FACTORS INFLUENCING THE DECISION TO FARM ORGANIC PRACTICES IN MALAYSIA

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ABSTRACT

This research investigates the factors that influence farmers' decisions to adopt organic farming practices. The research focuses on Malaysia, where people have recently become increasingly aware of the potential advantages of organic food; however, the adoption rates among farmers are still very low and the number of certified organic farmers remains also small. In fact, the demand from consumers for organic products continues to increase and cannot be met by local producers, hence suppliers have to rely on foreign imports. This thesis investigates the barriers preventing conventional farmers from adopting organic practices, as well as examining the attitudes of farmers in relation to organic farming. Drawing on the Theory of Planned Behaviour and the Diffusion and Innovation Theory, this thesis reveals key factors that influence farmers to adopt organic farming practices. The study applies a sequential mixed methods design, which involves three stages including both quantitative and qualitative methods. The first stage was based on exploratory interviews with seven key informants which provided an in-depth understanding of policy and government intervention relating to the growth of organic production. Then, a questionnaire survey was administered to 170 farmers, with 82 being organic farmers and 88 conventional. The survey gathered relevant data regarding the farm household, farm enterprises, and attitudes to adopting organic farming. Finally, a series of in-depth interviews was conducted with ten farmers, to explore further some of the underlying factors that enabled them to adopt organic farming. Logistic regression analysis was used on questionnaire data to identify factors that influenced adoption, and supporting with qualitative analysis. The results revealed that certain attitudes such as environmental awareness and information-sharing make an important contribution to the adoption of organic farming. Analysis of qualitative data further confirms that the adoption of organic farming in Malaysia is not only an economic consideration, but also reflects certain behaviours and socio-economic backgrounds. These observations can potentially contribute to national policy development by informing future strategies to encourage the expansion of the organic farming sector.

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AES	Agriculture Economic Society
CETDEM	Centre of Environment, Technology and Development
DoA	Department of Agriculture, Malaysia
EPU	Economic Plan Unit
ETP	Economic Transformation Programme
EUT	Expected Utility Theory
FA	Factor Analysis
FAMA	Federal Agriculture Marketing Authority
FAO	Food and Agriculture Organization
GAP	Good Agricultural Practices
GDP	Gross Domestic Products
GNI	Gross National Income
IFOAM	International Federation of Organic Agriculture Movement
KMO	Keiser-Mayer-Olkin value
LIFS	Low-Input Farming Systems
MAHA	Malaysian Agriculture, Horticulture & Agro-tourism
MoA	Ministry of Agriculture & Agro-Based Industry, Malaysia
MP	Malaysian Plan
NAP	National Agriculture Policy
NASAA	National Association for Sustainable Agriculture, Australia
NGO	Non-Governmental Organization
NKEA	National Key Economic Areas
OR	Odds Ratio
PBC	Perceived Behavioural Control

PCA	Principle Component Analysis
SAP	Sustainable Agricultural Practices
SCP	Sustainable Consumption and Production
SRI	Strategic Reform Initiatives
SSL	Self-Sufficiency Level
TOL	Temporary Occupation Lease
TPB	Theory of Planned Behaviour
TRA	Theory Reasoned Action
USDA	United State Department of Agriculture
WHO	World Health Organization

CHAPTER 1. INTRODUCTION

1.1 Overview of the Research

Improvements in lifestyle and associated changes in consumption are increasing the global demand for food, with the consequence that the need to develop a genuinely sustainable food production system becomes stronger every year. The limitations of arable land, soil degradation, and climate change all threaten the productivity of conventional farming systems. In addition, excessive chemical use in some farming systems has been found to have a negative impact on human health, soil and water quality, and pest management. These suggest that farming systems with a lower reliance on external inputs offer some promise of greater sustainability.

Agricultural sustainability is defined by Lewandowski et al., (1999, p. 185), as:

> *'The management and utilization of the agricultural ecosystem in a way that maintains its biological diversity, productivity, regeneration capacity, vitality, and ability to function, so that it can fulfill – today and in the future – significant ecological, economic and social functions at the local, national and global levels and does not harm other ecosystems'.*

One well-established approach to sustainable agriculture is organic farming, which relies on practices that are not dependent on chemical inputs.

Organic farming can ensure sustainability as long as it adapts to local farming, social, geographical and climatic factors (Paul & Charles, 2006). The term organic agriculture has been defined as an environmentally and socially sensitive food supply system, using methods that respect the environment at all stages from production to distribution (FAO, 2002). Therefore organic production can be argued to cover the entire system, from planting and cultivation to handling and processing, and even as far as the delivery of the final product to the consumer. According to the International Federation of Organic Agriculture Movements (IFOAM, 2006), organic agriculture is a whole-system approach based upon a set of processes resulting in a sustainable ecosystem, safe food, good nutrition, animal welfare and social justice. This is consistent with the United Nations Food and Agriculture Organisation's (FAO) description of the primary goal of organic agriculture,

as being to optimise the health and productivity of interdependent communities including soil, plants, animals and people (FAO, 2002).

1.2 Concept and Principle of Organic Farming

The basic principles that underpin organic production have not changed much over the past 65 years. According to the World Health Organisation (FAO/WHO, 2001), there are two main sources that provide guidance on the general principles and requirements that apply to organic agriculture at an international level. First, is the *Codex Alimentarius Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced food,* which focuses on coordinating organic standards and national regulations, as well as maintaining the integrity of organic products. Second, is the *International Federation of Organic Agriculture Movement* which is an international body that assists organic movements to coordinate their actions and supports the collection of scientific and experimental data from across the world. The IFOAM has become the main advocacy group for supporting the global organic movement (Paull, 2010). Up until now, more than 800 affiliates in over 100 countries, including Malaysia, have joined the organisation.

The IFOAM has defined organic agriculture based on the following four principles (Geier, 2007):

i. **Principle of Health**: Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.
ii. **Principle of Ecology**: Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.
iii. **Principle of Fairness**: Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.
iv. **Principle of Care**: Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

These principles can be applied to any agricultural situation, as long as it sustains natural and human resources and meets the needs of local people. Several other farming methods that are similar to organic agriculture have been identified, including *Low-Input Farming Systems* (LIFS) and *Nature Farming*. Most LIFS aim to optimise farm management by reducing production costs

and have been used as an alternative to organic farming in some European countries (Parr et al., 1990). *Nature Farming* was introduced by a Japanese philosopher in the 1930s and as well as integrating farming and natural systems, the approach also incorporates an important spiritual element. Therefore, there is no specific definition of organic farming as long as it incorporates a flexible system from a range of natural methods alongside practical approaches to sustain land management.

1.3 Why is Organic Farming Important?

Organic farming has attracted increasing attention in recent decades, as it is considered to have beneficial impacts for the future of sustainable food production, whilst also addressing the environmental problems associated with conventional agriculture (Mader *et al.*, 2002; Edwards-Jones & Howells 2001; Rigby & Caceres, 2001, Lampkin & Padel, 1994). Organic agriculture generally relies on the use of non-polluting inputs and the adoption of land management techniques sympathetic to local ecosystems (Kallas *et al.*, 2010). Organic farming is perceived by some farmers to offer solutions to environmental degradation, the depletion of non-renewable resources, food safety and other problems associated with conventional agricultural practices (Lampkin & Padel, 1994). In addition, organic farming also can be considered as a part of sustainable development for promoting particular practices, for instance the regulation of fertilizers and pesticides used, problematizing of genetic engineering, and protection of animal welfare (Byrne *et al.*, 2006).

However, on the contrary, there are also limitations regarding the contribution of organic agriculture, in terms of producing sufficient food to feed the world (De Ponti *et al.*, 2012; Padel & Lampkin, 1994). De Ponti & his colleagues (2012) for example argued whether organic agriculture can become more productive and economically competitive compared to conventional agriculture. They also debated that organic production requires more land for cultivation, hence the area of natural ecosystems might be declining due to farming activities. It is important to acknowledge the limitations and constraints of organic farming, however the literature also notes additional benefits from this type of practice which go beyond production concerns.

Organic farming is said to indirectly contribute to job creation, income generation by meeting local needs, the development of new technologies and indigenous knowledge, network construction, as well as supporting rural development (Darnhofer, 2005; Hamilton & Fischer, 2003; Scialabba, 2000). Therefore, Parrott *et al.,* (2006) identified two types of organic farming in developing countries: (1) officially certified organic farming; and (2) informal organic farming. The first tends to focus on the export of organic products, while the second involves small-scale activities to improve the livelihoods of individual farmers (Goldberger, 2008). While certification systems are necessary to access international markets, domestic markets for organic produce may first develop around the informal sector (Parrott *et al.*, 2006). Both types can be found in Malaysia.

1.4 Organic Farming in Malaysia: Why it is Important?

The total organic agricultural area in Asia is nearly 3.6 million hectares (IFOAM, 2011). This constitutes ten percent of the world's organic agricultural land, with over 700,000 producers (IFOAM, 2011). The leading countries by area are China (1.9 million hectares) and India (1.2 million hectares). Although domestic market size is still relatively small, demand from consumers and assistance from governments have led to this sector being closely regulated. For example, seven Asian countries, China, India, Japan, South Korea, Philippines, Taiwan, and Malaysia, have implemented organic labelling regulations. Others, including Sri Lanka and Nepal, have established government competent authorities to regulate production, while Thailand and Indonesia have established accreditation systems for organic produce (Willer, 2011).

In Malaysia, over recent decades, the agriculture sector has come to rely more on extensive production practices. In order to reduce the negative impacts that derive from the intensification of farming practices, environmentally-friendly production methods, such as organic farming, have been encouraged. A review of the literature related to organic farming and sustainable agriculture in Malaysia suggests that this topic has been well researched. These studies explore different approaches to organic farming including: (1) farmers' adoption of Sustainable Agriculture Practices (SAPs) and Good Agriculture Practices (GAP) adoption (Tey *et al.*, 2014; Terano, *et al.*, 2014; Tey, 2013; Barrow, 2009; Hashim *et al.*, 2008); (2) consumer preferences and behaviour (Chamhuri & Batt, 2015; Ibitoye & Nawi, 2014; Othman & Rahman, 2014; Wee *et al.*, 2014; Terano *et al.*, 2014; Mohamad *et al.,* (2014); Ahmad & Juhdi, 2013; Che Wel *et al.*, 2012; Saleki

& Seyedsaleki, 2012; Shafie & Rennie, 2012); (3) the market and supply chain management for fresh fruit and vegetables industries (Stanton *et al.*, 2011; Man *et al.*, 2009; Ali *et al.*, 2008); and (4) knowledge transfer among extension agents and other key actors involved in the agricultural community (Shariff *et al.*, 2014; Tiraieyari *et al.*, 2013; Tiraieyari & Uli, 2011). However, relatively little attention has been paid to farmers' adoption of organic farming practices in the context of Malaysian literature, with only a handful of studies exploring this topic (Jamal *et al.*, 2014; Tiraieyari *et al.*, 2014; Assis & Mohd Ismail, 2011).

To date, organic food still remains a niche market in Malaysia, although it is growing rapidly (Department of Agriculture (DoA), 2016). However, the latest figures from 2017 indicate that there are now 201 farms (with total area of 1,991.80 ha) engaged in organic production (DoA, 2017). Based on the recent figures, China and India are now among the top ten countries in the world in terms of increased organic area (Paull, 2011). This shows how far Malaysia lags behind these two countries in terms of organic production. This might be due to the rising awareness of consuming organic food particularly in such countries like China, Japan, Thailand, Korea and India (Agri Asia, 2015). As Figure 1.1 demonstrates an existing huge penetration of organic foods in Asia region, and the greater population size in the Asia Pacific region then lead to the higher consumption of organic products in particular area.

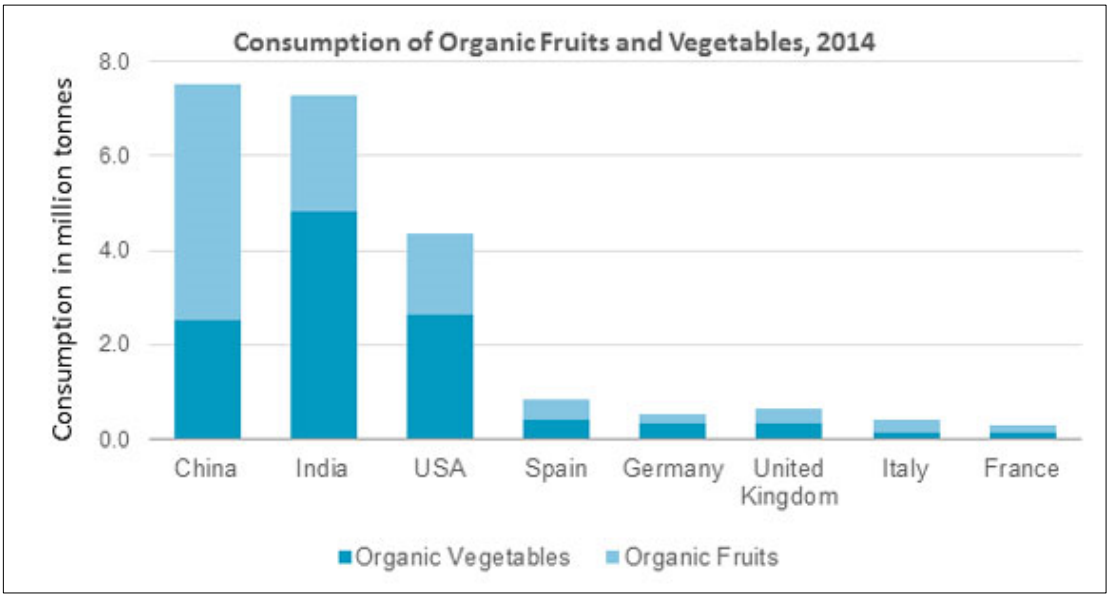

Figure 1.1 Consumption of Organic Products (2014)

Sources: https://blog.euromonitor.com/key-takeaways-from-agri-asia-2015/

In Malaysia, most of the consumers are well aware of organic products, with more than 90% of Malaysian consumers viewing organic products as healthy and free of chemicals (Suhaimee *et al.*, 2016). Farmers who wish to apply for certification, need to submit their applications through the DoA and they need to renew their organic status every year. The ongoing demand for organic products is projected to grow more than 12.4% a year with a financial value more than RM20 million a year (Suhaimee *et al.*, 2016). Despite the fact that a specific plan has been implemented by the Malaysian government within the National Agro-Food Policy, to encourage the growth of organic farming, the number of certified farmers still remains low (Tiraieyari *et al.*, 2014). In fact, the increasing demand from consumers for organic produce cannot be met by local producers and as a result the country needs to import organic goods, mostly from Australia and the US (Stanton *et al.*, 2011). The latest data on Malaysian food imports as a whole, show a significant increase in imports over recent years (Ministry of Agriculture & Agro-based Industry (MoA), 2012). High dependence on food imports suggests that the country will face supply problems in the future. These trends make the growth of organic production in Malaysia even more important.

Various studies, including Tiraieyari *et al.*, (2014) and Assis & Mohd Ismail (2011), confirm that organic farming is practised by a minority of farmers in Malaysia and that farmers' perceptions of organic agriculture are mainly negative. Therefore, the operational definitions of organic farming in this study refers to organic farmers who farm organically by default, with most of them continuing their farming traditionally from their parents. This study will provide recommendations for government and policy makers to strengthen the development of organic farming in Malaysia. The results of this study can be used to help increase farmers' awareness and acceptance of organic farming, by identifying the factors associated with a successful organic enterprise, and encourage more farmers to consider converting to this method of production.

In summary, this research will contribute to:

1. The organic farmers' movement by highlighting the key challenges and opportunities faced by organic farmers in Malaysia;
2. The government sector by suggesting improvements to enhance current policies related to organic farming;

3. The work of extension agents and agriculture officers, by providing insights that may be used to improve the advice and training offered to organic farmers; and
4. The international literature on farmers' adoption of organic farming.

1.5 Research Aim and Objectives

In general, the aims of this study are to determine the factors that influence farmers' decisions to farm organically and to explore the contribution made by various policies and practices in Malaysia to encourage the growth of organic production. The specific objectives are:

1) To determine the barriers that prevent farmers from adopting organic practices;
2) To analyse farmers' attitudes and behaviour around organic farming practices;
3) To identify the main factors that affect farmers' decisions to adopt farming organic practices;
4) To investigate the various policies and practices in the development of organic farming in Malaysia; and
5) To make policy and practice recommendations based on the research findings.

Therefore, to achieve these goals, this thesis employed a mix methods approach where both quantitative and qualitative methods were applied. The Diffusion of Innovation Theory by Rogers (2003) and the Theory of Planned Behaviour by Ajzen (2005) were a basis of underpinning the theoretical framework of this study.

1.6 Structure of Thesis

To achieve these objectives, this thesis begins with a review of the literature around the context of adoption of organic farming locally and internationally, drawing on several related theories. This is followed by an introduction to the organic agriculture movement in the Malaysian context in Chapter Three, while Chapter Four explains the methods used to tackle the research objectives set out above. The research results are described in Chapter Five, which presents the sampling frame and compares this to national data. This followed by Chapters Six which elaborates on barriers that underpinning organic adoption, Chapter Seven discussing on farmers behaviours that influencing organic adoption, as well as Chapter Eight focusing on factors influencing farmers to adopt organic practices. All of the results are set out with support of literature. Chapter Nine provides an overview and conclusions of this thesis, with some remarks and suggestions for future studies.

CHAPTER 2. ORGANIC FARMING & FARMERS' DECISION MAKING

2.1 Chapter Outline

Organic agriculture is the fastest growing agriculture-based industry in the world (Paull, 2011). Data from the IFOAM indicated that organic agriculture is practiced in 160 countries, and that the land devoted to organic agriculture worldwide has more than doubled from 15.8 million hectares in 2001 to 37.2 million hectares in 2011 (Paull, 2011). In addition, there has also been an increase in organic agricultural land in Asia, Europe, North America and Oceana (Willer, Lernoud & Home, 2013). In Asia, the total area of organic agriculture is nearly 3.7 million hectares, which constitutes ten percent of the world's organic land. China leads with 1.9 million per hectares, followed by India (1.1 million hectares).

The previous chapter briefly highlighted the importance of organic agriculture to the wider population globally, as well as in the Malaysian context. It can be seen as a potential movement in Malaysia, since the demand from consumers keeps increasing each year, and a lot of initiatives have been set up by the government to influence more farmers to shift and continuing organic farming practices. Hence, in order to understand how farmers make a decision to farm organic and to identify which factors might underpin this, this chapter considers a body of literature exploring farmers' decision-making in the implementation of organic farming. It is also important to look at the development of organic farming globally, the adoption of organic farming comprehensively and what theories are being applied in relation to its development.

The next section describes the development of organic farming internationally (Section 2.2), followed by a discussion on how farmers chose to farm organically (Section 2.3). This refers to several approaches, including economic theory (Theory of Planned Behaviour), and those from rural sociology (The Diffusion Adoption Model), thus leading to the challenges and determinants influencing farmers' decision in farming organic (Section 2.4). Section 2.5 concludes the chapter by bringing together the significance of the literature discussed.

2.2 The Development of Organic Agriculture Globally

Organic agriculture can be seen in the field of agriculture and food production, where both of these areas are important economic sectors. In the field of agriculture, it is also known as low internal input production techniques (as in the European and the USA context), and originated out of traditional and alternative farming practices in the late 19th and early 20th century (Niggli, 2007). The food production reflects on several contexts including on sustainable agriculture, food and nutritional quality, as well as ethical issues like animal welfare. A growing body of literature considers organic agriculture as an efficient and holistic approach in reaching the goals of successful agriculture sectors including food security and sustainable resources (Jaber, 2000).

2.2.1 The Historical Context

The organic concept is mainly derived from two different contexts independently; German-speaking and English-speaking countries in the early 20th century (Vogt, 2007). Vogt (2007) explained this was due to what was happening in parallel at that time: (1) a crisis in agriculture and agricultural science, (2) the emergence of biologically oriented agricultural sciences, (3) the Life and Food Reform movement, and (4) growing Western awareness of farming cultures of the Far East countries.

The crisis between agriculture and agricultural sciences happened in the two World Wars where countries faced ecological and soil related problems due to the chemical and technical intensification methods of farming. These involved the use of excessive chemical and mineral fertilizer, pesticides and machinery, which led to dramatic drops in yields and resulted in declining food quality and severe economic and social problems. This situation happened not only in Germany, but also in the UK and the USA (Vogt, 2007).

The emergence of a new agricultural discipline called ‘agricultural bacteriology’ in 1880’s developed an inclusive biological concept to increase soil fertility. The agricultural bacteriology concepts are dealing with bacteria in the soil, silage, manure and milk, whereby feeding the soil organisms by organic fertilization (like organic manuring and rotted organic material) leads to the interaction between roots and soil that will increase soil mineral. Organic farming can be seen as an intensification of biological farming that helps to improve soil fertility.

The reform movement, one of the earliest inspirations for organic farming focused on the concept of the naturalness of foods, rejecting the industrialization, urbanization, and growing excessive technology in the modern world. The movement started in the early 20th century, where it derived from eco-social movements such as the German 'Life Reform' and the American 'Food Reform' (Leifert, 2007). It was introduced as a 'natural way of living', consisting of vegetarian diet, physical training, natural medicine and going back to the land to farming organically. Hence, these reforms contributed initially to the organic movement, and indirectly promoted the health value through consuming organic food products.

Most western people involved in the early development of organic farming were inspired by the farming cultures of the Far East countries, and their sustaining of agricultural approaches over centuries. Western countries were influenced by reports about Far East countries, for instance a book entitled 'Farmers of Forth Centuries' (King, 1911) describes how farmers were farming organically particularly in countries like Japan, China and Korea. The Far East played a key role therefore in the development of organic farming by presenting a model for sustainable agriculture society based on gardening and farming (Vogt, 2007).

2.3 Assessing Farmers' Decisions in Agriculture Development

Farms are businesses where decisions are made and implemented largely by a single person, and there are excessive pressures on farmers with regard to their decision-making (Willock et al., 1999). Basically, decision-making can be viewed as the cognitive process which results in a selection of choice of action. Every decision-making process will produce a final choice (James, 1990). Farmers need to make a decision regarding how to run their businesses on daily basis, and need to think systematically about their information needed, the cost of information, alternative sources and the value of information, and identifying what is the necessary information to collect before making a decision (Kadlec, 1985). Therefore, farmers have to make a choice to become more productive and achieve higher yield. However, a good decision maker should weigh the positive and negative consequences of the decision. The decision success always depend on the contributing factors such as emotions, beliefs, values, attitudes, and people whose cooperation is needed, rather than logic and sound information (Mohamed Haris, 2013).

From the point of view of extension agriculture, it is essential that the decision-making process and the factors affecting the process are well informed to ensure that farmers receive the best advice, benefit from this advice and consequently improve agricultural performance (Douglas, 1984). With regard to decision-making, each decision maker personalizes the problem solving and information processing behavior and ability, while the decision process and various outcomes are influenced by certain characteristics (Keen & Scott, 1978; Ruble & Cosier, 1990).

2.3.1 Decision Making Model

Sonkkila (2002) suggested a general model of individual factors affecting decision-making and the interrelationships between the factors. As illustrated in Figure 2.1, it is noted that in practice, the relationship between the factors could be more complicated and that the factors could change based on different situations when making decisions.

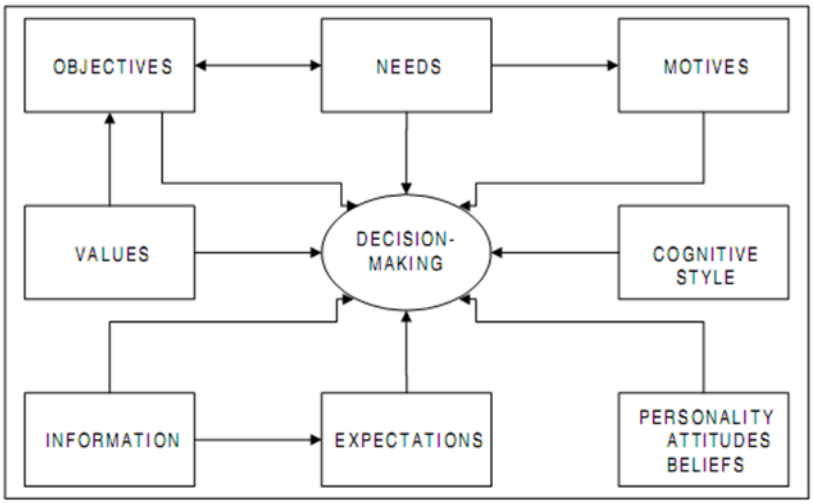

Figure 2.1 Factors Affecting Individuals' Decision-Making

Source: Sonkilla (2002)

From the model, personality refers to the attitudes and beliefs of individuals, where 'cognitive style' refers to the ways or methods by which an individual receives, stores, processes, and transfers the information (Pratt, 1980). Gul (1984) had divided the individual differences based on two related dimensions, personality and cognitive dimensions, and these can distinctly affect or interact with decision-making. Drucker (1974) suggested that the objectives should be set in eight key areas: marketing, innovation, human organisation, financial resources, physical resources,

productivity, social responsibility and profit. Hence, it is crucial to determine objectives first before making a decision, as the objectives generally indicate the direction of the change desired (Zionts, 1982). Values, according to this model refer to the principles and beliefs of a person, and need to be defined as a condition where satisfaction is desired. They are usually related to culture and regarded as permanent. Values are usually prescribed as socially accepted norms to gain objectives (Gasson, 1973). In addition, needs can be described as a condition usually associated with motivation, where in psychological theory the motive of actions derives from needs, and the action terminates when the need is satisfied (Simon, 1999). Hence, farmers' expectations may concern many future events, for instance the future prices, or the amount of yield produced in the next period. These factors are sometimes interrelated, where values and needs can affect the objectives, and these have an influence on decision-making. The individual expectations in this model may reflect the opportunities for future events or changes, which are basically based on the information about a certain situation.

Another study by Darnhofer *et al.,* (2005) has identified decision criteria and examined the decision making process of farmers through a decision tree model. From the qualitative results, five characteristics of farmers have been recognised based on their strategies and values. The five types of farmers are presented in Table 2.1. This is an important observation where the heterogeneity of farmers based on their attitude, preferences and goals are imperative towards their choice of farming methods.

Table 2.1 Types of Farmers and their Characteristics (based on Darnhofer *et al.,* 2005 study)

Type of Farmers	Characteristics
1. The "*committed conventional*"	The farmers not even considering a conversion to organic farming. They do not view organic farming as more environmentally friendly than conventional production methods. They do not believe the health claims made for organic foods, nor do they perceive that organic production is technically and/or economically feasible.
2. The "*pragmatic conventional*"	Farmers do not have a fundamental stance opposing organic farming. However, they point out that a conversion can entail a substantial amount of risk. They focus on the technical challenges of conversion, the uncertainty of price and market development, and the regulatory constraints. They are not eager to implement them unless they can expect a tangible benefit.

