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Perceived Usefulness and Ease of Use Towards the Intention of Using Drone Technology among Micro Farmers in Malaysia

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Abstract: Drones can perform various functions that lead to improvements in agricultural activities. The scopes of drone operations are irrigation, crop health monitoring, planting, crop spraying, crop inspection and soil analysis. The problems encountered in the use of drone technology that monitors crops and fertilizer sowing in farms in the country has not yet become a common norm and most of the efforts are still at the research stage carried out by government agencies and the initial cost of using the technology is high. This study aims to identify the level of intention to use drone technology in the agricultural industry among farmers, along with the level of perception of usefulness (PU) and ease of use (PEOU) of the drone technology, and the relationship between these two factors towards the intention to use drone technology. This study uses quantitative method focusing on Batu Pahat district with the total 173 micro farmers were involved in the survey questionnaire. The Statistical Package for Social Sciences (SPSS) was used for the data analyses. The results show all variables were recorded a moderate level among the farmers. The correlation coefficient between the perceived usefulness and the intention to use technology is r=0.668 whereas for perceived ease of use and the intention to use technology is r=0.623, both were statistically significant at $p<0.01$. The result of multiple linear regression shows that the variance of intention to use drone technology is 48.7 percent explained by PU and PEOU, significantly at $p<0.01$. It needs to be noted that

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acceptance of a technology is narrowly connected to the degree of ease of use and usefulness to farmers in applying it, not about the use of a new technology. If this technology is widely used in agriculture, it has the potential to have a significant impact on farmers.

Keywords: Perceived usefulness, Perceived ease of use, Intention to use, Drone technology, Micro farmers

1. Introduction

The use of drone technology is becoming increasingly popular in the agricultural sector. It is one of the important technologies in ensuring economic growth and increasing the income status of farmers in Malaysia (Mohamad Suhaimi, 2020). Drone technology can benefit the agricultural industry by assisting farmers in analyzing field conditions before the start of the planting season. This is due to the fact that this technology can map the status of farms in the form of three-dimensional (3D) images and identify problem areas (Mohamad Suhaimi, 2020). The use of drones improves the quality of crop management and provides better mapping where it can visualize crop conditions in each flight. At the same time, it increases productivity and reduces costs. Furthermore, according to Razalee Ismail who is the director for the provision of drone services Meraque Services Sdn. Bhd. states that COVID-19 has accelerated digital transformation in agriculture where demand for drone spraying services has soared since the start of the outbreak. Agriculture in Malaysia is one of the most important sectors that contribute to GDP and is a guarantee of food security in this state. There are 4 types of agricultural systems in Malaysia which are identified which are Nomadic Agriculture, Self-sufficiency Agricultural System, Smallholder Agricultural System and the latest Extensive and Commercial Plantation System (Commercial Agriculture). The shifting cultivation system is a simple traditional farming system with a shifting concept. Agricultural sites are often moved according to the level of soil fertility where land clearing involves forest burning. Forest burning has been used for a long time and is one of the most simple, cheap, fast, and proactive traditional agricultural systems to fertilize the soil and control unwanted tree growth (Santín & Doerr, 2016). The types of crops cultivated are short-term crops such as sweet potato, corn, cassava, and huma rice. The Intensive Subsistence Farming System is actively carried out by specializing in only one type of main crop such as paddy (*Oryza sativa*) in the paddy field in addition to several types of off-season crops such as sweet potato (*Impomea batatas*), corn (*Zea mays*) and vegetables. Meanwhile, the types of plants for sale include such as rubber plants (*Hevea braziliensis*), palm oil (*Elaeis guineensis*) and selected fruits as appropriate. Next, the Small Garden Farming system where this farming system usually involves the cultivation of non-cereal crops and is semi-commercial, which is a mixture of crops for sale and for personal use. For Extensive and Commercial Farming Systems where this system is a fully commercial concept. Crops are for sale and focus on profit and return on investment. The characteristics of this system are about the choice of plant types such as rubber plants, palm oil or pineapple.

Datuk Seri Mohamed Azmin Ali, Minister of Economic Affairs stated that the Malaysian government is always working to further expand innovation and also the use of new technology to increase the productivity of the agricultural sector, indirectly increasing income and also the national economy (Mohamad Suhaimi, 2022). In relation to that, Lembaga Kemajuan Pertanian Muda (MADA) is the first agency in Malaysia to use drone technology in the agricultural sector, especially for spraying poisons in rice fields. With the use of this technology, this spraying work can save time and the cost of materials used because the poison that is sprayed hits the target evenly and more effectively (Zaharudin & Abdul Aziz, 2021). To understand more deeply about the intention of using drone technology in the agricultural sector, the Technology Acceptance Model (TAM) approach is used because this model is an information system theory that models how users accept and use a technology. The variables involved are perceived usefulness (PU) and perceived ease of use (PEOU). The main goal of TAM is to explain the determinants of technology use intentions by analyzing the implications of a person's internal beliefs, attitudes and external influences on his intentions. TAM describes the causal relationship that exists between external variables and the use of technology as well as the relationship between perceived usefulness and perceived ease of use and its influence on the intention to use (Caffaro *et al.*, 2020).

