Corn Farmers Intention Towards IoT in Agriculture Production in Kelantan

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DECLARATION

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

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Corn Farmers Intention Towards IoT in Agriculture Production in Kelantan

ABSTRACT

This study was conducted to identify influential factors of corn farmers' intention towards IoT in agriculture production among corn farmers in Kelantan since farmers lack of acceptance, awareness, and knowledge about the Internet of Things (IoT). The main issue that arises in the agriculture sector is climate change, pest and disease, and low agriculture production. Besides that, some farmers do not want to accept the uses of IoT or smart farming in their farming. The sample size is 50 respondents of corn farmers and conducted in the Kelantan area. Then, this study carried out three objectives to determine the level intention of corn farmers towards IoT in agriculture production in Kelantan, to investigate the relationship of attitude, subjective norms, and perceived behavior control on intention of corn farmers towards IoT in agriculture production in Kelantan and to identify the most influential factor of corn farmer's intention towards IoT in agriculture production in Kelantan. Next, this study uses the methods of purposive sampling, which is a distribution of survey questionnaires by Google Forms among corn farmers in Kelantan by applying the Theory of Planned Behavior (TPB). The finding for this research study resulted in a high level of the level intention of corn farmers towards IoT in agriculture production, and the result also show there is a positive relationship between attitude, subjective norms, and perceived behavior control of corn farmers intention towards IoT in agriculture production in Kelantan. Next, the most influential factor is subjective norms corn farmers intention towards IoT in agriculture production in Kelantan. Then, the Confirmatory Factory Analysis also showed that it has an acceptable model fit where the SRMR value is less than 0.10 or 0.08. The value will be considered a good fit for this research study.

Keywords: Corn farmers, Internet of Things (IoT), Intention, Theory of Planned Behaviors

Niat Penggunaan Teknologi IoT Dalam Pengeluaran Hasil Pertanian di Kalangan Petani Jagung di Kelantan

ABSTRAK

. Kajian ini dijalankan untuk mengenal pasti faktor-faktor berpengaruh niat petani jagung terhadap IoT dalam pengeluaran pertanian di kalangan petani jagung di Kelantan kerana petani kurang penerimaan, kesedaran, dan pengetahuan mengenai "Internet of Things (IoT)". Isu utama yang timbul dalam sektor pertanian adalah perubahan iklim, perosak dan penyakit, dan pengeluaran pertanian yang rendah. Selain itu, sesetengah petani tidak mahu menerima penggunaan IoT atau pertanian pintar dalam pertanian mereka. Saiz sampel adalah 50 responden petani jagung dan dijalankan di kawasan Kelantan. Kemudian, kajian ini telah melaksanakan tiga objektif untuk menentukan tahap niat petani jagung kepada potensi baru penggunaan ke arah IoT dalam pengeluaran pertanian di Kelantan, untuk menyiasat hubungan sikap, norma subjektif, dan kawalan tingkah laku yang dirasakan terhadap niat petani jagung ke arah IoT dalam pengeluaran pertanian di Kelantan dan mengenal pasti faktor yang paling berpengaruh niat petani jagung terhadap IoT dalam pengeluaran pertanian di Kelantan. Seterusnya, kajian ini menggunakan kaedah persampelan purposif, iaitu pengedaran borang kaji selidik "Google Forms" di kalangan petani jagung di Kelantan dengan mengaplikasikan Teori Tingkah Laku Terancang (TPB). Dapatan kajian penyelidikan ini menghasilkan tahap yang tinggi daripada tahap niat petani jagung kepada potensi penggunaan baru ke arah IoT dalam pengeluaran pertanian, dan hasilnya juga menunjukkan terdapat hubungan positif antara sikap, norma subjektif, dan kawalan tingkah laku yang dirasakan oleh petani jagung terhadap IoT dalam pengeluaran pertanian di Kelantan. Seterusnya, faktor yang paling berpengaruh adalah norma subjektif petani jagung niat ke arah IoT dalam pengeluaran pertanian di Kelantan. Kemudian, Analisis Faktor Pengesahan juga menunjukkan bahawa ia mempunyai model yang boleh diterima di mana nilai SRMR kurang daripada 0.10 atau 0.08. Nilai ini akan dianggap sesuai untuk kajian penyelidikan ini.

Kata Kunci: Petani Jagung, Internet of Things (IoT), Niat, Teori Tingkah Laku Terancang (TPB)

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LIST OF ABBREVIATIONS AND SYMBOLS

USDA	United State of Department Agriculture
MARDI	Malaysia Agriculture Research and Development Institutes
IoT	Internet of Things
FAMA	Federal Agricultural Marketing Authority
DOA	Department of Agriculture
UN	United Nations
AI	Artificial Intelligence
TPB	Theory of Planned Behavior
GPS	Global Positioning System
$_P$H	Potential of Hydrogen
UMK	Universiti Malaysia Kelantan
SPSS	The Statistical Package for Social Science
IBM	International Business Machines Corporation
KMO	The Kaiser-Meyer-Olkin
PLS-SEM	Partial Least Square Structural Equation Modelling
CFA	Confirmatory Factor Analysis
SPM	Sijil Pelajaran Malaysia
STPM	Malaysian Higher School Certificate (Sijil Tinggi Persekolahan Malaysia)
n.d.	No Date
M	Mean Score
SD	Standard Deviation

&	And
%	Percentage

CHAPTER 1

INTRODUCTION

1.0 Introduction

In this research study, chapter 1 consists of background research, problem statement, hypothesis, research question, objective, scope of study, significance of study, and organization of study. This study focuses on the background of the study on the corn farmer intention towards IoT in agriculture production in Kelantan

1.1 Background Research

1.1.1 Corn Industry

Corn (Zea mays) or also known as maize and the family of grass is Poaceae. Corn is one of the crop productions that is widely distributed around the world and domesticated originated from America. As we know corn is widely consumed as human food, like biofuel and livestock feed. 10,000 years ago, corn was firstly domesticated by Mexico and widely spread as the most suitable crop for cultivation. Maize or known as corn contain good nutritional value such as vitamin C, vitamin E, vitamin B_1 and other source of vitamin that have benefits for human consumption (Rouf, et al., 2016). Furthermore, Potassium are major role in providing good source of nutrients which has a good significance on human diet deficient in it for average human being (Kumar, et al., 2013). In addition, corn also used to produce ethanol (ethyl alcohol) which is liquid biofuel. Biofuel that made from corn is initially claimed to be environmentally friendly as new alternatives for petroleum (Britannica, 2020).

1.1.2 Malaysia's Corn Industry

In agricultural industry, corn production is known as the third largest agricultural production around the world after rice and wheat. Corn is a cereal crop that can be grown easily in any kind of condition or climate. The history of corn farming in Malaysia started in the 16th century (Wong, 1992) at Malacca. Flint and Dent are the first types of corn that have been introduced, flint is the most popular one to be produced rather than the dent type of corn at that time (Mohammad Nor, 2019). Also, there is a lot of varieties of

corn that has been planted in Malaysia, and the most desirable type of corn for Malaysian people is sweet corn.

Furthermore, Malaysia main focusing on producing corn for human consumption and there is no commercial for animal feed. Corn is also planted across with other crops such as watermelon, banana, sweet potatoes, and pineapple to help generate the farmers' income (Abdul Ghani Wahab, 2017). Most of the grain corn planted is in Kelantan, Pahang, and Terengganu area which is cultivated by small farmers and now the demand for sweet corn is increasing and the production of grain corn is gradually decreased or increased due to the demand from the consumer.

Pleasantly, this could give benefits for corn farmers that cultivated sweet corn because it has the lowest cost of production and a shorter time to harvest by farmers. The data have shown that there is increasing in crop area which is increasing from 6,591 hectares in 2003 to 11,713 hectares in 2018. There is also an increase in the production of sweet corn which is from 31,907 tons to 84,170 tons (Chee, 1996). Another part of corn like the stem also can be produced as silages for feed animals. Furthermore, in 2020, the increase of corn production in Malaysia from 1971 to 2020 (Figure 1.1) is 5 thousand tonnes and 58 thousand tonnes which growing at 13.96% of average annual rate (USDA, 2021).

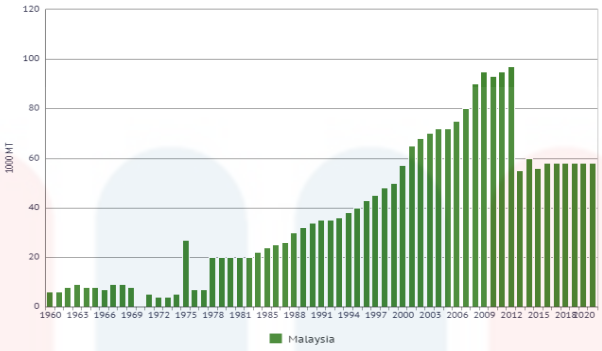

Figure 1.1: Malaysia Maize (Corn) Production Quantity from 1960 until 2020 (USDA, 2021)

1.1.3 Corn Farmers and Production of Corn in Kelantan

In Kelantan, there is not a lot of corn farmers involved because farmers prefer to cultivate paddy and fruit farming. Fruit farmers in Kelantan are about 70,930 and for paddy cultivation (30,810 farmers) as main production (Anem, 2011). According to Department of Agriculture (DOA) in 2019, the hectare of field crops by the state in Kelantan for planted area (1469.43 ha), harvested area (1422.84 ha), and production (16,657.53 mt) in 2019. Besides that, in Kelantan the corn farming is widely planted in Bachok, Machang, Jeli and Pasir Mas were focusing on planting corn in many methods such as Hybrid sweet corn planting project in Pasir Mas. The young corn farmers planting sweet corn using the technologies of hybrid increasing the production and process of crop yield (R. Karim, 2021)

1.1.4 Internet of Things (IoT)

Internet of things or also known as IoT is one of the widely used technologies nowadays that are using various kinds of field application such as resource management, health care, and assets tracking, and other specialties (Aeris, 2021). Internet of things can come out with a lot of things that are way out from what people expect and how it works to attract a lot of people to know about this field and experience themselves. Next, the Internet of things also refers to internet-related things that are directly and indirectly connected to an object that can transfer and collect data by using the wireless network without any interaction from a human being (Aeris, 2021). Besides, a things verb on the internet of things could be a person that makes up the software of using IoT such as a person that has a heart monitor implant, an automobile that using sensors application or farmers that apply using smart farming in farming practices (Gillis, 2020).

1.1.5 Internet of Things (IoT) in Agriculture

Nowadays, the growth of world population could affect human consumption around the world. According to UN Food and Agriculture Organization, need to produce 70% more food by 2050 because of the increase in population worldwide. Due to the decrease in agricultural land and natural source climate, this could be another biggest

reason that may impact on food security and agricultural sector around the world. Adoption internet of things is the answer for solving this issue and problem where it could help farmers to close the supply-demand gap and can ensuring the increasing high yield of crop production (IoT Solutions World Congress, 2020). For example, the uses of internet of things in agriculture are smart farming technologies, this technology using the concept of modern technology that can help in increasing the crop production product and quality of crop. Eventually, there is a lot of farmers start to adapt to uses of smart farming in the 21st century where farmers can easily monitor crop and farm work (Radhi M. a., 2020)

1.1.6 Internet of Things (IoT) in Malaysia Agriculture

Malaysia is one of a country that apply the use on internet of things technologies. Over the recent years, Malaysia takes what it must be one of the regional leaders that empowering the use of internet of things (IoT) by introducing a lot of companies that have developed using technologies with their capabilities to stay connected to internet. IoT also can help in generates and detect data through sensors or application that can create knowledge or information that can improve human intelligence to the next level of intelligence (Invest KL Malaysia, 2020).