Type of Farmers	Characteristics
3. The "*environment-conscious but not organic*"	Farmers are more flexible, and committed to environmentally friendly farming practices, but are not receiving any payments within the organic farming measure. This farmer type can include a variety of subtypes (e.g., conventional, environmentally friendly, or self-declared organic)
4. The "*pragmatic organic*"	Non-economic aspects are not dominant motivations for conversion. This type of farmer tends to perceive organic farming as offering a good prospect for securing an income. The compensatory payments within the agri-environment program are an especially important incentive for conversion.
5. The "*committed organic*"	Mostly are pioneers. They are deeply rooted in the founding philosophy of organic farming. Economic considerations are secondary and these farmers are willing to risk foregoing some of their income.

2.3.2 The Diffusion of Innovation Theory

The study of diffusion of innovations is one of the most influential theories in early rural sociology, which has been implemented in various field of studies including agriculture, particularly in farmer decisions (Boncinelli *et al.*, 2015; Gray & Gibson, 2013). In the early studies of adoption of agricultural technologies, this was conceptualised as a complex process of cognitive activities involving awareness, information seeking, evaluation and trial of the technology, followed by adoption (Rogers, 1962). It was called 'Rogers' Five Stages Decision Making', as it happens through a series of communication channels over a period of time. Pannell's (1999) study follows on from Rogers, and he proposed four conditions which are necessary for individual farmers adopting an innovative farming system. The conditions include: 1) awareness of the innovation, 2) perception that it is feasible to trial the innovation, 3) perception that the innovation is worth trying and also 4) perception that the innovation promotes farmers' objectives. Hence, the innovation might be rejected during or after the adoption process occurs.

What is diffusion? According to Rogers (1983), diffusion is "A process by which the innovation is communicated through certain channels over time among the members of a social system". Access to information and active communication around a new idea, reduce levels of uncertainty. Information affects uncertainty in a situation where a choice exists among the set of alternatives (Rogers & Kincaid, 1981).

Based on Rogers (2003), there are four key elements in diffusion of innovation research, namely;

i. Innovation: any idea, practice, or object that is perceived new by an individual or group (or society). The innovation is not necessarily a new invention, in fact it may have been invented a long time ago, but it can be considered as new innovation once the individual or community perceived it as a new innovation for them. Innovation will create uncertainty, and in order to reduce it, the individuals should be aware of all the consequences.
ii. Communication channel: the process by which participants transfer information to one another to meet mutual understanding. There are two main sources of communication channels; mass media and interpersonal communication. Mass media can be referred to radio, television, newspaper, or magazine, while interpersonal channels consist of two way communication between two individuals or more. Rogers highlighted that interpersonal channels are more influential in creating or changing individuals' behaviour. In addition, this interpersonal channel may involve different characteristics such as heterophily and homophily, where two or more individuals interact with similar (homophily) or different (heterophily) attributes such as beliefs, education level, socio-economic status and others.
iii. Time: involved in the decision process, whereby time is necessary for an innovation to be adopted. The rate of adoption and category of adopters are involved in the innovation diffusion process.
iv. Social systems: a set of interrelated social units (e.g. individuals, informal groups, organisations) that are engaged in problem solving to achieve a common goal. There are many roles in social systems, and their combination represents the total influences on potential adopter. He further argues that the nature of the social system may affect individual innovativeness, which reflects on the categories of adopters.

These five elements represent the main features of every diffusion research study. In addition, Rogers (1983) also highlighted five main characteristics of innovations or new practices that influence a decision by a potential end user (e.g. farmers):

1. Relative advantage: the degree to which an innovation is perceived as better than the one it is replacing, the greater the relative advantage, the more rapid of adoption likely to happen.

2. Compatibility: the degree to which innovations are consistent with the values, beliefs, needs and past experience of potential adopters. The more compatible an innovation, the higher the possibility of adoption.
3. Complexity: referring to how difficult an innovation is to understand and learn. The more complex an innovation, the slower the adoption process will be.
4. Trialability: also known as testability, where to what extent the innovation can be tested or experimented before an adoption is made. Learning by doing is an effective method to reduce uncertainty regarding new innovation, hence the more triable the innovation, the greater the possibility of adoption.
5. Observability: where an innovation provides tangible results. The easier it is for individuals to see the innovation results, the more likely they are to adopt.

In later edition, Rogers (1995) changes his terminology of the previous 'Five Stages Decision Making' to the Innovation-Decision Process Model that also follows five basic steps. It shows a progression of the previous model and describe the process of adoption as an information processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of the innovation align with communication channels. The innovation-decision process involves an individual passing from an initial knowledge of innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to the implementation of the new idea, and lastly to confirmation of this decision. This process is shown in Figure 2.2.

The innovation decision process starts with the knowledge stage, where the individual learns and seeks information about an innovation. According to Rogers, three types of knowledge arise here, namely; 1) awareness knowledge, 2) how-to knowledge and 3) principle knowledge. The awareness knowledge shows the existence of the innovations, and this may motivate to learn more about the innovations and thus adopting it. The how-to and principle knowledge provides more information regarding the innovations, and further explaining the system and function of how an innovation works. An individual may have all necessary knowledge, but this does not guarantee whether the adoption will occur.

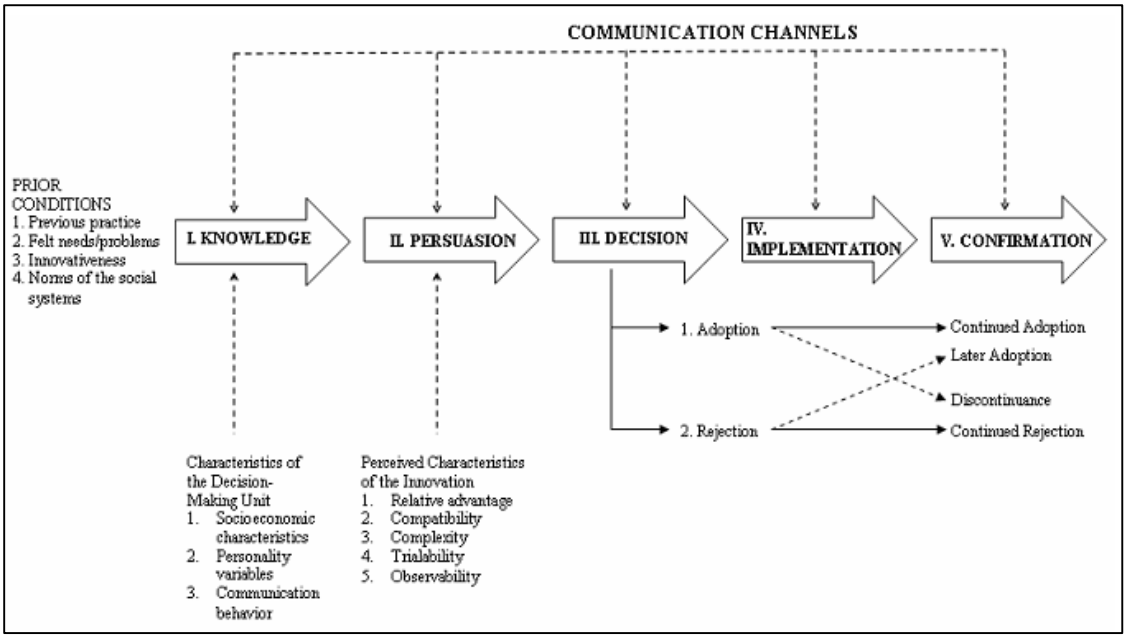

Figure 2.2 A Model of Five Stages in the Model of Innovation-Decision Process

Source: Diffusion of Innovation, Fifth Edition by Everett M. Rogers (2003)

The persuasion stage follows the knowledge stage. Here, individuals rely on feeling rather than cognitive ability. The degree of uncertainty about the innovation functioning and social enforcement from others like colleagues, peers and others may affect opinion and belief about the innovation, hence influencing the decision to adopt the innovation. At decision stage, the individual chooses whether to adopt or reject the innovation. While rejection always happens in the adoption decision process, Rogers claimed two types of rejection; active rejection and passive rejection. Active rejection is where individuals try an innovation and then refuse to adopt it; passive rejection involves an individual rejecting the innovation without trying it.

The implementation stage is where innovation is taken into action and an innovation is put into practice. Uncertainty still exists at this stage, however, through reinvention (a process involving modification of innovation) this is likely to become minimised and the more reinvention takes place, the greater the rapidness of adopting the innovation. The last stage, which is the confirmation stage, occurs when the decision has been already made, but individuals seek support to confirm the decision. Discontinuance also may occur at this stage, firstly when individuals are not satisfied with the performance of an innovation, and secondly where an innovation does not fulfil the needs or criteria of individuals.

Apart from the adoption decision as highlighted by Rogers (2003), the process of adoption also has been emphasised by various scholars, for instance as a role of social influences (Edward-Jones, 2006) and learning process (Pannell, 1999). Panell (1999) distinguished learning process of an adoption as associated with two distinct phases. Firstly, prior to the early stages of innovation, the uncertainties regarding innovation are high, and as the process of learning continues, the uncertainty will be reduced and better decisions can be made (Marra et al., 2003). Secondly, the other aspects of learning is an improvement of knowledge to develop the skills in applying the innovation (Abadi Ghadim & Pannell, 1999). Hence, through learning by doing like reading, listening and watching, the necessary skills can be developed and established (Pannell *et al.*, 2006).

Not all individuals in a social system adopt technology at the same time and based on that, Rogers (1962) categorised the adopters into five groups, which are the innovators, early adopters, early majority, late majority and laggards (see Figure 2.3). He emphasised that this classification refers only to those who successfully adopted the innovation, and this might generate such a curve over time.

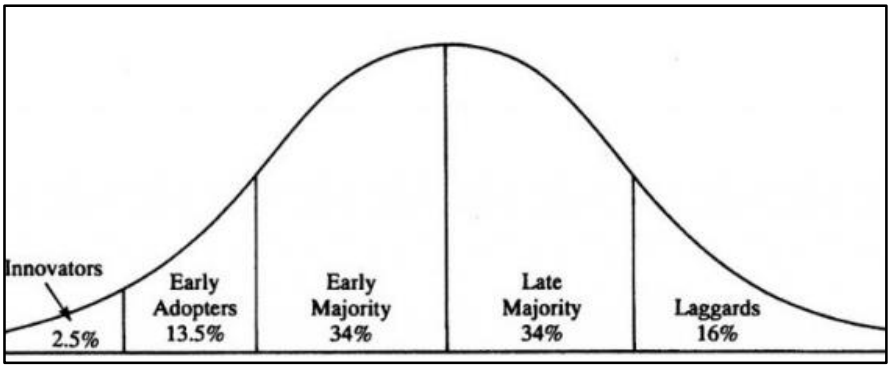

Figure 2.3 Categories of Adopter

Source: Diffusion of Innovation, Fifth Edition by Everett M. Rogers (2003)

The rate of adoption is basically described with an S-shaped curve (see Figure 2.4), where the numbers of individuals who adopt the new idea are plotted as a cumulative frequency over time (Rogers, 1962). At first, only a few farmers will adopt the innovation, and these are the innovators. At this stage, only a minority of farmers have acquired full information about the potential advantages of the technology, and farmers are reluctant to take a risk with the new technology, hence the pace of adoption is slow (Läpple & Rensburg, 2011). However, as the diffusion curve

begins to climb, more farmers will adopt. The adoption increases gradually and begins to level off, as fewer of the remaining decide to adopt. Finally, the curve reaches the maximum level and the diffusion process is finished. There is a variation in the slope, depending on the adoption rate. Some new ideas will diffuse rapidly and the s-shape will be quite steep, but some adoption has a slower rate resulting in a gradual slow s-shape. Therefore, the rate of adoption is usually measured by the length of time required for a certain percentage of the members of a system to adopt an innovation.

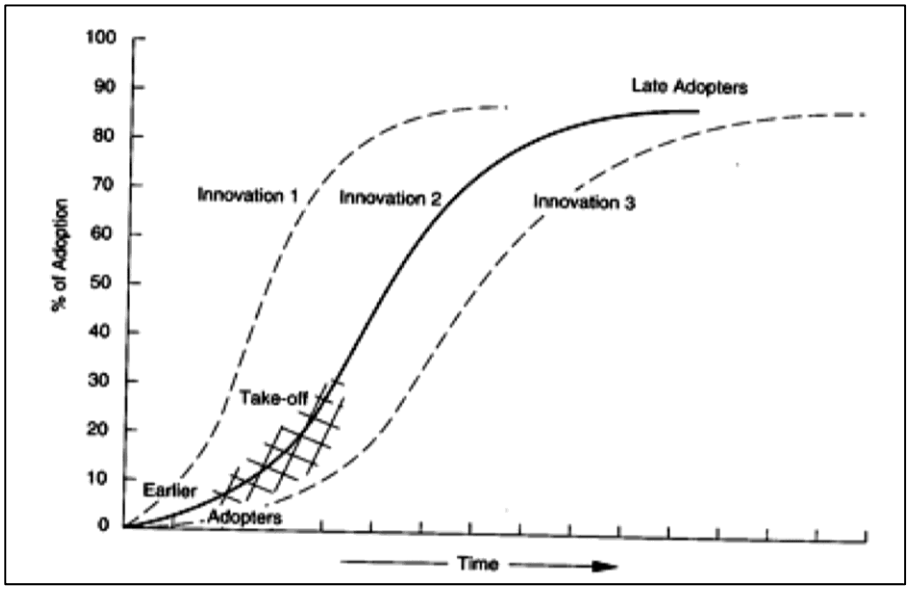

Figure 2.4 Shapes of curves of diffusion for innovations that spread over time

Source: Diffusion of Innovation, Third Edition by Everett M. Rogers (1983)

Rogers (2003) further classified the adopter categories into two major groups; earlier adopters and late adopters. The earlier adopters comprise of innovators, early adopters and early majority, while late adopters consist of late majority and laggards. These two groups are differentiated based on their socioeconomic status, personality variables, and communication behaviours.

Many studies are dealing with the process of diffusion which has been proposed earlier by Rogers' (2003). A great deal of literature identifies a broad range of factors associated with the adoption and non-adoption of organic farming (Burton *et al.*, 1999, 2003; Darnhofer *et al.*, 2005; Fairweather, 1999; Hattam *et al.*, 2012; Läpple & Rensburg, 2011; Padel, 2001; Sierra *et al.*, 2008). Most studies have a specific direction, for example the correlation between adoption and dependent variables. However, Padel (2001) argues that this model should not be explained based on the

personal characteristics of the adopters alone, in fact other factors such as policy support, the attitude of farmers towards organic movement, and market development also play a major role and need to be considered.

2.3.3 Theory of Planned Behaviour (TPB)

While the adoption decision theory by Rogers (2003) highlights the adoption decision process, the Theory of Planned Behaviour (TPB) proposes a better understanding towards behavioural aspects of individual farmers. In order to know whether behaviour is contributing to the adoption of organic farming, as well as what kind of attitudes promote organic practices across Malaysian farmers, the best approach is to refer to the Theory of Planned Behaviour (TPB) as a baseline. The TPB in this study will focus on the behavioural aspects of farmers (i.e. the attitudes and beliefs of farmers towards adoption), while the Diffusion of Innovation highlights the process of decision made to adopt innovation.

There is also a gap from a theoretical point of view, as regards the absence of merging the sociology, economic and psychological variables in a relevant model (Edward-Jones, 2006). Furthermore, Rigby *et al.*, (2001) argued that the attitudes of organic producers are different from those of conventional, which leads to the barriers of organic entries. Hence, a focus on the behaviour and other relevant elements is likely to highlight the important determinants that influence the decision to farm organic practices.

From the perspective of agricultural economics, farmers' decision-making and behaviours can be studied by two different approaches: Firstly, from purely economic models, that is Expected Utility Theory (EUT), and second, from socio-psychological theories (Borges et al., 2015). In socio-psychological theories, the psychological constructs are used to explain farmer's behaviour, and the widest theory that has been used to understand farmers' behaviour so far was Theory of Reasoned Action (TRA) by Fishbein & Ajzen, (1975) and its extended theory, Theory of Planned Behaviour (TPB) by Ajzen (1991).

The TPB was initiated from the Expectancy-Value theory of attitude (Fishbein, 1963) and the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). The Expectancy Value theory was originally created to explain and predict the relationship between individual's belief about an object and their attitudes towards that object. According to Feather (1982), Expectancy Value Theory involves probability that an action will be followed by a particular index by a subjective value (utility) placed on the consequences. This suggests that cognitive foundation of an attitude can be understood by examining the individual's beliefs about the objects (Ajzen & Fishbein, 2000). This model considers that attitude can be comprised of two components: (1) beliefs or expectations about the likelihood that an outcome is associated with an action, and (2) an evaluation of this outcome. Individuals differ from each other based on an evaluation of their belief and expectations that they hold. For example, in this study, the organic and conventional farmers might agree that organic products will allow them to obtain higher profit, but whether it is positive or negative, it depends on their evaluation and belief. However, this model does not make any prior assumptions about the beliefs that will be accessible (Ajzen & Fishbein, 2000). The accessible belief must be elicited, in order to explain in detail why people hold their positive or negative attitudes towards the object. In fact, by predicting behaviour using attitudes alone is not sufficient, therefore this leads to the development of the Theory of Reasoned Action (TRA) (Wicker, 1969).

The TRA explains the decision making process that underlies human bahaviour using the assumption that individuals make their decisions based on the available information and volitional control over their decisions (Ajzen & Fishbein, 1980). TRA aims to explain the relationship between attitudes and behaviours within human action. This theory is used to predict how individuals will behave based on their pre-existing attitudes and behavioural intentions. Based on this theory, intention to perform a certain behaviour will lead to the actual behaviour (Ajzen & Madden, 1986). To understand behaviour, two basic determinants of intention need to be considered; "personal in nature" and "social influence". The personal behaviour depends on an individuals' assessment, whether positive or negative and this can be called *attitude towards behaviour*. While the social influence can be referred as social influences that come from the perception of social pressures. Thus, this can be named as *subjective norm*. When individuals have a strong social pressure, it will respond to perform or not a particular behaviour (Ajzen & Fishbein, 1980, p. 6).

By extending the expectancy value model, TRA proposes that behavioural intention is driven by two factors; *behavioural beliefs* and *normative beliefs*. Behavioural beliefs are the immediate determinants of individual attitude, which are used to understand why an individual hold certain attitudes (Ajzen & Fishbein, 1980, p. 63). Whereas normative beliefs are related to beliefs about the expectations of others, such as family, friends or any individual people that are important. Individuals will utilise information to form beliefs about the expected outcome of their action (behavioural beliefs) and what others would think about the performing of the action (normative beliefs). The attitude towards the action will form the basis of behavioural beliefs that is salient information. A similar situation happens when individuals use normative beliefs to establish their subjective norms. The attitude will finally combine together with subjective norm to establish an intention that will lead to performing or not the behaviour. (See Figure 2.5)

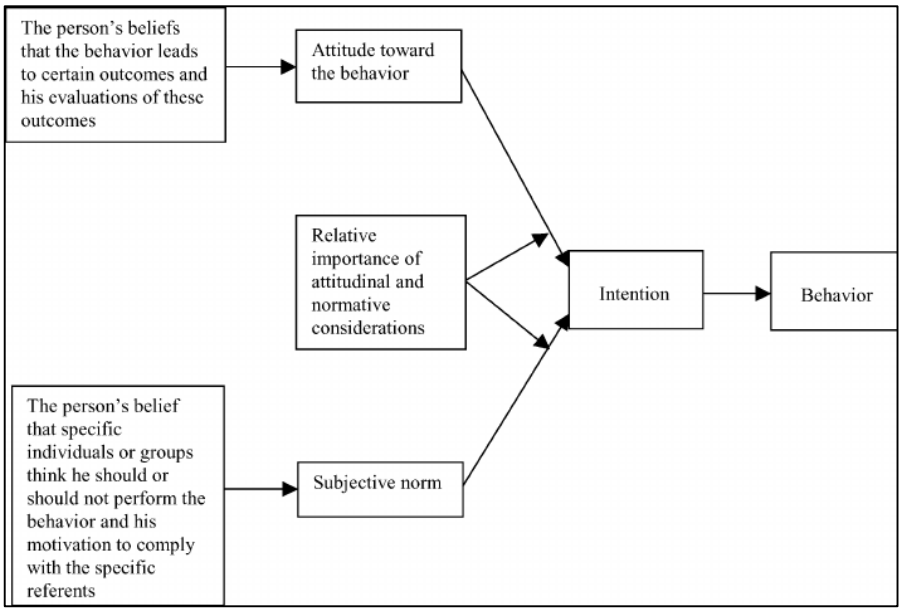

Figure 2.5 A Theory of Reasoned Action (TRA)

Source : Ajzen & Fishbein (1980)

TRA is measuring the attitude and social beliefs, which involves an individual's beliefs towards a certain action (Beedell & Rehman, 2000). However, some studies argued that the TRA is limited when an individual perceives his or her ability to successfully carry out behaviour with a low or not having a full volitional control over the behaviour (Burton, 2004; Ajzen & Madden, 1986). Many factors either internal (i.e. skills, abilities, knowledge or training) or external (i.e. time,

opportunity) can interfere with control over the behaviour (Ajzen & Madden, 1986). Therefore, by including the *Perceived Behavioural Control* (PBC) may strengthen the theory and this also is assumed to influence the intention in the Theory of Planned Behaviour (TPB). As the TPB emphasises, the attitudes alone are not sufficient in determining certain behaviour - other aspects such as social pressure and perceived difficulty in carrying out the action are also need to be considered. (Refer Figure 2.6)

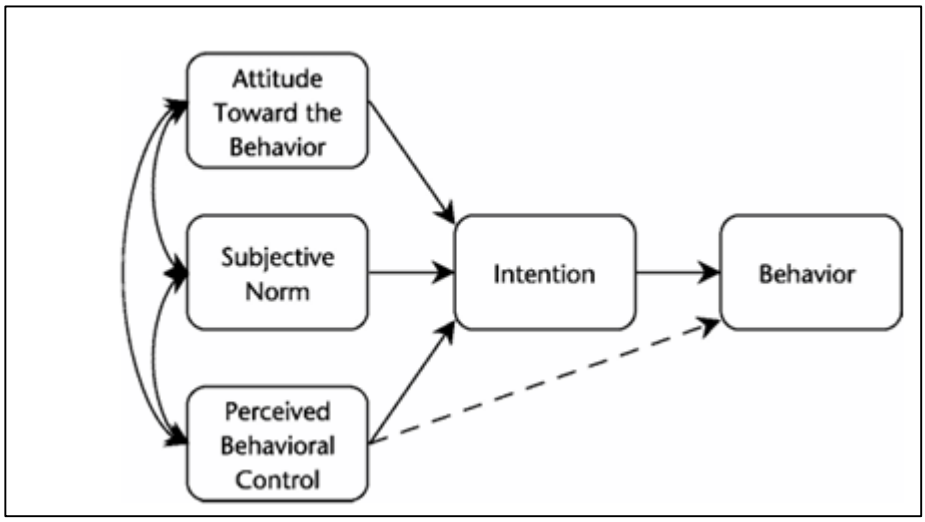

Figure 2.6 The Theory of Planned Behaviour

Source : Ajzen (2005)

The TPB theory assumes that the behavioural achievement depends on the intention which is based on the three factors of determinants (attitude towards behaviour, subjective norm and perceived behavioural control). In fact, in some cases perceived behavioural control could be more important for some behaviours than the others. In some instances, only one or two factors are needed in explaining the intention, while in other situation all three factors are important determinants. In addition, the weight of the three factors also may vary from one another, and depends on the sampling population.

Figure 2.6 also shows the importance of Perceived Behavioural Control (PBC) towards intention and behaviour. This concerns the link in Figure 2.6 which shows a direct arrow from PBC to the intention, without mediated effect by attitude or subjective norm. Besides, there also possibilities that PBC can influence behaviour directly (as shown broken arrows towards behaviour), and this

might happen as long as individuals are having an adequate control to form the behaviour. As Ajzen (2005) explains, the broken arrow indicates that the link between PBC and behaviour is expected to emerge when there is some agreement regarding the person's actual control over the behaviour.

PBC is found to be an important determinant in the TPB. As Ajzen (2005, p. 184) stated the PBC refers to people's perceptions of the ease or difficulty of performing the behaviour of interest. Hence, in the context of this PhD thesis, people who believed that they could farm organically and were confident about keeping organic documentation, will have a strong determination to farm organically. This is supported by the studies of Promotosh (2011) and Adnan *et al.*, (2017) who also reported that people's behaviour was strongly influenced by their confidence in their ability to perform it (PBC) (in this case, in purchasing organic products), and this may also facilitate the performance of the behaviour.

So far, TPB has been successfully applied and explained to a wide range of studies including financial studies (Bagozzi, 2000; East, 1993), consumer's intention (Promotosh, 2011; Ryan & Bonfield, 1975) and also in relation to health care (Conner *et al.*, 1999). Furthermore, a lot of research has been using TPB as a basic model within agricultural settings, for instance in exploring farmer's decision-making (Borges, Luzardo and Vanderson, 2015), explaining farmer's conservation and environmental behaviour (Beedell & Rehman, 1999; Lynne *et al.*, 1995; Reimer *et al.*, 2012) and farmer's behaviour towards agricultural schemes (van Dijk *et al.*, 2015; 2016). In the context of organic farming, there are also a number of studies that have applied TPB, focusing on the organic farming adoption (Barhoum, 2010; Läpple & Kelley, 2010; Rezai *et. al.*, 2016) consumer and intention behaviour towards organic products (Latiff *et al.*, 2015); as well as organic consumption behaviour (Al-Swidi *et al.*, 2005; Teng & Wang, 2015).

2.4 The Adoption and Diffusion Process in Agriculture

There is a vast literature on the adoption and diffusion of technologies in agriculture (Feder *et al.*, 1985), and the majority of these studies tends to focus on the adopters and non-adopters of a technology (Burton *et al.*, 2003; D'Souza *et al.*, 1999). Organic farming also shares similarities with other agricultural technologies in term of the adoption diffusion process (Burton, *et al.*, 1999; Läpple & Rensburg, 2011; Padel, 2001). Table 2.2 explores varieties of agriculture adoption and diffusion processes that have been studied in rural sociology and other relevant fields. From the

literature search, organic farming adoption shows a higher contribution towards the adoption diffusion process particularly in rural sociology field.