Precision Farming is a modern farming concept that allows farmers to use technology to handle related operations such as fertilization, irrigation, pest control and so on. In other words, Precision Farming is doing farming activities correctly, in the right area, with the right approach, and at the right time. In Malaysia, Precision Farming which incorporates technology such as drones to measure accurately in each agricultural process to ensure that resources are used at an optimal rate has yet to be fully explored. Most of the efforts carried out are still at the research stage carried out by government agencies such as MARDI, MIMOS Berhad and also local universities (Mahdin, 2022). For example, one of the local universities conducting research on this technology is Universiti Tun Hussein Onn Malaysia (UTHM) where the first large-scale cargo drone prototype has been successfully built and is known as C-Drone (Yamin, 2022). The problems faced in the use of drone technology that monitors crops and fertilizer sowing in farms in our country has not yet become a common norm (Mohamad Suhaimi, 2020). In addition, the limiting factor for the use of drone technology in the agricultural sector is the large initial cost. Not only is it expensive to use this technology like abroad, but it also needs to be adapted to local crops such as oil palm, rubber, rice and pineapple first (Mahdin, 2022). Through Harian Metro, an interview with a graduate of bachelor's degree in manufacturing engineering, Universiti Teknikal Malaysia Melaka (UTeM) who runs drone technology services stated that they have several drones including the DJI type with a capacity of 16 liters that cost between RM35,000.00 to RM65,000.00 for each one drones (Mohd Pilus, 2022). Advanced technology with a relatively high capital price makes the question whether the level of ability of local farmers to use drone technology in their agricultural activities and this leads to the main goal of the study to find out the intention of using drone technology among them. The agricultural sector needs to move along with the 4th Industrial Revolution (IR4.0) for the use of technology, one of which is the use of drones or unmanned aerial vehicles (UAVs) in the agricultural cultivation industry. It is to replace the manual method of spraying herbicides and insects and fertilizers, and some other activities related to agriculture.

The objective of this study is to identify the level of intention to use drone technology among farmers in Batu Pahat, Johor, as well as their level of perception of usefulness and ease of use of the drone technology. The study also intended to examine the relationship between the perception of usefulness and ease of use with the intention to use drone technology.

2. Literature Review

2.1 Agriculture Industry in Malaysia

In the early years of independence until the early 1980s, Malaysia's economy was heavily dependent on the agricultural sector, especially rubber and palm oil. Until now, the agricultural sector is still relevant and important in producing agricultural output to be processed to produce final products (Kambut, 2020). The huge profits in the cultivation sector have created curiosity and interest among many small and large farmers. Because this industry has become a commodity, it has been implemented in large-scale farms and has high investment capital, as implemented by the Federal Land Development Authority (FELDA). The establishment of various government agencies during the implementation of the Five-Year Economic Development Plan, starting with the First Malaya Plan (1956-1960) is an effort carried out by the Malayan government to improve the living standards of the rural population and reduce the disparity with the urban population (Zainal Abidin, 2017). Until the New Economic Policy (DEB) was implemented in 1970, many agencies were formed to increase the country's economic growth through the agricultural sector, including FELDA which was entrusted to clear land for commodity crops in the fields. The Federal Land Consolidation and Rehabilitation Board (FELCRA) was established to restore and consolidate unproductive lands so that they can be cultivated commercially and provide economic returns to landowners. Next, the Rubber Industry Smallholder Development Authority (RISDA) was established to help small rubber farmers, the Palm Oil Research Institute of Malaysia (PORIM) was tasked with developing the country's palm oil industry. In addition, the Federal Agricultural Marketing Authority (FAMA) functions and plays a role in marketing agricultural products, Padiberas Nasional Berhad (BERNAS) monitors and helps increase quality rice production in the country, and the Malaysian Agricultural Research and Development Institute (MARDI) plays a role in the development of research in agriculture (Zainal Abidin, 2017). The agricultural sector contributes to the country through exports, especially products produced from agricultural commodities such as palm oil. Total agricultural exports increased from RM118.7 billion in 2020 to RM154.5 billion in 2021. Meanwhile, total agricultural sector imports also showed an increase to RM120.5 billion in 2021 compared to RM98.3 billion in 2020. This is because Malaysia is a producer and the second largest exporter of palm oil in the world after Indonesia. Malaysia's palm oil production accounts for 26 percent of world production and 34 percent of world exports in 2020. Based on data obtained from the Batu Pahat Department of Agriculture, Johor (2021), agricultural activities carried out in the state are divided into 7 categories, namely floriculture, vegetable -vegetables, rice, herbs and spices, industrial crops, fruit crops, and farm crops or cash crops. Among the agricultural crops available are coconuts, rice, durian, bananas, pineapples, long beans, chilies, okra, passion fruit, honey and many more.