Furthermore, the agricultural sector is also one of the sectors that applied using the internet of things in agricultural production. Smart agriculture widely uses in

agriculture sector because can be used easily by farmers to collect data and can help farmers to face new challenges. Besides the use of smart farming, farmers also will be direct to the use of artificial intelligence (AI) where farmers will allow them to use analyze data of farming products and will be more environmentally friendly, efficient, and more profitable than the old ways (Yun, 2020).

1.2 Problem Statement

Nowadays, the Internet of things is widely known around the world and even exists in Malaysia, but farmers still lack familiarity on internet. Even Malaysia still far from the optimal stage to be involved with the uses of IoT in farming practices because most farmers in rural areas still apply traditional farming practices due to problems farmers are facing. The factor that affects small farmers are eventually such as land and remote location that have limited access for them to learning knowledge and technology about the internet of things (Arshad, 2016). Also, Malaysia also still in the stage of planning to increase the development of the Internet of Things (IoT) and it was not easy to develop and implement IoT due to some issues and challenges of devices (Ummi Wahida Badarudin, 2018).

Next, the level of education among the farmers is low and they also lack the finances to support farming if using internet of things in corn farming. This is because the farmers need to invest more money to join the training session. Besides that, one of the

focus issues is the acceptance of farmers towards smart farming in agriculture (Willems, 2020). The reason must be because farmers want it to be more cost-effective and it will be easy for farmers to use the technologies while handling farming (Blackmores et al, 2004). Thus, the lack of knowledge among the farmers on several smart farming technologies and other technology equipment will eventually become a shortcoming in agriculture sector. Hence it is essential to attract farmers involved in the use of smart farming because this can increase quality and quantity of farming production. This also could be the most important thing to try getting farmers involved by getting knowledge and practices about the concept internet of things (IoT) and every type of technology that use in this.

This study focusses on level intention of corn farmers towards IoT in agricultural production and identifies the most influential factor of corn farmer's intention towards IoT in agricultural production in Kelantan. Therefore, this study is needed regarding corn farmers intention towards IoT for agriculture in terms of attitude, social norms, perceived behavior and intention about IoT that influence the small farmers about the benefits of IoT will offer in agricultural sector to be more efficient and productive in farming (Olakunle et al., 2018).

1.3 Hypothesis of the Study

H_0: There is no relationship between attitude, subjective norms, and perceived behavior control of corn farmer's intention towards IoT in agriculture production in Kelantan.

H_1: There is relationship between attitude, subjective norms, and perceived behavior control of corn farmer's intention towards IoT in agriculture production in Kelantan.

1.4 Research Question

1. What is the level intention of corn farmers towards IoT in agriculture production in Kelantan?
2. What is the significance relationship of attitudes, subjective norms, and perceived behavior control on corn farmer's intention towards IoT for agricultural production in Kelantan?
3. What is the most influential factor of corn farmer's intention towards IoT for agricultural production in Kelantan?

1.5 Objective

1. To determine the level intention of corn farmers towards IoT in agriculture production in Kelantan.

2. To investigate the relationship of attitude, subjective norms, and perceived behavior control on intention of corn farmers towards IoT in agriculture production in Kelantan.

3. To identify the most influential factor of corn farmer's intention towards IoT in agriculture production in Kelantan.

1.6 Scope of Study

This study gives attention to corn farmer's intention towards IoT for agricultural production in Kelantan by using purposive sampling methods. The survey questionnaire will be shared online to corn farmers in Kelantan using social media and Google Forms. Then, this study will use a theoretical model which is the theory of planned behavior (TPB) was used which contains independent and dependent variables. Independent variables consist of attitude, subjective norms, and perceived behavior control while dependent variables are intention of corn farmers towards IoT in agricultural production in Kelantan.

1.7 Significance of Study

The result of this study can give amazing opportunities to agricultural sectors especially corn farmers who are directly and indirectly involved in using IoT in their farming. First, corn farmers can gain more knowledge throughout the learning about the uses of technologies in their farming practices and they also can gain more general income. Next, the corn farmers can increase their production and can optimize the crop yield to the maximum level of production. Nowadays, the acceptance of IoT among the farmers is increasing due to the demand from the agricultural sector that want to gain more great opportunities from the results of the outcomes. Besides that, the government sector is also at advantages where it could help increasing national finances and help make Malaysia the top leader among the famous country in the world producing agricultural crops using the internet of things (IoT). Next, the government must provide subsidies for small farmers that low in income and cannot afford to joining a class or getting knowledge. In addition, the government could also help by supporting the small farmers in rural areas by giving specialties or utilities for them to keep on continuing their farming without any worries about finances or lack of technologies.

1.8 Organization of the Study

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

Chapter 2: This chapter presents the literature review from the previous study on the intention of corn farmers towards IoT in agricultural production. Besides that, this chapter will provide information related to the purpose of this study.

Chapter 3: This chapter explains the method uses of theoretical framework and methodology that will cover the data analysis, sampling techniques, and design of research.

Chapter 4: This chapter presents the findings from the data analysis which cover the analysis from corn farmer's intention towards IoT in agriculture production in Kelantan**,** statistical test, and summary.

Chapter 5: This chapter more focus on summarise the results, implementation and contribution of the study, conclusion, and recommendations for the future research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this study, there are three objective that to determine the level intention of corn farmers towards IoT in agriculture production in Kelantan. Secondly to investigate the relationship of attitude, subjective norms, and perceived behavior control on the intention of corn farmers towards IoT in agriculture production among the corn farmers in Kelantan. Lastly, to identify the most influential factor of corn farmers intention towards IoT in agriculture production among the corn farmers in Kelantan. Besides that, from the previous study information could help to interpret and analyze in helping the research topic, hypothesis, and questions. This chapter also going to aim more insight on corn farmer's using the theory of behavior (TPB) towards IoT in agricultural production in Kelantan. This survey research identifies the level intention of corn farmers on the Internet of Things (IoT).

2.1 Theoretical Framework

Theoretical framework is defined as a structure that can support or control the theory of research study that in progression. The theoretical framework also is important to describe theory of our research on how to explain problem of the research under study that exists (Abend et al., 2008). Besides that, the importance of theoretical framework in research study is that it consists of definition, concept, and reference that may be relevant to the scholarly literature and theory that already exist study that is going to use in this research study paper. Furthermore, this is also one of the systematic views that can be used in determining the relationship between the variables and the prediction of research study. It is important because the theoretical framework is limit for scope use for relevant data which focuses on specific variables and viewpoint that will be defined the framework. The data will be analyzed and interpreting by researcher, and will understand the concept and variable that related to given definitions. At the same time, new knowledge will be created by validating knowledge or challenge the theoretical assumption (Torraco et al., 1997). In this study, theoretical framework that has been applied is the theory of planned behavior. This theory has been used because to identify the influential factor of corn farmer's intention towards IoT in agricultural production based on attitude, subjective norms, and perceived behavior control.

2.1.1 Theory of Planned Behavior Intention of Corn Farmers towards IoT in Agriculture Production

Theory of planned behavior intention of corn farmers towards IoT in agriculture production in uses or implementation of modern technology for corn farming practices. According to research by Nurliza et al., (2020), found that the intention and past behavioral of corn farmers have positive and negatives outcomes that influence the farmers' cooperative behavior but contradicted with behavior in accepting or doing something for corn farming (Nurliza et al., 2020). The corn farmers intention can be changing due to the behavioral act in farmers cooperative, such as perceived behavior control can be used as motivated factor for corn farmer to long-lived farming performance based on the opportunities and support from surrounding to get the confidence in continuing to perform well in corn farming practices (Nurliza et al., 2020).

In 1980, the Theory of Reasoned Action (TRA) was originally started theory of planned behavior (TPB) by Ajzen in 1991 which is used to forecast a person's intention to partake in a particular activity at a specific time and location. The theory was designed to understand all activities for which people would exercise self-control. Behavioral intention is a central component of this model behavioral motives are informed by one's attitude regarding the probability that a behavior will produce the desired result, as well as one's subjective assessment of the costs and benefits of that result (LaMorte, 2019). Then, this theory has also been represented by Icek Ajzen in 1985, which make both theories that can assume the intention and attitude of person on certain behavior that can be understandable that personal behavior and the social norms of the person in the same

society with us (Brown, n.d.). According to Ajzen, TPB is using to moderate the effect of intention on individual behavior where their intention will lead to the behavior of performance that will extent to high actual control. The biggest distinction between the Theory of Planned Behavior and the Theory of Reasoned Action is that with the Theory of Planned Behavior, there is a better possibility of understanding individual behaviors that manifest in physical behavior that is being carried out (Martin, 2017). The theory of planned behavior was implemented as an additional measure of intentions in the theory of expected action. According to this theory, individual behaviors are influenced by intentions (Ajzen, 1985). The individual intention will be determined by their own decision either individual want to perform or not to perform in any kind of action. In research from Ajzen (1991), motivational factors are one of the factors that will indicate the people that are willing to perform or not to perform any particular behavior, so the stronger of the individual intention to perform a behavior, the higher probability for the individual to perform the action.

The attitude was the first component of the Theory of Planned Behavior. Attitudes are defined as the person's behavior performance which is a negative or positive assessment (Paul et al., 2016). Attitude formation has been approached by the cognitive processing that has been approached by Fishbien and Ajzen's (1995) which is related to the model of attitude. According to the attitude model, it has been reasonable develop by people's beliefs about an attitude that directly associated with other objects, events, and characteristics. The relationship between behavior and attitudes has the outcome of a belief such as the negative and positive outcomes of human behavior and attitudes towards the attributes to the largely desirable and undesirable consequences (Ajzen, 1991). As an example, in this research study, attitude of corn farmers level intention towards IoT in agricultural production that will help the corn farmers to directly involved

and attracting them to the main purpose the use of smart farming in agricultural production without any doubt can change their intention and increase their knowledge due to the positive outcomes by using or apply Internet of Things in their corn farming.

Subjective norms are known as the perceived social pressure of the behavioral achievement that will explained the different of social references in performing a behavior where the individual want to perform or not to perform the task. The intention of one individual towards thinking on how it can be influential them in decide in thinking what if apply or starting to use technologies in farming such as smart farming or smart connected products (Catherine Viot, et al., 2017). The research by Catherine Viot et al. (2017) stated that subjective norms not only focusing on consumers or farmers but it also focusing on other preferences about the adoption of a new behavior by all of them or an individual that will be meet with their own expectations (Catherine Viot, et al., 2017). Corn farmers were influenced in using smart farming in their agricultural production. The uses of smart farming can help in a lot of aspects not just only in increasing the yields but also can create new opportunities along with the challenges in making the revolutionary change to the existing agriculture methods (Ayaz et al., 2019).

Perceived behavior control has also affected the attitude and subjective norms. Perceived behavior is more to the reflection of the ability and influence of one environment that will happen ahead of time (White, 1959). The factor of control in perceived behavior has two compartments which it can be external or internal. This showed that in their behavior where the more believe that they have control, the more they will likely adopt and engage with smart farming in their agriculture. Based on this study, the corn farmers, or individual behaviors towards IoT in agricultural production have been influenced by attitudes, subjective norms, and perceived behavior control (Figure 2.1).

