedah. The effort expectancy is very high positive and significantly correlated with paddy farmer adoption of drone technology.

Next, some studies have discovered that effort expectation has a beneficial impact on technology adoption (Gimpel, 2020). According to Ronaghi and Forouharfar (2020), the correlation coefficient from the study was r = 0.62, which was statistically significant and had a positive relationship between the effort expectancy and the behavioural intentions, showing that farmers' perception of IoT's ease of use had a beneficial influence on this technology use.

Like this study, (Hayat et al., 2020) assert a significant positive effect between effort expectancy and the intention to adopt conservative agriculture practices among rice farmers. The conservative agriculture practices reduce perceived effort or create efficiency for prospective users. Meanwhile, the previous study of Rübcke von Veltheim et al. (2021) shows that effort expectancy has a significant negative influence on the behavioural intention to use autonomous field robots. It is a significant negative influence between effort expectancy and behavioural intention to use autonomous field robots since agricultural decision-making has traditionally favoured risk avoidance over efficiency enhancement. In this study, hypothesis 4 is achieved when the relationship between effort expectancy towards paddy farmers' adoption of drone technology in Perlis and Kedah was significant.

Table 4.14: The Spearman's Correlation Analysis

Correlations

			Adoption of Drone Technology	Facilitating Condition	Social Influence	Performance Expectancy	Effort Expectancy
Spearman's rho	Adoption of Drone Technology	Correlation Coefficient	1.000	.801**	.833**	.927**	.900**
		Sig. (2-tailed)	.	.000	.000	.000	.000
		N	150	150	150	150	150
	Facilitating Condition	Correlation Coefficient	.801**	1.000	.867**	.813**	.771**
		Sig. (2-tailed)	.000	.	.000	.000	.000
		N	150	150	150	150	150
	Social Influence	Correlation Coefficient	.833**	.867**	1.000	.788**	.812**
		Sig. (2-tailed)	.000	.000	.	.000	.000
		N	150	150	150	150	150
	Performance Expectancy	Correlation Coefficient	.927**	.813**	.788**	1.000	.838**
		Sig. (2-tailed)	.000	.000	.000	.	.000
		N	150	150	150	150	150
	Effort Expectancy	Correlation Coefficient	.900**	.771**	.812**	.838**	1.000
		Sig. (2-tailed)	.000	.000	.000	.000	.
		N	150	150	150	150	150

**. Correlation is significant at the 0.01 level (2-tailed).

4.4 t-test Analyses

The t-test analyses are one of the tests to find out if the independent variable partly affects the dependent variable. The value significance of Levene's test for equality of variances is sig < 0.05 or t count $>$ t table, then it means that the independent variable influences dependent variables, or the hypothesis is true (Pratama, 2021).

In this study, an independent sample t-test was used to find the effect on the difference of age of paddy farmers towards the adoption of drone technology in Perlis and Kedah. The independent sample t-test is a parametric test used to determine whether there is a difference in the mean between two independent groups or two unpaired groups, with the intention that the two data groups come from different subjects (Hazra & Gogtay, 2016). This test can be performed under the conditions that the data come from different groups, numeric data types, interval or ratio data scales, the data are normally distributed, and the variance between the two sample groups is the same (Puspaningsih, Virrliana & Andriyani, 2016).

4.4.1 Effect on Difference of Age of Paddy Farmers towards Adoption of Drone Technology in Perlis and Kedah

In this study, there were two groups of paddy farmers, which is elderly paddy farmers and young paddy farmers. The range of young farmers (young workforce) in general is from 16 to 40 years of age, and the elders are 40 years above (Rodríguez Temiño, 2018). Mostly, elderly farmers are less exposed to drone technology information and rely on their skills and working experience. In MADA rice grenadiers, farmers in Kedah and Perlis have an average age of about 60 and are mostly monopolized by elderly and low-skilled farmers (Mokhzani, 2017).

Based on Table 4.15, the independent t-test are insignificantly difference (t=0.006, p=0. 672) since the p-value higher than 0.05 (> 0.05) . This indicated that the hypothesis of this study was rejected because there is no effect on the different ages of paddy farmers towards the adoption of drone technology in Perlis and Kedah. It means both groups, elder and young farmers, are equal and have no difference towards adopting drone technology. One of the reasons is most farmers were exposed to drone technology. MADA is one of the earliest agencies in Malaysia to emphasize the use of drones in the agricultural sector, especially for pesticide spraying work in paddy fields (Aziz & Zaharudin, 2021). Other than that, all range of age accepted agricultural technology including older people. According to Josh (2021), elderly individuals are more open to modern technology than before. Besides that, Adesina (2000) believed that older farmers have more experience and are more likely to invest in innovation.