2.2 Drone Technology

Advances in agricultural technology have become a major factor in the effective production of agricultural commodities, and one of the growing technical advances in the current era of globalization is drones. Drones, also known as Unmanned Aerial Vehicles (UAVs), are remotely controlled flying robots that can transport goods depending on their function. Drones were first used in the military by the United States; however, with the advancement of technology, drones are now used in various industries from area mapping to health, images, films and so on (Ikhwana & Hapsari, 2019). The use of drones is usually for dangerous work done by humans and only in the military field that a lot of this technology is used. However, after this technology developed and expanded, the use of drone technology now covers commercial, scientific, recreational, agricultural, aerial monitoring, aerial photography and so on. Drone technology provides great benefits and opportunities in various fields. Drones provide support tasks such as surveying, humanitarian work, disaster risk management, research and transportation (Ayamga *et al.*, 2020). Global Positioning Systems (GPS) and customizable applications for smartphones and tablets have provided better drone flight duration, reliability, ease of use and the ability to better use cameras and other sensors needed to use drones in agriculture. Drones can perform various functions that lead to improvements in agricultural activities. Examples of drone operations are irrigation, crop health monitoring, planting, crop spraying, crop inspection and soil analysis. In addition, drones equipped with several sensors such as 3D cameras and thermal imaging cameras, where these sensors can be used to monitor plant conditions and diseases, plant health indicators, vegetable density, pesticide detection, fertilizer, forecasting, plant counts, plant height measurement, field water mapping, exploration report, nitrogen measurement (Islam *et al.*, 2021). Drones can play an important role at the beginning of this crop cycle as the technology produces accurate 3D maps for soil analysis. This is very useful for seed planting patterns. After planting, drone-driven soil analysis provides data for management of irrigation and nitrogen levels (Ahirwar *et al.*, 2019). According to Veroustraete (2015) using drone sensors and image processing allows farmers and agronomists to easily distinguish high intensity weed breeding areas from healthy crop areas growing next to them. Historically, many farmers did not realize the importance of their weed problem until harvest. The same opinion was expressed by Suhaizi *et al.* (2017) where weeds give a bad effect to plants where these weeds will compete with other plants to get nutrients from sunlight. Therefore, the use of drones is used for monitoring purposes in agricultural areas. In addition, the data collected via drones provides the raw data that is much needed to enable agricultural analysis models. Drones can monitor soil and crop health to support precision agriculture, assist in planning irrigation schedules, efficient fertilizer use, estimate yield data and provide weather analysis data (Doddamani *et al.*, 2020).

2.3 Intention to Use Drone Technology in the Agricultural Industry

Attitude towards the use of something according to Aakers and Myers (1997) is an attitude of like or dislike towards the use of a product. This is where the attitude of liking or disliking a product can be used to predict the behavior of a person's intention to use the product or not use it. Attitude towards using technology (attitude towards using technology), defined as the user's assessment of their interest in using technology (Davis, 1989). User beliefs influence attitudes which in turn change the intention to use or not use certain technologies. On this basis, Davis (1989) identified the main ideas that are Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) which can be defined as PU is the level where a person believes that using a certain system will improve his work performance. In contrast, PEOU is the degree to which the individual believes that using a particular system will not increase his workload. In general, the higher the perception of technology usability, the higher the intention to use the technology (Angelica *et al.*, 2021). The definition of intention as a psychological emotion that is channelled through the user's evaluation of the innovation. If the intention is found to be positive, then the intention to use a technology tends to be positive. It also includes the opinion of whether the considered behaviour is good or bad, whether the user wants to act in a certain way and the user's perception of the consequences associated with the behaviour (Verma & Sinha, 2018). In the context of farmers, intention refers to the positive or negative feelings of potential users towards the use of new technology. The intention to use precision agriculture technology was found to positively influence the intention to adopt precision agriculture technology (Bakhsh *et al.*, 2017). In general, when farmers perceive a new technology as complex and difficult to master, their willingness or intention to adopt the technology will decrease. Next, perceived usefulness refers to farmers' perceptions of how technology will improve things like efficiency, production, and profitability. Farmers who find the technology more useful are expected to be more likely to adopt it. Besides that, the more comprehensive the farmer's understanding of technology, the higher the willingness to adopt a technology (Zheng *et al.*, 2019).

2.4 Perceived Usefulness and Intention to Use Drone Technology

Based on the Technology Acceptance Model (TAM) introduced by Davis (1986), the perception of usefulness is the most important factor in user acceptance of a system. Perceived system usefulness is related to the productivity and effectiveness of the system and the overall benefit of improving user performance. In other words, it is the extent to which a person believes that using technology will improve his work performance. Therefore, the more useful a technology is, the higher the desire of users to use it. In the study of Tahar *et al.* (2020), in terms of administration, e-Filing may offer potential benefits to the government because the tax return process by citizens can be effectively managed through technological facilities. Regarding e-Filing, if corporate taxpayers feel that e-Filing is useful, it increases the level of intention to use it. The perception of utility directly affects the intention to try and use the e-Filing system. If taxpayers feel the benefits, they will want to use the system; on the contrary, if they do not feel the benefits of the system, then they will not intend to use it. The study of Tahar *et al.* (2020) showed that perceived usefulness does not affect the intention to use e-Filing. The next study is about online purchases where the power to buy online lies in the usability and utility of technology, which is the belief that using an application improves one's performance. In this context, performance focuses on the benefits gained through online purchases versus retail purchases. Therefore, the assertion can be made that there is a positive influence of PU on the intention to purchase online (Ramayah & Ignatius, 2007). In a health context, perceived usefulness is used in online information seeking research to predict Internet use behaviour about searching for disease symptoms. There is a direct relationship between perceived usefulness and the intention to use websites for health information. The usefulness of health websites has a positive effect on the intention to use the website (Boon-itt, 2019). Next is a study on mobile money payments where the perception of usefulness in mobile payments refers to the extent to which the user believes that he will get the same benefits if they make payments using a smartphone such as. For example, consumers believe that by using mobile payments their tasks will be more effective and efficient. Users feel comfortable using this service without carrying cash to make payments (Winata & Permana, 2020). Based on past studies that have been studied, every use of technology has benefits and also provides benefits and convenience to users. In conclusion, the proposed hypothesis is as below.