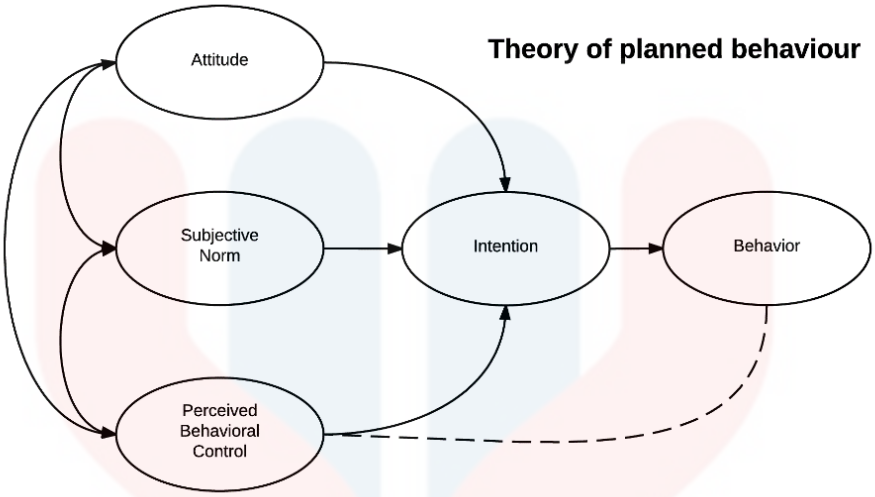

Figure 2.1 Theory of Planned Behavior (Ajzen, 1991)

2.2 Level Intention of Corn Farmers towards IoT in Agriculture Production.

The level intention towards IoT in agriculture production is widely applied in agriculture sector that is involved in farming. The agricultural sector in Malaysia has been using smart agriculture which is the most famous method that has been used to enhance the productivity of agriculture and make farmers better used with this technology (Radhi, et al., 2020). The potential of using IoT in farming is to increase the quantity and quality of agricultural product by using modern technology. Nowadays, the uses of technology have been widely used by people around the world to access data easily and more conventional than traditional ways. Farmers can easily access data through Global Positioning System (GPS), for gathering data management, soil scanning to check the pH and healthiness of soil, and many other specialties to monitor farming from faraway (Radhi, et al., 2020).

Next, the level of success with the use of IoT technologies in agricultural industries is the use of many new technologies and methods in handling the crop such as precision farming. Precision farming is one method that has been used to minimize the management practices of farming by reducing the cost by providing detail spatial information for the farm operator (Radhi, et al., 2020). But in developing countries such as Malaysia, the uses of precision agriculture have been limited due to the land use for another kind of plantation such as oil palm, rubber plantation and other precision technologies use for another crop plantation rather than use on the paddy or corn farming (Radhi, et al., 2020).

The performance of IoT in agriculture production is one of a new solution to improve and helping corn farmers to meet the demand gap from consumer by ensuring the productivity of corn production, maintaining high yields, profitability, and environment friendly. The Business Intelligence, intelligence makes an expectation survey by adopting the uses of IoT in the agricultural industry it will help this industry reach 75 million in 2020 which will annually increase by 20%. At the same time, the global market size of smart agriculture will also be expected to increase triple by the year 2025 (IOT, 2019).

2.3 The Relationship of Attitudes, Subjective Norms and Perceived Behavior Control of Corn Farmers Intention towards IoT in Agricultural Production

The attitude was the first component or predictor which is related to corn farmers in relationship with the influence behavior in Theory of Planned Behavior (TPB) model. Attitude has been defined as level of an individual favorably or unfavorably assess the behavior being examined (Ali, et al., 2020). Attitude towards IoT in agricultural production can be accomplished or established with the belief of cognitive and effects from corn farmers perceive with some respect towards the innovation of technologies. Individual preference is one of the main components for belief and effects in attitude of a person (Fishbein & Ajzen, 1995). The uses of Internet of Things (IoT) in farming could affect preference of individual attitude in innovation which it defined as corn farmer's attitude in acceptance of changing in uses of technologies modern in farming (Akyüz & Theuvsen, 2019). The assumption that has been made in the framework is about identifying the influential factor of corn farmer's intention towards IoT in agricultural production based on attitude. Furthermore, also can identify the intention of farmers in the uses of modern technologies in farming which can be influenced by attitude behavior.

Next, subjective norms where it can reflect in many aspects around the individual environment itself. This can be reflected from the motivation and support from our own family, friends, and people who keep us in using IoT in farming or not to continue in using the technology in farming. According to Ajzen (1991), subjective norms is one of social pressures that made one individual behavior to perform particular behavior in doing something. Farmers in agricultural sector have own intention to involve in using Internet of things (IoT) usually it came from social norms which is an idea of how individual behavior is influenced by the misperceptions of other people act and think (Wayne, 2019). In addition, it also stated by Li et al., (2012) where individual intention could be positively influenced by subjective norms in order of how person behave or act. Next, government support also can play the biggest part on how individual intention to behave with the

support that Government have. In research from Zhai Yun (2020), the smallholders in Malaysia for agriculture sector were widely dominate by smallholder farmers who are facing low productivity and low production, as well as a lack of manpower source. By getting support from government, can provide financing for smallholder to use in upgrading from traditional to modern technologies. There is also a study from Jui et al. (2020) that shows the intention of farmers to use modern innovative technologies has been impacted by the perceived organizational support in perceived usefulness. Perceived usefulness in individual performance would be enhanced if that person believes in using a particular way in doing his or her job (Jahangir et al., 2008). Therefore, the farmers' behavior decision is strong because of the influence of social norms (Qiu et al., 2021)

Perceived behavior control (PBC) is based on individual perception of ability toward own behavior either it is ease or difficulty in performing (Ali et al., 2020). The theory of planned behavior (TPB) has been predicting the behavioral intention of farmers that using IoT in agriculture sector for risk management and attitude was the most influential for the intention and followed by perceived behavioral control and subjective norms at the end (Ali et al., 2020). Perceived behavior in individual or farmers that using Internet of Things (IoT) or smart farming in farming will have bigger potential and willing to adopt the behavior to increase production and development of system to modern technologies. However, perceived behavior control is hard or difficult in determining person behavioral control has over the performance of given behavior and it is typically used for proximity actual control of person. Intention with perceived behavior control is one of accurate reflection for the actual behavior where it will be used to explain and predict behavior.

Next, the intention of corn farmers towards IoT in agricultural production can be analyzed or determined by attitude, subjective norms, and perceived behavior control of

farmers' intention. There is a lot of studies have been made about the fit of TPB that is widely used in agriculture have a relationship with attitude and PBC are the most significant predictor of intention in agriculture (Vamvaka et al., 2020). Furthermore, there is a lot of variety about perceived self-efficiency and attitude has turned out to have a stronger relationship with intention in individual compared to perceived controllability (Ajzen, 2002; Armitage & Conner, 2001; Huang & Chen, 2015; Kraft et al., 2005).

2.4 The Most Influential Factor of Corn Farmers Intention towards IoT in Agriculture Production.

Agricultural sector is one of biggest sector that important in Malaysia's economy. Agriculture field that uses the Internet of Things (IoT) is the best way to solve problem of small farmers who want to increase production and maintaining their crop health. Among the influential factors that can influence the farmers intention towards IoT in agriculture production are crop choice environmental, household and farmland which is including the demographic, economic and institutional (Greig, 2009). This is because some small farmers that live in rural area tend to have problem with farming such as drought, flood, pests, and disease etc. Furthermore, when farmers in rural areas lack in accessibility about Internet of Things (IoT) or knowledge about modern farming and any information that may be useful to help farmers to achieve maximum of agricultural yield (Das, P, 2015). Nowadays, there is a lot of farmers use smart farming as one new alternative way in increasing production and the connectivity with devices to Internet of Things (IoT) is undeniable around the world. In addition, smart agricultural technology

can help farmers to be successful in controlling the process of growing crops of agriculture using modern technologies (Goyal, 2019).

Next, the importance of Internet of Things (IoT) is important around the world because of positive outcomes of the production, cost and resource can be reduce, data processed using devices or GPS and can improve the product quality. The benefits of using IoT in corn farming can collect data by using smart agriculture sensors to improve farmland and demographic which can be observe weather conditions, progress of crop growth, soil quality and health of crops. Besides, that it also can use to observe performance of the equipment and staff or manpower that handling the technologies (Chalimov, 2020). The use of smart farming focuses in providing agricultural industry with the advance modern technology because can help agriculture industries in increasing the demand in crop yield, natural resource will be use efficiently, have better communication and information, and help farmers in increasing crop production (Bernstein, 2019).

Moreover, IoT designed to help farmers to improve practices of farming by helping farmers to monitor vital information such as air temperature and quality of soil by using sensors and improve yields, planning more systematic irrigation and make harvest forecasts in most easy way. Sometimes, farmer's hard work will be destroyed by pests which causes damage to crop, and additional cost needed. The farmers can use IoT to prevent such situation from happening by using monitor and scan to monitor environment parameter and plant growth cycle (Geschreven, 2018).

In Malaysia, the uses of IoT can be part of economic and institutional that can be understanding by farmers because it is important influential factor that effect agricultural land such as the institutions of market land and regulations. The cost of transaction and level of profitability which the land use have legal mean or contract of enforcement

(Ciaian et al., 2012). According to Hayrol Azril et al., (2010) agricultural sector in Malaysia consists of waste management, processing, production of crop as one of important industries where Malaysia economy generate income from it and have been proven to prevent the poverty.

Farmers in Malaysia mostly still use the traditional method of agricultural processing and production in farming and instead using modern technologies due to the lack of awareness and knowledge (Azril et al., 2009; Ezhar et al., 2007). Corn farmers intentions regarding IoT in agricultural production are influenced by a number of factors, including knowledge and intention. In research from Toma et al., (2018) show that the main influence on intentions and behavior is access through the technology information and perceived usefulness to the source of information. The uses of technologies such as smart farming could attract more corn farmers to apply technologies to transforming farming practices without any doubt that can increase production, can read real data in time, increasing the quality of production and lowered operation costs that have been approved by many countries.

2.5 Chapter Summary

This chapter discussed by the previous researcher about corn farmers' intention towards IoT in agriculture production in Kelantan. The first section in this chapter shows the theoretical framework which analyse the result for this study. The second section was told about Theory of Planned Behavior (TPB) model used in this thesis which attitude, subjective norm, and perceived behaviors control as corn farmers' intention towards IoT

in agriculture production in Kelantan. Third section was the studies from previous research about the level of corn farmers' intention towards IoT in agriculture production in Kelantan. Next section was indicated the relationship of attitude, subjective norm, and perceived behavior control towards corn farmers' intention towards IoT in agriculture production in Kelantan. The last section shows about the most influential factor of corn farmers' intention towards IoT in agriculture production in Kelantan.

CHAPTER 3

METHODOLOGY

3.0 Introduction

This chapter explained the methodology used in order to achieve the objectives of this study. There are three sections in this chapter where the first section, described about the conceptual framework used for this study. While the second section will be explained about the data and questionnaires used to distributed to farmers involved in applying IoT in Kelantan. Next, the third section explained the analysis used to achieve the objectives of descriptive analysis, reliability analysis, correlation analysis, factor analysis and partial least squares structural equation modeling.

3.1 Conceptual Framework

Conceptual framework is an illustration what will expected to get through this research to estimate the significance factor and relationship between corn farmers intention towards IoT in agricultural production in Kelantan. The theory of planned behavior (TPB) is the most suitable model for this research objective which is to investigate the relationship of attitude, subjective norms, and perceived behavior control on intention of corn farmers towards IoT in agriculture production, to determine the level intention of corn farmers towards IoT in agriculture production and to identify the most influential factor of corn farmer's intention towards IoT in agriculture production. The conceptual independent variables of corn farmers intention towards IoT in agriculture production are attitude, subjective norms and perceive behavior control which it has been modified by using the model from TPB (Figure 3.1 given).

First independent variable is attitude which it has influence the corn farmers intention towards IoT in agricultural production in Kelantan. Attitude is referring to the behavioral belief of individual towards event or characteristic that can influence over behavior and can predict attitude of individual. Besides that, there is a lot of other factors that influencing behavioral belief which is knowledge about IT, security and privacy of the system, social influences, cost and finance, acceptance of IoT and demographic (Mahmoud, 2018).