A study discovered that there was an insignificant difference in age between biogas adopters and non-adopters (Wahyudi, 2017). It shows that age did not affect the adoption of biogas technology in cattle farming, even though younger people are more engaged with technology. The previous study found that there is a negative significant difference between the age of farmers and the use of drones since most elderly are less exposed to technology information and rely on their skill and experience working (Zheng et al., 2020). According to survey-based studies, farmers' ages significantly impact their adoption of bioenergy crops. Older farmers, for example, would be more risk-averse and thus less likely to adopt new farming practices that require large capital investments or pose a greater financial risk than younger farmers (Pathak et al., 2019).

In a recent study, there is a negative and significant difference in the age of farmers with the use of smartphones, which increases the age of farmers reduces their likelihood of using smartphones (Zhang et al., 2020). It's common for younger farmers to have less farming experience. Younger farmers are lack farming experience, so they may use smartphones to get agricultural data and make production and marketing decisions. Most young people find it easy to use modern technology because they have grown up using it. On the other hand, Elder has a lower tendency to use modern technology. According to one study, young farmers are more adaptable and likely to implement innovations and affect future agricultural activity (Balezentis, Morkunas, Volkov, Ribasauskiene, & Streimikiene, 2021).

Table 4.15: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Adoption of drone technology	Equal variances assumed	.180	.672	.006	148	.996	.00113	.20172	-.39749	.39976
	Equal variances not assumed			.006	32.025	.996	.00113	.20425	-.41490	.41717

4.5 Summary

This chapter discussed the study results that validate the variables of Unified Theory of Acceptance and Use of Technology (UTAUT) in the context of the adoption of drone technology among paddy farmers. Using UTAUT as a model showed that all the independent variables showed a significant value for all the variables. This suggests that UTAUT is an efficient model to predict the adoption of drone technology among paddy farmers.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.0 Conclusion

This study consists of three objectives: the first objective is to determine the level of adoption, facilitating condition, social influence, performance expectancy and effort expectancy of drone technology among paddy farmers in Perlis and Kedah. The second is to study the relationship between facilitating conditions, social influence, performance expectancy, and effort expectancy towards the adoption of paddy farmers on drone technology in Perlis and Kedah. The third objective is the effect on the difference between the age of paddy farmers towards the adoption of drone technology in Perlis and Kedah.

The first objective is achieved when all the variables show response trends leaning towards medium mean based on mean score corresponding to 2.34-3.67 which is the mean of adoption of drone technology (M= 3.1895), facilitating condition (M= 3.0592), social influence (M= 2.9333), performance expectancy (M= 3.2733) and effort expectancy

(M=3.1708). That result was analyzed with descriptive analysis by referring to the mean score of each variable. The second objective was also achieved by rejecting the null hypothesis due to there is a significant value relationship between the relationship of facilitating conditions, social influence, performance expectancy and effort expectancy towards the adoption of paddy farmers on drone technology in Perlis and Kedah. which is measured by Pearson's Correlation Analysis. The third objective is rejected since a p-value higher than 0.05 showed that there is no significant difference between the age of farmers with the adoption of drone technology in Perlis and Kedah.

Overall, drone technology is important among paddy farmers to counter pests efficiently and quickly lead to producing high quality and yield of paddy. Lastly, this study also revealed factors that influenced the paddy farmers in Perlis and Kedah on adopting drone technology, such as facilitating conditions, social influence, performance expectancy, effort expectancy, and willingness to use agricultural technology in their tasks.

5.1 Recommendation

Other researchers can use it as a reference by reevaluating the objectives raised as a basis for producing a significantly better study. The first recommendation is further to expand the scope of the study to other specific areas of paddy cultivation such as Selangor, Perak, Kelantan, or cover all-state in Malaysia since this study was conducted on farmers in the Perlis and Kedah states. If, in future, the research covers other states in Malaysia or the entire country, the extent to which the level of adoption of drone technology among paddy farmers in Malaysia can be analysed extensively, making the study more valuable. Future research can then focus on the adoption of other agricultural technologies or the practices of farming other crops such as oil palm. It might help the other researcher collect information regarding the state of agricultural technologies adoption in Malaysia. Technologies change with the passage of time and the development of the world from time to time, so information on agricultural technology plays an important role in the process of agricultural development. Finally, the study recommends that future studies consider combining UTAUT with other theories such as KAP that include knowledge, attitude, and practices. The future study could focus more on attitude, knowledge and practice towards the adoption of agricultural technology. This can be applied to detect the relationship of those variables on the adoption of drone technology among paddy farmers relevant to this study, especially knowledge.