H_1: Perceived usefulness significantly influence the farmer's intention to use drone technology.

2.5 Perceived Ease of Use and Intention to Use Drone Technology

In the study of Tahar *et al.* (2020) regarding e-Filing, increasing the readiness of information technology can certainly increase efficiency and effectiveness in the use of technology. Technological readiness means the availability of existing and sufficient software tools in technology to be able to process data quickly and accurately. Therefore, it shows that perceived ease of use has a significant positive influence on the intention to use e-Filing for taxpayers. In the context of online shopping, Internet users who perceive Internet shopping as easy, then perceive it as useful. In part, this is due to the fact that Internet users will naturally try to form their perception of online shopping based on their experience in engaging in Internet shopping (Ramayah & Ignatius, n.d.). Based on studies conducted by Tahar *et al.*, (2020), Ramayah and Ignatius, Boon-itt, (2019), and Winata and Permana (2020), all studies conducted obtained a positive and significant relationship.

H_2: Perceived ease of use significantly influence the farmer's intention to use drone technology.

2.6 Research Framework

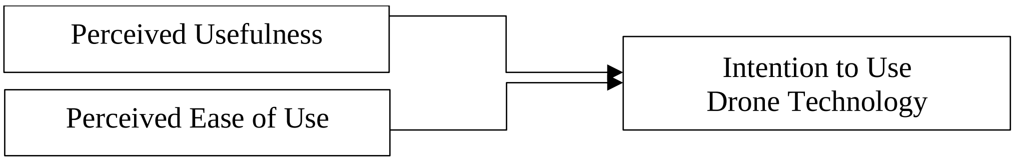

Figure 1: Research Framework

3. Research Methodology

3.1 Research Design

In this study, the quantitative method will be used to study the perception of usefulness and ease of use on the intention to use drone technology in the agricultural industry in Malaysia.

3.2 Unit of Analysis

The unit of analysis in this study is individual farmers in Batu Pahat, Johor.

3.3 Population and Sampling

The entire population is the target population because it has the characteristics of the respondents required in the study. The target population is farmers in Batu Pahat, Johor. The total recorded population of farmers is 993 people based on sources from the Batu Bahat Agriculture Department. Purposive sampling technique was used. Purposive sampling is where the researcher has selected respondents to participate in this survey based on criteria that have been set, namely farmers in the Batu

Pahat district, Johor, who are actively involved in the farming activities. The sample size was determined based on the Sample Size Table introduced by Krejcie and Morgan (1970). Based on 993 total population, a minimum of 278 study samples are required.

3.4 Research Instrument

The survey form is divided into three parts, namely parts A, B and C where part A is the demographic information of the respondents. A 5-point Likert scale is used in the questionnaire in part B and part C. The scale used is 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree. Bilingual i.e., Malay and English have been used since the respondents are made up of farmers of various ethnicities and it is possible that there are respondents who do not really understand if the questions were only asked either in English or Malay. The study items were taken from the study of Shroff *et al.* (2011). 5 items for each variable.

3.5 Data Collection

The data for this study was collected through a Google form questionnaire that was distributed through the WhatsApp application. The telephone numbers of the farmers were obtained from the Department of Agriculture in Batu Pahat, Johor. The respondents were contacted beforehand the Google Form link was given and were explained about the purpose of data collection. Respondents were also briefed on the use of drone technology. Due to the lack of initial response, data collection was also done by physically visiting the farmers at their farms. Farmers are more comfortable being questioned directly than answering through an online application.

The data collection period was 2 months. Both primary and secondary data are very important when conducting research. To facilitate the data collection process, an official letter of student identification from the university was submitted along with the questionnaire to each individual and organization involved in this study as the official proof of the undertaken fieldwork. Examples of secondary data used are agricultural information such as agricultural types, areas, and categories and the number of farmers through the Department of Agriculture website, Regional Farmer Growth and several other sources.

3.6 Data Analysis

For categorical variables such as age, a frequency distribution will be used to tell the number of respondents who gave their response. Whereas for continuous variables, the mean descriptive value is used to summarize the level statistics of the measured variables. A mean value of 1.00-2.33 represents low, 2.34-3.67 represents medium, and 3.68-5.00 represents high. Reliability analysis is used to measure the extent to which data is reliable and consistent over time, thus stability and consistency can be determined (Sekaran & Bougie, 2020). The most commonly used test for reliability is Cronbach's alpha coefficient where the ideal coefficient of a scale should exceed 0.7. The higher the Cronbach's alpha coefficient, the more reliable the test. The value of $\alpha \geq 0.9$ is very good, $0.7 \leq \alpha < 0.9$ is good, $0.6 \leq \alpha < 0.7$ is acceptable, $0.5 \leq \alpha < 0.6$ is weak and $\alpha > 0.5$ is not acceptable.