Table 2.2 Agriculture Adoption and Diffusion Process in Rural Sociology and Other Relevant Fields

Adoption	Example Authors
Organic Farming Adoption	Leslie Duram (1999) Burton, Rigby & Young (1999) Padel (2001) Dimara & Skuras (2003) Ika Darnhofer *et. al.* (2005) Paul (2011) Läpple & Rensburg (2011) Kings & Ilbery (2012) Kallas *et. al.* (2012) Shohreh *et. al.* (2013) Läpple & Kelly (2013) Laure & Celina (2014) Robert (2014) Mrinila Sing *et. al.* (2015) Sodijinou (2015) Altenbuchner *et al.*, (2016)
Conservation practices adoption	Grainer & Gregg (2011) Grainer (2009) Goswami (2012) Vignole *et. al.* (2010)
ICT and Technology Adoption	Jabir Ali (2012) Mc Donald (2015) Meijer (2015)

2.4.1 The Challenges of Farming Organically

Blabaum (1983) explored barriers to conversion to organic farming in the Midwestern US. According to this research, barriers included lack of information on organic methods, fear of a radical drop in yields, weed problems, and objections from concerned landlords. This theme continues with Fisher (1989), who highlighted barriers including perceived technical difficulties (in term of pest control), the uncertainty of organic food markets, lack of production and marketing information, and current economic hardship as main deterrents preventing producers adopting organic farming in New Zealand at that time.

The conversion to organic farming involves firm decision making and strategic planning that will affect the whole farm. The literature highlights institutional barriers as a major concern in shifting to organic farming. A range of institutional barriers have been identified, including landlord objections, problems with certification, as well as lack of access to technical information and extension support (Blobaum, 1983; Henning *et al.*, 1991; Padel, 2001; Asadollahpour *et al.*, 2016). Unhelpful advisory services may also lead farmers to obtain information from other sources and ignore the role of agricultural extension services (Lampkin & Padel, 1994). Padel (2001) highlighted that organic farming is an information intensive farming method that requires substantial learning and changes in farming systems. Hence, it is important to have institutional assistance and research on educational needs is a key concern in supporting farmers to adopt organic farming.

In contrast, Sierra *et al.*, (2008) identified a wide range of economic barriers towards organic conversion. Based on their work, farmers ranked their main concerns as farm production, marketing and regulatory problems, followed by costs and obtaining organic premiums. In these results, economic concerns are argued as the main deterrent to adopting organic farming. Most farmers are concerned about financial costs and spending time and energy on conversion (Asadollahpour, Najafabadi & Hosseini, 2016; Jouzi *et al.*, 2017). Financial incentives, debt and income are also barriers to conversion among small scale farmers (Pinthukas, 2015). Padel *et al.*, (2002) revealed that eligibility restrictions for receiving financial assistance have become an important challenge to the greater uptake of organic practices among EU countries. However, Läpple & Kelley (2010) argued that technical and social constraints need to be addressed before economic incentives. This

is because financial incentives alone, particularly around support payments, are not sufficient to increase the number of organic farmers, without first overcoming technical and social barriers. Technical and social barriers are also identified as important challenges for farmers shifting to organic farming. Jouzi *et al.*, (2017) revealed concerns about lower yields and difficulties in soil management as the main deterrents for conversion. Also, Läpple & Kelley (2013) pointed out that social acceptance may become a barrier to adoption. For instance, negative opinions of family members and other farmers regarding organic farming practices may constrain adoption (Gardebroek, 2006).

A study by Wheeler (2008), emphasised that market issues were the main barriers to farmers' adoption of organic practices in Australia. This is concurrent with Xie Wang *et al.,* (2015) who argued that the organic food market problem might relate to consumers' lack of knowledge, relatively high premium price and lack of availability of organic products. Furthermore, general assumptions in the domestic organic market such as higher prices and lack of availability, were barriers in the consumption of organic products (Partap & Saeed, 2010).

2.4.2 Factors Influencing the Decision to Farm Organically

A large and growing body of literature has investigated the factors that influence farmers to adopt organic farming practices. A great deal of literature identifies a broad ranges of factors associated with the adoption and non-adoption of organic farming (Burton *et al.*, 1999; 2003; Darnhofer *et al.*, 2005; Fairweather, 1999; Hattam *et al.*, 2012; Läpple & Rensburg, 2011; Padel, 2001; Sierra *et al.*, 2008). Most studies have a specific direction where the investigation is based on the correlation between adoption and dependent variables. A number of studies refer to Rogers' (2003) process of diffusion, however, Padel (2001) argues that this model should not be relied on alone as it only consider the personal characteristics of the adopters; when in fact other factors such as policy support, the attitude of farmers towards organic movement, and market development play a major role and need to be considered as well.

Several studies have attempted to describe the factors and the determinants of adopting organic farming systems. These studies used different approaches including (1) the adoption approach, which relied upon cross-sectional data analysis to assess any conversion (Anderson *et. al.*, 2005; Rigby & Young, 2001); (2) the diffusion approach, which investigated the cumulative adoption

rates using time series-data (Feder & Umali, 1993); (3) the impact approach, which used mathematical programming and simulation methods to measure the outcomes based on farm performance (Kerselaers *et. al.*, 2007); and (4) the comparison approach, which compared organic and conventional farming methods (Serra *et al.*, 2008). The lists of authors and the type of statistical analysis has been summarised as in Appendix 1, with regards to the adoption decision studies.

In terms of methodological approach, some of these studies are investigated based on quantitative analysis of surveys (Hattam, 2006; Läpple & Rensburg, 2011; Mzoughi, 2011a). Two main statistical approaches are used in measuring the adoption of new technology (Rigby, Young and Burton, 2001). The first uses bivariate analysis (typically binomial and multinomial logit techniques), where the model deals with the choice between two alternatives, including dichotomous and continuous adoption variables (Green, 2000). These techniques are well-established approaches in measuring the adoption of agricultural technology (Feder *et al.*, 1985; Lapple & Kelley, 2015). The second statistical approach is focused on the diffusion, where the cumulative adoption rate is measured at the aggregate level (Feder, Just and Zilberman, 1985; Feder and Umali, 1993). Other than these, there are also studies that involved multivariate analysis in identifying the factors, by using a principle component factor analysis (PCA), cluster analysis and also discriminant analysis (Greiner *et al.*, 2009; Läpple & Kelley, 2013; Nandi *et al.*, 2015). The PCA is useful to pool or reduce the variables into a smaller number of factors, while discriminant analysis is purposely used for identifying the most important variables explaining the dependent variables, i.e. farmers' decision for conversion to organic production methods (Hair *et al.*, 2010). Davies (1979) examined that the issue of why particular farms adopt earlier than others but this is not well addressed in the diffusion studies. Some researchers come to conclusions by using duration analysis in order to explain the time that farmers take to adopt new technology, particularly in both decision and diffusion aspects in organic farming (Burton *et al.*, 2003; Kallas *et al.*, 2010). The great advantage of duration analysis is that it deals with both cross-section and time series data, where it allows the information of adoption and diffusion to be measured at the same time (Rigby, Young and Burton, 2001).

There are also qualitative studies, drawing on in-depth interviews in order to have a better understanding of how farmers make a decision to farm organically (Fairweather, 1999; Darnhofer, 2005; Duram, 2009). This approach usually encompasses a smaller sample size (less than 80

farmers), and it provides in depth understanding about the decision making process (using decision tree model), the barriers farmers face in adopting organic farming practices, as well as the various factors that affect farmers choice.

Furthermore, a number of studies have examined the organic farming adoption through employing the economic and management theory approaches. For instances, Hattam & Holloway (2005) found that the adoption is certainly influenced by production cost per hectare and inputs. Pietola & Lansink (2001) estimated farmers' responses to economic incentives and the importance of input and output prices when converting to organic farming, while Musshoff & Odening (2005) trace the differences in gross margins and the size of transaction costs in seeking out new markets and information. Some studies have compared the economic and financial performance of organic and conventional farms to show the differences between these two alternatives (Lampkin & Padel, 1994; Offermann & Nieberg, 2000). However, other research has shown that financial and economic motives are a key driver in converting to organic farming (Best, 2010; Koesling *et al.*, 2008). Fisher (1989) argued that a combination of economic and non-economic factors have a greater influence on the likelihood of shifting to organic farming practices.

Conversion to organic farming also involves a complex system of change, often leading to higher production costs and greater risks; outcomes that farmers usually try to avoid (Asadollahpour *et al.*, 2016; Padel, 2001). Previous research suggests that organic adopters have been influenced by non-economic considerations, such as environmental (Knowler & Bradshaw, 2007; Chouichom & Yamao, 2010) and health concerns (Alexopoulos *et al.*, 2010; Mzoughi, 2014). Some research argues that adopters are not driven by financial concerns, but instead by attitudinal and social factors (Burton *et al.*, 2003; Rigby *et al.*, 2001).

Others used a broader approach by considering a variety of socio-economic factors (Burton *et al.*, 2003; Läpple, 2010). These empirical works demonstrated that output prices, policy changes, farm and structural factors, the farmer's own characteristics contributed to the uptake of organic farming. Despite providing valuable insight into the adoption process of organic farming, all of these studies treat farmers as a homogeneous group and, more importantly, only a few studies measure farmer heterogeneity. These studies mainly measure the willingness and ability of farmers to convert to organic farming (Läpple & Kelley, 2013).

The importance of farmers' information and knowledge were also emphasised in several studies that examined the process of converting to organic agriculture. For instance, Lockeretz (1989) noted that the accumulation of knowledge is important to the expansion of organic farming. In a study on conversion from conventional to organic cereal and livestock farming, Wynen (2004) noted that with regard to a farmer's decision to switch to organic farming, it is extremely important to be well informed about organic farming prior to making the conversion. Padel (2001) also highlighted the importance of knowledge networks in converting to organic farming. According to Wollni & Andersson (2014), neighborhood networks are the most critical for influencing farmers to choose organic.

Beyond those issues, social factors also play an important role in affecting the adoption of organic agriculture. Bremiyer (1984) argued that not all farmers undertake organic practices purely for economic reasons and that social factors can influence conversion decisions. Similarly Lobley *et al*., (2005) suggested that the "social space" of the farmer is an important component in making a decision, with respect to giving advice and receiving information from others.

Debates have emerged on the relatively importance of a combination of various factors in determining the adoption and diffusion of organic farming, such as socio-demographic and economic variables, perceptions and attitudes behavior (Sattler & Nagel, 2010; Wilson & Hart, 2000). Mzoughi (2011) also emphasised that moral and social concerns also play a major role in farmers adopting organic farming practices. Based on this study, social concerns such as showing an environmental commitment can drive decisions to adopt organic farming, whereas moral concerns will increase the possibility of adoption. Appendix 2 indicates various factors by study that influence farmers in adopting organic farming practices.

2.4.3 Determinants in Developed and Developing Countries

While organic farming is well established in developed countries, it is still an emerging sector in the developing world. The demand for organic produce from developed countries in recent decades has encouraged the development of organic agriculture in some developing countries (Karki *et al.*, 2011), such as those in Southeast Asia (Chouichom & Yamao, 2010; Lee *et al.*, 2016).

By comparing the determinants of organic conversion across developed and developing countries, clear differences are apparent. Most organic conversion in European countries has been driven by environmental and health concerns (Best, 2010; Burton *et al.*, 2003; Läpple, 2010; Rigby *et al.*, 2001). Other than that, the expansion of the organic movement has also been influenced by policy support, such as subsidies under agri-environment schemes, and improved technical efficiency, such as improved pest and disease control (Kallas *et al.*, 2010; Latruffe & Nauges, 2014; Sahm *et al.*, 2012). In contrast, the adoption of organic farming in developing countries is mostly driven by institutional factors, particularly government support and extension services (Altenbuchner *et al.*, 2016; Salazar, 2014; Sodjinou *et al.*, 2015). This is followed by socio-economic factors (Karki *et al.*, 2011; Pinthukas, 2015; Singh *et al.*, 2015) and farmer attitudes (Nandi *et al.*, 2015; Pornpratansombat *et al.*, 2011).

Several studies in Southeast Asia, particularly in Thailand and the Philippines, have revealed that the attitudes and experience of farmers, and support from extension services, all play a major role in the adoption of organic farming (Chouichom and Yamao, 2010; Salazar, 2014; Pinthukas, 2015). In Malaysia, the literature review found little relevant research examining the factors that lead farmers to adopt organic practices, although some research has explored the issues and challenges faced by organic farmers during adoption (i.e. Tiraieyari *et al.*, 2014; Suhaimee *et al.*, 2016). However, there are similar studies focusing on adoption decisions around sustainable agricultural practices (SAPs), for example research by Tey *et al.*, (2014). This research suggests that the adoption of SAPs depends on a range of factors, including socio-economic, agro-ecological, institutional, informational and psychological factors. Other research focuses on the relationship between farmers' attitudes and their intentions towards organic methods, demonstrating the role of contract farming as a moderating effect on the adoption of organic farming practices (Rezai *et al.*, 2016). Both studies utilise conventional farmers as their main unit of analysis. Jamal *et al.*, (2014) also seek determinants that influence conventional farmers' decisions to adopt new rice varieties, where the results indicated that technology plays a major role in influencing farmers' decisions.

2.4.4 Behavioural Aspects in Determining Organic Adoption

Another strand of research takes the behavioural approach to explain farmers' conversion to organic farming. As suggested by Burton *et al.,* (2003), motivation, values and attitudes determine individual farmers' decision-making processes. Thus, farmer types and their rationale for being organic have been identified by Darnhofer *et al.,* (2005) and Fairweather (1999). Lampkin & Padel (1994) reviewed the evidence on the motivations of organic farmers, and identified the most common factors among organic producers, including family's health, concerns about husbandry (e.g., soil degradation, animal welfare), lifestyle choices (ideological, philosophical, religious) and financial considerations.

Farmers' attitudes towards organic farming should not be overlooked when exploring the potential to expand the adoption of these practices. Previous studies have shown that farmers' attitudes are important determinants in their willingness and ability to adopt new technologies, including organic farming methods (e.g., Burton *et al.,* 2003; Altenbuchner *et al.,* 2016; Okon & Idiong, 2016). According to Ajzen (2005), attitudes can be assumed to be relatively stable, although they may change due to new information received. Chouichom & Yamao (2010) revealed that, compared to conventional farmers, organic farmers show a greater enthusiasm and desire to learn about organic methods.

Evidence from Iran suggests that Iranian farmers who have a positive attitude towards organic farming, are more likely to adopt organic farming practices (Soltani *et al.,* 2013). This finding is supported by other studies where positive attitudes have been found to influence the decision to adopt organic farming (Kallas *et al.,* 2010; López & Requena, 2005; Rezvanfar *et al.,* 2011; Rigby *et al.,* 2001). Lobley *et al.,* (2009) emphasised that the important distinctions between organic and non-organic farmers do not directly reflect their farming systems, but instead relate to the individual farmers and their behaviour.

2.5 Summary

This chapter describes the definition and principles underpinning organic farming and explores the development of organic agriculture worldwide. In assessing farmer's decision making towards organic farming, several theories have been discussed including the Decision Making Model (Sonkilla, 2002), the Diffusion Innovation theory (Rogers, 2003) as well as the Theory of Planned Behaviour (Ajzen, 2005). Rather than drawing on just one theory, this doctoral thesis draws on different theoretical approaches from the literature and uses these to explain decision-making behaviour concerning the decision to adopt organic farming in Malaysia. Even though most of the theories originated in western countries, these theories are used to inform the empirical model in relation to farming adoption in a Malaysian context.

This chapter also exploring the challenges of farming organically besides considered studies that explore a combination of relevant factors influencing farmer's decision, including behavioural aspects in influencing the adoption of organic farming. These literature eluting some critical information that also highlights other studies who come across and using the adoption of organic farming from various motives, for instance economic point of views, socio-economic and behavioural approaches and also sociological considerations.

This thesis will draw upon both theories (Diffusion Innovation theory (Rogers, 2003) and the TPB by Ajzen (2005)) when exploring farmer decision-making and attitudes towards organic farming, specifically from the Malaysian context. It is important to examine the agricultural context more broadly in Malaysia and specifically the development of organic farming and in the next chapter, in understanding the nature of organic movement particularly by looking at the structural, cultural and socio-economic characteristics. This might provide more explicit explanation on the nature of organic movement in Malaysia so far, and also identifying policy instruments that has been implemented in promoting organic movement.

CHAPTER 3. THE DEVELOPMENT OF ORGANIC AGRICULTURE IN MALAYSIA

3.1 Chapter Outline

Organic development in Malaysia is relatively young and was first introduced as a concept in 1986 by a Non-Governmental Organisation (NGO) who committed to promote organic practices. Several pioneering organic farms were established in the 1990s but these were scattered across the peninsula. While this early growth was initiated by external drivers (i.e. the NGO), support from the Malaysian Government since 1998 has grown to include specific budgetary allocations, administered through various plans and programmes, aimed at farmers who intend to adopt organic practices. Such allocations are still being made and plans for the future development of sustainable agriculture in Malaysia identify organic farming as a priority.

Most of the organic farms in Malaysia are small scale producers but the sector has grown substantially over the years. This growth has been supported by the *MyOrganic* certification scheme that helps to ensure that certified organic products meet certain health and quality standards. As well as the work of NGOs and government, consumer demand for organic food has also been an important factor in increasing organic production. Since the demand for organic products is projected to increase in the future, it has become more important for Malaysia to be able to produce its own organic products rather than relying on imports. Such concerns remain important in the Malaysian context and it is important to identify the future role that organic farming will have in achieving sustainable agricultural growth at a national level.

Following reviews of literature on factors influencing farmer's decision to adopt organic farming and the challenges of farming organically in the previous chapter, this section will provide some specific key information about Malaysian agriculture and the organic farming movement. An overview of agriculture activities in Malaysia is presented in Section 3.2, the details of the policies governing agricultural sectors are examined in Section 3.2.1, and future targets for the organic movement are discussed in Section 3.2.2. Section 3.3 focus on the development of the organic movement in Malaysia, including relevant policy interventions (Section 3.3.1) and a description of organic accreditation in Malaysia (Section 3.3.2). The demand and markets for organic products

are identified in Section 3.3.3, while the current state of the organic movement is reported in Section 3.3.4. Section 3.3.5 discusses knowledge exchange and the support provided for organic farmers, while Section 3.4 explores future supports for developing organic farming in Malaysia. Section 3.5 concludes the chapter.

3.2 An Overview of Agriculture Sector in Malaysia

Malaysia is located in the South East of Asia, and consists of Peninsular Malaysia (West Malaysia) and Malaysian Borneo (East Malaysia). It is situated to the south of Thailand, bordering the Strait of Malacca to the west, and Singapore to the south. East Malaysia, the other part of the federation is located in the northern part of the island of Borneo bordering the South China Sea, and it consists of Sabah and Sarawak (Figure 3.1).

Google Earth: Searchable Map and Satellite View of the Federation of Malaysia.

Figure 3.1 Map of Malaysia

Sources: https://www.google.co.uk/maps/search/malaysia

As shown in Figure 3.2, Peninsular Malaysia can be divided into four regions, namely; Northern, Eastern (East coast), Central and Southern. Overall, Malaysia comprises of thirteen states and three federal territories (the Federal Territory of Kuala Lumpur, Putrajaya and the Federal Territory of Labuan, Sabah).

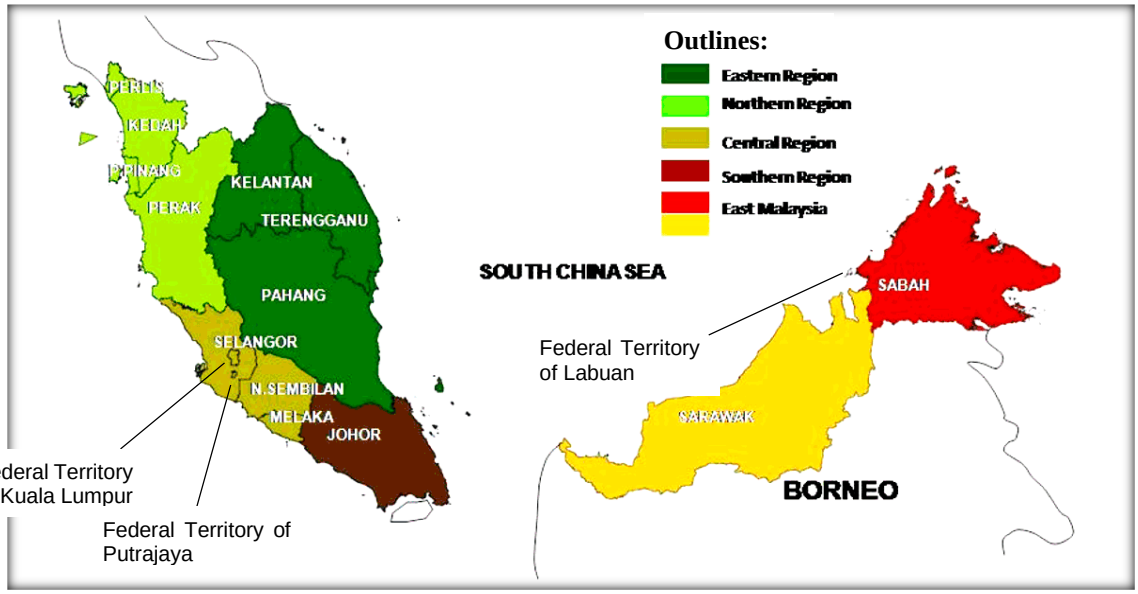

Figure 3.2 Region and Territory in Peninsular Malaysia

Sources from:

http://www.mlit.go.jp/kokudokeikaku/international/spw/general/malaysia/index_e.html

The agricultural sector plays a major role in the economic development of the country, by providing rural employment, uplifting rural incomes, and ensuring national food security. In fact, agriculture activities have been identified as one of the country's engines for growth since the 8th Malaysian Plan (2001-2005). Even though agriculture's contribution to Gross Domestic Product (GDP) declined from 28.8% in 1970 to 7.3% in 2010 (due to a shifting focus from agriculture to manufacturing), in poorer states such as Perlis and Sabah, agriculture's share of GDP can be as high as 25 to 30% (Jala, 2013). The agricultural sector accounted for 7.1% of Malaysia's GDP in 2013 (ETP Annual Report, 2014), and the latest data provided by the Department of Statistics Malaysia (2016) indicates that the agricultural sector continues to expand with a contribution of 8.9% to GDP in 2015 (Figure 3.3), where oil palm was a major contributor at 46.9%, followed by other agriculture (17.7%), livestock (10.7%) and fishing (10.7%).

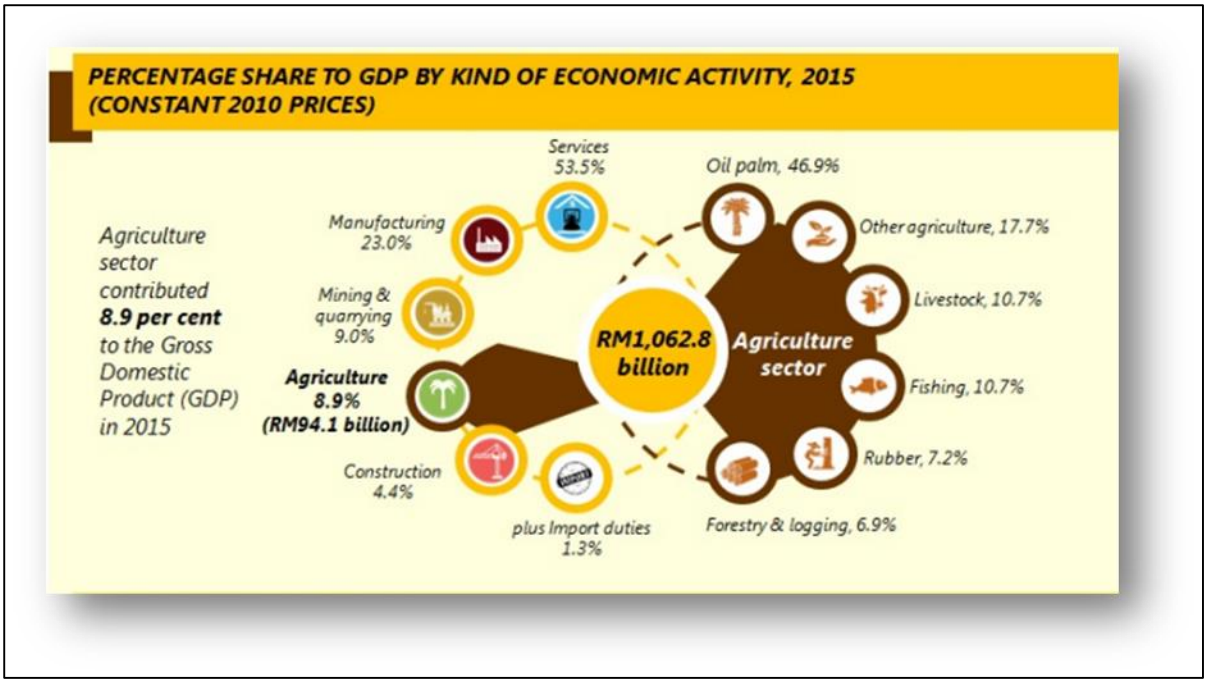

Figure 3.3 Agriculture Sector Contribution towards GDP in 2015

Source: Department of Statistics Malaysia (2016)

Even though the relative importance of agriculture may be declining, it is still crucial to maintain food security and rural employment. It deserves attention because a large number of people depend on it. People need agriculture for supplying essential food, as Malaysia is still not self-sufficient. In addition, since patterns of food consumption in Malaysia have changed due to increases in awareness around food quality and safety, farmers have started to respond to the high demand for new agricultural products, specifically fresh fruit and vegetables. High returns can be made from using agriculture land to grow oil palm, fruit and vegetables (Olayini, Ramli and Sood, 2013).

In response to increase demands for fresh fruit and vegetables, the Malaysian Ministry of Agriculture and Agro-based Industry (MoA) established National Key Economic Areas (NKEA) in 2010. This programme aimed to increase annual production of these commodities based on specific targets. According to the Economic Transformation Program (ETP) Report in 2014, vegetable and fruit production in the NKEA Programme met the 2014 target and also succeeded in surpassing the 2014 Gross National Income (GNI) target (recording a GNI contribution of RM57.8 billion). To date, the agricultural sector has sustained the development, and this sector contributed to the RM73.6 billion in 2017 GNI. This is generated by the growth of the processed food sector,

aquaculture and herbal products, as well as from development of Smallholder and Medium Enterprises (SMEs).

In addition, by looking at the latest Self-Sufficiency Level (SSL) for each commodity, the majority have recorded positive increases since 2010. This is due to specific planned interventions, including improving seed quality, encouraging wider technological adoption among farmers, improving extension services and introducing better agronomic practices (11th Malaysian Plan, 2016). Table 3.1 present the SSL for food commodities, starting from 2010 and projecting data up to 2020.