Subjective norms referring to person or group of people belief that will support in particular behavior and also determined by social pressure on corn farmers in deciding to

involve with IoT in agriculture production. Subjective norms are relationship with normative beliefs which normative beliefs are beliefs of individual about thinking people surrounding farmers first who are important before starting to perform particular behaviors (Trafimow, 2020). Next, culture and community also can control and support the corn farmers behavior like friends, family, expert in agriculture, lecturer, government, and media social. Besides that, subjective norms also influence the intention of corn farmers towards IoT in agriculture production. Government agency like Malaysian Agricultural Research and Development Institute (MARDI) organized event like Digital Agriculture Conference 2020 (DigAC 2020) which is focusing on Leveraging Digital Transformation Towards Sustainable Agriculture. The objective of this event is to share knowledge, implementation, and adaption in using digital technologies in sector of agricultural, strengthen collaboration between public and private sector and increasing the awareness of IoT in agriculture sector among the farmers.

Perceived behavior control has affected by attitude and subjective norms. The corn farmers being monitored to perform their behavior. The perceived behavior control of corn farmers in Kelantan may be influence by attitude behavior such as knowledge, experience, and skill in farming. The conceptual framework for this study is TPB, the attitude, subjective norms and perceived behavior control is using in determine the intention of corn farmers towards IoT in agriculture production as independent variables while the intention of corn farmers towards IoT in agriculture production is independent variables (Figure 3.1).

As given figure 3.1 it shows that conceptual framework the Theory of Planned Behavior (TPB) model with application to the intention of corn farmers towards IoT in agriculture production in Kelantan (Source: Adapted model from Ajzen, 1991).

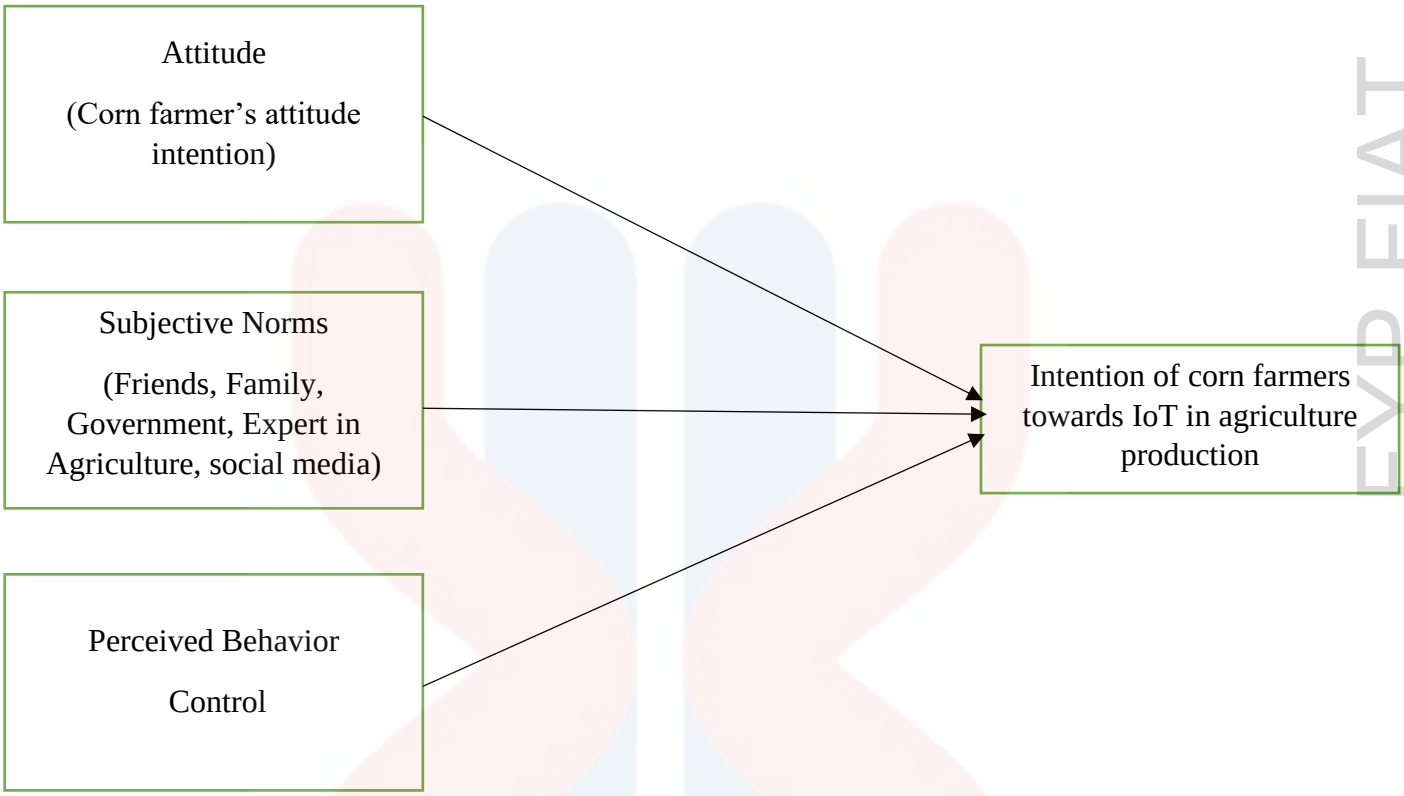

Figure 3.1 Conceptual framework of Theory Planned Behavior Model Source: (Adapted model from Ajzen, 1991)

3.2 Data Collection

Data collection is defined as the process in collecting, measuring information, and analyzing the accurate data that stated in research question, hypothesis testing and evaluate the outcomes (Kabir, 2016). This research has been conducted in Kelantan area. The sample size will be about 50 respondents where the question has been distributed to determine the level intention of corn farmers, the relationship between attitude, subjective

norms, and perceived behavior control towards IoT in agriculture production and the most influential factor of corn farmer intention towards IoT in agriculture production.

3.2.1 Sampling Methods / Techniques

This research is designed to corn farmers in Kelantan for the intention towards IoT in agricultural production. This research study targeted the intention of corn farmers and determine the level intention of corn farmers towards IoT in agriculture production. Method that has been used for this research is non-probability sampling methods that use to selected samples based on subjective judgment rather than random selection from the population (Mc Combes, 2021). But there is one major disadvantage of non-probability sampling methods in choosing the sample due to impossible to know how we going to representing the very large population (Stephanie, 2021). It is useful because it has limited time, workface, and resource. Therefore, the questionnaire survey is distributed to corn farmers in Kelantan. This survey also used another method in approaching people who is involved in agriculture sector through online or email for collecting data.

3.2.2 Sample Size

The sample size for this research study will be about 50 respondent of corn farmers in Kelantan. Larger sample size can give more reliable results with greater precision from conducting the survey and it also will help us to detect the differences more easily (Littler, 2018). For this survey, the minimum sample size has been agreed to be 30 respondents. Good maximum of sample size is usually 10% and not exceed 1000, even in 200,000 population but with 1000 sampling will normally give the most accurate and excellent results (Bullen, 2022).

3.2.3 Source of Data

Source of data contain two sources which is primary and secondary data sources. Primary data source usually include the surveys, questionnaire, observation, etc while secondary data sources include source form journal, websites or webpage, books, article, etc. Besides, the primary data sources required of commitment from the researcher and interaction with the subject of study. On the other hand, secondary data source not require any interaction with the subject even before we start the survey questionnaires (Blog, 2020). Furthermore, another source of data is statistical data was collected through online department from government portal or any applicable data or information that related to this research.

3.2.4 Instrument Method

Instrument methods or known as research instrument is a tool that uses to collect and analyse data that related to this research by using survey. This survey questionnaires have been prepared to the intention of corn farmers towards IoT in agriculture production in Kelantan. This survey questionnaires were preparing according to the previous study that related or quite similar with this study. It has been constructed based on problem statement and literature review which including the socio-demographic characteristic of corn farmers. Then, the factor that influence in using IoT in agriculture production ere attitude, subjective norms, and perceived behavior control. This factor is so important to evaluate the level intention of corn farmers towards IoT in agriculture production. This research consists of four sections of questionnaires:

Section A: Demographic information of corn farmers intention towards IoT in agriculture production that related to study which include gender, age, marital status, education level, race, religion, agriculture experience and family background.

Section B: The question based on level intention of corn farmers towards IoT in agriculture production in Kelantan.

Section C: This section required, questions that has been divided into three part which is attitude, subjective norms, and perceived behavior control:

a) Part 1: Attitude of corn farmers towards IoT in agriculture production.

b) Part 2: Subjective norms of corn farmers which influence the intention of corn farmers towards IoT in agriculture production.

c) Part 3: Perceived behavior control of corn farmers towards IoT in agriculture production.

3.2.5 Pilot Study

In previous research, students from UMK Jeli, Kelantan, conducted the research study of corn farmers using IoT in Kelantan by distributing survey questionnaire to farmers in Jeli. For about 30 respondents have answer the questionnaire and it is enough to measure the viability form the survey questions. The Statistical Package for Social Science (SPSS) was used to analyse and interpret the data whether the data can be accepted and understandable before we distributed to corn farmers around Kelantan.

3.3 Data Analysis

According to LeCompete and Schensul, the research data for analysis data is process that have been using by researcher to interpret and reducing data into derive insights and turn the large data into smaller fragments, which it makes the data acceptable (Bhat, 2020). The data analysis is processed to evaluate the data using statistical and analytical tools to prove and analyse the accuracy for the data that we have obtained from the survey questionnaire. SPSS have been used in finding the descriptive analysis for mean, maximum, minimum, frequencies, percentage, and standard deviation. Inferential statistical analysis was used in this study such as using reliability test, correlation analysis and factor analysis.

3.3.1 Descriptive Analysis

Descriptive analysis was used in this study where the raw data have been transformed into form that have been simply summarize and can be easily interpret and understand. In research from Zikmund (2003) there is nominal type of measurement which it be divided into two category which is into table of frequency for proportion and more than two categories which is for table of frequency category proportion. Furthermore, it also uses to determine and analyse the frequency and percentage of demographic of corn farmers. The data continue to analyse for the intention of corn farmers attitude, subjective norms, and perceived behavior control towards IoT in agricultural production.

3.3.2 Reliability Test

Cronbach's alpha model has been applied into the reliability test which is used to measure the scale of reliability or the internal consistency. Reliability test also refers to study that have properties of measurement scale and the data that have been composed into the scale and provide the relationship information between individuals item in the scale (IBM, 2017). SPSS statistic commonly used to analyse the scale for Cronbach's alpha. The survey questionnaire that has Likert scale answer and can determine the reliable scale. The acceptance value in Cronbach's alpha model for the reliability range is between 0 to 1, which resulted in indicating greater internal consistency with higher value and if the value got 1.0 then the range will be "complete agreement" or the greater the internal consistency for the scale variables (Taylor, 2004).

Table 3.1 shows the alpha coefficients for the data variables which is greater than 0.70. Which the coefficients are acceptable reliability for each scale value for 0.70 or above (Taber, 2018).

Table 3.1: Reliability Analysis

Constructs	No. of Items	Pilot Study (Cronbach's Alpha)
Intention	8	0.911
Attitude	8	0.921
Subjective Norms	8	0.971
Perceived Behavior Control	8	0.943

(Source: Survey, 2021)

3.3.3 Correlation Analysis

Correlation analysis is one known statistical method that have been used in evaluate the relationship strength between two quantitative variables which is dependent and independent variables. If the two or more variables have strong relationship between them it would have high correlations, if it resulted in weak correlation means that the variables hardly to related to each other (Franzese et al., 2019). Next, by using correlation coefficient we can indicates the strength of the relationship between the two variables. The value of coefficient can be value from -1 to 1 which is for -1 for perfect negative correlation, 0 there is no correlation and do not have relationship and 1 for perfect positive correlation (Corporate Finance Institute, 2020). There are three types of correlation which is Pearson, Kendall, and Spearman correlation. Pearson correlation analysis have been used in this study to measure the statistical relationship between the two variables and to measure the strength and direction of the two variables.