Correlation analysis is used to give the direction, strength and significance of the relationship for all variables that are dependent variables and independent variables. According to Hair *et al.*, (2010), the scale used to interpret the relationship between the dependent variable and the independent variable is based on the *r* coefficient index value. The index value of the correlation coefficient is used to determine the strength of the relationship between variables. The coefficient has a value between negative and positive values as the index of the coefficient ($-1 < r < +1$). A value of zero indicates that there is no relationship between the variables, while *r* approaching -1 or +1 indicates that the relationship between the variables is very strong. Positive values indicate the same direction, while negative values indicate the opposite direction (Mohd Majid, 1998). The magnitude of *r* coefficient is interpreted as 0 as nil, 0.01 – 0.20 as very weak, 0.21 – 0.40 as weak, 0.41 – 0.70 as moderate, 0.71 –

0.90 as strong, 0.91 – 0.99 as very strong and 1 as perfect relationship. The same approach is used for multiple linear regression. The squared variable (quadratic) component might be applied as a forecaster in the existence of theoretical or statistical evidence which show that there is one or another predictor variables possess curvilinear correlation towards the dependent variable. The coefficients measure the intensity of variable changes that can be either negative or positive (George & Mallery, 2019).

3.7 Pilot Study

In the pilot study, a total of 30 farmers were involved. A total of 30 sets of questionnaires were distributed to study the acceptance and understanding of the farmers in answering the questionnaires. Cronbach's Alpha value for perceived usefulness is 0.961. Next, the perception of ease of use obtained a Cronbach's Alpha value of 0.869. Meanwhile, Cronbach's Alpha value for the intention to use technology is 0.937. All variables are tested with 5 questions each. The question items asked in the questionnaire are acceptable, good and very good. In general, the Cronbach's Alpha results obtained are above 0.7, so the items and the questionnaire can be distributed for the actual study.

4. Results and Discussion

4.1 Response Rate

A total of 278 questionnaires were distributed with 173 responses successfully returned. The response rate of this study was 62.23%. The response rate of respondents did not reach the entire form distribution due to several factors. This may happen because farmers do not understand or do not read the questions on the questionnaire. In addition, the age factor and the educational background of these farmers also affect their level of understanding.

4.2 Demographic Analysis

Respondent demographic information was analysed using frequency and percentage. The background of the respondents that have been collected include age, gender, race, education level, agricultural category, agricultural products, number of years of crop cultivation, number of full-time workers, type of technology used in agriculture, knowledge of drone technology, experience using drone technology, experience the use of drone technology in agriculture, the period of use of drones in agriculture and knowledge of the advantages of drones in the agricultural sector. The results of the analysis show that many respondents are male (f=155, 89.6%), aged 41 and above (f=91, 52.6%), Malay (f=162, 93.6%), with the highest level of education being SPM (f= 107, 61.8%). All the responses received are from micro-sized farmers with less than 5 full-time employees. Table 1 represent the overall summary of the demographic profiles of the respondents.

Most of the types of agriculture involved are vegetable farming (f=64, 36.8%), and the most individual crop types are durian cultivation (f=24, 13.8%). Durian, bananas, and other agricultural products are the three agricultural products that get the highest percentage in answering the questionnaire, each of which represents 13.8%, 11.5% and 42.5% respectively. Other agriculture is dominated by a variety of vegetable crops. Durian, bananas, and other agricultural products are the three agricultural products that get the highest percentage in answering the questionnaire, each of which represents 13.8%, 11.5% and 42.5% respectively. This is so because according to farmers in the Batu Pahat area, durian products, bananas and others are the three products that give the highest percentage in the list of active agricultural projects. Other agricultural products are such as spinach, papaya, oyster mushrooms, soursop, sweet potato, collard, sugar cane, honeydew, eggplant, cucumber, tomato, and tapioca. Therefore, it is reasonable if the percentage of respondents is dominated by these agricultural products.

A moderate percentage comes from agricultural products, chili 7.5%, coconut 6.3%, and pineapple and long beans, which each represent 5.7%. The percentage of less response is from passion fruit, okra and paddy agricultural products which are 4%, 1.7% and 0.6%. The results of this finding clearly show that agriculture in Batu Pahat, Johor is more about agriculture in the fruit and vegetable category. Much of the period of agricultural operation is 5 years and below (f=72, 41.6%). There are 122 farmers (70.7%) stating that they use farm mechanization technology in agriculture, 3 farmers (1.7%) stating that they use biotechnology technology in agriculture, 36 farmers (20.7%) stating that they use nanotechnology technology in agriculture, 4 farmers (2.3%) using conservation planting technology/greenhouse in their agriculture and 8 farmers (4.6%) use other technologies in agriculture.

From this finding, it was found that the use of farm mechanization technology in agriculture is a technology that has been widely used by farmers in the study area apart from other technologies that have been mentioned. Farm mechanization is like the use of machinery or machines, biotechnology is a technology to modify the biological functions of an organism for good purposes such as high production characteristics, resistance to disease, resistance to weeds, resistance to soil acidity and good quality. Nanotechnology is like nano-fertilizers and nano-pesticides, while for protected cultivation or greenhouses, it functions to control temperature, humidity, light and other factors according to plant needs.