Table 3.1 Self-Sufficiency Level (SSL) of Food Commodities, 2010-2020 (%)

	2010	2015	2020
Crops			
Rice	63.1	71.4	100
Fruits[1]	103.3	101.6	106.5
Vegetables[2]	89.8	91.8	95.1
Livestock			
Beef	30.1	27.2	50
Mutton	12.2	17.3	24.6
Poultry	105.6	104.6	103.7
Pork	94.7	88.7	83.1
Eggs	114.6	122.1	130
Milk	8.5	13	13.6
Fish[3]	93.9	92.6	95.8

Note: [1] Excludes temperate fruits
[2] Excludes temperate vegetables
[3] Includes seaweed
SSL = Production / (Production+Import±Stock-Export) x 100
Source: Ministry of Agriculture & Agro-based Industry (2016)

Since there is an urgent need to develop agricultural products to fulfil global demand as well as supporting national and rural incomes, it is not surprising that the MoA is willing to take vigorous action to influence more farmers to participate in agriculture activities. Their aim is to transform agriculture into agribusiness, moving towards a model that focuses on market-centricity, economies of scale and value chain integration in the future (NKEA, 2010).

3.2.1 Agricultural Policy

The Agricultural Policy is an official written strategy, documented and formulated by the government to support the development of the agricultural sector in Malaysia. The Agricultural Policy is based on a specified period, and achievement is monitored at the end of each phase. The policy was established in two distinct eras; firstly before Malaysia achieved independence (1948-1957) and secondly after independence (1958-2020).

1) Pre-independence Period (1948-1957)

The pre-independence policy focused on plantation crops, such as rubber, palm oil and cocoa, which were more likely established by the British. During that time, rubber plantations became the most important commodity that produced raw material for industrial and manufacturing products for the United Kingdom and the United States. A lot of immigrants from India were imported to work in the plantations, whereas other food commodities such as rice, fruit and vegetables were produced by small-scale farmers, the majority of whom were traditional farmers. Because of this concentration on plantations, rubber became the most important contributor to the economy through export income, and Malaysia became one of the top producers of rubber during this period.

The contribution of the agricultural sector during this period was extremely important to the development of Malaysia in terms of infrastructure, i.e. establishment of ports, road systems, and railways. These facilities were important as they became the basic means of transportation for the commodities to be exported to other countries. However, because the focus was more on plantations (for export production), rather than other commodities, other crops were neglected, leaving the indigenous population lagging behind in terms of domestic agricultural production and consumption. This situation led in two directions; first profitable rubber plantations for exports, and secondly hand-to-mouth subsistence within rural communities. This pre-independence policy has led to a unique racial identification by types of commodity, whereby classification can be differentiated by ethnicity, for instance rice paddy for indigenous Malays, rubber for Indians and vegetable farms for Chinese. This separation of enterprise would become the basis for agricultural development and is still in evidence today.

2) Post-independence Period (1957-2020)

After Malaysia gained independence in 1957, the government continued the agricultural policy that had been set up by the British administration. The original policy plan was called 'The Malaya Economic Plan (1957-1983)' where a strategic direction was designed and published as national policy. During this period, the focus was on continuing previous strategies and this led to rubber plantations and palm oil becoming the main sources of income in the Malaysian economy.

The period from 1984 to 1990 showed a remarkable shift in the development of the agricultural sector in Malaysia. During this period, the First National Agricultural Policy (NAP1)[1] was established and this era revealed a significant transformation from agriculture to manufacturing sectors, which resulted in great challenges in terms of labour, costs and land as there was competition between the sectors. NAP1 was purposely designed to address the issue of rural poverty and the imbalance in income between commercial and traditional farmers. This era generated employment opportunities for rural communities as well as increasing food production for local consumption.

The next National Agricultural Policy (NAP2)[2] was published in 1992 continuing from the previous plan. This policy placed great emphasis on increasing production, aiming to meet the demand for agro-food products in the domestic and local markets. Throughout this period, the government began to fund a variety of incentive schemes, using infrastructure and subsidy programmes to increase the participation of small-scale farmers. In addition, the government also focused more on research, development and training to improve farmers' knowledge.

The Third National Agricultural Policy (NAP3)[3] was launched as a revised version of NAP2, and was formulated in response to the Asian Financial Crisis (AFC) in 1997. This policy ran from 1998 until 2010, and aimed to enhance food security, purposely targeting the sustainable development of agriculture. During this era, the application of new technologies such as mechanisation and

[1] Ministry of Agriculture Malaysia (1983). *National Agriculture Policy* (1984-1991) Executive Summary. Kuala Lumpur
[2] Ministry of Agriculture Malaysia (1992). *Second National Agriculture Policy* (1992-2010) Executive Summary. Kuala Lumpur
[3] Ministry of Agriculture Malaysia (1999). *Third National Agriculture Policy* (1998-2010) Executive Summary. Kuala Lumpur

automated production systems had started to be implemented to increase productivity and reduce production costs.

In continuing the responsibility for the development of the agricultural sector in Malaysia, the National Agro-Food Policy (2011-2020)[4] or NAP4 has been formulated to address the challenges of agro-food production in both the domestic and global markets. The term 'sustainable' has been used widely, as food security and safety have become the main challenges that need to be tackled. This policy also aims to transform the agricultural sector into a more modern and dynamic food industry, incorporating further strategies in line with improving the health and nutritional aspects of food systems.

3.2.2 Modernising the Malaysian Agricultural Sector towards the Year 2020

Malaysia continued its programme of a planned development by launching a critical element of Malaysia's journey to become a developed nation by 2020. By focusing on the agricultural sector, the plan is in line with National Agro-Food Policy (2011-2020) and National Commodity Policy (2011-2020)[5]. The main aim is to transform the agro-food industry into a sustainable and high-income sector. Key objectives include ensuring food security, improving productivity, enhancing delivery services, enhancing farmers' knowledge and skills, as well as ensuring compliance with international market standards.

To achieve targets, seven strategies have been identified to spur the growth of the agricultural sector. One strategy is to emphasise performance-based incentives through certification programmes (as stated as in Strategy 7, 11th Malaysian Plan). This strategy encourages more farmers to become certified (focusing on the Good Agricultural Practices (*MyGAP)* Certification) by prioritising certified farmers for incentives and support. An increasing number of farmers have been granted *MyGAP* certification, and 829 fruit and vegetable farms had been awarded by 2016 (Economic Transformation Programme (ETP), 2016)[6]. Alongside this, *MyGAP* has enhanced

[4] Ministry of Agriculture and Agro-Based Industry (2011). *National Agro-Food Policy* (2011-2020). Kuala Lumpur
[5] Ministry of Plantation Industries and Commodities (2012). *National Commodity Policy* (2011-2020). Kuala Lumpur
[6] Economic Transformation Program (ETP). *Annual Report* (2016). Prime Minister Department Kuala Lumpur

consumer awareness and demands regarding food quality and safety, and boosted competitiveness at the international level (Dardak, 2016).

To date, *MyGAP* certification has had a promising response from farmers, many of whom have opted to participate in the scheme. Indirectly, the positive impacts of *MyGAP* certification can influence other farmers who can see how the certification process has become an effective tool for promoting agricultural modernisation, as well as providing a means of providing quality assurance for agricultural products.

Apart from the certification programme, various new agricultural technologies have been developed. These range from the development of new or better varieties of seed, methods of harvesting, storage, and transportation technologies. For instance, biotechnologies have been widely used in Malaysia to develop crops that are more resistant to pests, less susceptible to weather changes and to improve the sensory qualities of food. Chemicals and mechanisation have also been used extensively in Malaysia. These modern agro-technologies have led to improvements in farmers' livelihoods (Wan Saiful, 2011). It is argued that these innovations can increase yields, while reducing losses and costs. This has led the government to provide subsidies and incentives (in the form of support for infrastructure improvements and mechanisation) to assist farmers to adopt these new approaches.

3.3 Development of Organic Agriculture in Malaysia

There are a mixture of drivers that have encouraged the growth of the organic movement in Malaysia. In addition to internal drivers, such as support from government agencies and NGOs, various external bodies, such as the European Union (EU), promote the development of sustainable agriculture, including organic farming.

In the early stages of organic development, growth has followed two paths, one led by non- NGOs and the other by the private sector. One NGO that was instrumental in establishing organic farming is the Centre of Environment, Technology and Development (CETDEM), which played a major role in raising public awareness on human health issues, particularly around the impacts of pesticides. In 1987, CETDEM decided to promote organic principles in its work. Many organic farms were established in the 1990's in their traditional ways, looking to take advantage of the

increase health conscious consumers. Some of these had cancer and the majority were Buddhist vegetarians. Over time, organic food has developed into an informal niche market, with individuals setting up home-based distribution centres to sell and distribute organic products.

The introduction of the commercial production of organic compost and fertiliser in Malaysia was an important milestone in the development of organic agriculture and provided organic farmers with a steady supply of vital inputs. In 1995, Premier Organic Produce was established as a commercial wholesalers for organic products, supplying a range of fresh produce, mostly vegetables. From here, organic farming started to become more important to the country, with national policies targeting the conversion of smallholder farmers to organic methods.

3.3.1 Policy Intervention

Organic practices have been highlighted in Malaysian planning and agriculture policy development since 1998. This started with the National Agriculture Policy (NAP3) (1998-2010), where organic agriculture was identified as a market opportunity, mainly for vegetable and fruit growers, and organic farming was identified as a niche market opportunity for small-scale producers (Ahmad, 2001). Suhaimee et al., (2016), suggest that while the targets set out in NAP3 were not successfully achieved, the Malaysian Government continued to support organic farming through its National Plan (see Table 3.2) and the National Agro-Food Policy (2011-2020), where the development of organic agriculture was identified as an important objective on the way to achieving more sustainable development. Table 3.2 illustrates some significant phases of these plans, particularly their influence on promoting organic farming activities. The table demonstrates that organic farming has become more important over the years and various strategies have been implemented to encourage more farmers to adopt organic practices.

Table 3.2 Malaysian Plan Promoting Organic Farming

Phase	Agenda that focus on organic farming
8th Malaysian Plan (2001-2005)	• Aiming to increase organic land by 250 hectares (ha). • Government assists in US$1300 per ha (in the form of infrastructure) and introduces a certification scheme targeting the domestic market.

	• 2002 – Ministry of Agriculture and Agro-Based Industry (MoA) support services like extension, training, and R&D to develop more organic agriculture in Malaysia • 2003 – the establishment of Malaysian Organic Certification scheme by the Department of Agriculture (DoA) based on Malaysia requirement MS1529:2001
9th Malaysian Plan (2006 – 2010)	• Government targets 20,000 ha of organic farms developed by year 2010 • Set up the Organic Farm Project for farmers who are interested in adopting organic practices
10th Malaysian Plan (2011-2015)	• Transforming a traditionally small scale, production based sector into large scale agribusiness that contributes to economic growth and sustainability • Focusing on modern agriculture (i.e. organic farming, precision agriculture, mechanisation) offering higher yields and sustainability
11th Malaysian Plan (2016 – 2020)	• Under the New Economic Model which consist of three main targets (inclusivity, sustainability & high income), and the organic farming focus was included based on sustainable targets • Strategic Reform Initiatives 8 (SRI 8) focuses on a sustainable economic development approach

Source: Economic Planning Unit, Prime Minister's Department Malaysia (2001-2020)

Also, the SWITCH-Asia Program was launched by the European Union to promote Sustainable Consumption and Production (SCP) across the Asian region, which includes Malaysia. It was initiated in 2012, and in 2014 the Prime Minister's Department was appointed to serve as SCP representatives to coordinate the activities of government and non-government agencies. These include activities that will promote sustainable development including organic farming.

3.3.2 Organic Accreditation

The Malaysian Organic Certification Scheme (*Sijil Organik Malaysia (SOM)*) was established in 2003 by the DoA. It is a free certification programme that recognised organically cultivated farms by the requirements specified by national organic standards MS 1529:2001 (The Production, Processing, Labelling and Marketing of Plant Based Organically Produced Foods). FromJune 2015, *MyOrganic* certification replaced the *SOM*. This new scheme is a significant extension of the previous one, as it covers all aspects of food production including vegetables, fisheries and

poultry. Its current focus is on vegetable production, and it will focus on the other sectors in the future. The changing logos for organic certification in Malaysia are shown in Figure 3.4.

Figure 3.4 The Transition of the Organic Certification Logo Standard, Starting from the Year 2003 until the Latest 2015 (adapted from *Suhaimee et al*., 2016)

The DoA is the only government body that is fully responsible for evaluating and granting certification to farmers. For farmers to apply for *MyOrganic* certification, they need to fulfil all the requirements listed by the DoA. To date, there are 17 standards or elements that farmers need to achieve to be certified. Then, the officer will inspect the farm and prepare a report. Once approved, the farmers need to prepare some samples (i.e. water and soil) for pesticide and heavy metal identification for further auditing. The result will be presented to the Farm Certification Committee under the DoA, and if they agree the certification will be approved.

Farmers who have been granted *MyOrganic* certification, will be regularly monitored by the DoA, and will receive incentives in the form of infrastructure support. Farmers need to renew their certification every year, but they do not need to pay for the renewal process. They have to keep 13 farm records updated while certified (Department of Agriculture, 2007)[7].

3.3.3 Demand and markets for Organic Products

Malaysia is a multicultural society, consisting of Malays, Chinese and Indians as the majority. The Chinese community can be seen as a major contributor to purchasing and consuming organic products rather than other ethnicities (Suhaimee *et al.*, 2016), which is in contrast with an earlier study that revealed even though Malaysia has a diverse religious composition, these differences

[7] Department of Agriculture (2007), *Malaysian Organic Scheme, Department of Agriculture*. Kuala Lumpur

were not found to be indicators for the purchase organic food (Shaharudin *et al.*, 2010). The health concerns of consumers are most important factors in the decisions to purchase organic products. This is in line with another study where the increased consumption of organic food in Malaysia is linked to an increase in health consciousness, the growth of organic agriculture movement as well as the physical appearance of the product (Mohamad *et al.*, 2014; Suhaimee *et al.*, 2016).

In general, Malaysian consumers are becoming more interested in organic products, raising demand significantly (Ahmad & Juhdi, 2013). In general, the intention to purchase organic food (including rice) is significantly influenced by the consumer's perception of its environmental and health attributes (Wee *et al.*, 2014; Mohamed *et al.*, 2014; Ibitoye & Nawi, 2014; Shafie & Rennie, 2012). In addition, sensory attributes, such as nutritional value, taste, freshness and appearance also play an important role for consumers when purchasing organic food (Shafie & Rennie, 2012). Many organic buyers believe organic food to be healthier, tastier, and better for the environment than conventional food (Ahmad & Juhdi, 2013). However, Wee *et al.*, (2014) argue that the quality of organic foods does not influence the consumer to purchase the products. Food quality is usually associated with freshness, food safety, nutritional content and value. Freshness, on the other hand has become the most important consumer preference when purchasing vegetables and meat in Malaysia (Chamhuri & Batt, 2015).

Vegetables are the most frequently consumed organic product in Malaysia, followed by fruit, food supplements and processed foods (Suhaimee *et al.*, 2016). In term of organic market channels, the organic vegetable farming hub in Malaysia can be found in the Cameron Highlands, where it was established by Grace Cup Pte Ltd. (Pahang, Malaysia) and Cameron Organic Produce Pte Ltd. (Pahang, Malaysia) (Somasundram *et al.*, 2016). Large local retailers such as Zenxin and Country Farm Organics play a major role in supplying organic food to their customers.

The distribution of organic food products is scattered due to the existence of speciality shops that operate across the country. About 70% of organic food products are distributed through specialised organic food stores, which are usually found in supermarkets or hypermarkets, and the rest is sold through traditional (religious) retail shops, wet markets and home deliveries (Stanton, Emms & Sia, 2011). The demand for organic products is forecast to increase by more than 12.4% a year in

term of sales, with a projected future financial value of RM20 million a year (Suhaimee *et al.*, 2016).

3.3.4 Current State of Organic Movement in Malaysia

To date, organic production remains a niche market in Malaysia but one that is growing rapidly. The proportion of certified organic farms has increased steadily, starting with only three farms in 2003 to 2005 and increasing to 43 certified organic farms by 2010. This increase was encouraged by government support for organic conversion, where farmers received incentives for shifting to organic production and applying for certification. The cumulative number of organic farms has increased year on year and by 2017, 201 farms (cumulative of 1,991.80 hectares) had been certified under *MyOrganic* certification (Figure 3.5).

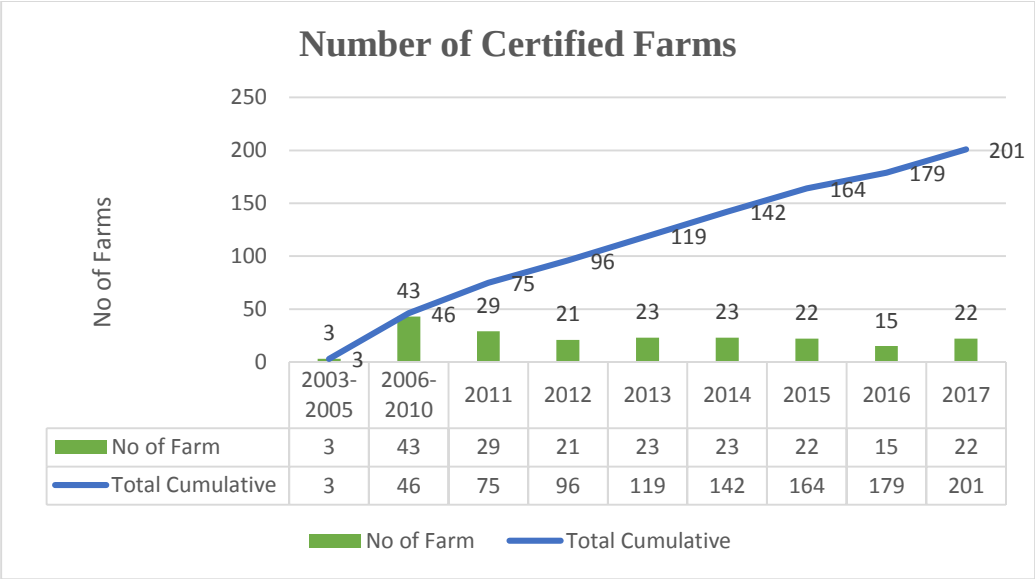

Figure 3.5 Certified Organic Farms in Malaysia

Source: Department of Agriculture Malaysia (DoA), (2017)

Overall, based on the diagram above, even though the numbers of certified farms remains low, the numbers still keep increasing each year. The government, particularly the DoA, have set a target for the number of farms to be certified each year and this will regularly monitored by the MoA.

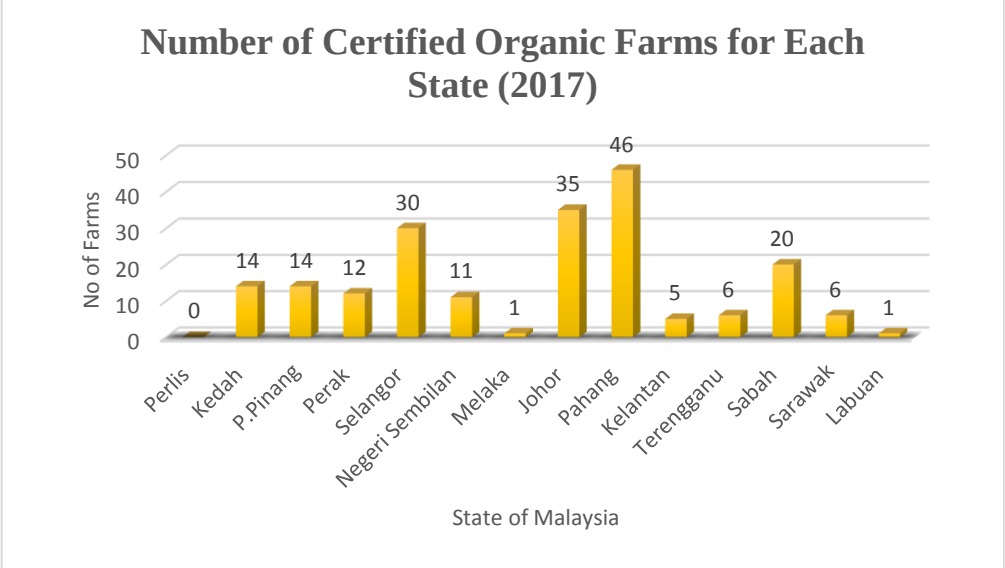

Figure 3.6 Number of Certified Organic Farms for Each State

Source: Department of Agriculture Malaysia (DoA), (2017)

There are clear regional differences between the numbers of certified farms in each state. Based on Figure 3.6, Pahang state shows the highest number of certified farms (with 46 certified organic farms), followed by Johor (35 farms) and Selangor (30 farms). East Malaysia (Malaysian Borneo) also demonstrates a promising number of registered organic farms, while Sabah has 20 farms, Sarawak six farms and Labuan one farm. By looking at the area of land granted *MyOrganic* Certification (see Figure 3.7), it can be seen that this is similar to the population for land area farmed in each region (Figure 3.8). Johor and Pahang states show the highest proportion of certified land area, where all the cropping types comprise vegetables, fruit, herbs, and industrial crops (including mushrooms).

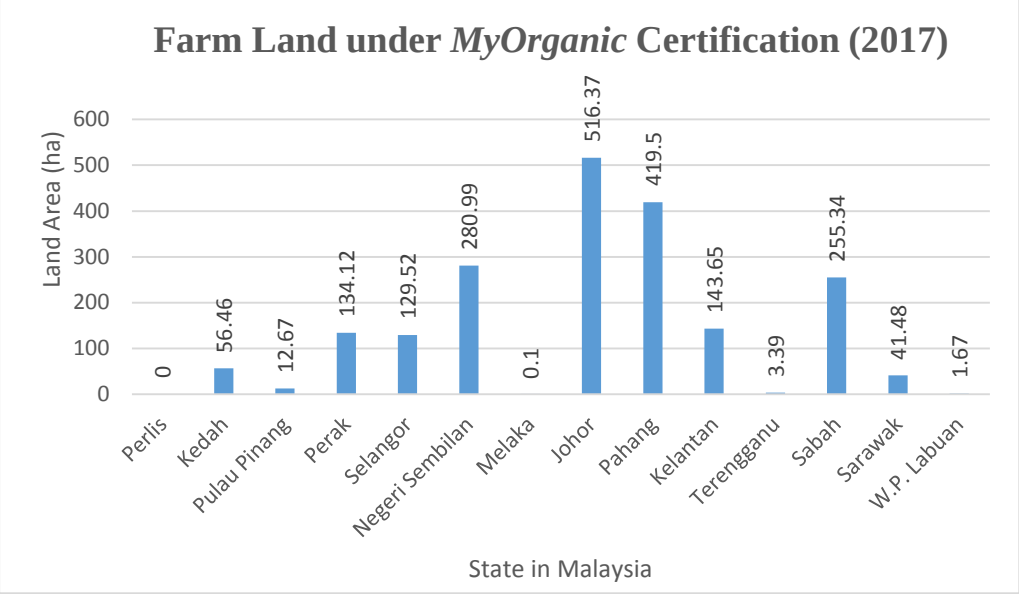

Figure 3.7 Area of Farm Land under *MyOrganic* Certification by State in 2017

Source: Department of Agriculture Malaysia (DoA), (2017)

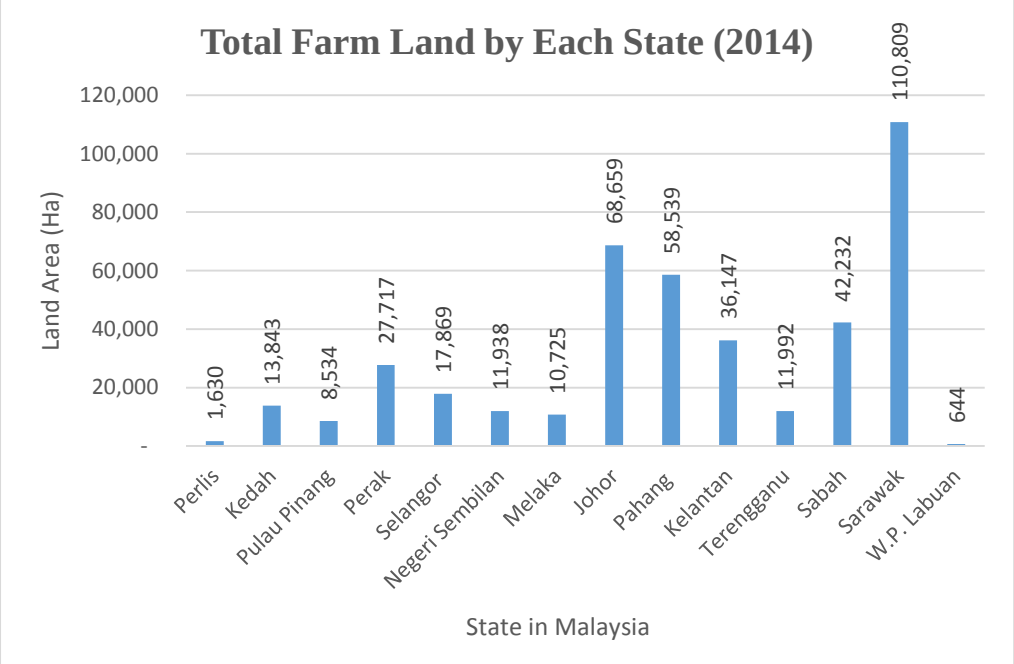

Figure 3.8 Area of Farm Land by State in 2014

Source: Department of Agriculture Malaysia (DoA), (2015)

3.3.5 Agricultural Extension in the Organic Sector

Table 3.3 illustrates the knowledge exchange and advice assistance provided for organic farmers. There are two main sources of information: government and NGOs. The DoA is the only government body actively engaged with farmers at the regional level, managing the Malaysian Organic Scheme Certification approval process, they disseminate knowledge, as well as monitoring and inspecting farms. Each state has their own agriculture officer who is responsible for providing support on the certification process, among other things.

In term of NGOs, CETDEM, initiators of the organic pathway in Malaysia in 1986 and still actively involved with organic farmers, provide fundamental training and knowledge exchange. In fact, they also encourage new entrants to become involved with organic farming, providing a variety of exciting programmes for those who are interested in learning. They differ from government extension services in terms of providing free support and advice to the farmers and community.

Table 3.3 Professional Bodies Assisting Organic Farmers

No	Professional bodies	Scale	Function
1.	Ministry of Agriculture and Agro-Based Industry (MoA) (Government)	National	• Involved in policy development • In charge of the budgets • Recruit agencies to assist in certification (e.g. DoA)
2.	Department of Agriculture (DoA) (Government)	Regional	• Deals directly with farmers (training, advice and consultation) • Accreditation on certification process
3.	Centre for Environment, Technology and Development Malaysia (CETDEM) (NGO)	Local	• Promotes public awareness of organic products • Encourages people to become involved in organic farming projects • Support organic farmers by providing fundamental training
4.	Organic Alliance Malaysia (NGO)	Local	• Promote, develop and implement a code of conduct in the marketing and trade of organic products. • Provide inspection and certification services related to the production, processing, handling and marketing of organic products

No	Professional bodies	Scale	Function
5.	Ministry of Health (MoH) (Government)	National	• Initiated the Certification of *Makanan Selamat Tanggungjawab Industri* (MeSTI) based on the Food Hygiene Regulations 2009. • Monitor food safety • Involves a system of planned and documented practices and control records which cover premises, such as shops or restaurants.