3.3.4 Pearson Correlation Analysis

Pearson correlation have been producing the sample correlation coefficient (r), which is focusing on strengthen the measure and the direction of linear relationship between two quantitative variables (Kent, 2021). Pearson correlation have been used to

measure the statistical relationship between variables influencing corn farmers intention towards IoT in agriculture production. The relationship of socio demographic factor and dependent variable have been used in this study to find the correlation between these two variables. In addition, Pearson correlation coefficient can range in values of negative or positive values which is from -1 to +1, if values of the coefficient are bigger the relationship between variables will grow strong. Correlation research method have been using to specify the non-experimental design that will be used to determine the strength of the relationship between two variables without changing the variables (Tanujaya et al., 2017) as shown in Table 3.2 below.

Tables 3.2 The relationship strength between two variables by using correlation coefficient.

No	Value of correlation Coefficient	Relationship
1	0.00 – 0.20	Very Weak
2	0.20 – 0.40	Weak
3	0.40 – 0.60	Moderate
4	0.60 – 0.80	Strong
5	0.80 – 1.00	Very Strong

3.3.5 Factor Analysis

Factor analysis is known as statistical techniques to identify the underlying factors are measured by larger group of number for observed variables (Berg, 2021). This technique can help in reduce bigger numbers of variables to few numbers of factor that will explain the variability factor on this study. There are two types of variances in factor analysis which is common variance and unique variance. The factor analysis has been used in this study to determine the most influential factor of corn farmers intention towards IoT in agriculture production. Besides, there is two tests have been used to analyse the data which is the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test for measure the sampling adequacy and identify the sampling adequacy and correlation between the variables. The KMO test, is statistic test that indicates proportion of variance in variables that might cause underlying factor while Bartlett's test of sphericity is for hypothesis the correlation matrix to identity matrix that would indicates the variable are unrelated and not suitable for structure detection. The value for KMO, if the values close to 1.0 which mean high values it will generally indicates that the data may be useful but if less than 0.50 the result will not be valid to use. For Bartlett's test, when the value less than 0.05 the value would be significance level indicate the factor analysis and the value can be useful for the data (KMO and Bartlett's Test, n.d.).

3.3.6 Partial Least Square Structural Equation Modelling (PLS-SEM)

Partial Least Square Structural Equation Modelling (PLS-SEM) is one of application software using SmartPLS that developed by Ringle, Wende & Will (2005). PLS-SEM also has been used to analyses and examine relationship that exist between two variables that is dependent and independent variables in the research study (Wong, 2013). Besides. PLS-SEM also can relate to the set of independent variables to multiple dependent variables (Garson, 2016).

In this research study, Multivariate Analysis and Confirmatory Factor Analysis (CFA) was used to analyses the smallest set of data that have been performed by SPSS and to test the represent variables in the constructs of number. Confirmatory Factor Analysis (CFA), also been uses as tool to specify the number of factors required in data that will be used to measure the variables of latent variables path models in PLS-SEM (Statistic Solution, 2020). This tools also been used to calculate all the indicators data that have be obtained from the survey and identify whether the current set of data fits with the structure models. The model fits in PLS-SEM are very important to determine the relationship between two or more variables to get the positive outcomes from the data. The acceptable indicator loadings for PLS-SEM are reliability values in between 0.60 and 0.70 are “acceptable” and values between 0.70 and 0.90 are “satisfactory to good” if it higher than that the data probably not valid and the item are redundant and it will be resulted in undesirable patterns (Diamantopoulos et al., 2012; Drolet and Morrison, 2001). The value of chi-square in model fits is one of fixed index where to observed

values of independence whether the indicator is acceptable fit in determining the relationship between variables is exists or not (Powers, 2020).

3.4 Chapter Summary

This chapter showed the research design where it was explained how the research has been conducted on corn farmers' intention towards IoT in agriculture production in Kelantan. There were five analyses used for this research where it will used to analyse or interpret the data, which is descriptive analysis, reliability test, correlation analysis for Pearson correlation analysis, factor analysis, and partial least squares structural equation modelling.

CHAPTER 4

RESULTS AND DISCUSSION

4.0 Introduction

For this research study, this chapter will explained the results and discussion of the study. The study has been conducted with 50 respondents of corn farmers in Kelantan using non-probability sampling methods where corn farmers intention towards IoT in agriculture production was selected. In this study, the online survey data was collected and used for further analysis. The analysis used in discussing the objective of the study that determine the level intention of corn farmers towards IoT in agriculture production in Kelantan, investigate the relationship of attitude, subjective norms, and perceived behavior control on intention of corn farmers towards IoT in agriculture production in Kelantan and identify the most influential factor of corn farmers intention towards IoT in agriculture production in Kelantan.

4.1 Demographic Profile of Corn Farmers

For demographic profile of corn farmers, descriptive analysis was used in this research study to analyse and describe corn farmers socio-demographic information. For example, gender, age, district, race, maritual status, educational level, farm worker, monthly income, farm size, any participation or working in agriculture sector, reason become a farmers and type of IoT use.

According to Table 4.1, it shows the results where majority of corn farmers are male farmers who involved in corn farming and uses of IoT in Kelantan are 32 people (64%) while for women farmers are 18 people (36%). Next, for age of corn farmers is mostly come from young farmers where there are in between 20 until 29 years old, which is 30 people (60%), the remaining farmers are in 30 until 39 years old which is 12 people (24%), third most farmers involved are in 40 until 49 years old which is 6 people (12%) and remaining 2 farmers come from age less than 20 years old and more than 50 years old with 2% of the percentage. Majority of respondent of corn farmer come from Pasir Mas for about 17 people (34%) and the remaining corn farmer come from Jeli which is 10 people (20%), Kota Bharu with 7 people (14%), 4 people (8%) of corn farmer come from Tanah Merah and Bachok. Following next same amount of respondent come from Machnag, Kuala Krai and Pasir Puteh with 2 people (4%) and only one respondent come from Tumpat and Gua Musang (2%).

In this study, Malay shown the most respondent among other race where the value are 48 people (96%) and follow by Chinese and Indian with only 1 people (2%). The maritual status of corn farmers in Kelantan show that 33 out of 50 respondents are single

(66%), followed by 17 are married corn farmers (34%). Next, for educational level of most corn farmer come from STPM/ A-Level/ Diploma/ Matriculation, 24 people (48%). Then, the second highest score followed by, Undergraduate (Bachelor's Degree), 20 people (40%) and the last 6 people of corn farmers with SPM (12%).

Then, for farm workers that involved in corn farming show that majority of corn farmers have less than 10 people that worked with them where it shows that only 40 people (80%). As the second highest with farm workers are just about 11 until 15 people with 9 people (18%) and lastly the lowest farm workers hire just about 1 people (2%) with 16 util 20 people that work under corn farmer. For monthly income of corn farmer, show that monthly income in between RM 1001 to RM 3000, 26 people (52%) which is the highest one and followed by RM 3001 to RM 5000 which is 13 people (26%). For second lowest monthly income are less than RM 1000 with only 8 people (16%) and followed by the last 3 people (6%) with more than RM 5001. For farm size, show the highest percentage with 56% (28 people) for 1 – 4 acres, for about 18 people (36%) with less than 1 acre. Next, for 5 – 9 acres with 3 people (6%) and follow by the lowest percentage 2% with 1 people only.

Table 4.1 show that corn farmers in Kelantan that have been involved in any participation or have been working in agriculture sector. The results show that the longest period corn farmers been involved with agriculture sector are 31 people (62%) and for about 19 people (38%) have not involve in any agriculture sector before start to work as corn farmer. Then, for next part, we want to look into the reason of becoming famers among the corn farmers itself. Corn farmers that become corn farmer due to interest are about 31 people (62%) and because of social impact from family or friend or people surrounding such as government or any expert in agriculture that impact them to become

corn farmer are about 12 people (24%). Next, 7 people (14%) becoming corn farmer because there is no suitable occupation for them to continue making living.

Apart from that, most of corn farmer intention towards IoT are not involved in using type of IoT in corn farming resulted in 14 people (28%) due to many farmers come from rural areas or remote location prefer using traditional farming (Arshad, et al., 2016). Next, corn farmer that using automatic tractor is 13 people (26%). This show that, the uses of automatic tractors are accepted among the corn farmers because it is a part of precision farming that could help to increase the production and efficiency during the operations (Linly, 2021). The third uses of IoT are automatic watering for about 11 people (22%) where this method could save more time and water and at the same time, it can help the crop get enough amount of water that are require (Waddington, 2019). Then, smart greenhouse shows that just 8 people (16%) apply the uses of this for corn farming practices. Lastly, the least uses of IoT among the corn farmers are agriculture drone, 4 people (8%) this is because small impact on the uses of civilian drone cause the implementation of regulation is often delayed and left behind (Rao, et al., 2016).

Table 4.1 The Demographic Profile of Corn Farmer Towards IoT in Agriculture Production in Kelantan

Variables	**Frequency**	**Percentage (%)**
Gender		
Female	18	36
Male	32	64
Age		
< 20 Years Old	1	2
20 – 29 Years Old	30	60
30 – 39 Years Old	12	24
40 – 49 Years Old	6	12
> 50 Years Old	1	2

District		
Tumpat	1	2
Pasir Mas	17	34
Tanah Merah	4	8
Jeli	10	20
Machang	2	4
Gua Musang	1	2
Kuala Krai	2	4
Pasir Puteh	2	4
Bachok	4	8
Kota Bharu	7	14
Race		
Malay	48	96
Chinese	1	2
Indian	1	2
Maritual Status		
Single	33	66
Married	17	34
Divorce / Widow	0	0
Educational Level		
SPM	6	12
STPM/ A-Level/ Diploma/ Matriculation	24	48
Undergraduate (Bachelor's Degree)	20	40
Postgraduate (Master's Degree, PhD)	0	0
Farm Worker		
< 10 People	40	80
11 – 15 People	9	18
16 – 20 People	1	2
> 20 People	0	0
Monthly Income		
< RM 1000	8	16
RM 1001 – RM 3000	26	52
RM 3001 – RM 5000	13	26
> RM 5001	3	6
Farm Size		
< 1 Acre	18	36
1 – 4 Acre	28	56
5 – 9 Acre	3	6
10 – 19 Acre	1	2
> 20 Acre	0	0

Any Participation/ Working in Agriculture Sector		
1 -10 Years	31	62
11 – 20 Years	0	0
21 – 30 Years	0	0
> 30 Years	0	0
No	19	38
Reason Become a Farmer		
Interest	31	62
Social Impact (Family/ Friends)	12	24
No Suitable Occupation	7	14
Type of IoT Use		
Agriculture Drone	4	8
Automatic Tractor	13	26
Smart Green House	8	16
Automatic Watering	11	22
No	14	28

(Source: Survey, 2021)

4.2 Level Intention of Corn Farmers Towards IoT in Agriculture Production

In this research study, the first objective was to determine the level intention of corn farmers towards IoT in agriculture production in Kelantan. Following the Table 4.2 show that, the mean score and standard deviation of the level intention of corn farmers towards IoT, the mean score were divided into three range which is label as low level (1.0 – 2.33), moderate (2.34 – 3.66) and high (3.67 – 5.0) by Landell interpretation of mean score (1997).