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APPENDIX A

LEMBAGA KEMAJUAN PERTANIAN MUDA
(MUDA AGRICULTURAL DEVELOPMENT AUTHORITY)
KEMENTERIAN PERTANIAN DAN INDUSTRI ASAS TANI
IBU PEJABAT MADA, AMPANG JAJAR, 05990 ALOR SETAR, KEDAH DARUL AMAN, MALAYSIA.
Telefon: 04-7728255 (12 Talian). Telefaks: 04-7729231. Laman Web: http://www.mada.gov.my.

MADA

(BAHAGIAN PERANCANGAN DAN TEKNOLOGI MAKLUMAT)

Ruj. Tuan :
Ruj. Kami : **MADA(D)/PTM/708108(1)**
Tarikh : 18 Oktober 2021

Fakulti Industri Asas Tani
Universiti Malaysia Kelantan,
Kampus Jeli,
17600 Jeli,
KELANTAN
[u.p.: Puan Tengku Halimatun Sa'adiah binti T Abu Bakar]

Tuan/Puan,

MAKLUM BALAS PERMOHONAN KEBENARAN MENJALANKAN PENYELIDIKAN/ KAJIAN TERHADAP PESAWAH PADI DI KEDAH DAN PERLIS

Dengan hormatnya izinkan saya merujuk perkara di atas dan surat daripada pihak tuan/puan **No. Rujukan UMK.JL/a07/600-5/2/7 (22)** yang bertarikh **7 Oktober 2021** adalah berkaitan.

2. Sukacita dimaklumkan bahawa pejabat ini tiada halangan terhadap permohonan pelajar mengikut butiran berikut:

Nama	: Nur Izzatul Aimuni binti Yusmadi
No. Matrik	: F18A0279
Kursus	: Sarjana Muda Sains Gunaan (Agroteknologi) dengan Kepujian

di bawah seliaan universiti ini untuk membuat kajian terhadap pesawah padi di Kedah dan Perlis.

3. Sehubungan itu, sebarang maklumat lanjut tuan/puan boleh menghubungi pihak Lembaga Kemajuan Pertanian Muda (MADA) untuk membincangkan maklumat yang diperlukan bagi kajian yang akan dijalankan.

Sekian, terima kasih.

"WAWASAN KEMAKMURAN BERSAMA 2030"

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

(SURIANIE BINTI BAKAR)
Ketua Cawangan Kajian Dan Statistik
Bahagian Perancangan Dan Teknologi Maklumat
b.p. Pengurus Besar
Lembaga Kemajuan Pertanian Muda.
SB/sfnah : No. Dokumen: 2021101866

APPENDIX B

ADOPTION OF DRONE TECHNOLOGY AMONG PADDY FARMERS IN PERLIS AND KEDAH

PENERIMAAN TEKNOLOGI DRON DI KALANGAN PESAWAH PADI DI PERLIS DAN KEDAH

Dear respondents:

1) **This research is to:**
   - **i determine the level of adoption, facilitating condition social influence, performance expectancy, and effort expectancy of drone technology among paddy farmers in Perlis and Kedah.**
   - **ii study the relationship between facilitating condition, social influence, performance expectancy, effort expectancy towards adoption of paddy farmers on drone technology in Perlis, and Kedah.**
   - **iii identify effect on different between age of paddy farmers towards adoption of drone technology in Perlis and Kedah.**
2) **Please answer all questions.**
3) **Thank you for your cooperation and the information given.**

Kepada responden:

1) *Kajian ini adalah untuk:*
   - *i. tentukan tahap penerimaan dron teknologi, keadaan kemudahan, pengaruh sosial, jangkaan terhadap prestasi dan jangkaan terhadap usaha di kalangan pesawah padi di Perlis dan Kedah.*
   - *ii. mengkaji hubungan di antara keadaan kemudahan pengaruh sosial, , jangkaan terhadap prestasi dan jangkaan terhadap usaha ke atas penerimaan pesawah padi terhadap teknologi dron di Perlis dan Kedah.*
   - *iii. mengenal pasti kesan perbezaaan ke atas umur pesawah padi terhadap penerimaan teknologi dron di Perlis dan Kedah.*
2) *Sila jawab semua soalan.*
3) *Terima kasih di atas kerjasama dan maklumat yang berikan.*

SECTION A : DEMOGRAPHIC INFORMATION OF PADDY FARMERS
BAHAGIAN A: LATAR BELAKANG PESAWAH PADI

Please tick (/) in the appropriated box to indicate your answer.
Tandakan (/) di kotak yang sesuai untuk menunjukkan jawapan anda.