The data shows that 139 (79.9%) farmers know about drone technology. While the remaining 34 (19.5%) farmers do not know about drone technology. This shows that knowing about drone technology is no stranger to farmers in Batu Pahat. An interesting finding shows that a large number of 158 (90.8%) farmers in this study do not use drone technology while 15 (8.6%) farmers state that they have used drone technology. For the 15 respondents who have used drone technology based on information from demographics where the majority are 31 years old and above and it is possible that among these farmers, they have children or relatives who are skilled in drone technology and the initial function of drones is used to record videos. Continuing from that, a total of 168 (96.6%) farmers have never used drone technology in agriculture and only 5 (2.9%) farmers have ever used drone technology in their agricultural activities. The age factor is expected to be one of the factors in the use of drone technology because it is quite difficult to use or understand for individuals who are passive towards advance technology.

In addition, the small area of crops also plays a role where the use of drones in agriculture is considered unnecessary or not worthwhile. This is because the initial cost of using drone technology is high and as a matter of fact, they are all micro farmers with very minimal financial capacity. This matter was highlighted by one of the farmers during the data collection process. A total of 168 (96.6%) farmers never used drones in agriculture, 4 (2.3%) farmers used drones in agriculture within 4 to 6 years and only one (0.6%) farmer used drones in agriculture within 1 to 3 years. Findings show that the educational background of farmers who use this drone technology is at the master’s degree level where this drone technology is part of the mechanization of their agriculture. It can be proposed that educational background is also likely to have an influence on the use of drone technology in agriculture.

A total of 111 (63.8%) farmers knows the advantages of drones in the agricultural sector while the other 62 (35.6%) farmers state that they do not clearly know the advantages of drones in the agricultural sector. This shows that majority of the farmers in Batu Pahat know that using drone technology in agriculture has many advantages and helps in agricultural production. The question that may arise is why the use of drones among micro farmers in Batu Pahat is still very low even though they know the advantages of using drone technology. What are the factors that cause drone usage statistics among farmers to be low and do these factors affect their intentions in using drone technology.

Table 1: Demographic information

Demographics	Items	Frequency (N=173)	Percentage (%)
Gender	Male	155	89.6
	Female	18	10.4
Age (years)	20 years and below	1	0.6
	21 – 30 years	6	3.5
	31 – 40 years	75	43.4
	41 years and above	91	52.6
Ethnicity	Malay	162	93.6
	Chinese	11	6.4
Education Level	SPM	107	61.8
	STPM/Diploma/Matriculation	61	35.3
	Bachelor’s Degree	3	1.7
	Master’s Degree/PHD	2	1.2
Agricultural category	Vegetables	64	36.8
	Paddy	3	1.7
	Herbs and spices	0	0
	Industrial Crops	3	1.7
	Fruit Plants	47	27.2
	Field Crops/Cash Crops	56	32.4
Agricultural products	Coconut	11	6.4
	Paddy	1	0.6
	Durian	24	13.9
	Banana	20	11.6
	Pineapple	10	5.8
	Long beans	10	5.8
	Chili	13	7.5
	Okra	3	1.7
	Passion fruit	7	4.0
	Others	74	42.8
Number of years of crop cultivation	5 years and below	72	41.6
	6 – 10 years	56	32.4
	11 – 15 years	38	22.0
	16 – 20 years	6	3.5
	21 years and above	1	0.6
Number of full-time employees	< 5 employees	173	100.0
	5 – <30 employees	0	0
	30 – ≤75 employees	0	0
Types of technology used in agriculture.	Farm Mechanization	122	70.5
	Biotechnology	3	1.7
	Nanotechnology	36	20.8
	Greenhouses/Protected cultivation	4	2.3
	Others	8	4.6

4.3 Reliability Analysis

The number of items measured is the same as during the pilot study, which is 15 items. The generally accepted rule is that a Cronbach’s Alpha value of 0.6–0.7 indicates an acceptable level of reliability, 0.9 or higher an excellent level. Cronbach's Alpha value for perceived usefulness is 0.873, perceived ease of use is 0.784 and intention to use technology is 0.834. The reliability test shows the data collected is reliable and valid for further analyses.

4.4 Descriptive Analysis

(a) Descriptive Analysis of Intention to Use Drone Technology

Table 2 shows that the item of intention to use had the highest mean of 3.77 (σ = 0.51) for the item ‘I expect the use of drone technology to continue in the future’. While the item ‘I intent to use the drone technology in the next year’ has got the lowest mean score which is 3.06 (σ = 0.55). The total number of mean scores for intention to use is at a moderate level which is μ = 3.43 (σ = 0.43).