Firstly, the mean score for statement of "I intend to use Internet of Things (IoT) technology in my corn farming for agriculture production in Kelantan" with mean score

(M = 4.40, SD = 0.606) with average (2.5%), agree (48.0%) and totally agree (46.0%). This show that many corn farmer in Kelantan intend in to use Internet of Things (IoT) technology in corn farming for agriculture production because farmer can access data easily and will be more convention than traditional farming. According to Radhi et al., (2020), farmers can easily access the data through the use of Global Positioning System (GPS), for gathering all the data management and many other specialties that can give benefits for farming. For example, the second statement "I think using IoT technology in corn farming can increase more production than before" show mean score (M = 4.34, SD = 0.717) with farmers choose to agree (44.0%) and totally agree (46.0%).

Next, the majority of corn farmer choose to agree (40.0%) and totally agree (44.0%) for the statement "My level intention in corn farming can help to achieve my target to produce more yield production in Kelantan" this is because many corn farmer agreeing with the level of success with the uses of IoT technologies in corn farming can help handling crop more easily by using precision farming that can give more opportunities for corn farmers in experiencing the technologies and learning. Therefore, about (48.0%) agree and (40.0%) totally agree with the statement "I will put more effort in learning and using the used of IoT technology for my future farming practices". This show that, precision farming can be accepted by corn farmers in order to help them in using new methods that will be used to minimize the management practices of farming by reducing the cost and increase yield production of corn farming (Radhi et al., 2020). Besides, corn farmers choose the average option (2.4%), (58.0%) agree and totally agree (32.0%) with mean score (M = 4.22, SD = 0.615) for statement "Positivity and awareness in using IoT in farming rather than using traditional farming can be more motivated for me to use IoT". Because the uses of IoT and precision farming have been also widely

used in agriculture sector in Malaysia that help in enhance the productivity of agricultural and farmers start to feel comfortable with the uses of it (Radhi et al., 2020).

Furthermore, for the sixth statement "I think the main purpose of using IoT in corn farming is to produce more quality as well as the health of crop" with mean score (M = 4.22, SD = 0.615), agree (58.0%) and totally agree (32.0%) since precision farming one of methods that can check the healthiness of soil, water requirement and identified any harmful crop disease in real time monitoring. Then, the highest score agreement for statement "The implementation of IoT in corn farming can boost more productivity and reduce cost for production in Kelantan" was (44.0%) agree and totally agree (40.0%) with mean score (M = 4.22, SD = 0.763) where performance of IoT in agriculture production known as new solution in order to improve and help corn farmers to meet their demand from consumer by ensuring the quality and productivity of corn production. Last statement "The Internet of Things can help me to attract more customers or buyers to purchase more good quality of corn production in Kelantan" with mean score (M = 4.32, SD = 0.683), agree (44.0%) and totally agree (44.0%) where this show consumer willing and attract to purchase the good quality of corn even the price is higher than corn that planted in traditional way.

The results of this objective have been determined resulted in high mean score with the total (M = 4.285, SD = 0.675) where this was stated as the highest level for mean score and according to mean level which is between 3.67 – 5.00, Thus, for first objective of this research study was achieved due to the level of mean score are high level intention of corn farmers towards IoT in agriculture production. This is because subjective norms for this research study are one of the most influential factors that influence corn farmers intention towards IoT in agriculture production. As stated by Jui et al. (2020), corn farmers intentions to implement modern agricultural technology have been influenced by

the organizational support in perceived usefulness, as getting support by the government's in providing money for small farmers who needs help in implementing modern farming practices.

Table 4.2 Mean score of level intention of corn farmers towards IoT in agriculture production in Kelantan

Statement	Percentage (%)					Mean	Standard Deviation (S.D)	Level
	1*	2*	3*	4*	5*			
I intend to use Internet of Things (IoT) technology in my corn farming for agriculture production in Kelantan	0	0	6.0	48.0	46.0	4.40	0.606	High
I think using IoT technology in corn farming can increase more production than before	0	2.0	8.0	44.0	46.0	4.34	0.717	High
My level intention in corn farming can help to achieve my target to produce more yield production in Kelantan	0	0	16.0	40.0	44.0	4.28	0.729	High
I will put more effort in learning and using the used of IoT technology for my future farming practices	0	0	12.0	48.0	40.0	4.28	0.671	High

Positivity and awareness in using IoT in farming rather than using traditional farming can be more motivated for me to use IoT	0	0	10.0	58.0	32.0	4.22	0.615	High
I think the main purpose of using IoT in corn farming is to produce more quality as well as the health of crop	0	0	10.0	58.0	32.0	4.22	0.615	High
The implementation of IoT in corn farming can boost more productivity and reduce cost for production in Kelantan	0	2.0	14.0	44.0	40.0	4.22	0.763	High
The Internet of Things can help me to attract more customers or buyers to purchase more good quality of corn production in Kelantan	0	0	12.0	44.0	44.0	4.32	0.683	High
Total Mean Score						4.285	0.675	High

*Indicator: 1) Totally Disagree; 2) Disagree; 3) Neutral; 4) Agree; 5) Totally Agree
Notes: Value of means correspond to 1.0 – 2.33: Low; 2.34 – 3.66: Medium; 3.67 – 5.00: High.
(Source: Survey, 2021)

4.3 The Relationship of Attitude, Subjective Norms and Perceived Behavior Control of Corn Farmers Intention Towards IoT in Agricultural Production

The analysis used in this research study to the relationship of attitude, subjective norms, and perceived behavior control of corn farmers intention towards IoT in agricultural production is Pearson's Correlation Analysis. In this study, the independent variables were attitude subjective norms, and perceived behavior control while dependent variables is intention of corn farmers towards IoT in agriculture production. The purpose of this research study is to investigate the hypothesis of the relationship of attitude, subjective norms, and perceived behavior control of corn farmers intention towards IoT in agricultural production. The null hypothesis (H_0) shows that there is no relationship between relationship of attitude, subjective norms, and perceived behavior control of corn farmers intention towards IoT in agricultural production in Kelantan but the H_1 show that there is relationship between relationship of attitude, subjective norms, and perceived behavior control of corn farmers intention towards IoT in agricultural production in Kelantan. The strength of correlation analysis between the variables shows and can be determined based on the Table 3.3.

According to Table 4.3, the relationship between corn farmer intention towards IoT in agriculture production and attitude show strong relationship at value of r = 0.877. This relationship was ranged 0.80 to 1.00 due to strength of relationship between the two variables and the significance at the 0.01 level (2- tailed). Where corn farmers attitude has been identified as level of favourably by individual or unfavourably assess the behavior examines (Ali et al., 2020). Then attitude of corn farmer also will be affected in the uses of Internet of Things (IoT) in their farming practices where it could affect their preference in innovation which defined as the corn farmers in acceptance of the changing in uses of technologies modern in their farming practices (Akyüz & Theuvsen, 2019). Hence, this attitude will influence the corn farmers intention towards IoT in agriculture production.

The subjective norms towards corn farmers intention indicates a strong positive relationship correlation analysis at the value of r = 0.724 and due to the strength of significance value between the two variables at 0.01 level (2 – tailed) (p = 0.000). According to Qiu et al., (2021), social norms are one of the strong influences towards the farmers behavior in making decision in doing something and where their individual performance would be enhanced if they believe the person can using a particular way in doing their job (Jhangir et al., 2018). Therefore, the government support also plays a bigger major role to help small farmers who facing with problem that involved in low productivity and low production and as well lack in technologies or co-workers to help them in doing farming work by provided financing (Zhai Yun, 2020).

Table 4.3 shows a very strong positive correlation analysis of perceived behavior control of corn farmers intention towards IoT in agriculture production which is r = 0.846 with significance value at 0.01 level (2 – tailed). Ali et al., (2020) stated that perceived behavioral control was the most influential factor after attitude followed by subjective norms at the end use to predicting the behavioral intention of farmers is using modern technologies for the risk management system in farming practices.

For this research study, the relationship of attitude, subjective norms, and perceived behavior control of corn farmers intention towards IoT in agriculture production has a positive relationship between all the variables. Hence the H_1 is accepted while H_o is rejected in this research study.

Table 4.3 Results of Pearson correlation analysis

		Attitude	Subjective Norms	Perceived Behavioral Control
Corn farmer intention towards IoT in agriculture production in Kelantan	**Pearson Correlation**	.877**	.724**	.846**
	Sig. (2-tailed)	.000	.000	.000

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

4.4 The Most Influential Factor of Corn Farmers Intention Towards IoT in Agriculture Production

For the third objective of this research study was to identify the most influential factor of corn farmers intention towards IoT in agriculture production by using factor analysis. According to Table 4.4, the Keiser-Meyer-Olkin (KMO) to measure the sampling adequacy and Bartlett's test of Sphericity for all variables showed that the value for attitude (0.904), subjective norms (0.922), and perceived behavior control (0.854) from corn farmers intention towards IoT in agriculture production which the value are greater than 0.5. According to KMO and Bartlett's test (n.d) the value can be useful for the data if the values close to 1.0 and acceptable and the results will be valid to use for research study. Thus, from the results show that this study was significance for this research.

Table 4.4 KMO and Bartlett's Test

		Attitude	Subjective Norms	Perceived Behavioral Control
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.904	.922	.854
Bartlett's Test of Sphericity	**Approx. Chi Square**	250.124	521.188	331.474
	df	28	28	28
	Sig.	.000	.000	.000

(Source: Survey 2021)

4.4.1 Attitude of corn farmers intention towards IoT in agriculture production

For this section, it will contain 8 statements from survey question regarding the attitude of corn farmers intention towards IoT in agriculture production where it was measured by using 5-point Likert's scales which the results show all the variables greater than 0.4. The corn farmers need to answer survey questions whether they totally disagree, disagree, neutral, agree, and totally agree. According to Table 4.5, showed that the factor analysis of attitude corn farmers intention towards IoT in agriculture production where 0.798 for "IoT for agricultural production in Kelantan is very important to me as a farmer", then for "I am sure that my corn production in Kelantan will be recognized by the public when using IoT technology" are 0.681, for "The use of IoT technology is crucial for me to increase corn production in agriculture" are 0.876, for "The emergence of IoT technology made me realize how important the technology is in agricultural production" are 0.858, then for statement "I am not afraid of using IoT technology in my corn farming" are 0.863, for "I am looking for suitable methods and farming practices for

agricultural production towards IoT technology" are 0.779, then for "Choosing the right IoT technology is necessary for me before venturing into agriculture" are 0.827 and lastly, for "I will take the challenge as a farmer to apply IoT technology in my farming practices" are 0.730. These results showed the variance explained percentage indicates 64.672%.

Table 4.5 Factor analysis of attitude corn farmers intention towards IoT in agriculture production in Kelantan

Statement	Factor Loading
IoT for agricultural production in Kelantan is very important to me as a farmer	0.798
I am sure that my corn production in Kelantan will be recognized by the public when using IoT technology	0.681
The use of IoT technology is crucial for me to increase corn production in agriculture	0.876
The emergence of IoT technology made me realize how important the technology is in agricultural production	0.858
I am not afraid of using IoT technology in my corn farming	0.863
I am looking for suitable methods and farming practices for agricultural production towards IoT technology	0.779
Choosing the right IoT technology is necessary for me before venturing into agriculture	0.827
I will take the challenge as a farmer to apply IoT technology in my farming practices	0.730
Variance (Percent of explained)	64.672

(Source: Survey, 2021)

4.4.2 Subjective Norms Corn Farmers Intention Towards IoT in Agriculture Production

The second factor in this research study are subjective norms which it also contains 8 statements. For factor analysis of subjective norms corn farmers intention towards IoT in agriculture production was 0.857 for "My family members would prefer me to use IoT technology in corn farming", then for "My friends will give support and agree with my decision to start using IoT technology for my farming practices" are 0.895, for statement "The social influence in agriculture sector makes me want to use the implementation of Internet of Things in my farming practices" are 0.924, for "Government support and advertisement influence me to take part in using IoT for my corn farming production" are 0.940, for "Workshop or seminar makes me want to take part in learning more about implementation Internet of Things in agriculture production" are 0.931, for "Media's information influences me that corn farming produced using IoT technology is better than traditional farming" are 0.940, for "Media's information influences me that corn farming produced using IoT technology is better than traditional farming" are 0.931 and lastly for the statement "By using IoT technology in corn production will enable me to obtain external loans" are 0.916. Thus, these Table 4.6 results show that corn farmers in Kelantan was influenced by subjective norms where the percentage of variance explained are 84.105%.