1	Gender/*Jantina*	☐ Male/*Lelaki* ☐ Female/*Perempuan*
2	Age/*Umur*	______________ years /*tahun*
3	Marital Status/*Status perkahwinan*	☐ Married/*Berkahwin* ☐ Divorced/*Bercerai* ☐ Single/*Bujang*
4	Education Level/*Tahap pendidikan*	☐ Not going to school/*Tidak bersekolah* ☐ Primary school /*Sekolah rendah* ☐ High school/*Sekolah menengah* ☐ Diploma/*Diploma* ☐ University/*Universiti* ☐ Others, please state:____________/ *Lain-lain, sila nyatakan:* ________
6	Farmer's experience in paddy cultivation (years)/ *Pengalaman petani dalam penanaman padi (tahun)*	☐ < 5 years/*tahun* ☐ 6 – 10 years/*tahun* ☐ 11 – 15 years/*tahun* ☐ Other, please state:_____________/ *Lain-lain, sila nyatakan:* ________
7	Paddy cultivation area/*Kawasan penanaman padi*	☐ Perlis/ *Perlis* ☐ Kedah/ *Kedah*
8	The area of land cultivated (ha)/ *Luas kawasan penanaman padi (ha)*	☐ < 5 ha ☐ 6 – 10 ha ☐ 11 – 15 ha ☐ Other, please state:_____________/ *Lain-lain, sila nyatakan:* ________
9	Estimation of income per season (RM)/ *Anggaran pendapatan setiap musim*	RM __________

10	Experienced in using drone/ *Berpengalaman menggunakan dron*	□ Yes/*Ya* □ No/*Tidak*
11	Reason for using drone / *Sebab menggunakan dron*	□ Spraying pesticide and fertilizer evenly at optimum amount/ *Menyembur racun perosak dan baja secara merata pada jumlah optimum* □ Reducing labor dependence/ *Mengurangkan kebergantungan terhadap pekerja* □ Influenced by other farmers and relatives/ *Dipengaruhi oleh petani lain dan saudara-mara* □ Got encouragement from agriculture agencies/ *Mendapat dorongan dari agensi pertanian* □ Saving cost and time on spray material and its process/ *Menjimatkan kos dan masa dari segi bahan semburan dan prosesnya* □ Increase profitability and paddy yields/ *Meningkatkan keuntungan dan hasil padi* □ Other, please state:____________/ *Lain-lain, sila nyatakan:* ________

Instruction: For statement on SECTION B, C, D, E and F, please read for each item and indicate your answer between one (1) to five (5). Your score (1) would indicate you strongly disagree with the statement and score (5) would indicate you strongly agree with respective statement.

Arahan: *Untuk pernyataan mengenai BAHAGIAN B, C, D, E dan F, sila baca setiap item dan nyatakan jawapan anda antara satu (1) hingga lima (5). Skor anda (1) menunjukkan anda sangat tidak setuju dengan pernyataan dan skor (5) akan menunjukkan bahawa anda sangat setuju dengan pernyataan tersebut.*

Strongly disagree (sangat tidak setuju)	Disagree (tidak setuju)	*Either Agree or Disagree* (Sama ada setuju atau tidak))	Agree (setuju)	Strongly agree (sangat setuju)
1	2	3	4	5

SECTION B : DRONE TECHNOLOGY ADOPTION
BAHAGIAN B: PENERIMAAN DRON TEKNOLOGY

Each statement below represents paddy farmers' adoption of drone technology in Perlis and Kedah.
Setiap pernyataan di bawah mewakili penerimaan pesawah padi terhadap dron teknologi di Perlis dan Kedah.