3.4 Future Planning for Organic Movement in Malaysia

Many government initiatives both at national and state level have been implemented to increase the participation of farmers in organic activities. Malaysia aims to develop further strategies and policy intervention to ensure that the organic movement is well sustained in the future. Examples of future government planning with regard to the organic movement includes the National Sustainable Consumption Production (SCP) Blueprint (2016-2030). This blueprint was developed in 2012, and was implemented as part of the 11th Malaysian Plan (2016-2020). As stated in the plan;

> *"Sustainable Consumption and Production (SCP) a concept that promotes economic growth without compromising the environment or jeopardising the needs of future generations. This means efficient use of natural resources, minimising the use of hazardous substances and reducing pollution and waste over the life cycle of products and services. Through this life cycle approach, SCP invites people to consider the environmental impact and ensures resource efficiency at both the production and consumption phases."*
>
> 11th Malaysian Plan (2016-2020), p. (6-15)

This holistic approach aims to support sustainable practices, green technologies and sustainable lifestyles and is linked to national policies, such as Vision 2020 and the 11th Malaysian Plan, as well as the UN 2030 Agenda for Sustainable Development. In order to achieve this long term goal, there is a focus on 10 pathways, two of which are relevant to the organic movement, namely: 'Pathway 4: Towards a Circular Economy Waste System' and 'Pathway 7: Sustainable, Safe and Nutritious Food.' As stated in Pathway 4, the government will accelerate the landfill diversion programme where there will be a separate collection for organic waste. Any useful by-products of

waste collection and processing, such as compost, biogas and biodiesel, will be used as fertilisers and fuels.

On the other hand, Pathway 7 focuses on sustainable food systems and aims to ensure that safe and nutritious food is provided along the supply chain from farm to consumer. The main target is to secure a sufficient supply of safe, high quality, healthy and affordable food for the nation. Sustainable food systems deliver security of supply from the producer to the consumer, through sustainable practices including farming, processing, distributing, consumption and avoidance of food losses. As stated in the requirements for sustainable food in Malaysia, one challenge is to enhance the knowledge and skills required for good agricultural practices which would encompass initiatives like *MyGAP* and *MyOrganic*. This pathway will emphasise the life cycle of food systems where it combines the processes, infrastructure, organisations and resources involved in feeding a population.

3.5 Research Implications

As the agriculture sector has become more significant in contributing to the Malaysian economy in term of food supplies and rural employment, a lot of initiatives and policy has been developed to sustain the importance of agriculture sector in Malaysia. The main goal is to transform the agriculture sector to become a modern and dynamic sector by the year 2020.

By looking at the policy contributions towards the development of agriculture, particularly in relation to the organic movement in Malaysia so far, the direction of interventions can be mostly characterised as following a 'top-down approach' even though in the early stages it was initiated by the consumer side. While in contrast, one of the impressive aspects of the organic movement in many countries is its bottom-up origins. As discussed in Chapter Two before, in many other countries like Europe and the USA, the rise of organic farming has largely been driven by consumer demand, while in other areas like India, Africa and South America, it has been led by farmers themselves. In other areas like China, Cuba and Indonesia, governments and local institutions have influenced farmers to become involved in the organic movement (Myers, 2006).

The DoA is the only government body responsible for assisting the organic movement in terms of administering the certification processes while providing monitoring and advice. Table 3.4 summarises the assistance received so far by organic and conventional farmers from government policy instruments.

Table 3.4 Government Assistance Received by Organic and Conventional Farmers

Government Policy	Conventional Farmers	Organic Farmers
Subsidies	Received by all conventional farmers (in the form of credit and input supplies) *Automatically received subsidies once registered as cooperative members	Not receiving subsidies, but certified farmers will receive incentives (in the form of infrastructure support)
Cooperative members	Farmers register to access subsidies	Not applied to organic farmers
Farmers' associations	Almost all farmers are involved	Only certain crops (e.g. mushrooms) were supported by farmers' associations

Considering current trends around organic production and future strategies for sustainable agriculture in Malaysia, we can draw some inferences about the future of organic farming, if such initiatives continue to support organic growth in Malaysia. This is expected to motivate more farmers in organic farming and improve local organic food production. As long as they receive consistent support from the government and stakeholders, the organic movement has the potential to become the most influential movement in the agricultural sector.

In order to determine the relevant factors that might influence farmers to adopt organic practices in Malaysia, a mix-method approach was adopted. The details on how the data were gathered are discussed in the following chapter.

CHAPTER 4. RESEARCH METHODOLOGY

4.1 Chapter Outline

In general, there are two major sources of information about a phenomenon of interest, namely primary data and secondary data. Primary data are obtained from sources that provide new and often original information, for instance through observation, semi-structured interviews or questionnaires. Secondary data, on the other hand, is based on existing sources of information, which can include historical data sets and documentary sources such as industry reports or governmental statistics based on census records. The choice of data source and the methods used to obtain data, depends on the purpose of the study, the availability of the resources and the choices or interests the researcher.

The previous two chapters draw insights some of the understanding about the body of knowledge around organic growth globally and nationally, as well as explaining the current state of organic farming in Malaysia. In this doctoral research, in order to examine the factors that influence farmers to adopt organic farming in Malaysia, a mixed methods approach, comprising three distinct phases of data collection was developed. This involved both primary and secondary data sources, where the primary data was used to achieve the research objectives of the study and the secondary data (e.g. Reports from the Department of Agriculture (DoA) regarding organic farming) to help better understand the wider context of the study. Hence, the first stage of this study involves a qualitative exploration of the organic movement in Malaysia to gain a more in-depth understanding of the issues facing organic farming there. Findings from this qualitative research are used to inform the development of a survey instrument for data collection in the subsequent quantitative stage. The quantitative study was designed to identify the main factors that lead farmers to adopt organic practices, and the final qualitative stage was used to investigate and clarify in greater depth, some of the underlying factors that may not have been identified in the quantitative modelling.

The aim of this chapter is to discuss the rationale for adopting a mixed methods approach and to present the research design employed in this study. The chapter begins with a discussion of the mixed method design (Section 4.2) and outlines the rationale for using this approach and describes the overall research process (Section 4.3). It continues with an explanation of each phase of data

collection, starting with the exploratory key informant interviews in phase 1 (Section 4.4), followed by the questionnaire survey in phase 2 (Section 4.5) and farmer interviews in phase 3 (Section 4.6). The chapter is summarised in Section 4.7.

4.2 What is Mixed Methods Research?

The field of mixed methods research is relatively new and was first discussed explicitly in the late 1980s, though studies using a combination of qualitative and quantitative approaches can be found well before this. Definitions of mixed methods approaches can be found across different disciplines, such as business management, education, sociology, and health sciences (Creswell & Plano, 2011). Creswell (2014) refers to mixed methods designs as "*combining or integrating the qualitative and quantitative research and data in a research study*" (p. 14), while Tashakkori & Teddlie (2003) argue that these approaches "*incorporate techniques from both quantitative and qualitative research tradition, … combining them in unique ways to answer the research questions that could not be answered in any other way*" (p. x).

It can be seen that several definitions for mixed methods have emerged over the years and that these incorporate various elements, including methods, research processes, and research design (Creswell & Plano, 2011). In relation to this, Creswell (2014) described the core characteristics of mixed methods research as follows:

- It involves the collection of both qualitative (open-ended) and quantitative (closed-ended) data in response to answering the research questions or hypothesis;
- It includes the analysis of both forms of data;
- The procedures for both qualitative and quantitative data collection and analysis need to be conducted rigorously (e.g., adequate sample sizes); and
- The two forms of data are integrated into the analysis through merging, connecting, or embedding the data.

In addition, it may be important to consider some other elements in designing an appropriate mixed methods approach for this particular study. Creswell & Plano (2011) emphasise that the researcher needs to:

- Collect and rigorously analyse both qualitative and quantitative data linked to their specific research questions;
- Mix or integrate the data by either combining them sequentially, by having one build into another, or by embedding one within the other; and
- Give priority to one or both forms of data (depending on the research aim).

4.3 Rationale and Research Approach

4.3.1 Rationale for using mixed methods

Tashakkori & Teddlie (2003) highlight three benefits of using mixed methods designs compared to using a single approach: first, mixed methods research can answer research questions that the other methodologies cannot; second, they provide better inferences and understanding; and third, they provide opportunities for presenting a greater diversity of divergent views.

In general, a mixed methods approach has been chosen for this study mainly because of its strength in drawing on both a quantitative and a qualitative context and minimizing the limitations of both approaches. It also helps the researcher to gain a more complete understanding of the research problem, by providing a more detailed explanation of the issues arising than that gained from using a single approach alone. For example, the quantitative approach used in this study can be used to identify factors influencing the decision to farm organically. The qualitative work helps to provide a greater understanding of these factors and also uncovers some underlying factors that, otherwise, might have been overlooked during the quantitative modelling.

4.3.2 Mix Methods Research Design

A key decision in choosing a mixed methods design is based on how the quantitative and qualitative strands of the study relate to each other. A strand is a component of a study which encompasses the basic process of conducting quantitative and qualitative research, for instance posing research questions, collecting and analysing data, and interpreting the results (Teddlie & Tashakkori, 2009). For a mixed methods design, there should be at least one strand for each quantitative and qualitative method involved in the study. This is illustrated in Figure 4.1, where the study begins with a quantitative strand which is followed by a qualitative strand.

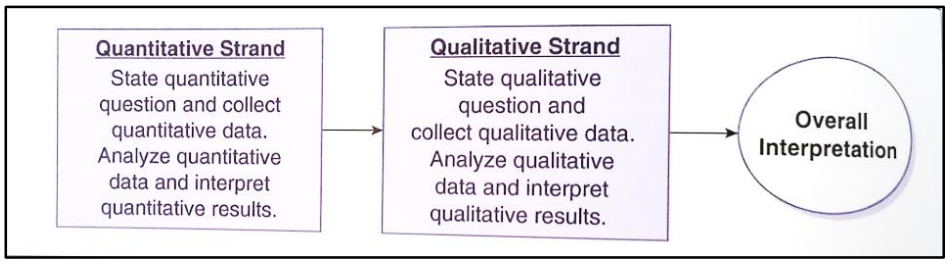

Figure 4.1 Example of Basic Mixed Methods Study Design

Sources: Creswell & Plano, 2011

Based on the basic design shown above, this study will employ an explanatory sequential design, consisting of three distinct phases: qualitative phase, a quantitative phase followed by a qualitative study (Creswell & Plano, 2011). However, some modifications have been made in this case, which begins with an initial qualitative study comprising exploratory interviews designed to draw insights regarding organic farming in Malaysia. The exploratory findings from this phase were used to inform questionnaire design. Further qualitative data was collected following the analysis of the quantitative data and was used to further explain or elaborate the findings obtained in the previous stage (refer Figure 4.2).

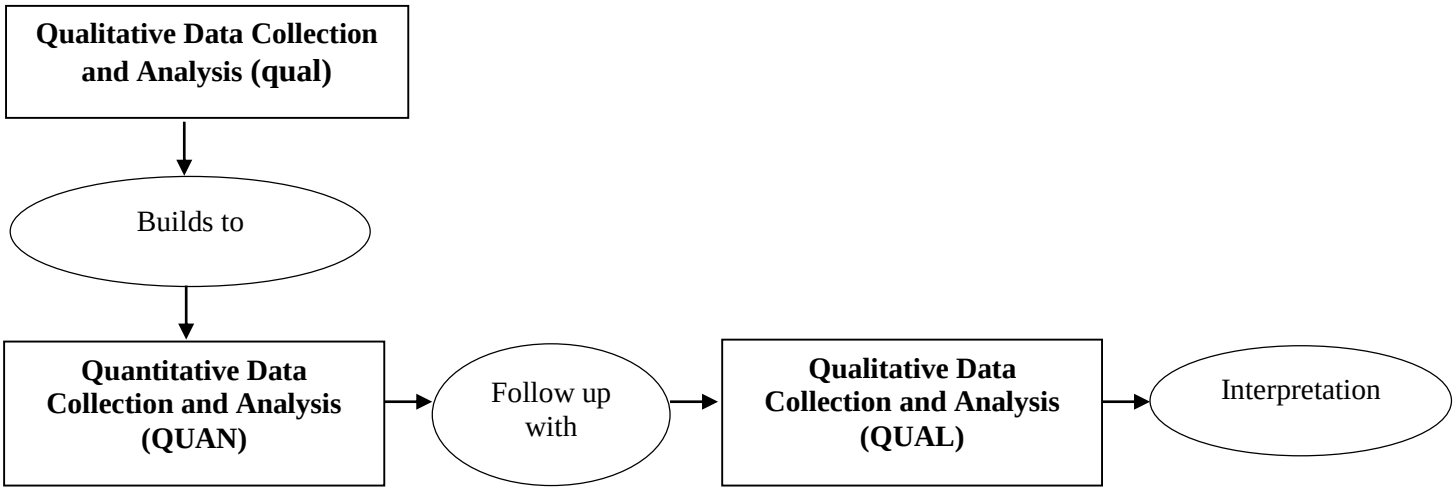

Figure 4.2 Explanatory Sequential Mixed Methods (Adapted from Creswell, 2014, p. 220)

The rationale for using this mixed methods approach is that any single approach would not be sufficient to explore the complexity of the growth of the organic farming sector in Malaysia. Hence, in order to provide a deeper understanding of the research topic, the qualitative analysis is used to refine and explain the statistical results by exploring participants' views in more depth (Creswell,

2003; Ivankova *et al.*, 2006). Creswell & Plano (2011, p. 82) argue that this design is most useful when the researcher wants to assess relationships or trends observed in quantitative data, and also to explain the mechanisms or reasons behind those results.

Therefore, this study employs an explanatory sequential design approach. The first qualitative exploration phase of data collection is based on key informant data, and will also provide some context for policy and government intervention around the growth of organic production in Malaysia. This phase also provides a more in-depth understanding of key informants' perceptions regarding organic practices among Malaysian farmers. This information is also used as the basis for defining instrument variables in the next phase. The quantitative approach is used to gather data on the factors that influence farmers' decisions to adopt organic methods, and also provides data on their attitudes towards organic farming, as well as information on the farm household and farm enterprises. Finally, the qualitative phase is conducted to clarify and explore in more depth some of the underlying factors that may or may not be identified in the quantitative modelling. Hence, another advantage of this approach is that the design lends itself to emergent approaches, where the final qualitative phase is informed by what is learned from the previous quantitative phase of the study (Creswell & Plano, 2011, p. 83).

There are four key decisions involved in determining the appropriate mixed methods design, namely: (1) the interaction level between different strands; (2) the priority given to different strands; (3) the timing of strands; and (4) the procedure of mixing the strands (Creswell & Plano, 2011, p. 64). The level of interaction is the extent to which the quantitative and qualitative strands are allowed to interact which each other. In this study, the two methods are interactive, where the design of the second qualitative phase is dependent on the results of the quantitative survey. Priority refers to the importance of the two methods for achieving the research objectives. This study places a greater emphasis on quantitative methods and the qualitative strands have a secondary role in supporting the underpinning results. Sequential timing is applied in this study, where this study involves three distinct phases, with data gathering and analysis being conducted in sequence across the phases. The mixing first occurs through data from the first qualitative phase being used to develop and shape the data collection and instruments for the second phase. It also occurs during data analysis for the second and third phase of data collection. At this point, the quantitative and qualitative results will be synthesised and interpreted in the light of each other and the broader literature. This follows the advice of Creswell & Plano (2011, p. 67), who argue that mixed methods

designs should address the research problem by combining methods and findings in the final interpretation.

4.3.3 Overview of the Research Approach

As an overview, the first phase of data collection in this study was a series of exploratory semi-structured interviews with key informants to provide a primary contextual data for this study. Seven key informants from various policy and practice backgrounds were interviewed, including representatives from government sectors, NGO's, R&D sectors as well as retailers that actively involved in organic development in Malaysia. This approach was intended to become the basis for the later phase of quantitative modeling, besides provide more understanding of key informants' point of view regarding organic movement so far.

Based on the literature and using information from the analysis of the data from the key informant interviews, a questionnaire was designed to collect data from a sample of farmers across Malaysia. A pilot study was undertaken to refine the questionnaire. A total of 170 farmers took part in the subsequent survey, including 82 organic and 88 conventional farmers. The results of the survey were analysed using SPSS software, where some descriptive analysis, factor analysis and logistic modelling were the main statistical techniques used. The results, identified a number of variables likely to be significant in a farmers' decision to adopt organic practices and these were used to inform subsequent qualitative data collection.

This third phase of follow-up interviews focused on organic farmers and, as discussed previously, it was used to get a more in-depth understanding of what influences them to farm organically. Farmers in the quantitative phase were asked if they would consent to be contacted for a follow-up interview. Out of 40 organic farmers who agreed to be contacted, ten participated in the follow-up. The qualitative and quantitative results are integrated and explained in Chapter 6 until Chapter 8.

Ethical approval was obtained from the Newcastle University Ethics Committee before starting data collection. The anonymity of the respondents was protected by assigning them unique identification numbers. In addition, participants who were involved in the interview sessions were also assigned a pseudonym, thus keeping the responses confidential. All data and recordings of interviews for this study have been stored on a password-protected external hard drive and will be destroyed following the completion of this research.

Table 4.1 Visual Model for Mixed Methods Sequential Explanatory Design Procedure

Stage	Procedure	Product
Phase 1		
Qualitative Data Collection	• In-depth exploratory, face to face interviews with key stakeholders of the organic movement in Malaysia (n = 7)	• Interview protocol • Text data (Interview transcript) • Image data (photographs)
Qualitative Data Analysis	• Translation of data • Coding and thematic analysis	• Codes and themes • Similar and different themes and categories
Connecting Qualitative with Quantitative	• Developing survey questions by incorporating some of the themes in the questionnaire • Pilot study	• Questionnaire
Phase 2		
QUANTITATIVE Data Collection	• Cross-sectional questionnaire survey (n=170)	• Numeric data
Quantitative Data Analysis	• Data entry and screening (univariate) • Factor analysis • Logit model • SPSS software	• Descriptive statistics, missing data, outliers • Factor Loadings • Coefficient estimates
Connecting Quantitative with Qualitative	• Identification significant coefficient • Purposive sampling of organic farmers • Developing interview questions	• Cases (n=10) • Interview protocol
Phase 3		
Qualitative Data Collection	• Individual in-depth interviews with ten organic farmers (n=10)	• Text data (interview transcripts) • Image data (photographs)
Qualitative Data Analysis	• Transcription of data • Translation of data • NVIVO qualitative software	• Codes and themes • Use of quotations in supporting findings
Integration of Quantitative and Qualitative Results	• Interpretation and explanation of the quantitative and qualitative findings	• Discussions • Implications • Future research

4.4 Phase 1: Exploratory Interviews with Key Informants

Interviews are one of the most common approaches to data collection within the social and health sciences (Briggs, 1986; Braun & Clarke, 2013). Interviewing can be defined as a professional conversation, with the goal of getting a participant to talk about their perceptions or perspectives (Rubin & Rubin, 2005; Kvale, 2007). In qualitative research, there are four methods that researchers typically rely on for gathering information, namely: (1) participating in the setting; (2) observing directly; (3) interviewing in depth; and (4) analysing documents and materials (Marshall & Rossman, 2006).

Interviewing key informants is a more specialised form of interview. Key informants are often influential and prominent in their organisations or communities and are selected on the basis of their expertise in certain areas. Much valuable information can be gained from such interviews, as the experience and position of the key informants often permits them to provide a useful oversight from their particular perspective (Marshall & Rossman, 2006).

4.4.1 In-depth Interviews

The first phase of data collection in this study took place between July and August 2015. A series of exploratory semi-structured interviews were conducted with key informants to provide primary contextual data for this study. The purpose of exploratory interviews is to develop a deeper understanding of how respondents think and react to particular topics and issues. A semi-structured interview permits the interviewer greater flexibility in asking questions, allowing the sequence of questions to be altered, so that interviewers may probe for more information or explore new avenues that have been introduced in previous answers (Fielding & Thomas, 2016). This approach is highly flexible and permits respondents to define the world in their own unique ways (Merriam, 2013). This qualitative approach was intended to provide an in-depth understanding of key informants' perceptions regarding organic farming practices and become the basis for the later phase of quantitative modeling, by highlighting potential variables influential in farmers' decisions to adopt organic farming.

Seven respondents from various policy and practice backgrounds were interviewed. These included representatives from the Ministry of Agriculture and Agro-Based Industry Malaysia (MoA), the Department of Agriculture Malaysia (DoA), two Non-Governmental Organisations (NGOs) the

Centre of Environment, Technology and Development Malaysia (CETDEM) and Organic Alliance Malaysia (OAM), research and development (R&D) from the Malaysian Agricultural Research and Development Institute (MARDI), and also the main retailers (AEON) that actively promote organic development in Malaysia (Refer Appendix A2 for detail). Most of the respondents involved held a senior position in their institution. The main criterion behind the selection of these individuals was that they all have experience in the organic movement and are knowledgeable about agricultural development and policies in Malaysia.

Ethical approval for this study was obtained in April 2015. Covering letters from the project supervisors were sent to the interviewees through email, two months before the fieldwork. Within a month, all potential correspondents had responded and agreed to be interviewed. A follow-up confirmation of the appointment was undertaken by telephone two weeks prior to the fieldwork.

The interviews were conducted at locations chosen by the respondents and the purpose of the exercise was explained to the respondent prior to commencing the interview. The language used during the interviews depended on the preference of the respondent. Most used Malay or English (and sometimes interchangeably) as the main medium for conversation. The use of a device to record the interview was explained and participants were informed that the interview would take about one hour and that they could stop the discussion at any time. Respondents were also required to sign a consent form before the interviews commenced.

4.4.2 Interview Guide

In qualitative research, developing the interview guide is always considered an important process (Krauss *et al.*, 2009). Merriam (2013) refers to this as a list of questions that the researcher intends to ask in the interview. Creswell (2007) proposed that the interview guide for semi-structured interviews need not exceed five or six general questions. Bryman (2012) further emphasised that it is important for the interviewer to consider the questions that relate to participants' social worlds, since there is flexibility in conducting the interviews. The interview guide in this phase can be divided into five main topics as displayed in Table 4.2:

Table 4.2 Interview Guide for Key Informants' Interview (Phase 1)

No	Main Topics	Related Questions
1.	The key informant's role and contribution in developing organic activities	- What is their role in promoting organic farming (as an individual/ organisation)? - To what extent do their beliefs fit with the organic movement? - Are they involved with other agencies linked to organic farming?
2.	Problems and challenges facing the organic movement	- What are the main problems that organic farmers face currently? - How in their opinion can these problems be resolved?
3.	Factors influencing farmers to adopt organic farming	- What factors influence farmers to be organic? - Are there any differences between organic and conventional farmers?
4.	Is there any documentation that can provide information on the organic movement in Malaysia?	- Are there any reports that highlight the organic movement? - Can they suggest any magazine or other articles that promote the organic movement in Malaysia?
5.	Future observations about the development of organic production	- How can future policy contribute towards the growth of organic practices in Malaysia? - How do they see organic farming in the future? 5 or 10 years ahead? Will it thrive or not? - Do they have any thoughts about how to improve or encourage the organic movement in Malaysia?

4.4.3 Data Analysis

Qualitative data analysis requires a reflexive process that begins while developing the study (Merriam, 1988; Marshall & Rossman, 2006). Unlike quantitative research, this process is continuous and the analysis can begin soon after data collection commences. Analysis involves a constant moving backwards and forwards within the data set, the coded extracts from the data and the final data (Braun & Clarke, 2013). Interview transcripts provide raw data that needs to be analysed systematically. This can be done using content analysis, through word-based or code-based approaches.

Krippendorff (2004) notes that content analysis can range from the simplest form of word counting to conceptual or thematic analysis. This study used thematic analysis to help reveal the patterns of ideas found in the body of text. Braun & Clark (2013, p.201) defined thematic analysis as "*a method for identifying, analysis and reporting patterns or themes within data, where it minimally organises and describes the data as a set in more detail*". Swan (1997) emphasises that this approach attempts to discover similar cognition under the same concept, rather than just counting words.

Braun & Clarke (2013) have provided guidance for conducting thematic analysis. Figure 4.3 illustrates the seven phases of carrying out thematic analysis. This guidance is not prescriptive, rather it permits a flexible approach in linking the research questions to the data (Patton, 1990). It is also a process that develops over time and should not be rushed (Ely *et al.*, 1997).

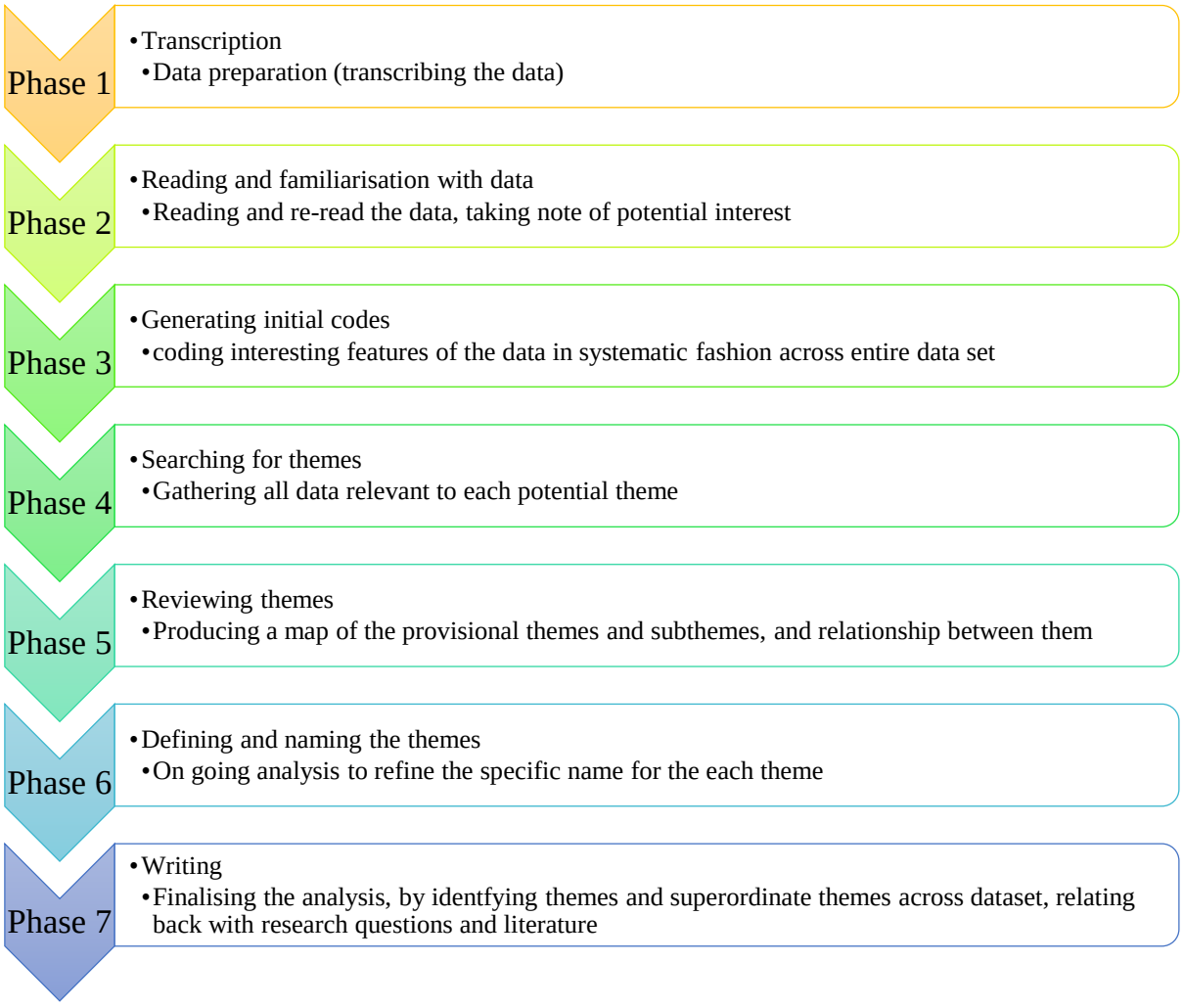

Figure 4.3 Stages of Coding and Analysis described by Thematic Analysis Procedure (adapted from Braun & Clarke, 2013)

The first step in thematic analysis is transcription, where verbal data must be transcribed into writing. There are no specific rules to follow when producing a transcript. However, at a minimum it must be a verbatim record (covering all verbal and non-verbal utterances). It is also important to retain the meaning of data and all essential contextual information (Poland, 2002). In this research, all interviews were conducted using a combination of Malay and English. The transcription was done verbatim and manually. The researcher, as a native speaker of Malay and having English as a second language, ensured that the translation was done carefully without losing the meaning of the words used.