Table 2: Descriptive analysis for intention to use drone technology

No.	Item	Mean (μ)	Std Deviation (σ)	Level
1.	I intent to use the drone technology in the next year.	3.06	0.55	Moderate
2.	I intent to use the drone technology frequently for my job.	3.27	0.57	Moderate
3.	I intent to use the drone technology as often as possible.	3.44	0.55	Moderate
4.	I plan to use the drone technology in the future.	3.63	0.57	Moderate
5.	I expect the use of drone technology to continue in the future.	3.77	0.51	High
	Total Average Score	3.43	0.43	Moderate

(b) Descriptive Analysis of Perceived Usefulness (PU)

Table 3 shows that the item of perceived usefulness got the highest mean of 3.53 (σ = 0.60) for the item ‘I found using the drone technology useful in my field’. While the item ‘Using the drone technology improve my work performance’ has got the lowest mean score which is 3.41 (σ = 0.60). The total number of mean scores is at a moderate level which is μ = 3.47 (σ = 0.50).

Table 3: Descriptive analysis for perceived usefulness

No.	Item	Mean (μ)	Std Deviation (σ)	Level
1.	Using the drone technology enhance my effectiveness in workplace.	3.50	0.62	Moderate
2.	Using the drone technology improve my work performance.	3.41	0.60	Moderate
3.	Using the drone technology increase my productivity in my job.	3.47	0.62	Moderate
4.	Using the drone technology enable me to accomplish tasks more quickly.	3.46	0.63	Moderate
5.	I found using the drone technology useful in my field.	3.53	0.60	Moderate
	Total Average Score	3.47	0.50	Moderate

(c) Descriptive Analysis of Perceived Ease of Use (PEOU)

Table 4 shows that the item of perceived ease of use had the highest mean of 3.60 (σ = 0.56) for the item ‘I found the drone technology are flexible to interact with’. While the item ‘Overall, I found the drone technology features are easy to use’ has got the lowest mean score which is 3.17 (σ = 0.45). The total number of mean scores is at a moderate level which is μ = 3.29 (σ = 0.36).

Table 4: Descriptive analysis for perceived ease of use

No.	Item	Mean (μ)	Std Deviation (σ)	Level
1.	Overall, I found the drone technology features are easy to use.	3.17	0.45	Moderate
2.	Learning to use the drone technology features are easy for me.	3.25	0.47	Moderate
3.	My interaction with the drone technology features was clear and understandable.	3.23	0.47	Moderate
4.	It was easy for me to become skilful at using the drone technology features.	3.24	0.49	Moderate
5.	I found the drone technology are flexible to interact with.	3.60	0.56	Moderate
	Total Average Score	3.29	0.36	Moderate

4.5 Correlation and Multiple Regression Analysis

The results of the normality test show that the value for the dependent variable, which is the intention to use technology, shows a significant value below 0.05 ($p<0.05$), this result indicates not normal data. Both Kolmogrov-Sminov and Shapiro-Wilk tests show significant values both with $p<0.01$. Furthermore, graphical testing involving histograms, P-P plots and scatter diagrams were performed and the data distribution pictured a normal distribution. With these latter assumptions, the Pearson correlation was used in the next analysis. Table 5 shows the correlation coefficient between the perceived usefulness and the intention to use technology is $r = 0.668$ and statistically significant at $p < 0.01$ ($p = 0.000$). Next, the correlation coefficient between the perceived ease of use and the intention to use technology is $r = 0.623$, statistically significant at $p < 0.01$ ($p = 0.000$). It was proven that the relationship strength was both moderate.

Table 5: Pearson Correlation

Variable	Intention to use drone technology
Perceived usefulness	0.668**
Perceived ease of use	0.623**

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

According to the model explanation from Table 6 and Table 7, the R square value is 0.487. This means that the two independent variables of perceived usefulness and perceived ease of use can explain 48.7 percent of the intention to use drone technology. The remaining 51.3 percent of the factors are not included in this study. When observed more specifically in Table 8, it reveals that both factors have a significant impact towards intention to use at $P<0.01$. Therefore, both hypothesis H_1 and H_2 are supported.

Table 6: Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	0.698[a]	0.487	0.481	0.30842

Table 7: ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	15.381	2	7.690	80.847	0.000[b]
Residual	16.171	170	0.095		
Total	31.552	172			

Table 8: Multiple Linear Regression

Model	Unstandardized Beta		Standardized Coefficient	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.916	0.218		4.201	0.000
Perceived usefulness	0.391	0.068	0.455	5.740	0.000
Perceived ease of use	0.353	0.095	0.295	3.724	0.000

5. Discussion and Conclusion

Objective 1: Identifying the degree of intention to use drone technology in Malaysia's agricultural sector is the first goal. The intention to use drone technology among micro farmers is moderate, according to the research. It demonstrates that people are eager to adopt cutting-edge technology because they plan to use it. Technology is used more frequently the higher the purpose or desire to use it. Nugroho (2021), who claimed that purpose had a favourable impact on technology users, supports the study's findings. The results of this study indicate that micro farmers in Batu Pahat have a moderate level of intention to employ drone technology. Since all of the respondents were micro farmers, this finding is solely indicative of micro farmers. The survey's findings demonstrate that the majority of Batu Pahat's micro farmers have a modest level of interest in drone technology and indicate a willingness to employ it. According to Fishbein and Ajzen's Theory of Reasoned Action (1975) and its successor, the Theory of Planned action (1991), which contends that behavioural intention to use is a significant predictor of actual action. Many scholars have utilised TAM to predict behavioural intentions towards the usage of information technology in the application of information technology. It is anticipated that behavioural intention will have a sizable positive impact on how people utilise technology. Because it gets harder as you get older to learn new technical abilities, older and less experienced people have a harder time adjusting to technological change. It is believed that gender has a moderating effect because men and women encode and process information using distinct socially created cognitive frameworks, which in turn affect how we use technology. The size of the farm also influences how technology is used because it is compared to its intended function (Schukat & Heise, 2021).