	In my opinion. *Pada pendapat saya:*	1	2	3	4	5
1	I am frequently adopting drone technology in paddy cultivation. *Saya sering mengamalkan teknologi dron dalam penanaman padi*					
2	I am adopting drone technology on a regular basis. *Saya mengamalkan teknologi dron secara tetap.*					
3	Drone technology should be adopted regardless of costs. *Amalan teknologi dron harus diguna pakai tanpa mengira kos*					
4	Adopting drone technology in paddy cultivation is needed. *Penggunaan teknologi dron dalam penanaman padi adalah diperlukan*					
5	I adopt drone technology because can facilitate work especially when spraying pesticide. *Saya menggunakan teknologi dron kerana dapat memudahkan kerja terutama ketika menyemburkan racun perosak.*					
6	I am adopting drone because technology's efficacy. *Saya menggunakan dron kerana keberkesanan teknologi tersebut.*					
7	Adopting drone in paddy cultivation is due to my willingness to accept innovation and being open minded. *Penerapan dron dalam penanaman padi adalah kerana kesediaan saya untuk menerima inovasi dan berfikiran terbuka*					

SECTION C : FACILITATING CONDITION
BAHAGIAN C: KEADAAN KEMUDAHAN

Each statement below represents facilitating condition of paddy farmers in Perlis and Kedah on drone technology.
Setiap pernyataan di bawah mewakili keadaan kemudahan pesawah padi terhadap dron teknologi di Perlis dan Kedah.

In my opinion. *Pada pendapat saya:*		1	2	3	4	5
1	I have the facilities to implement drone technology in paddy cultivation *Saya mempunyai kemudahan untuk menerapkan teknologi dron dalam penanaman padi*					
2	The authorities provide facilities in terms of loans to me in adopting drone technology. *Pihak berwajib menyediakan kemudahan dari segi pinjaman kepada saya dalam mengamalkan dron teknologi*					
3	I can easily obtain consultation services (for using drone technology. *Saya dapat memperoleh perkhidmatan perundingan dengan mudah untuk menggunakan teknologi dron*					
4	If I have any doubts about how to adopt the drone, there will be professionals to help me. Bila ada masalah ada kawan *Sekiranya saya mempunyai keraguan tentang cara menggunakan dron, akan ada profesional untuk menolong saya*					
5	I have enough information on the latest types of methods or technologies suitable for my paddy crop. *Saya mendapat maklumat yang cukup mengenai jenis kaedah atau teknologi terkini yang sesuai untuk tanaman padi saya*					
6	MADA's guidance is adequate for the use of new technology (drones) in paddy cultivation. *Bimbingan daripada pihak MADA adalah mencukupi bagi penggunaan teknologi baru (dron) dalam penanaman padi.*					
7	I have many collegues who are willing to help and share drone technology facilities for my paddy crop. *Saya mempunyai ramai kenalan yang boleh mambantu dan berkongsi kemudahan teknologi dron untuk penanaman padi saya.*					
8	Government agencies provide necessary drone technology workshop and training to me in adopting drone technology. *Agensi-agensi kerajaan menyediakan bengkel dan latihan teknologi dron yang diperlukan kepada saya dalam mengamalkan amalan teknologi dron*					

SECTION D : SOCIAL INFLUENCE
BAHAGIAN D: PENGARUH SOSIAL

Each statement below represents social influence of paddy farmers in Perlis and Kedah on drone technology.
Setiap pernyataan di bawah mewakili pengaruh sosial pesawah padi terhadap dron teknologi di Perlis dan Kedah.

	In my opinion. *Pada pendapat saya:*	1	2	3	4	5
1	My relatives influence my decision to use drone technology. *Saudara-mara saya mempengaruhi keputusan saya untuk menggunakan teknologi dron*					
2	Other paddy farmers (fellow farmers and friends) effected my decision to adopt drone technology. *Rakan petani mempengaruhi keputusan saya untuk menggunakan teknologi dron*					
3	MADA encouraged me to explore new agricultural technologies, such as the use of drones for fieldwork. *Pihak MADA menggalakkan saya beralih kepada penggunaan teknologi pertanian baharu termasuk menggunakan dron bagi melakukan kerja sawah*					
4	I was influenced by media information such as newspaper to adopt drone instead of a conventional method. *Saya dipengaruhi oleh maklumat media seperti keratan akhbar untuk menggunakan dron dan bukannya kaedah konvensif*					
5	The Agriculture Officer's approach has encouraged me to adopt innovations and technologies of drone in the paddy industry. *Pendekatan yang dijalankan oleh pegawai pertanian menggalakkan saya mengamalkan inovasi dan teknologi dron dalam industri padi*					
6	My adoption of drone technology is influenced by organised campaign, programmes and workshop related to agricultural technology especially drone. *Penerimaan teknologi dron saya dipengaruhi oleh kempen, program dan bengkel yang teratur yang berkaitan dengan teknologi pertanian terutama dron*					
7	I adopt drone technology because there are many agencies or banks that provide loan assistance to me in adopting drone technology. *Saya mengamalkan teknologi dron kerana terdapat banyak agensi atau bank yang menyediakan bantuan pinjaman kepada saya dalam mengamalkan amalan teknologi dron*					
8	The government sectors encourage me in adopting drone technology by providing sufficient facilities and training to me. *Sektor kerajaan menggalakkan saya untuk mengamalkan amalan teknologi dron dengan menyediakan fasiliti dan latihan yang mencukupi.*					