The second stage begins with the process of data immersion, where the researcher becomes more familiar with the depth and content of the data set. The aims of this stage are to start noticing key points that are relevant to the research questions. The process involves reading and re-reading the textual data and repeated listening to any audio data. During this stage, some codes were generated based on the research questions and the researcher began to produce notes with initial ideas for the coding. This led to the next stage, which is 'coding'. Codes can be identified as features of data that appear interesting from the point of view of analysis and provide a means of systematically organising the data in a meaningful way (Boyatzis, 1998; Braun & Clarke, 2013). All of the codes used in this study were identified based on the research objectives and the relevant data were matched with the codes.

The fourth stage proceeds after all of the qualitative data have been coded and combined and where suitable themes have been identified to fix the codes. In this phase, Braun & Clarke (2013, p.202) emphasise that "*they need to re-focus the analysis at the broader level of themes, which involves sorting the relevant codes into potential themes, and collating all relevant coded data extracts within the identified themes*". During this phase, mind mapping (Bazeley, 2013) was used and the codes were sorted, based on the themes and sub-themes and tagged with a different colour. All of the themes are then further refined in the next phase (fifth stage). According to Braun & Clarke (2013, p.218), "*all the data within themes should cohere together meaningfully, while there should be clear and identifiable distinctions between the themes*".

The last two stages (sixth and seventh) involve ongoing analysis to refine the specific data for each theme and to ensure that the overall themes are clearly defined and cover the full scope of the analysis. The writing up of this analysis has to provide a concise, coherent, logical, and interesting

account of the story the data tells either within or across the themes. Therefore, Table 4.2, which describes the themes, emerged based on the codes identified at an earlier stage of the analysis.

4.5 Phase 2: Questionnaire Survey (Quantitative Phase)

Questionnaires are a suitable tool for asking questions to elicit quantitative and qualitative data. Questionnaires are highly structured, standardised sets of questions that are commonly used as a method of primary data collection for survey research in social science (Leddy-Owen, 2016). Using questionnaires enables the researcher to administer the questions and receive replies without having to communicate directly with every respondent individually (Walliman, 2018). Bryman (2012) also suggests that having a clear visual representation of the questionnaire makes it easier for participants to understand and complete at their own convenience. However, some drawbacks with this approach include the difficulty of participants including their own ideas and suggestions or of seeking clarification about questions if required (Bryman, 2012). O'Cathain & Thomas (2004) addressed the former issue by introducing an open-ended question inviting "any other comments or suggestions" at the end of the questionnaire. The main objective of the questionnaire survey was to answer specific research objectives and in particular to identify the main factors that influence farmers' decisions to farm in an organic or conventional way.

4.5.1 Survey design

Questionnaire surveys provide a quantitative or numeric description of trends, attitudes or opinions of a population through studying a sample of that population (Creswell, 2014). According to De Vaus (2002), survey research has two broad aims: (1) to be descriptive, to discover facts about the population, such as age, gender, average income, through collecting sample data; and (2) to be analytical and analyse the causal relationships between certain variables. In this study, a questionnaire survey was employed to identify the factors that influence farmers' decisions to undertake organic farming in Malaysia. This survey collected cross-sectional data, where data is collected at one point in time due to time and cost constraints. Both organic and conventional farmers were involved in this study, where a sampling frame of organic farmers was obtained from a list provided by the DoA. The sample of conventional farmers was based on a snowball sampling method (discussed later in this chapter).

4.5.2 Instrumentation

The questionnaire was designed to address the research problem and research objectives set out in Chapter 1 of this study and comprised seven sections aimed at both organic and conventional farmers. As suggested by Leddy-Owen (2016) and Bryman (2012), it is important for the questionnaire to have a clear format, a layout that is easy on the eye and wording that is concise and appropriate to the abilities and understanding of sample respondents.

This questionnaire can be divided into three major parts, namely: cover letter; the main body of the questionnaire; and the closing instructions (see Appendix B1 for detail). The first section (Section A) of the questionnaire identifies whether respondents are organic or conventional farmers. In Section B organic farmers are asked about their current organic practices and about the condition of their farms. For conventional farmers, Section B asks whether farmers have considered applying organic methods on their farms and asks about the barriers that they think might constrain them from adopting organic methods. Section B also asks about factors that might influence the decision to farm organically, with questions based on the findings of the key informant interviews. Farmers are asked to use a five-point Likert scale (1=Very unimportant, 2=Unimportant, 3=Unimportant nor Important, 4=Important, and 5=Very important) in their answers. From Section C onwards, all questions are identical for both categories of farmer.

Section C is focused on measuring farmers' attitudes, using questions adapted from (Läpple, 2012) (after obtaining permission from the author). However some modifications have been made, for instance removing some statements that the researcher did not consider relevant to the Malaysian context and some minor changes to wording to make the sentences easier to interpret when translated into Malay. A five-point Likert scale is used in this section, where farmers have a choice from 1= Strongly Disagree to 5=Strongly Agree, in stating their opinions. This section is also divided into five subsections to measure farmers' behaviour towards organic adoption, namely: environmental motives; profit orientation; risk behaviour; information seeking behaviour; and perceived behaviour control. These aspects were chosen because the literature highlights them as important factors in decisions to adopt organic farming as discussed in Chapter 7 (Wynn *et al.*, 2001; Defrancesco *et al.*, 2008; Läpple, 2010).

Further questions regarding respondents' expectations about the future of farming are asked in the next section (Section D). Again in this section, farmers have to answer based on a five-point Likert scale. In these questions, farmers are asked to think about their farms over the next 10 years, and to state whether or not they plan to move into organic farming, continue with their current enterprises, convert their farm to other uses, or rent them out for agricultural or non-agricultural purposes. The three last sections (Section E, F and G) are all related to the farming enterprising, supply chain and credit access and also provide demographic information about the respondents. All of these sections comprise closed-ended questions supplemented by some open-ended questions at the end of the section (See Table 4.3). Some questions provided an 'other' category, which allowed respondents to add any other responses that do not fit with the alternatives provided.

There is also an open ended question at the end of the questionnaire, asking if respondents have any comments or suggestions regarding this study. From the observations, most of the respondents provided their ideas and suggestions to improve the organic movement in Malaysia. Their answers were analysed and used for supporting some of the quantitative results (See Appendix C1).

Table 4.3 Questionnaire Format Used

Questionnaire Section	Questions measured	Type of Questions
Section A	Farm type (whether organic or conventional)	Yes/No
Section B	Farm Practices	
	(1) Organic Farmers	
	- Reason for conversion	5 Point Likert scale
	- Current usage	Yes/ No
	- General questions	Yes/No, List, Open
	- Information sources	List
	(2) Conventional Farmers	
	- Use of organic methods	Yes/No, Open
	- Consideration of organic methods	5 Point Likert scale
	- Information sources	List
	- The barriers to going organic	List, Open

Questionnaire Section	Questions measured	Type of Questions
Section C	Farmers' attitudes (including environmental motives, profit, risk behaviour, information seeking, and perceived behaviour control)	5 Point Likert scale
Section D	Farm expectations (10 years ahead)	5 Point Likert scale
Section E	Farm business and enterprises	Yes/No, Categorical, Open
Section F	Farm supply chain & credit access	Yes/No, Open
Section G	Personal information	Categorical, Open

Validity and reliability issues are not overlooked in this study. Validity helps to determine the appropriateness of the instrument and the reliability of any measurements generated from it. The validity of the questionnaire refers to whether or not a question is measuring what it is supposed to measure (Bryman, 2012). According to Mathew & Ross (2010), a pilot study involving a few respondents, friends or even an experts can help to identify issues of validity as well as other possible problems related to the questionnaire. Thus, a group of academics with expertise in areas relating to the study content in the UK, and a panel of extension officers who work closely with organic farmers were consulted prior to implementation. Care was also taken to ensure the correct use of native Malay phrases, involving checking and correction by Malaysian academics and extension officers in Malaysia. The purpose of this step was to ensure the use of language that was appropriate for the respondents and therefore most likely to result in accurate responses.

On the other hand, the reliability of an instrument refers to its ability to elicit similar results when the experiment is replicated (Chua, 2006). According to Ary *et al.*, (2010), testing the instrument should aim to identify ambiguities, misunderstandings and other inadequacies. To test the reliability and internal consistency of the instruments, a pilot test was carried out to measure Cronbach's Alpha. Miller (2002) and Ary *et al.*, (2010) suggested that Cronbach's Alpha is the

most widely used and appropriate tool used to measure the internal consistency of a research instrument.

Therefore, a reliability test was conducted to measure attitudinal components through pilot testing with ten organic farmers. This pilot test was executed after the questionnaire was completed but before actual data collection. This testing is important to establish the content validity of the scores, as well as for improving the questions used in the questionnaires (Creswell, 2014). The less reliable questions were modified or removed in order to make sure that the value of Cronbach's Alpha reached the minimum requirement (at least 0.6). Based on a rule of thumb, the acceptable level for a reliable instrument is a value of 0.6 or above. In this case the Cronbach's' Alpha scores were greater than 0.6, confirming that the instrument was sufficiently reliable and could be used for data collection (George & Mallery, 2001).

4.5.3 Study area

This study was carried out in all four regions of Peninsular Malaysia, namely Northern Region, Central Region, Southern Region, and East Coast Region (See Figure 4.4). According to the DoA, Penang, Selangor, Johor and Pahang hosted the highest number of organic farms (as registered with DoA).

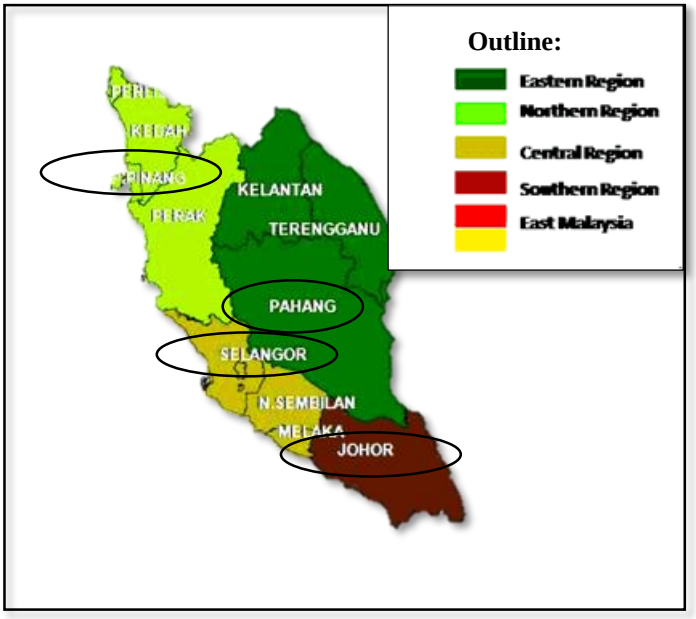

Figure 4.4 Four Regions of Peninsular Malaysia

In Malaysia, two certifications are fully monitored by the Ministry of Agriculture and the DoA, namely (1) *MyOrganic* Certification (for farmers who are fully applying organic practices) and (2) *MyGAP Certification* (for farmers who use good agricultural practices and lower levels of chemical fertiliser). Most conventional farmers are registered under *MyGAP* Certification, mostly using organic manure as the main fertiliser and at the same time minimising the usage of chemical fertilisers. DoA indicates that there are three categories of organic farming, i.e. registered and certified under *MyOrganic;* non-renewed (where *MyOrganic* certification has lapsed); and also non-certified organic farmers. All groups of farmers were considered as potential respondents in this study.

4.5.4 Sampling Technique

The questionnaire survey took place from October to December 2016. Ethical approval was obtained in August 2016 (Refer Appendix B2). The survey was administered using non-random sampling (purposive sampling procedure), an approach generally associated with small, in-depth studies with research designs that are focused on the exploration and interpretation of experiences and perceptions of social groups with particular characteristics, and used in both quantitative and qualitative research (Mathew & Ross, 2010). This approach is particularly useful in cases where no sampling frame exists for the population of interest (Gkartzios *et al.*, 2017); for instance, a sub-population of organic farmers that only represents a small proportion of farmers in Malaysia. Through this approach, unlike the probability sampling procedure, there is no attempt to create a sample that is statistically representative of the population. In fact, the chosen sample becomes the main focus for the researcher.

In this study, organic farmers were the key focus, with the intention of drawing insights about and exploring the organic movement in Malaysia. Lists of organic farmers were obtained from the Agriculture Officer in charge in the Plant Quality Control Division of the DoA. At this point (the year 2016), 179 farms were registered under *MyOrganic* Certification, with Pahang, Selangor, Johor and Pinang provinces showing the highest number of certified organic farms. As Mathew & Ross (2010) point out, the sample in a purposive sampling procedure is selected on the basis of characteristics or experiences that are directly related with research interest and allow the researcher to study area topic in more detail.

In addition, conventional farmers were obtained by using a snowball sampling procedure, another non-probability sampling method. These approaches are suitable for a small-scale experiment, and cross-sectional survey research design constrained by limited time and resources (Mathew & Ross, 2010). As described by Bryman (2012), this approach enables the researcher to make initial contact with a small group of people who are relevant to the research and then uses these to establish a connection with others. This method also applied when the populations or samples are quite hard to obtain because there is no sampling list provided, nor are there obvious places where the cases may be found (Mathew & Ross, 2010). By considering this, a sample of conventional and non-certified organic farmers who are not registered with the DoA can be achieved through this method. These farmers were selected because they lived near to the farmers in the certified organic sample and could be assumed to face similar conditions in terms of geography, climate, markets and infrastructure and to, perhaps, have the ability to make similar choices to their certified organic neighbours.

4.5.5 Data collection method

Data used in this study were obtained from face to face interviews with a total of 170 farmers, 82 of whom were organic and 88 conventional farmers. Prior to the implementation of the survey, the researcher received cooperation from the headquarters of the DoA in Putrajaya, particularly from the Farm Certification Committee (Plant Quality Control Division) who provided a letter of authorisation. This letter attached together with a cover letter from the supervisor was distributed to each DoA State Director through email, in order to obtain cooperation from their Head Department at the District Level. Permission from the Head Department (in each state) was confirmed subsequently over the telephone and dates and venues were set up to discuss the implementation of the field survey. The discussion with the Head Department of each district culminated in a decision to access the organic farms in the area with or without the extension officer. Cases where assistance was needed from the extension officer included accessibility issues (remote farms or farms that can only be reached by using a four-wheel-drive vehicles hired from the DoA) and issues around illiteracy where some farmers could require further explanations from the extension agent.

Where the researcher needed to approach farmers individually, different methods were applied to gather the information, depending on the suitability of the farmers. The main approaches were based on the list of organic farmers provided by the DoA. Based on the list, farmers were contacted personally, provided with information about the purposes of the questionnaire and their rights as respondents and asked to give their permission to be interviewed. Time and place were arranged based on their preferences (usually at the farm) and the questionnaire administrated through face-to-face discussion. At the end of the interview, farmers were asked to suggest the names of other local farmers (whether organic and conventional) who could be asked to participate in this study. Most farmers were very cooperative and suggested a range of neighbours, friends or relatives, including non-certified organic farmers who would otherwise have been very difficult to identify. The advantage of personally administering a questionnaire is that the researcher can help respondents to overcome difficulties throughout the questions and try to avoid any misunderstandings around any unfamiliar terms used. In addition, to make questions more nteresting and easier to comprehend, show cards were used, particularly for the Likert scale questions. The show cards are based on text extracted from the questionnaire and presented in a clear (big font size) and colourful format that makes it easier for the researcher to communicate to respondents (many of whom are older farmers). The researcher found it was a most useful item and contributed significantly to successful data collection.

Where necessary, DoA extension officers asked local extension agents to arrange meetings between farmers and the researcher. This approach was particularly useful with farmers of Chinese or Indian ethnicity because in some cases they had difficulty understanding some elements of the questionnaire. Any issues arising from the interviews were also discussed with the extension agent.

As well as on-farm interviews, some data was collected at external events. For example, the biennial Malaysia Agriculture, Horticulture & Agrotourism Event (MAHA 2016) took place in early December 2016. This event promotes agriculture and agro-based industries, showcasing different components of the industry in Malaysia. The programme included training for extension officers and farmers from various Asian countries. Several farmers participating at the event were asked to complete the questionnaire.

During data collection, several problems were encountered:

1. It was sometimes hard to get cooperation from the non-Malay farmers usually because of the languages barriers;
2. Extension officers needed to give approval for interviews and sometimes took a long time to process the necessary approval letter;
3. Organic farms are scattered geographically and travelling between farms was time consuming; and
4. Some extension agents did not cooperate and as a result information was hard to obtain from respondents.

However, most extension agents were helpful and data collection was completed within three months.

4.5.6 Quantitative analysis

Data analysis process was carried out directly after data collection. SPSS was used to analyse the data. The data were first entered into SPSS, then a series of cleaning and editing procedures was carried to ensure there were no errors or omissions.

(1) Descriptive Analysis

Descriptive analysis was used to describe the characteristics of the variables used in this study. Descriptive statistics include those describing the demographic background of respondents as well as details about their enterprises. This information provides important context for the study and might be helpful in understanding the results of subsequent data analysis.

(2) Barriers to Adoption

In order to ascertain barriers to the adoption of organic practices, conventional farmers were asked to rank a list of nine potential barriers in order of importance. The resulting ranks were converted into scores using an ad-hoc technique suggested by Abeyasekara *et al.,* (2001), where the first choice is given a score of eight, the second choice a score of seven, the third choice a score of five and so on. Options not ranked are scored as zero. Then a mean rank score for each potential barrier is calculate, and the highest mean is assumed to represent the most important barrier to adoption.

(3) Factor Analysis – Principle Component Analysis (PCA)

Factor analysis is a statistical technique that is applied to a set of data in order to determine the variables that are relatively independent of one another (Tabachnick & Fidell, 2007). Variables that correlate with each other but are largely independent of other subsets of variables are combined into factors for the purpose of data reduction.

There are two methods of data reduction: (1) Principle Component Analysis (PCA) and (2) Factor Analysis (CFA). Both aim to reduce the correlation matrix to a smaller set of dimensions (Field, 2013). PCA aims to extract maximum variance from the data set with each component (Pallant, 2011), while CFA is used to reveal the underlying relationships among variables (Hair *et. al.*, 2014). Regarding the differences between PCA and CFA, Tabachnick & Fidell (2007) conclude that if the study is looking at theoretical solutions, then CFA is the best option; however, if the focus is on providing an empirical summary of the data set, then PCA is the best choice.

Hence, PCA was used in this study to better understand the combination of the set of variables and identify the composite scores for each combination (factors). The PCA was used to group two different items: (1) factors that influence the decision to farm organically; and (2) attitude measurement. These factors will be used to support further analysis.

(4) Logistic Regression Modelling

Logistic regression is a flexible technique that allows a researcher to predict the value of a discrete dependent variable based on a set of one or more independent variables (Tabachnick & Fidell, 2007; Hair *et al.,* 2014). It has a similar function to discriminant analysis and answers the same questions as multiple regression analysis, though in this case with a discrete dependent variable. The purpose of the analysis in this study is to estimate the impact of a set of exogenous variables generated by the questionnaire on the probability of an individual adopting organic farming.

Since the model is nonlinear, the equations used to describe it are different from multiple regression. The outcome variable, $\hat{Y}$, is the probability of having one outcome or another based on a nonlinear function of the best linear combination of predictors with two outcomes:

$$\hat{Y}_i = \frac{e^u}{1+e^u}$$

where $\hat{Y}i$ is the estimated probability that the i case (I= 1, …, n) is in one of the categories and u is the basic linear regression equation:

$$u = A + B_1X_1 + B_2X_2 + \cdots + B_k X_k$$

with constant A (β_0), coefficient B_j, and predictors X_j for k predictors (j =1, 2. …, k).

This linear regression creates the logit or log of the odds:

$$\ln(\frac{\hat{Y}}{1-\hat{Y}}) = A + \Sigma \, B_i \, X_{ij}$$

L is the log of the odds ratio and is linear in the equation *X* as well as in the estimation. In the binary logistic regression, the dependent variable takes the values of 1 or 0. *L* becomes negative and increasingly large as the odds ratio decreases from 1 towards 0 and becomes increasingly large as the odds ratio increase from 1 to infinity (Gujerati & Porter, 2009).

The logit equation is the natural log ($\log_e$) of the probability of being in one group divided by the probability of being in the other group. As in multiple linear regression, the estimating coefficient is used to identify the best linear combination of predictors, however in the logit model the method of maximum likelihood is applied to maximise the likelihood of obtaining the observed outcome frequencies (Tabachnick & Fidell, 2007). The likelihood value is used when calculating the measure of overall model fit. The basic measure of the maximum likelihood estimation procedure is found by looking at the likelihood value, where it measures model estimation fit with the value of negative two times the log of the likelihood value (also referred to as -2LL or -2 log likelihood). The minimum value for -2LL is 0, hence the lower the -2LL value, the better the fit of the model (Hair *et. al*, 2014).

In logistic regression, the goodness of fit can be measured in two ways: first, by assessing the model estimation fit using 'Pseudo R^2' values and, second, by examining predictive accuracy. Both techniques can predict model fit under different perspectives; however, they still produce similar conclusions (Hair *et al.*, 2014).

The 'Pseudo R^2' value measures are similar to the coefficient of determination in multiple regression. It derives from the same function as R^2 in regression analysis and the value ranges from 0 to 1. The model can be considered to fit when -2LL is 0 and the value of Pseudo R^2 is 1. Two other measures that are similar and can be categorised as Pseudo R^2 measures are the Cox and Snell and Nagelkerke statistics, which both range between 0 and 1, with 1 indicating a perfect model fit.

Overall, predictive accuracy can be measured by two common approaches, namely the classification matrix and chi-square-based measures of fit. The classification matrix approach measures how well group membership is predicted, calculating a hit ratio (percentage correctly classified), that can be used in discriminant analysis. The chi-square-based measure is a classification test that measures predictive accuracy (Hosmer & Lemeshow, 2013). This test depends on sample size and will have a small statistically significant difference when the sample sizes become larger.

The quantitative analysis was conducted, in order to identify any significant coefficients that may help to explain the adoption of organic farming. Results were then used to inform the subsequent phase, follow-up interviews with organic farmers.

4.6 Phase 3: Interviews with Organic Farmers (Qualitative Phase)

The third phase of data collection was completed in December 2016, once the second phase of data collection was finished. A series of face-to-face interviews were conducted as a follow up from the previous phase and, as described previously, built directly on the quantitative results. This was intended to elicit further information regarding farmers' decisions to farm organically and explored some of the underlying factors that may not have been identified in the quantitative modelling. This approach is helpful in gaining more insights into the quantitative results and provides a more in-depth understanding of the qualitative data (Creswell, 2014).

4.6.1 Sampling method

Ten organic farmers who had previously completed the questionnaire survey were involved in this phase. All participants were selected based on their willingness to participate in further research. Participants who were willing to be contacted again for a follow-up interview left contact details so that they could be contacted by the researcher. Figure 4.5 illustrates the corresponding questions.

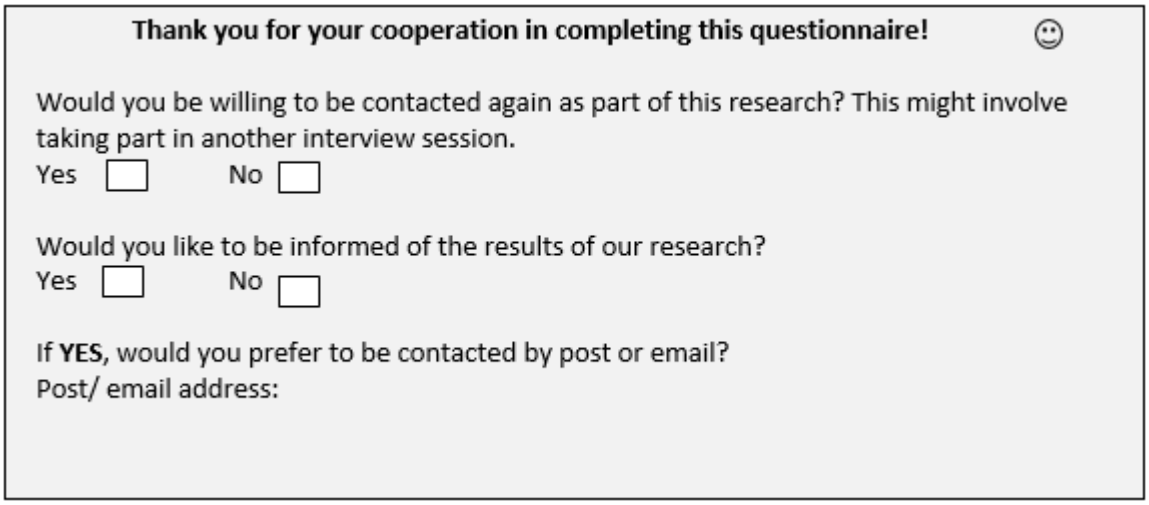

Figure 4.5 Questions Asking Respondents to participate in Future Research

Of the 82 organic respondents, 35 agreed to be contacted again and left their contact numbers and email addresses in the questionnaires. The researcher then called every person to check their availability and asked them to participate in another interview session. Most were willing to assist; however, only ten farmers were available to be interviewed within the timeframe available to the researcher. The locations for interview were chosen based on respondents' preferences and the purpose of the exercise was explained to the respondents prior to commencing the interview. Personal data and contact details collected for this process were stored securely (some respondents have asked for results to be sent to them and their details have been retained accordingly).