Table 4.6 Factor analysis of subjective norms corn farmers intention towards IoT in agriculture production in Kelantan

Statement	Factor Loading
My family members would prefer me to use IoT technology in corn farming	0.857
My friends will give support and agree with my decision to start using IoT technology for my farming practices	0.895
The social influence in agriculture sector makes me want to use the implementation of Internet of Things in my farming practices	0.924

Government support and advertisement influence me to take part in using IoT for my corn farming production	0.940
Workshop or seminar makes me want to take part in learning more about implementation Internet of Things in agriculture production	0.931
Media's information influences me that corn farming produced using IoT technology is better than traditional farming	0.940
Media's information influences me that corn farming produced using IoT technology is better than traditional farming	0.931
By using IoT technology in corn production will enable me to obtain external loans	0.916
Variance (Percent of explained)	84.105

(Source: Survey, 2021)

4.4.3 Perceived Behavior Control Corn Farmers Intention Towards IoT in Agriculture Production

According to Table 4.7, this section has 8 statements, and all the values are greater than 0.4. The factor analysis of perceived behavior control corn farmers intention towards IoT in agriculture production was 0.839 for "If I want, I can produce more corn production yield using IoT technology", for "My corn farming using IoT technologies are more cost effective and can boost more productivity" are 0.802, for statement "IoT in corn farming can ensure consumer trust upon the health and safety of the corn production" are 0.862, for "I know that by maintaining the crop quality using IoT technology will be purchased more by consumer even it more expensive than other corn" are 0.866, for "Due limited resources and time, IoT technology can take place and get support from government policies" are 0.842, for "In addition, the quality of corn production will become attractive for consumer or reseller to purchase the corn" are 0.849, for "Using IoT technology for

farming practices can improve more corn farmers perception towards IoT in agriculture production" are 0.884 and last statement is "I know that using IoT will become more effectively convenience for improving corn production" are 0.828. The percentage of variance explained for perceived behavior control were 71.689%. As it been mentioned before by Ali et al., (2020) where individual or farmers using Internet of Things (IoT) or smart farming for farming practices they will have believe that they will earn more potential than before and willing to adopt the behavior in order to increase their production if the changing to modern technologies.

Table 4.7 Factor analysis of perceived behavior control corn farmers intention towards IoT in agriculture production in Kelantan

Statement	Factor Loading
If I want, I can produce more corn production yield using IoT technology	0.839
My corn farming using IoT technologies are more cost effective and can boost more productivity	0.802
IoT in corn farming can ensure consumer trust upon the health and safety of the corn production	0.862
I know that by maintaining the crop quality using IoT technology will be purchased more by consumer even it more expensive than other corn	0.866
Due limited resources and time, IoT technology can take place and get support from government policies	0.842
In addition, the quality of corn production will become attractive for consumer or reseller to purchase the corn	0.849
Using IoT technology for farming practices can improve more corn farmers perception towards IoT in agriculture production	0.884
I know that using IoT will become more effectively convenience for improving corn production	0.828
Variance (Percent of explained)	71.689

(Source: Survey, 2021)

4.4.4 Variance Explained

In this study, percentage of variance explained was used in order to measure the total variance explained by factor. According to Akhtar et al., (2020), the total of variance explained value should be not less than 60% in order to get the significance value from the data. If the data less than 60% or under 35%, it will be not useful, and the data need to be generated again in order to get significance value. Besides that, it will be more likely factor will show up than the expected factor that have been in the model if it less than 60%. Therefore, Table 4.8 show the data where the total variance for attitude was 64.672%, followed by the subjective norms which is show the highest significance value with 84.105% and 71.689% for perceived behavior control factor. These results of total variance explained show that the most influential factor of corn farmers intention towards IoT in agriculture production in Kelantan are subjective norms. Subjective norms were one of factor that influence farmers in using technology or ICTs in handling their agricultural risk and other farm work (Ali, et al., 2019). This is because corn farmers intention towards IoT in agriculture production hearing and considering opinion regarding the influence of subjective norms such as from people surrounding them like family member or fellow farmers that eventually will influence them in making decision (Ali et al., 2019).

Table 4.8 Results of variance explained

Dimension (Factor)	Variance (Percent of explained)
The Attitude Corn Farmers towards IoT in Agriculture Production in Kelantan	64.672%
The Subjective Norms Corn Farmers towards IoT in Agriculture Production in Kelantan	84.105%
The Perceived Behavior Control Corn Farmers towards IoT in Agriculture Production in Kelantan	71.689%

(Source: Survey, 2021)

4.4.5 Confirmatory Factor Analysis

The Confirmatory Factor Analysis (CFA) used to look into the model of this research study. The model of CFA will be used to explained factor that influence corn farmer intention towards IoT in agriculture production were attitude, subjective norms, and perceived behavior control. Figure 4.1, show the model of SmartPLS that used in this research study where the variables were measured using five-point Likert scales and all the data recorded above 0.6.

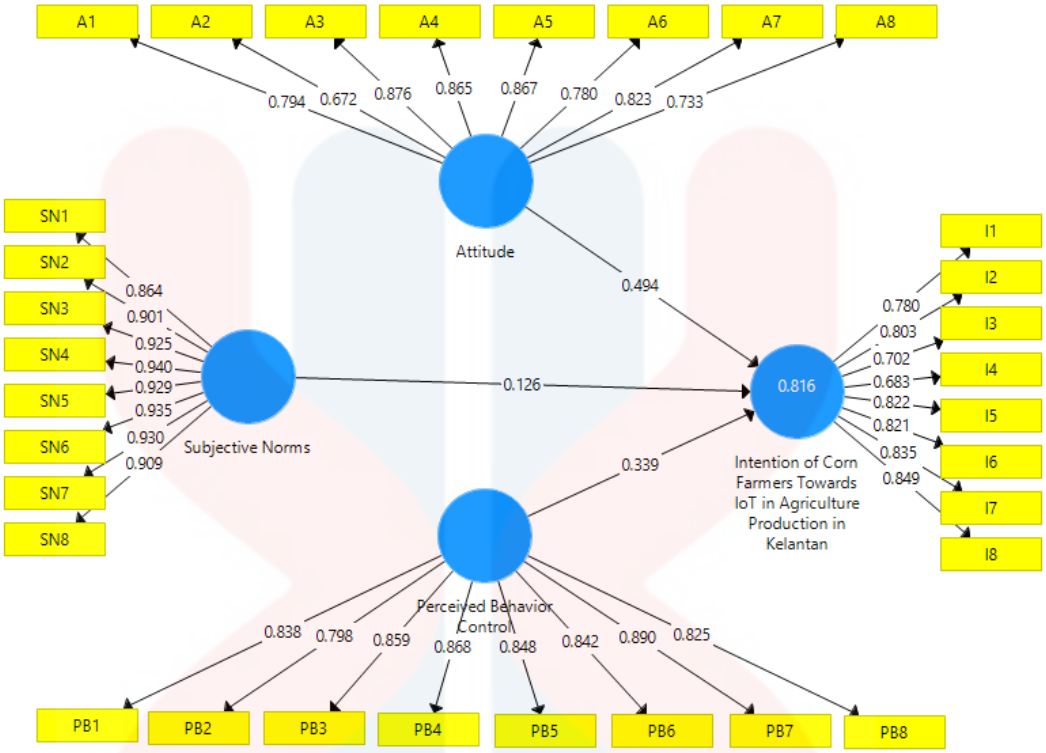

Figure 4.1: The Model fits of Theory Planned Behavior Model

Based on Table 4.9, it shows that the value of SRMR for this study was 0.074 where the SRMR value considerable acceptable model that fit for this research study. As stated by Hu and Bentler (1999), if the value of fit model for SRMR value was less than 0.10 or of 0.08, the value will be considerable a good fit for this research study (Henseler et al., 2014). Then, the value of chi-square was 881.473.

Table 4.9 Results of confirmatory factor analysis

	Saturated Model	Estimated Model
SRMR	0.074	0.074
d_ULS	2.902	2.902
d_G	5.280	5.280
Chi-Square	881.473	881.473
NFI	0.621	0.621

(Source: Survey, 2021)

4.5 Chapter Summary

In this chapter, the results of this research study are determined by using the Theory of Planned Behavior of corn farmers intention towards IoT in agriculture production in Kelantan where attitude, subjective norms, and perceived behavior control as independent variables. The results from this research study show that subjective norms are known as the most influential factor that influence corn farmers intention towards IoT in agriculture production in Kelantan where the percentage of variance explained are 84.105% while most of other factor loading was significant with this research study.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In this research study, there were three main objectives, to determine the level intention of corn farmers towards IoT in agriculture production in Kelantan, to investigate the relationship of attitude, subjective norms, and perceived behavior control towards IoT in agriculture production in Kelantan and to identify the most influential factor of corn farmers intention towards IoT in agriculture production in Kelantan. At the end of this research study, all the objectives were achieved.

The first objective was achieved where all the variables show a mean high score where the mean score of corn farmers intention are 4.285, based on the mean score corresponding to 3.67 – 5.0. Then for second objective of this research study is also achievable when the null hypothesis (Ho) was rejected because there is a relationship

between the independent variables: attitude, subjective norms, and perceived behavior control of corn farmers intention towards IoT in agriculture production in Kelantan. This objective was investigated using Pearson's Correlation Analysis. For the third objective, it also achievable where subjective norms known as the most influential factor of corn farmers intention towards IoT in agriculture production in Kelantan among all the independent variables. This is because the value of total variance explained for the subjective norms are 84.105% followed by attitude 64.672% and perceived behavior control 71.689%. Furthermore, in this study, the Confirmatory Factor Analysis (CFA) value showed the acceptable model fits value as the SRMR value is 0.074.

In conclusion, the uses of the Internet of Things (IoT) are really important for agriculture production to help Malaysia agriculture production where the corn farmers can improve their farming practices by using modern technologies to help them increase the production and yield of corn farming. Besides that, by using modern technologies, the government sector will also be opened with many opportunities from the results outcomes of corn farming where this will drive Malaysia through the success of producing agricultural crops in using the internet of things (IoT) for better agriculture future. Moreover, this research study can also improve and help corn farmers itself to make them learn new knowledge and use modern technologies in their farming practices. Thus, this study indicates that all factors such as attitude, subjective norms, and perceived behavior control influence corn farmers' intention towards IoT in agriculture production.

5.2 Limitation of Study

Limitation of the study for this research survey is to gather corn farmers information in Kelantan that directly and indirectly involved with the uses of the Internet of things (IoT) in agricultural production, the intention of corn farmers towards (IoT) from previous study and the relationship of attitude, subjective norms, and perceived behavior in the Internet of Things (IoT) in agricultural production.

Besides that, the process of collecting data for this survey from respondents will be a limitation for this study. It is difficult to find and collect data from corn farmers because most farmers in Kelantan are involved in other farming such as paddy and vegetables and most of them are in the older age group which may be some hard time for them to understand such question to answer. So, this will need more extra time from the timeline of this study.