Objective 2: The second objective of the study is to determine the perceived level of usefulness and ease of use of drone technology in agriculture in Batu Pahat, Johor. According to the results, there is a moderate level of assessment of the value and simplicity of drone technology. The findings indicate that micro farmers in Batu Pahat have a moderate impression of the utility and simplicity of drone technology in agriculture. People who believe using technology is simple also believe it to be more beneficial (Davis, 1989). The TAM framework predicts that a farmer who considers operating a drone to be simple will be more likely to use it for agricultural purposes. Additionally, the farmer will have a stronger intention to employ the drone if he believes the data, it provides would be helpful for farm operations. Additionally, a farmer will regard a drone to be more valuable if he finds operating one to be simple (Michels *et al.*, 2021). Therefore, it stands to reason that a farmer would regard the drone as more beneficial if he felt that certain of its functions fulfilled his needs for the farm. According to Rose *et al.* (2016), farmers are more likely to employ support tools or technology if they believe the information being supplied is pertinent to their task. The TAM model's conclusion is that PU is the first construct that serves as a paradigm for how people should embrace and use technology. It is established that PU has an impact on one's intention to adopt a system. Even if this study's level is moderate, its results are nevertheless encouraging. PEOU is the public expectation that the system will function without human effort. Users are more likely to accept a system that is simple to use (Rose *et al.*, 2016). By judging drone technology to be simple to use, the PEOU in this study gauges how comfortable a farmer is using it. Farmers' intentions to employ drone technology are negatively impacted if they believe it to be inconvenient and difficult to use.

Objective 3: The third objective aim at examining the relationship and influence between the perceived usefulness and ease of use with the intention to use drone technology in the agricultural industry in Malaysia. The relationship between these two variables is explained through the hypothesis that the perception of usefulness and the perception of ease of use have a significant effect on the intention to use technology. In this study, it is proven that both hypotheses have been answered clearly and it is accepted that there is a significant positive influence for both variable relationships where for the correlation value, it is at a moderate positive correlation level. Further analysis through multiple linear regression, the R^2 value obtained has proven a positive and significant influence on the intention to use technology explained by PU and PEOU factors. TAM is used to describe technology users' intentions to use technology. TAM consists of variables namely perceived usefulness (PU), perceived ease of use (PEOU), and behavioural intention to use. Specifically, PU is defined as "the degree to which a person believes that using a particular system will improve his work performance," while PEOU is "the degree to which a person believes that using a particular system will be free of effort". In this study, if farmers believe that the use of drone technology in their agriculture is beneficial, then their intention to use it will be high. When farmers perceive drone technology as easy to use, this view will directly affect PU. This can be supported by the study of Tahar *et al.* (2020), where it can be concluded that if the effect of ease of use of technology is accompanied by ready-to-use information technology, then the intention to use a technology will also increase. Therefore, drone technology provides great benefits and opportunities in various fields, not least in agriculture. Drones provide support tasks such as surveying, humanitarian work, disaster risk management, research, and transportation (Ayamga *et al.*, 2020). Drones can monitor soil and crop health to support precision agriculture, assist in planning irrigation schedules, efficient fertilizer use, estimate yield data and provide weather analysis data (Doddamani *et al.*, 2020). The desire or intention of farmers to use drones is influenced by the perceived ease of use and perceived usefulness as suggested by TAM.

Suggestions to help in continuing this research in the future is about other factors that can be considered as variables that influence the use of drones. For example, a comprehensive study is required on various factors such as price value, the age of drone users as well as the maybe the academic background. An example is DJI's Agras T16 drone, which is a type of drone used in agriculture to spray poison, fertilizer, or rice seeds, which is worth RM54,000.00. In addition, the impact of individual socio-economic characteristics on the use of drones also requires further analysis. Many farmers in Batu Pahat, Johor lack knowledge about how to use this drone technology. Therefore, stakeholders in agriculture should act by providing adequate education and training. For example, experts in digital and advanced technology, agronomy, agricultural engineering, and others should collaborate with researchers, agricultural officials for the development of specific, easy-to-use, and cost-effective drone technology applications, and in the context of this study so that it meets the needs of micro-sized farmers. In addition, this study is also recommended to be done using different methods such as face-to-face interviews or telephone conversations so that data collection is more reliable. This is because the data obtained from respondents is more reliable where it can reduce respondent falsification even if it takes a long time. By using this method, the researcher also could ask questions in more detail and can receive the answers given by them more clearly. To increase farmers' intention to use and confidence, drone technology suppliers or parties involved in the agricultural sector is suggested to first lend the drones to farmers to conduct pilot tests of the use of the technology in the actual field. Finally, the study needs to be repeated with a more representative sample, considering feedback from farmers of various sizes.

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