4.6.2 Data collection

Ethical approval for this phase (together with Phase 2) was obtained from the Newcastle University Research Ethics Committee in August 2016. The permission and approval letters from the supervisor were shown to all correspondents who agreed to be interviewed. The use of a tape recorder was also explained, and participants were informed that the interview would take about one hour and that they could stop the discussion at any time if they wished. Respondents also signed a consent form before being interviewed.

Face-to-face semi-structured interviews were used to gather data on what factors influence farmers' decisions to pursue organic farming. This is by Mathew & Ross (2010), where they suggest using a semi-structured interview in explanatory research intended to seek explanation and gain a better understanding of participants' experiences, behaviour or feelings towards certain phenomenon.

Hence, since explanatory mixed methods designs require the qualitative research element to expand and explain the quantitative results, the interview guide used the quantitative results and logit model to suggest important themes for questions. The preliminary analysis of quantitative results was therefore undertaken prior to the qualitative phase taking place. Four major themes were identified in this way:

Table 4.4 Interview Guide for Farmers' Interview (Phase 3)

No	Main Topics	Related Questions
1.	How do you see the organic movement today?	- The role of assistance from government or related agencies? - The response from the community?
2.	What are the main factors that influence you to farm organically	- Did your family play an important role in influencing your decision to become organic? - Do you think that training and education play an important role in influencing farmers to become organic?
3.	What kind of behaviour do you think is important in managing organic farming?	- Do you think that it is important to make the largest profit possible from farming? - What is the main consideration for you in undertaking organic farming?
4.	How do you see the organic movement in the future?	- Are there any current initiatives that will improve this sector? - Is there a bright future for the organic movement?

All interviews were conducted in the participants' preferred language, with most preferring the Malay language or a mix of English and Malay (Chinese participants) as the main medium of communication. The researcher was also aware of the participants' rights (for instance keeping all information private and confidential) and took into account safety and cultural considerations during the interviews.

4.6.3 Data Analysis

Following the same analytical process outlined for the first phase, the analysis was conducted in accordance to the guidance of Braun & Clarke (2006) for thematic analysis. The recorded interview data were first transcribed using the Malay language for better understanding (to ensure the meaning was preserved) and then translated into English for analysis. The data were coded based on the themes developed from the quantitative results. The transcription analysis was done using NVIVO software. However the translating and managing themes was done manually by the researcher. The researcher felt confident in doing this manually using a table of themes where each row of the table referred to a specific topic or theme, and participants' interviews were sorted according to the theme.

4.7 Summary

This chapter began with an explanation of the research design which involved a mixed methods approach. This provides a rationale for using mixed methods in the study, thus introducing the three-phase approach adopted here. Detailed description and explanation continue for each phase, starting from the first phase (exploratory interviews with key informants), followed by the second phase (survey questionnaires) and the third phase (follow up interviews with organic farmers). The following chapters present the findings of this study focusing on the demographic background of this study in Chapter 5, discussing the barriers underpinning organic farming in Chapter 6, exploring the behaviour to adopt organic farming in Chapter 7 and the most important aims in this study; identifying the factors that contribute to the organic adoption in Chapter 8.

CHAPTER 5. DEMOGRAPHIC CHARACTERISTICS OF SAMPLING FRAME

5.1 Chapter Outline

This chapter will focus on the background of the respondents and the chapter is organised as follows. Section 5.2 describes the demographic characteristics of the sample and how it compares to the overall population, Section 5.2.1 explains its geographic distribution, Section 5.2.2 describes land ownership and 5.2.3 farm supply chains and enterprises. The chapter continues with a description of the farmers' engagement with relevant organisations in Section 5.2.4. Sections 5.3 and 5.4 explain the socio-economic profile of organic and conventional farmers, respectively. The final section discusses and summarises the findings.

5.2 Sample Demographic

Table 5.1 reports on the distributions of the 170 farmers sampled in this study. Similar numbers of organic and conventional farmers were sampled, with 82 farmers organic and 88 conventional. Of the organic farmers, 61 of them are certified under the *MyOrganic* certification, while the rest (21 farmers) are not certified. Of the certified farmers, 52 were certified until 2016 (when this fieldwork was undertaken), however nine farmers had not renewed their certification. Of the conventional farmers, only 37 had *MyGAP* certification, while the rest applied conventional farming methods.

Table 5.1 Distribution of Respondents

Variables	Frequency (%)	Comparison with National Data (Year 2016)
Farmer proportion (n=170)		
Organic	82 (48.2%)	179 certified
Conventional	88 (51.8%)	192,692 farmers
Organic farmers (n=82)		(including veg, fruit,
MyOrganic certification	61 (73.4%)	herbs, industry
Non-certified	21 (25.6%)	including mushrooms)
Certified organic farmers (n=61)		*The proportion (1:1076);
Renewal/ still certified	52 (85.3%)	where 1 organic farmers
Non-renewal	9 (14.7%)	to 1076 total of farmers
Conventional farmers (n=88)		
MyGAP certification	37 (42.1%)	
Conventional	51 (57.9%)	

Table 5.2 summarises respondents' characteristics. Most farmers in the sample are male (89%). This is in line with the current data provided by the Department of Statistics Malaysia (2016), where employment in agriculture is dominated by males (more than 70% in 2015).

Nearly all farmers are married (86%) and most of the respondents are Malay (56%), followed by Chinese (37%), Indian (6.5%) and one respondent from Melanau, in Sabah (other). The majority of the respondents are educated up to either secondary (41.2%) or primary (20%) levels, while nearly 15% are educated up to degree level. Interestingly, 5.3% of the respondents had undertaken postgraduate studies, most of them to Masters' level.

Table 5.2 Profile of Respondents

Variables (n=170)	**Organic (%) (n=82)**	**Conventional (%) (n=88)**	**Total (100%)**	**χ^2 value**
Gender				0.104
Male	69 (40.6%)	82 (48.2%)	151 (89%)	
Female	13 (7.6%)	6 (3.5%)	19 (11%)	
Family Status				1.000
Single	12 (7.1%)	12 (7.1%)	24 (14.1%)	
Married	70 (41.2%)	76 (44.7%)	146 (85.9%)	
Ethnicity				0.000***
Malay	31 (18.2%)	64 (37.6%)	95 (55.9%)	
Chinese	43 (25.3%)	20 (11.8%)	63 (37.1)	
Indian	7 (4.1%)	4 (2.4%)	11 (6.5%)	
Other	1 (0.6%)	0 (0.0%)	1 (0.6%)	
Education				0.055*
Primary school	12 (7.1%)	22 (12.9%)	34 (20%)	
Secondary school	30 (17.6%)	40 (23.5%)	70 (41.2%)	
Higher certificate	5 (2.9%)	7 (4.1%)	12 (17.1%)	
Diploma	14 (8.2%)	6 (3.5%)	20 (11.8%)	
Degree	14 (8.2%)	11 (6.5%)	25 (14.7%)	
Postgraduate	7 (4.1%)	2 (1.2%)	9 (5.3%)	

Notes: (*, **, *** significant at 10%, 5% and 1% levels respectively)

Based on the result of a Chi-square test between the organic and conventional farmers, a statistically significant difference is found between the two groups for ethnicity and education (as shown in Table 5.2). This suggests that Malays are more likely to farm organically, with Chinese farmers more likely to farm conventionally. In terms of education, more organic farmers studied until certificate level, while conventional farmers are more likely to have studied at higher levels (Diploma and above).

Out of the total sample, the mean age of the respondents was 48, with the majority aged between 41 and 60 (62%) (See table 5.3). The mean length of time spent farming was 15 years, though many respondents (46.5%) had less than 10 years of experience. By contrast nearly a quarter of respondents in the sample had farmed for more than 20 years (see Table 5.3).

Table 5.3 Frequency Distribution for Respondents' Age and Experience in Agriculture

Variables (n=170)	Frequency	Percent (%)	Mean	SD
Age			48.21	11.61
20 – 30 years	16	9.4		
31 – 40 years	25	14.7		
41 – 50 years	53	31.2		
51 – 60 years	54	31.8		
61 – 70 years	17	10.0		
71 – 80 years	4	2.4		
81 – 90 years	1	0.6		
Experience in agriculture			14.82	10.42
1 – 10 years	79	46.5		
11 – 20 years	48	28.2		
21 – 30 years	33	19.4		
31 – 40 years	9	5.3		
41 – 50 years	0	0.0		
51 – 60 years	1	0.6		

The mean size of the farm was 4.2 hectares (ha), but almost 70% of the farmers have less than 3 ha of land. Only 7% had more than 7 ha of land (see Table 5.4).

Table 5.4 Frequency Distribution for Respondents' Farm Size Category

Variables (n=170)	Frequency	Percent (%)	Mean	SD
Farm Size Category			4.168	18.11
Less 1.0 Ha	60	35.3		
1.01-3.00 Ha	65	38.2		
3.01-5.00 Ha	24	14.1		
5.01-7.00 Ha	8	4.7		
More 7.01 Ha	13	7.6		

By comparing farm sizes between organic and conventional farms in Table 5.5, the majority of the organic farmers have very small farms (less than 1 ha) while most conventional farmers have more than 2 ha of land.

Table 5.5 Comparison of Farm Size between Organic and Conventional Holdings

Variables	Organic (n = 82)	Conventional (n = 88)	*p*-value	Effect size (r)
Farm size	0.95	2.0	0.000***	0.40

Notes: (***significant at 1%) [8]

5.2.1 Geographic Distribution

Table 5.6 reports the geographic distribution of respondents in this sample. There are similar numbers in Selangor and Pahang provinces, with nearly 50 farmers sampled from each region. Negeri Sembilan has 38 respondents, Johor 17, Pulau Pinang five, Malacca and Kuala Lumpur four each and Kedah only one respondent. In terms of the proportion of organic farmers, most were sampled in Pahang state with 34 farmers, followed by Selangor (13) and Negeri Sembilan (12). On the other hand, Selangor shows the highest number of conventional farmers (38), followed by Negeri Sembilan (26) and Pahang (16).

Table 5.6 Frequency Distribution for Respondents' Province and Comparison with National Data

Province/ Region	Organic	Conventional	Total in Sample	National Data[9]
Pulau Pinang	5 (2.9%)	0 (0.0%)	5 (2.9%)	2,395
Kedah	1 (0.6%)	0 (0.0%)	1 (0.6%)	10,003
Pahang	34 (20.0%)	16 (9.4%)	50 (29.4%)	34,032
Selangor	13 (7.6%)	38 (22.4%)	51 (30%)	3,777
Negeri Sembilan	12 (7.1%)	26 (15.3%)	38 (22.4%)	6,052
Kuala Lumpur	3 (1.8%)	1 (0.6%)	4 (2.4%)	NA[10]
Malacca	3 (1.8%)	1 (0.6%)	4 (2.4%)	4,900
Johor	11 (6.5%)	6 (3.5%)	17 (10.0%)	41,219

[8] A Mann-Whitney U test revealed a significant difference between them (Organic (Med = 0.95, n = 82) and conventional (Med = 2.0, n = 88) farmers, with U = 1930.5, z = -5.247, p = 0.00, r = 0.40). Based on the Cohen (1988) criteria, r = 0.40 can be considered as a medium effect.

[9] Population of farmers in 2016 which farming vegetables, fruits, and herbs, in correspond with each region. Sources from Department of Agriculture (2015).

[10] Data not available for Kuala Lumpur, as Kuala Lumpur is a big city, only small scale farmers or urban farmers are farming in this area

Table 5.7 Frequency Distribution for Respondents' Region

Province/ Region	Organic	Conventional	Total	χ^2 value
Northern Region	6 (3.5%)	0 (0.0%)	6 (3.5%)	0.000***
East Coast Region	34 (20.0%)	16 (9.4%)	50 (29.4%)	0.000***
Central Region	28 (16.5%)	65 (38.2%)	93 (54.8%)	0.000***
Southern Region	14 (8.2%)	7 (4.1%)	21 (12.4%)	0.000***

Notes: (***significant at 1%)[11]

Looking at Table 5.7, the majority of respondents come from the Central and East Coast regions, with organic farmers sampled across all provinces. This corresponds to the latest figures on the numbers of organic farms provided by the Malaysian DoA, where the East Coast region has the highest number of organic farms in peninsular Malaysia, followed by the Central region, Southern region and Northern region (DoA, 2016).

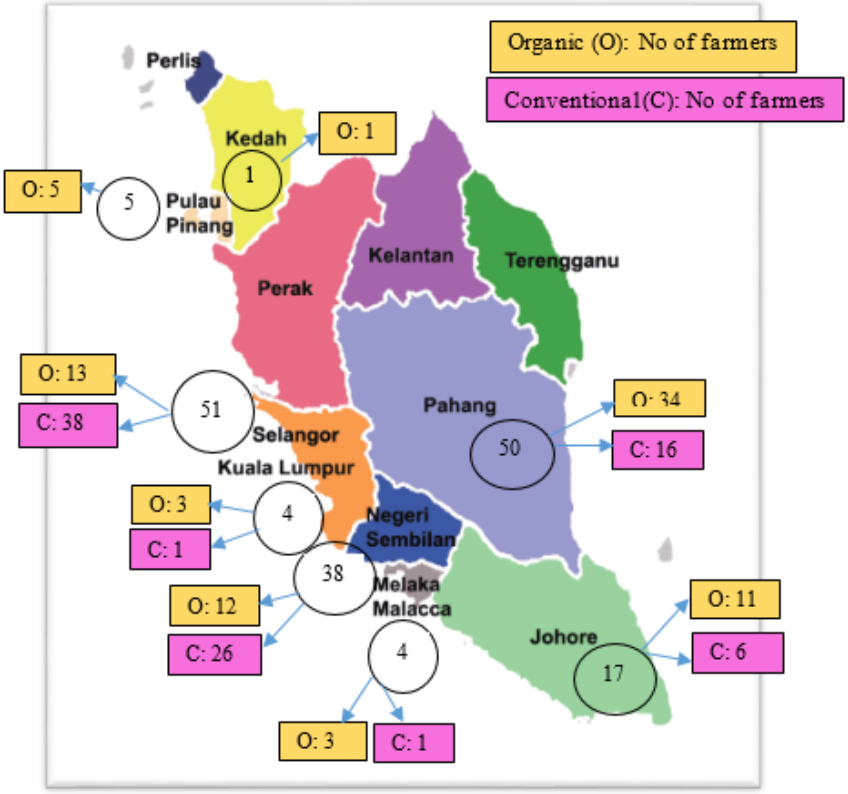

Figure 5.1 Geographic Distribution of the Sample

[11] A Chi-square test was performed which indicated that there is a significant association between the numbers of organic and conventional farmers in all regions with $\chi 2$ (3, n=170) = 29.359, p=0.000 where (p< 0.01) level of significance.

Inspection of Figure 5.1 shows that the distribution of organic and conventional farmers sampled across provinces and regions is not even. This reflected the purposive nature of the sample, with a greater number of organic farmers sampled in the Northern and Southern regions to ensure that a sufficiently large organic sample could be gathered. More conventional farmers were interviewed in these regions to keep costs down (i.e. the Northern and Southern regions entailed higher travel and accommodation costs).

5.2.2 Land Ownership

Land ownership was raised in Section E of the questionnaire. As the results, only 27.6% of the sample owned their farm: the rest were tenants (45.9%) or had a Temporary Occupation Lease (TOL) (21.2%). TOLs[12] are most common in the Cameron Highlands, in Pahang State (as in Figure 5.2) where farmers are allowed to use the land temporarily but need to pay rent to the government.

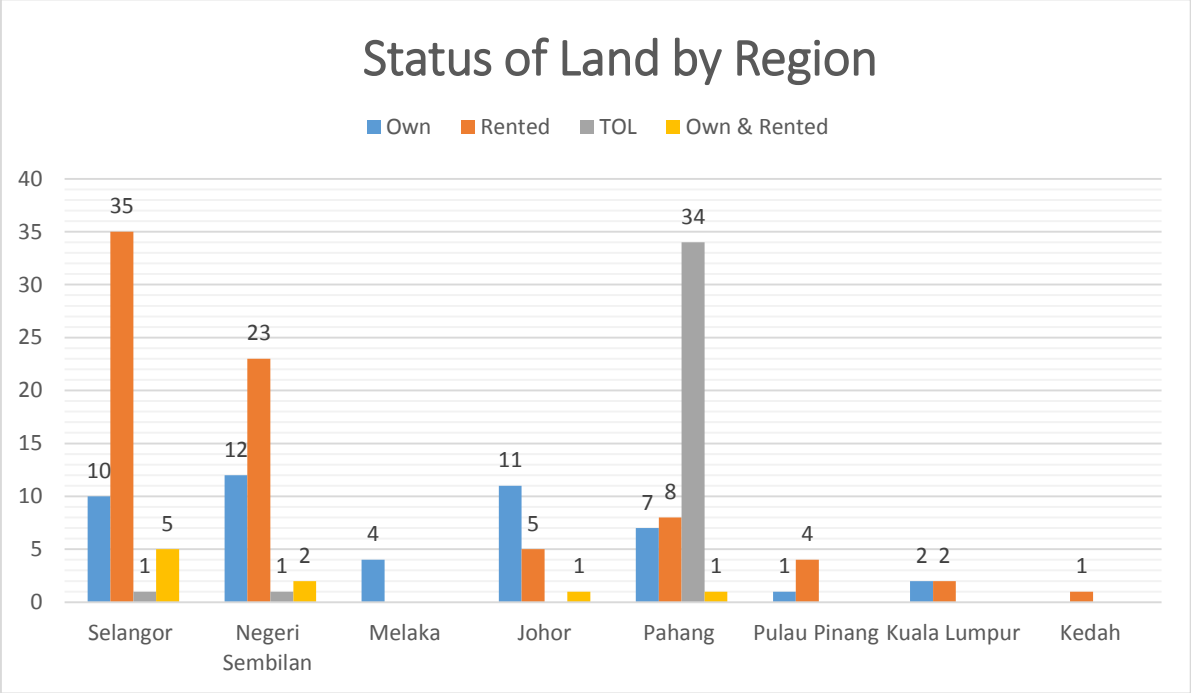

Figure 5.2 Status of Land by Region

[12] A TOL is a temporary authorisation to an individual or company to occupy government or reserved land permitted by the state authority under the Seksyen 65 National Land Code 1965 (Idham Lai, 2010). The land is under state control, and the license must be renewed annually. Only the state authority is empowered to issue the licence and any monitoring and assistance is also the state government's responsibility.

The result of the Chi-square test indicated that there is a significant difference between organic and conventional farmers in the sample regarding farm status at the $p<0.01$ level of significance (see Table 5.8). This indicates that more organic farmers in the sample own their farm compared to conventional farmers. This is consistent with the rules of the DoA where farmers who intend to apply for *MyOrganic* certification need to provide some evidence regarding their land ownership status. Within the sample TOL status is currently more common for organic farmers than for conventional. This could suggest that more organic than conventional farmers are applying for land under TOL. This would not be surprising as organic farmers in Cameron need to renew and pay for their TOL land before renewing or applying for their *MyOrganic* certificate.

Table 5.8 Frequency Distribution of Farm Status

Variables	**Organic (%) (n=82)**	**Conventional (%) (n=88)**	**Total (100%) (n=170)**	**χ^2 value**
Farmland status				20.662
Own	29 (17.1%)	18 (10.6%)	47 (27.6%)	(0.000)***
Rented	27 (15.9%)	51 (30.0%)	78 (45.9%)	
Temporary (TOL)	25 (14.7%)	11 (6.5%)	36 (21.2%)	
Own & rented	1 (0.6%)	8 (4.7%)	9 (5.3%)	

Notes: (*** significant at 1%)

5.2.3 Farm Supply Chain and Enterprises

When asked about farm supplies, there were significant differences between the two groups regarding their customers (see Table 5.9). Both organic and conventional farmers have their own regular customers. For organic farmers, most of their direct customers are local people, organic shops, and restaurants. For most conventional farmers their regular customers are usually the nearest wholesale market, wet market, or contract farm under the Federal Agriculture Marketing Authority (FAMA). Organic farmers in the sample are more likely to sell their products to a hypermarket like AEON, Tesco, Giant or Jaya Grocer, while conventional farmers are more dependent on middlemen and wholesalers. This is because for conventional producers their products are high volume and highly perishable, so need to be sold quickly. By contrast, organic products attract many specialist customers, such as cancer patients, who seek them from specific shops, usually hypermarkets.

Table 5.9 Comparing the Supply Chains of Organic and Conventional Farmers

Variables (n=170)	Organic (%)	Conventional (%)	Total (100%)	χ^2 value
Supplies produce to:				42.026
Regular customers	47 (27.6%)	37 (21.8%)	84 (49.4%)	(0.000)***
Hypermarkets	19 (11.2%)	4 (2.4%)	23 (13.5%)	
Wholesalers	9 (5.3%)	13 (7.6%)	22 (12.9%)	
Collectors	2 (1.2%)	13 (18.2%)	33 (19.4%)	
Others	4 (2.4%)	0 (0.0%)	4 (2.4%)	
FAMA	1 (0.6%)	3 (1.8%)	4 (2.4%)	

Notes: (*** significant at 1% level)

Most of the respondents grow vegetables (43.5%), followed by 18.2% who cultivate mushrooms, 14.7% fruit and 1.2% herbs (see Table 5.10). Other crops (22.4%) include tubers and rice. The Chi-square results revealed a significant difference between the two groups, which suggests that organic farmers in the sample are more likely to grow mushroom as their main crops. In term of livestock, majority do not have livestock on the farm (84%) and of the 16% who employ integrated farming practices, most are organic farmers.

Table 5.50 Comparing Enterprise Type and Rearing Livestock between Organic and Conventional Farmers

Variables	Organic (%) (n=82)	Conventional (%) (n=88)	Total (100%) (n=170)	χ^2 value
Main crop				65.742
Mushroom	26 (15.3%)	5 (2.9%)	31 (18.2%)	(0.000)***
Vegetables	48 (28.2%)	26 (15.3%)	74 (43.5%)	
Herbs	2 (1.2%)	0 (0.0%)	2 (1.2%)	
Fruits	5 (2.9%)	20 (11.8%)	25 (14.7%)	
Others	1 (0.6%)	37(21.8%)	38 (22.4%)	
Livestock				5.289
Yes	19 (11.2%)	8 (4.7%)	27 (15.9%)	(0.021)*
No	63 (37.1%)	80 (47.1%)	143 (84.1%)	

Notes: (***, ** significant at 1% and 5% levels respectively)

5.2.4 Farmers' Participation and Credit Access

As shown in Table 5.11, only 16.5% of the respondents are members of a cooperative, and most of these are conventional farmers (15%). Around half of the farmers sampled are members of farmer organisations. Nearly 65% of respondents have no access to credit or loan access, while those who do have access are more likely to be organic farmers.

Table 5.61 Frequency Distribution for Access to Credit and Membership of Farmer Groups

Variables (n=170)	Organic (%)	Conventional (%)	Total (100%)	χ^2 value
Cooperative members				17.144
Yes	3 (1.8%)	25 (14.7%)	28 (16.5%)	(0.000)***
No	79 (46.5%)	63 (37.1%)	142 (83.5%)	
Farmers association				18.519
Yes	26 (15.3%)	58 (34.1%)	84 (49.4%)	(0.000)***
No	56 (32.9%)	30 (17.6%)	84 (50.6%)	
Credit access				2.639
Yes	36 (21.2%)	27 (15.9%)	63 (37.1%)	(0.104)*
No	46 (27.1%)	61 (35.9%)	107 (62.9%)	
Loan access				0.955
Yes	31 (18.2%)	26 (15.3%)	57 (33.5%)	(0.328)
No	51 (30.0%)	62 (36.5%)	113 (66.5%)	
Government subsidies				21.119
Yes	33 (19.4%)	67 (39.4%)	100 (58.8%)	(0.000)***
No	49 (28.8%)	21 (12.4%)	70 (41.2%)	

Notes: (*, **, *** significant at 10%, 5% and 1% levels respectively)

5.3 Socio-economic profile of organic farmers

By looking at the organic farmers in this study, most of them are Malay and educated to certificate level. The majority range in age between 41 to 50 years old, and the oldest are 70 years old. Nearly all have experience ten years or lower, and only a few having experiences of 60 years (more than conventional farmers). The organic farm sizes are generally small (almost 1 ha), largely in the East Coast region. This notably indicated the highest proportion of organic farmers by Department of Agriculture Malaysia (DoA). In terms of ownership, organic farmers mostly own their farms. This corresponds to the requirement of applying the *MyOrganic* certification, where the basic process of applying the certification requires the certificate of land ownership. For the supply chain marketing, organic groups prefer regular buyers from specialised organic shops, and local people and restaurants as their main customers, followed by hypermarkets. Most of them cultivate mushrooms and vegetables as the main crops. Those who apply for credit and loan access are also from the organic group of farmers.

5.4 Socio-economic profile of conventional farmers

In contrast, the criteria of conventional farmers in this study are considerably different from the organic farmers. The majority are Chinese, ranging in age between 51 to 60 years old and mostly educated farmers, their education up to higher level (Diploma and above). In terms of experience, mainly 50% of them having their experience ten years and below, and the longest years of experience are up to 40 years only. The farm sizes are generally big, more than 2 ha of land and mostly rented land. The majority of them are from the Central Region, cultivating fruits as well as other crops including vegetables, and more likely to supply theirs produces to the collector, wholesaler and their own consumer like local people. Almost all are applying for subsidies from the government, and become a member of cooperative and farmers association.

5.5 Summary

This chapter presents the findings of the questionnaire including descriptive statistics that covers their demographic information including the geographic distribution, farm ownership. Their supply chain as well as farmers participation in organic farming. Even though the proportion of certified farmers and the total population of farmers can be considered as high, but by comparing with the population of each region, the sampling represents the population. For instance, the majority of organic farmers in this study are from Pahang, corresponding with the data provided by the DoA which also noted that most of the certified organic farmers are in Pahang (refer to page 47, Figure 3.8).

Furthermore, it is also important to highlight that based on the socio-economic profiling for each group of farmers, organic farmers in this sample are mostly Malays, educated up to certificate level and having a farm size less than 1 ha. Generally, they cultivate mushrooms as their main crop. On the contrary, conventional farmers are mostly Chinese, quite highly educated (higher education i.e. diploma and above) and have larger farms (more than 2 ha). For generality, a better understanding of sample characteristics will provide greater understanding of the context, which will improve the interpretation of the results.