5.3 Recommendations

According to the results of this research study, some recommendations will be suggested in order to improve the research for better future uses. As recommendation, this research study can be more variety and diversify in not only focusing corn farmers intention towards IoT in Kelantan area only which is we could expand more to collect

data from all corn farmers around Malaysia by increasing the sample size of this research study. Moreover, beside focusing on only corn farmers, we also could focus on other farmers that involved in agriculture production that require in using Internet of Things (IoT) in agriculture production in Kelantan. Thus, this future research study will obtain more accurate research data from farmers that using the implementation of Internet of Things in their farming practices.

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APPENDICES

Greetings dear respondent,

I am doing this academic research study entitled:

Corn Farmers Intention Towards IoT in Agriculture Production in Kelantan

With honor I would like to inform you that, you have been selected as a respondent for this research study. Your cooperation in this research study is crucial in determining the success of this study. In this research study, I would like to assess your intention concerning certain factors of corn farmers intention towards IoT in agriculture production. Please read carefully all the instruction pertaining to every question and answer sincerely.

All responses provided will be strictly confidential and will be used for academic purpose research study only.

Thank you very much for your cooperation,

Sincerely,

……

Nur Aqilah Binti Nawayee

Faculty of Agro Based Industry,

Universiti Malaysia Kelantan,

17600 Jeli, Kelantan

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

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

SECTION A: DEMOGRAPHIC CHARACTERISTICS OF CORN FARMER IN KELANTAN

Please answer the questions below and tick (/) in the box provided to indicate your answer.

1.	**Age** *Umur*	□ < 20 years □ 20 – 29 years □ 30 – 39 years □ 40 – 49 years □ > 50 years
2.	**Gender** *Jantina*	□ Male □ Female
3.	**District** *Daerah*	□ Tumpat □ Pasir Mas □ Tanah Merah □ Jeli □ Machang □ Gua Musang □ Kuala Krai □ Pasir Puteh □ Bachok □ Kota Bharu
4.	**Race** *Keturunan*	□ Malays □ Chinese □ Indians □ Others
5.	**Marital Status** *Status Perkahwinan*	□ Single □ Married □ Widowed / Divorced
6.	**Education Level** *Peringkat Pendidikan*	□ SPM □ STPM / A-Level / Diploma / Matriculation

		□ Undergraduate (Bachelor's Degree) □ Postgraduate (Master's Degree, PhD)
7.	**Farm Worker** *Pekerja Ladang*	□ < 10 people □ 11 – 15 people □ 16 – 20 people □ > 20 people
8.	**Monthly Income** *Pendapatan Bulanan*	□ < RM 1000 □ RM 1001 – RM 3000 □ RM 3001 – RM 5000 □ > RM 5001
9.	**Farm Size** *Saiz Ladang*	□ < 1 acre □ 1 – 4 acres □ 5 – 9 acres □ 10 – 19 acres □ > 20 acres
10.	**Any participation / working experience in agricultural sector** *Sebarang penyertaan / pengalaman bekerja di sektor pertanian*	□ If yes, how many years? ( ) 1 – 10 years ( ) 11 – 20 years ( ) 21 – 30 years ( ) Above 31 years □ No
11.	**Reason become a farmer** *Sebab menjadi seorang petani*	□ Interest □ Social impact (family member / friends) □ No suitable occupation
12.	**Type of IoT use** *Jenis penggunaan IoT*	□ Agriculture Drone □ Automatic Tractor □ Smart Green House □ Others (Please state your answer):

SECTION B – THE INTENTION OF CORN FARMERS TOWARDS IOT IN AGRICULTURE PRODUCTION IN KELANTAN

Please answer the questions below by choosing the scale from 1 to 5 to indicate your answer

Statement	**1**	**2**	**3**	**4**	**5**
1) I intend to use Internet of Things (IoT) technology in my corn farming for agriculture production in Kelantan. *Saya berhasrat menggunakan teknologi Internet of Things (IoT) dalam pertanian jagung saya untuk pengeluaran pertanian di Kelantan.*					
2) I think using IoT technology in corn farming can increase more production than before. *Saya fikir dengan menggunakan teknologi IoT dalam peertanian jagung dapat meningkatkan pengeluaran lebih banyak daripada sebelumnya*.					
3) My level intention in corn farming can help to achieve my target to produce more yield production in Kelantan. *Niat saya yang tinggi dalam pertanian jagung dapat membantu mencapai sasaran saya untuk menghasilkan lebih banyak pengeluaran hasil di Kelantan.*					
4) I will put more effort in learning and using the used of IoT technology for my future farming practices. *Saya akan berusaha lebih keras dalam belajar dan menggunakan teknologi IoT yang digunakan untuk amalan pertanian masa depan saya.*					
5) Positivity and awareness in using IoT in farming rather than using traditional farming can be more motivated for me to use IoT. *Kesedaran dalam menggunakan IoT dalam pertanian daripada menggunakan pertanian tradisional dapat memberi motivasi kepada saya untuk menggunakan IoT .*					
6) I think the main purpose of using IoT in corn farming is to produce more quality as well as the health of crop. *Saya rasa tujuan utama penggunaan IoT dalam pertanian jagung adalah untuk menghasilkan jagung yang lebih berkualiti dan kesihatan tanaman lebih terjamin.*					
7) The implementation of IoT in corn farming can boost more productivity and reduce cost for production in Kelantan. *Pelaksanaan IoT dalam pertanian jagung dapat meningkatkan lebih banyak produktivitas dan mengurangi biayaan untuk produksi di Kelantan.*					

8) The Internet of Things can help me to attract more customers or buyers to purchase more good quality of corn production in Kelantan. *Internet of Things dapat membantu saya menarik lebih banyak pelanggan atau pembeli untuk membeli pengeluaran jagung yang lebih berkualiti di Kelantan.*					

SECTION C - THE RELATIONSHIP OF ATTITUDE, SUBJECTIVE NORMS AND PERCEIVED BEHAVIOR CONTROL OF CORN FARMERS INTENTION TOWARDS IOT IN AGRICULTURE PRODUCTION IN KELANTAN

Please answer the questions below by choosing the scale from 1 to 5 to indicate your answer

SECTION C1: ATTITUDE

Each statement below represent attitude of corn farmers intention towards IoT in agriculture production

Statement	**1**	**2**	**3**	**4**	**5**
1) IoT for agricultural production in Kelantan is very important to me as a farmer. *IoT untuk pengeluaran pertanian di Kelantan sangat penting bagi saya sebagai petani.*					
2) I am sure that my corn production in Kelantan will be recognized by the public when using IoT technology. *Saya yakin bahawa pengeluaran jagung saya di Kelantan akan dikenali oleh orang ramai dengan menggunakan teknologi IoT.*					
3) The use of IoT technology is crucial for me to increase corn production in agriculture. *Penggunaan teknologi IoT sangat penting bagi saya untuk meningkatkan pengeluaran jagung dalam pertanian*.					
4) The emergence of IoT technology made me realize how important the technology is in agricultural production. *Kemunculan teknologi IoT membuat saya menyedari betapa pentingnya teknologi dalam pengeluaran pertanian*.					
5) I am not afraid of using IoT technology in my corn farming. *Saya tidak takut menggunakan teknologi IoT dalam pertanian jagung saya*.					
6) I am looking for suitable methods and farming practices for agricultural production towards IoT technology. *Saya mencari kaedah dan amalan pertanian yang sesuai untuk pengeluaran pertanian ke arah teknologi IoT*.					

7) Choosing the right IoT technology is necessary for me before venturing into agriculture. *Memilih teknologi IoT yang tepat adalah penting untuk saya sebelum menceburkan diri dalam bidang pertanian*.					
8) I will take the challenge as a farmer to apply IoT technology in my farming practices. *Saya akan menghadapi cabaran sebagai petani untuk menerapkan teknologi IoT dalam amalan pertanian saya*.					

SECTION C2: SUBJECTIVE NORMS

Each statement below represent subjective norms influence corn farmers intention towards IoT in agriculture production

Statement	**1**	**2**	**3**	**4**	**5**
1) My family members would prefer me to use IoT technology in corn farming *Ahli keluarga saya lebih suka saya menggunakan teknologi IoT dalam penternakan jagung*					
2) My friends will give support and agree with my decision to start using IoT technology for my farming practices *Rakan-rakan saya akan memberi sokongan dan bersetuju dengan keputusan saya untuk mula menggunakan teknologi IoT dalam amalan pertanian saya*					
3) The social influence in agriculture sector makes me want to use the implementation of Internet of Things in my farming practices *Pengaruh sosial dalam sektor pertanian membuat saya ingin menggunakan pelaksanaan Internet of Things dalam amalan pertanian saya*					
4) Government support and advertisement influence me to take part in using IoT for my corn farming production *Sokongan kerajaan dan iklan mempengaruhi saya untuk mengambil bahagian dalam menggunakan IoT untuk pengeluaran pertanian jagung saya*					
5) Workshop or seminar makes me want to take part in learning more about implementation Internet of Things in agriculture production *Bengkel atau seminar membuat saya ingin mengambil bahagian dalam mempelajari lebih lagi mengenai pelaksanaan Internet of Things dalam pengeluaran hasil pertanian*					
6) Media's information influences me that corn farming produced using IoT technology is better than traditional farming.					

Maklumat media mempengaruhi saya bahawa pertanian jagung yang dihasilkan menggunakan teknologi IoT lebih baik daripada pertanian tradisional					
7) Expert in agriculture sector motivate and support me to produce and manage corn production using IoT technology. *Pakar dalam sektor pertanian memberi motivasi serta menyokong saya untuk menghasilkan dan mengurus pengeluaran jagung menggunakan teknologi IoT.*					
8) By using IoT technology in corn production will enable me to obtain external loans. *Dengan menggunakan teknologi IoT dalam pengeluaran jagung akan membolehkan saya mendapatkan pinjaman luaran.*					

SECTION C3: PERCEIVED BEHAVIOR CONTROL

Each statement below represent perceived behavior control of corn farmers intention towards IoT in agriculture production

Statement	**1**	**2**	**3**	**4**	**5**
1) If I want, I can produced more corn production yield using IoT technology. *Sekiranya saya mahu, saya dapat menghasilkan lebih banyak hasil pengeluaran jagung menggunakan teknologi IoT.*					
2) My corn farming using IoT technologies are more cost effective and can boost more productivity. *Pertanian jagung saya menggunakan teknologi IoT lebih menjimatkan kos dan dapat meningkatkan produktiviti.*					
3) IoT in corn farming can ensure consumer trust upon the health and safety of the corn production. *IoT dalam pertanian jagung dapat memastikan kepercayaan pengguna terhadap kesihatan dan keselamatan pengeluaran jagung.*					
4) I know that by maintaining the crop quality using IoT technology will be purchased more by consumer even it more expensive than other corn. *Saya tahu bahawa dengan mengekalkan kualiti tanaman menggunakan teknologi IoT akan dibeli lebih banyak oleh pengguna walaupun harganya lebih mahal berbanding jagung lain.*					

5) Due limited resources and time, IoT technology can take place and get support from government policies. *Oleh kerana sumber dan masa yang terhad, teknologi IoT boleh digunakan dan mendapat sokongan daripada dasar kerajaan.*					
6) In addition, the quality of corn production will become attractive for consumer or reseller to purchase the corn. *Di samping itu, kualiti pengeluaran jagung akan menjadi lebih menarik bagi pembeli atau penjual untuk membeli jagung.*					
7) Using IoT technology for farming practices can improve more corn farmers perception towards IoT in agriculture production. *Menggunakan teknologi IoT untuk amalan pertanian dapat meningkatkan persepsi petani jagung terhadap IoT dalam pengeluaran pertanian.*					
8) I know that using IoT will become more effectively convenience for improving corn production. *Saya tahu bahawa menggunakan IoT akan menjadi lebih berkesan untuk meningkatkan pengeluaran jagung.*					