SECTION E : PERFORMANCE EXPECTANCY
BAHAGIAN E: JANGKAAN TERHADAP PRESTASI

Each statement below represents performance expectancy of paddy farmers in Perlis and Kedah on drone technology.

Setiap pernyataan di bawah mewakili jangkaan terhadap prestasi pesawah padi terhadap dron teknologi di Perlis dan Kedah.

In my opinion. *Pada pendapat saya:*		1	2	3	4	5
1	Drone technology would be useful in my job as a paddy farmer. *Teknologi dron akan berguna dalam pekerjaan saya sebagai pesawah padi*					
2	Drone technology would be better and more efficient than knapsack sprayer. *Teknologi dron akan lebih baik dan lebih cekap daripada penyembur ransel*					
3	Drone technology will improve operational performance by speeding up the spraying process. *Teknologi dron akan meningkatkan prestasi operasi dengan mempercepat proses penyemburan*					
4	Drone technology will increase my profitability in paddy cultivation. *Teknologi dron akan meningkatkan keuntungan saya dalam penanaman padi*.					
5	With drone technology, I will be able to reduce the dangers of pesticides to my health. *Dengan teknologi dron, saya boleh mengurangkan bahaya racun perosak terhadap kesihatan saya.*					
6	Drone technology allows me to effectively counter paddy disease and pests. *Menggunakan teknologi dron membolehkan saya memerangi penyakit padi dan perosak dengan lebih berkesan*.					
7	Using drone technology increases my chances of producing higher and quality paddy yields. *Menggunakan teknologi dron meningkatkan peluang saya menghasilkan hasil padi yang lebih tinggi dan berkualiti.*					
8	Using drone technology to spray pesticides and fertiliser could save money, time, and energy. *Menggunakan teknologi drone untuk menyemburkan racun perosak dan baja dapat menjimatkan wang, masa, dan usaha.*					

SECTION F : EFFORT EXPECTANCY
BAHAGIAN F : JANGKAAN TERHADAP USAHA

Each statement below represents effort expectancy of paddy farmers in Perlis and Kedah on drone technology.
Setiap pernyataan di bawah mewakili jangkaan terhadap usaha pesawah padi terhadap dron teknologi di Perlis dan Kedah.

	In my opinion. *Pada pendapat saya:*	1	2	3	4	5
1	Using drone technology requires less physical effort. *Menggunakan teknologi dron memerlukan usaha fizikal yang lebih sedikit*					
2	The drone is easier to use compared to other technologies in paddy cultivation. *Dron lebih mudah digunakan berbanding dengan teknologi lain dalam penanaman padi*					
3	I can easily adapt myself to the new agriculture technology especially drone that used for spraying pesticide and fertilizer. *Saya dapat menyesuaikan diri dengan teknologi pertanian baru terutamanya dron yang digunakan untuk menyemburkan racun perosak dan baja*					
4	I believe in the perceived ease of use of drones, which reflects my level of comfort with agricultural technology in the pesticide and fertiliser spraying process. *Saya percaya pada kemudahan penggunaan dron, yang mencerminkan tahap keselesaan saya dengan teknologi pertanian dalam proses penyemburan racun perosak dan baja*					
5	It would be quick and easy for me to become skilled in the spraying process if I used drone technology. *Adalah mudah bagi saya untuk mahir dalam proses penyemburan jika saya menggunakan teknologi dron*					
6	It is easy for me to get information about drone technology. *Adalah mudah bagi saya mendapatkan maklumat mengenai amalan teknologi dron*					
7	Government easily providing financial assisting to me for adopt drone technology. *Kerajaan dengan mudah menyediakan bantuan kewangan kepada saya untuk megamalkan amalan teknologi dron dari kerajaan.*					
8	It is easy for me to get facilities assisting for drone technology from government. *Adalah mudah bagi saya untuk mendapatkan bantuan kemudahan bagi amalan teknologi dron daripada kerajaan.*					