CHAPTER 6. BARRIERS AND CHALLENGES UNDERPINNING THE ADOPTION OF ORGANIC FARMING

6.1 Chapter Online

This chapter discusses the barriers that prevent conventional farmers from adopting organic farming practices. It comprises a discussion of quantitative results, followed by a more detailed review of qualitative results to provide a more in-depth understanding. The challenges identified here should to be taken into consideration by policy makers if they wish to encourage more farmers to engage in organic farming activities.

6.2 Quantitative Results

Only conventional farmers were asked about what prevented them from becoming organic. From a list of nine potential barriers (the last item was "other" which they needed to specify) respondents were asked to rank the three most important barriers for them. The ranks were then converted into scores using an ad-hoc technique suggested by Abeyasekara *et al.*, (2001), where the first choice is given a score of eight, the second choice a score of five, and the third choice a score of three.

Out of 88 conventional farmers, 77 responded to this questions. From the results (see Table 6.1), the overwhelming responses to what were the most important barriers were '*Lack of Support from the Government and Related Agencies*'. The second and third most important barriers were '*Drop in volume*' and '*Lack of Training and Extension Services*'.

Table 6.1 Rank of Farmers' Barriers in Converting to Organic

Rank	Barrier	Mean score	Std. Dev
1	Lack of support from government and related agencies	16.30	4.96
2	Drop in volume production	13.15	0.62
3	Lack of training and extension services	12.15	1.18
4	Could not sell the product	10.65	1.44
5	Drop in quality	8.45	0.99
6	Rigid certification process	4.35	0.64
7	Problem in hiring labour	4.10	2.00
8	Problems in land ownership / licensing (e.g. TOL)	1.35	1.79

6.3 Qualitative Results

In order to gain broader contextualisation, qualitative methods from Phase 1 permit greater exploration of the quantitative results. Four challenges were identified from the themes underpinning organic adoption in Malaysia and these are now considered.

6.3.1 Government Intervention and Support

Based on the results, most of the key informants agreed that political issues intervened in the focus of government intervention towards organic farming. This might be due to changes in government focus, mostly occurring when politicians (i.e. ministers) change their positions after an election, and the focus is no longer the same. This has resulted in a lack of monitoring and evaluation systems for the specific agenda that has been established earlier. Key informants' responses to this included:

> *Maybe part of the problem is that they keep on changing people (politicians), so there is no continuity (Key Informant 2)*
>
> *It happens when the ministry changes their portfolio, then there is less budget provided for certain agendas, like what happens in the organic movement (Key Informant 4)*

This has resulted in less government assistance and this has become the main challenge for farmers applying new techniques, specifically organic farming practices. A few key informants emphasised the importance of government assistance:

> *That's why organic is a really tough industry. We need support. Then only if we get support from government … we can actually grow better (Key Informant 5)*

> *But the thing is that the government will have to come in and help. They have to be more proactive (Key Informants 1)*

> *I personally think we really need government to support … because growing organic vegetables is slightly different from the conventional (Key Informant 6)*

This view also was supported by an extension officer, who thought that the DoA should play a major role in providing information and disseminating it to farmers:

> *The extension linkage between farmers and researchers should be strengthened through DoA involvement, where everyone has to play their role to make the organic movement more visible to both farmers and the community. (Key Informant 2)*

All of these challenges might influence farmers' ability to adopt new methods of practice because they lack confidence and knowledge about the new practices. As one of the key informants claimed:

> *For the first few years maybe they are fine with organic, but with little knowledge, all of this might turn them back to their old practices and that's when they start to use chemicals again (Key Informant 5)*

6.3.2 Market orientation

Other obstacles to adopting organic farming from the survey include the niche market around organic products, which leads to some farmers experiencing difficulties in finding a market.

> *Actually, organic farms in Malaysia are a very niche market. Most of them have problems selling their produce (Key Informant 1)*

The niche market has then impacted on the prices of organic products, which are always up to three times higher than conventional products. This might be due to less suppliers compared to demand.

> *Vegetables are the most fast moving but not for organic. If one day we can make supply match demand, then of course our price will be very competitive in the market and everybody will be able to enjoy organic produce. (Key Informant 2)*

When probing into how the prices would differ, one of the key informants (on behalf of the organic suppliers) highlighted that one of the reasons would be that conventional producers are more focused on mass production in the shortest time, whereas organic farmers need more time to harvest and produce at lower volumes.

> *Growing organic vegetables is very costly. Why? Conventional farming can produce a lot because they use chemicals and after maybe 25 or 20 days they can harvest and then you can sell it - but for organic you need double the time! (Key Informant 5)*

6.3.3 Land Ownership

The other challenge that constrains farmers from farming organic is land ownership (Temporary of License, TOL), where this was a key concern of the Cameron Highland (Pahang State) respondent only. As Cameron Highlands is a major vegetable producer in Malaysia, this problem should not be overlooked.

> *Land is the most important issue but the issue still exists until now (Key Informants 6)*

The two key informants from the DoA who are responsible for Certification and Crop Management Practices explained that land certification or renewal depends on state authority. This process might slow down the renewal of, or applications for, MyOrganic certification, because the DoA needs the land certificate as a proof to submit the application.

> *The TOL has got nothing to do with organics... It's different. Farmers have to depend on the TOL renewal first and then apply for the organic certification or renewal certification (Key Informant 1)*

> *We can approve the application, as long as it is legitimate land. That is the condition. … That is under the Land Registry Office authority (Key Informant 4)*

Therefore, the key suppliers of organic products urge the government or responsible authorities to solve these land issues so that more farmers can be involved in organic farming, particularly in the Cameron Highland area.

> *We really need government … to take action because most farmers in Cameron face the issue of land title. … Because of this, organic farms cannot be certified by the DoA (Key Informant 5)*

6.3.4 Rigid Certification Processes

In addition, the rigid certification process might also impede farmers applying for *MyOrganic* certification. As one of the key informants argued, a lot of documentation needs to be completed and submitted to the DoA and if farmers have lower literacy skills, this might become a problem for them.

> *Most people tend not to write reports, therefore they failed to prepare the records (Key Informant 6)*

6.4 Discussion on the farmers constraints to farm organically

Several barriers that have been discussed above might prevent farmers from converting to organic methods. From the quantitative results, most of the conventional farmers claimed that a lack of support from government is the most limiting factor preventing them moving from conventional to organic production. Farmers are also not confident about yields if they moved to organic farming. Insufficient training has also become an obstacle to adopting organic farming practices. Results from the qualitative study also show similar outcomes where government interventions, market orientation, land ownership and rigid certification processes constrain the adoption of organic farming practices.

Overall, all of the results (in this chapter) can be classified into three groups namely: lack of support and assistance from government (including training and facilities); on-farm issues (i.e. difficulties in obtaining inputs and lower yields) and market issues (e.g. difficulties in selling products at premium prices). These results were consistent with those of another Malaysian study by Tiraieyari, *et al.*, (2014), which found that organic farmers faced challenges with regards to land

tenure, certification processes, hiring foreign workers, marketing, and support from government (including training and extension services). This study differs from that of Tiraieyari *et al.*, (2014) which only covered organic farmers by also considering the views of conventional farmers.

These findings also support those of Nandi *et al.*, (2015), who highlight four main barriers around the production of organic fruit and vegetables in South India, namely: production, marketing, techno-managerial issues and economics concern. Findings are also similar to a study from Iran which showed that farmers faced challenges in certifying, marketing, and accessing reliable technical information and credit (Soltani *et al.*, 2013). Similarly, in a study based in China, Dendler & Dewick (2016) identified limited support from the Chinese government, as well as procedural problems, as the main challenges facing organic transition in China.

On-farm issues, particularly production difficulties, pests and diseases, are the second largest obstacle to conversion identified by Wheeler (2008) . Jouzi *et al.*, (2017) came to a similar conclusion in their study, which found that lower yields and nutrient management issues were among the main challenges faced by organic farmers in developing countries. Earlier studies of organic farming identified that the main challenges included improving nutrient management and increasing yields (Tuomisto *et al.*, 2012). However, the specific challenges faced by farmers largely depend on farming systems and site characteristics. Some studies have found for example that under certain conditions where there are good management practices, particular crop types and favourable growing conditions, organic systems can nearly match conventional yields and sometimes might lead to higher yields (Seufert *et al.*, 2012; Auerbach *et al.*, 2013; Badgley *et al.*, 2007).

6.4.1 What types of support are required to overcome the barriers identified?

Support from government can be seen as a major factor in helping farmers and organic farming to move forward. Government intervention and assistance from other stakeholders and NGOs has been found to have a great influence on the organic movement in other countries such as Vietnam (Tran, 2009); China (Dendler & Dewick, 2016); India (Nandi *et al.*, 2015); Canada (Khaledi *et al.*, 2007), and Spain (Sierra, Zilberman & Gil, 2008). Government support for organic farming is not a new phenomenon and began in the late 1980's with national initiatives in several countries like

Denmark, Austria, and Switzerland and under EU various programmes (Lampkin *et al.*, 1999; Lockeretz, 2007).

There are various ways in which government agencies and NGOs can help to sustain and support organic farmers, for instance by providing assistance in the form of technical training and providing regular on-farm monitoring. Research on organic cotton farmers in Tanzania has shown that training and regular technical advice have become the most important factors for helping them to overcome their challenges (Altenbuchner *et al.*, 2016).

Organic price premiums and subsidies are found to be important elements in influencing other farmers to farm organically, as well as maintaining the involvement of existing organic farmers (Sierra *et al.*, 2008 ; Nandi *et al.*, 2015). External incentives such as subsidy payments could play a similar role to internal motives like environmental attitudes (Frey & Busenhart, 1995). Daugbjerg *et al.*, (2011) conducted a study modelling the impacts of policy intervention, with a focus on the organic subsidies between the UK and Denmark. The study revealed that subsidies were crucial in influencing farmers to shift to organic farming: however the timing of the subsidies given can differ, e.g. after conversion (UK) or before conversion (Denmark). Furthermore, Ilbery & Maye (2011) asserted that a range of subsidies and price supports are available for farmers to remain economically viable, so farmers may have no need for organic premiums. However, the success of such schemes will depend on social acceptance and awareness of the mechanism of the payment, hence requires proactive consultation with advisory services and farming communities (Moxey and White, 2014).

In term of marketing, Rezai *et al.*, (2016) suggested contract marketing as a possible solution in motivating farmers to enhance their participation in organic farming practices in Malaysia. Through this, farmers are motivated to become involved in organic production by controlling over the supply chain and channelling their produce directly to the buyers. This might become one of the solutions for conventional farmers who experience difficulties in marketing organic products.

In addition, organic support can now be extended into different areas, such as research, market development and consumer promotion (Stolze & Lampkin, 2009). The international expansion of the market for organic produce may also motivate other producers to apply organic principles on their farms. Adequate market incentives, for instance cheaper access to credit, improved market

infrastructure and adequate fiscal incentive, may also help farmers to remain organic (Islam *et al.*, 2010).

Table 6.2 compares the challenges faced by organic (from Tiraieyari *et al.*, (2014) study) and conventional farmers, as well summarising key informants' insights into the organic movement. This shows that the challenges observed in the 2014 study still exist and if government and related agencies do not take serious action, these issues will persist and the organic movement will be unable to progress.

Table 6.2 Comparison of the Challenges Faced by the Organic Farming Movement in Malaysia

Organic Farmers (Tiraieyari *et al.*, 2014)	**Conventional Farmers (This thesis, 2018)**	**Key Informants (This thesis, 2018)**
Land tenure	Government support (including training and extension services)	Government intervention
Certification Process	Drop in production volume	Market orientation
Hiring Foreign Workers	Marketing	Land ownership
Marketing	Rigid certification processes	Rigid certification processes
Support from Government (Training and extension services)	Labour	
	Land ownership (ToL)	

From the empirical findings presented here and earlier studies in literature, it becomes apparent that in Malaysia, to encourage more farmers to become involved in organic production, the government should take action to resolve the land ownership problem, as well as improving the *MyOrganic* certification process. Even though land ownership approval is under State authority, maybe the DoA could suggest some action plan; for example, farmers might start planting organic crops while awaiting approval. However, this might depend on collaboration between both authorities. Nevertheless, certain actions need to be undertaken in order to increase farmers' participation in organic practices to achieve sustainable agriculture in the future.

6.5 Summary

This chapter provides a greater understanding of the context around conversion to organic production and also some of the limitations that farmers face in adopting organic methods. The challenges can be classified under three main headings for further refinement, namely: institutional and support barriers; market issues; and on-farm issues. Reviewing other studies it is apparent that many have similar findings to this study and it is also apparent that barriers to adoption are common across most developed and developing countries. Understanding and learning from these lessons will help to overcome these issues to promote further organic development in the future.

CHAPTER 7. FARMER'S ATTITUDES TOWARDS ORGANIC FARMING PRACTICES

7.1 Chapter Outline

Drawing upon the results of the barriers that constrain conventional farmers from farming organically in the previous chapter, most of these barriers are emerging from external sources (i.e. institutional support, market and farm issues), but not from individual behaviour (i.e. farmers preferences). Internal resources, namely individual behaviour, might play a major role in determining whether or not farmers decide to practise organic farming methods. It is now important to consider and explore the attitudes of farmers who chose to farm or not to farm organically. Apart from socio-economic factors which may influence organic farming adoption, there is also a debate that attitudinal factors influence the conversion decision into organic farming (Burton *et al.*, 2003; Padel, 2001). Furthermore, the TPB in the earlier chapters (in Chapter 2) also indicated that behavioural aspects should not be overlooked as they also contribute to the farmers' decision to adopt organic practices (Barhoum, 2010; Läpple and Kelley, 2010; Läpple, 2012; Rezai *et al.*, 2016).

In order to meet the specific objectives discussed in earlier chapters (to analyse farmers' behaviour towards organic farming practices), this chapter aims to investigate the attitudes of farmers towards organic farming practices. As farmers' attitudes are very important determinants in the decision to adopt organic farming practices, this section will investigate the perceptions of both organic and conventional farmers through descriptive analysis and further correlate these behaviours to the adoption of organic farming. The qualitative results reported here are used to provide further explanation of the quantitative findings. The discussion triangulates the results from both methods, which also provides further explanation of the context.

7.2 Quantitative Results

This section aims to provide an understanding of farmers' attitudes towards organic farming, focusing on their opinions and preferences regarding several issues related to organic practices. Both groups of farmer (organic and conventional) had to answer these questions. Both categories

of farmer were questioned to identify whether there are any differences between the groups in terms of their attitudes towards organic practices.

The 20 variables included in the analysis are based on a series of statements which were read out to respondents who were then asked to state whether they agreed or disagreed with them, using a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). Answers based on this scale are reported using the sample mean score and a simplified three-point scale broadly summarising the proportion of responses that disagreed, neither disagreed nor agreed, or agreed with the statement. Statements were based around attitudinal issues including environmental concerns, profit orientation, risk behaviour and information seeking behaviour. Table 7.1 reports the attitudes of organic farmers and Table 7.2 those of conventional farmers.

According to the results in Table 7.1, most organic farmers agree with the statements (almost all means are above 4.0). Only in a few cases were mean scores less than 4.0. Profit orientation and risk averse behaviour were among the main concerns, with a mean score below 3.70 (as highlighted). For organic farmers, obtaining the highest possible price is not always an important issue and this variable had the lowest mean score (3.22). Responses to the price statement revealed some disagreement among farmers: only 55% agreed that it is important to receive the highest possible price for organic produce, compared with 34% who disagreed.

Table 7.1 Organic Farmers' Attitudes towards Organic Farming

Criterion (n=82)	Percentage of respondents (%)			Mean (score)	Std. Dev
	Disagree (strongly)	Neither disagree nor agree	Agree (strongly)		
Environmental Concern					
It is important to be sensitive to the environmental impacts of farming by reducing input use on the farm	6.1	6.1	87.8	4.24	0.825
The use of chemical inputs has a negative impact on the health of people and animals	1.2	1.2	97.5	4.40	0.645
It is important to take the environment into consideration, even if it lowers profit	1.2	7.3	91.5	4.39	0.733
It is important to farm in an environmentally friendly way	0	0	100	4.72	0.452
Organic farming is better for the environment than conventional farming	0	1.2	98.8	4.67	0.498

Profit Orientation					
It is important to receive the highest possible prices for produce	**34.2**	11.0	**54.9**	**3.22**	**1.054**
Profit Orientation					
It is important to make the largest possible profit from farming	13.4	15.9	70.8	3.87	0.991
It is important to try new ways to increase profit	1.2	1.2	97.6	4.45	0.591
Farming is about maximizing profits from the farm business	6.1	12.2	81.8	3.96	0.808
To survive in farming, a farmer has to adapt to changing and new technologies	1.2	1.2	97.6	4.59	0.587
Risk Behaviour					
Before applying different farming practices they first need to be proven on other farms	**19.5**	9.8	**70.7**	**3.72**	1.01
It is important to be cautious about adopting new ideas	1.2	1.2	97.6	4.21	0.515
Before adopting new ways of doing things it is important to learn from other farmers	4.9	20.7	74.7	4.02	0.860
Information Seeking					
It is important to discuss farming options with other farmers	2.4	2.4	95.1	4.57	0.667
It is important to have a knowledge about good farming practices	0	0	100	4.61	0.491
It is important to have good contact with extension officers to discuss related issues	6.1	0	83.9	4.38	0.780
It is important to visit other farms to look at their farming methods	7.3	1.2	91.5	4.33	0.832
It is important to seek advice before making farm decisions	0	3.7	96.3	4.43	0.567

From the conventional farmers' point of view (see Table 7.2), almost all respondents agreed with the statements in the questionnaire survey. There are two statements with a mean of less than 3 which both refer to environmental behaviour concerns (as highlighted in the column). In response to the statement *"It is important to be sensitive to the environmental impacts of farming by reducing input use on the farm",* only 65% agreed and 24% disagreed. Some farmers claimed that both methods are essential to achieved higher yields and they preferred not to separate them. However, for the statement *"It is important to take the environment into consideration, even if it lowers profit"* 76% of respondents agreed to consider environmental effects, but 11% still prioritise profits over environment.

Table 7.2 Conventional Farmers' Attitudes towards Organic Farming

Criterion (n=88)	Percentage of respondents (%)			Mean (score)	Std. Dev
	Disagree (strongly)	Neither disagree nor agree	Agree (strongly)		
Environmental Concern					
It is important to be sensitive to the environmental impacts of farming by reducing input use on the farm	**23.9**	11.4	**64.8**	**3.59**	1.14
The use of chemical inputs has a negative impact on the health of people and animals	0	1.1	98.8	4.17	0.46
It is important to take the environment into consideration, even if it lowers profit	**11.4**	12.5	**76.1**	**3.78**	0.823
It is important to farm in an environmentally friendly way	0	3.4	96.6	4.16	0.452
Organic farming is better for the environment than conventional farming	0	2.3	97.7	4.28	0.502
Profit Orientation					
It is important to receive the highest possible prices for produce	13.6	17.0	69.3	3.95	1.06
It is important to make the largest possible profit from farming	2.3	3.4	94.3	4.39	0.668
It is important to try new ways to increase profit	0	0	100	4.42	0.496
Farming is about maximizing profits from the farm business	3.4	4.5	92.1	4.10	0.626
To survive in farming, a farmer has to adapt to changing and new technologies	0	1.1	98.8	4.50	0.525
Risk Behavior					
Before applying different farming practices they first need to be proven on other farms	1.1	3.4	95.4	4.30	0.590
It is important to be cautious about adopting new ideas	1.1	1.1	97.7	4.23	0.519
Before adopting new ways of doing things it is important to learn from other farmers	0	1.1	98.9	4.30	0.483
Information Seeking					
It is important to discuss farming options with other farmers	1.1	0	98.8	4.65	0.548
It is important to have a knowledge about good farming practices	0	0	100	4.32	0.468
It is important to have good contact with extension officers to discuss related issues	0	5.7	94.3	4.38	0.593
It is important to visit other farms to look at their farming methods	1.1	1.1	97.7	4.22	0.513
It is important to seek advice before making farm decisions	0	1.1	98.9	4.26	0.467

To summarise, five categories representing attitudes and behaviours of organic and conventional farmers, were computed and the mean factors are presented in Figure 7.1. Comparing the mean values across organic and conventional farmers, reveals substantial differences in terms of environmental concern between organic and conventional operators. However, by contrast, conventional farmers are highly profit orientated and less risk averse group. The mean for information sharing does not indicate much difference between the two groups, which further emphasise that information sharing is important for both groups of farmers.

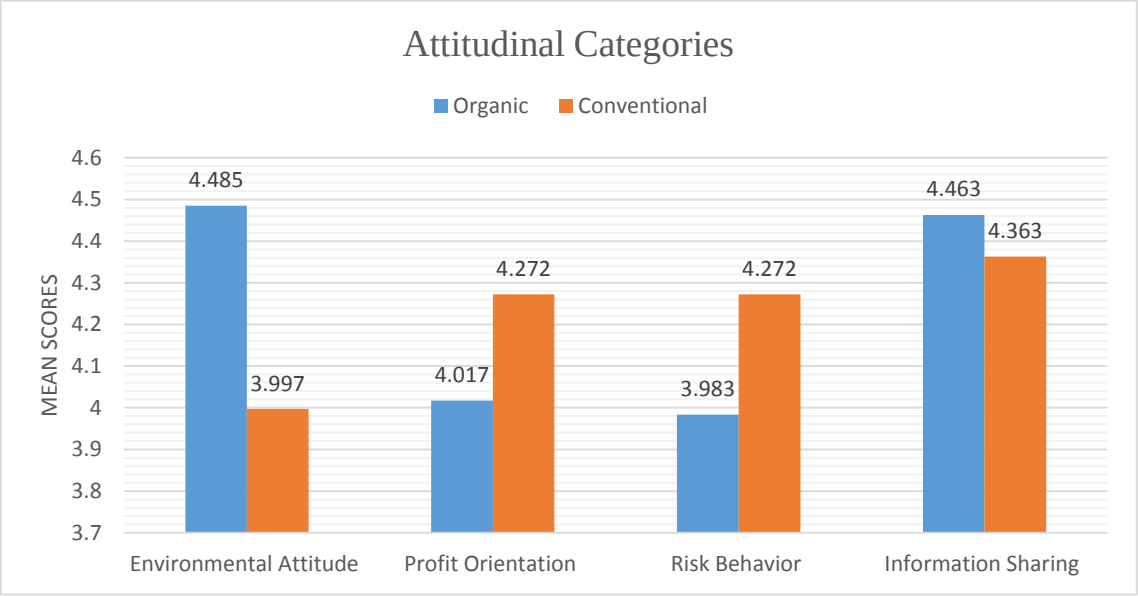

Figure 7.1 Mean Scores for Attitude between Organic and Conventional Farmers

By examining whether these behaviour scores have contribute significantly between the two groups of farmers, further analysis (Independent Sample T-test) has been done and presented in Table 7.3.

Table 7.3 Attitude Scale Grouped by Organic and Conventional Farmers

Attitude	Organic farmers $n = 82$	Conventional farmers $n = 88$	*t*	*Sig-t*
Environmental concern	4.485 (0.384)	3.997 (0.432)	7.765	*0.000
Profit orientation	4.017 (0.512)	4.273 (0.474)	3.382	*0.001
Risk behaviour	3.984 (0.559)	4.273 (0.430)	3.791	*0.000
Information seeking	4.463 (0.455)	4.364 (0.354)	1.587	0.115

*Notes: Mean and standard deviation in parentheses, *t* indicate significance at the 99% level.

Both farmer groups differ significantly with regard to environmental attitudes. Organic farmers show a higher level of environmental concern compared to conventional farmers (t = 7.765, p = 0.000). On the contrary, the two groups differ significantly in terms of their attitudes towards profit, where most conventional farmers are found to be more profit oriented than organic farmers (t = 3.382, p = 0.000). There are also significant differences between organic and conventional farmers in terms of risk behaviour, with conventional farmers exhibiting greater levels of risk aversion towards organic farming (t = 3.791, p = 0.000). All of the three behaviours, as mentioned earlier, show similar results to the previous study undertaken by Läpple (2012), except for information-seeking attitudes. This research found that there was no significant difference with regard to their information-seeking attitudes, which suggests that gathering relevant information is important to both groups in the Malaysian context. These findings have been discussed and critiqued in the academic forum, particularly in Mohamed Haris (2018), where a paper presented at the International Agricultural Congress (IAC) Annual Conference in 2018.

7.3 Qualitative Results from Phase 3

In order to understand the behavioural aspects that lead to the adoption of organic farming through a qualitative lens, follow-up interviews were employed with organic farmers.

Analysis of the data showed two themes; environmental awareness and information gathering, emerging from the interviews, and these results support the quantitative results, as presented in Section 7.2.

7.3.1 Environmental awareness

Most of the organic farmers demonstrated an environmental awareness, empahsising how a safe and healthy environment shapes farmers preferences towards organic. One farmer articulates such an awareness:

> *The awareness about the importance of safe and healthy environment plays a major role in organic farming (OF2)*

Another farmer claimed that it is important to keep the environment in a natural way as it is, even where excessive technology is used:

Technology comes to assist us in farming, but still we have to follow the needs of nature… we need to go back to the basic way of farming (OF3)

Other farmers also support this view:

We will consider applying a new method of farming, as long as if it is good for environment and in natural way (OF4)

In Malaysia, education and awareness about healthy environment is very crucial, if we can change on this, we can change a lot already (OF1)

7.3.2 Information gathering and knowledge exchange

Knowledge is a very important source for farmers to develop their skills and competence. One farmer highlighted the importance of educating farmers towards the safety of organic production:

I used to educate farmers to see the importance of organic to our health and environment, from here they will learn and trying to implement the organic method (OF10)

Another farmer extends this principle by not only focusing on farming organically but also adapting his lifestyle:

Education is very important, we learn and we applied what we had learned. Besides, we also must consider how to extend the knowledge into our lifestyle … this also might empowered other farmers to farm organic (OF7)

The processes through which information is exchanged remains a priority for many farmers, as one organic farmer put it:

For me, the knowledge needs me to apply and deliver, because without sharing the knowledge will remains there and at the end will saturate … we will not improve (OF9)

Other farmers also agree:

It is important to learn from other farmers, and discuss farming options with other farmers (OF6)

Information sharing is really good and beneficial for us and this will improve our knowledge and confidence in applying organic farming (OF5)

7.4 Discussion

This study employed both quantitative and qualitative methods in analysing the results. By adapting Läpple's (2012) instrument as a basis for the quantitative method, this study has explored four attitudinal categories based around the environment, profit, risk aversion and information seeking. Analysis revealed that organic farmers have higher environmental attitude scores than their conventional counterparts, and the doctoral thesis results are consistent with Läpple's (2012) study. This is also supported by a growing body of literature with similar results, where greater levels of environmental concern have led to a greater uptake of environmentally-friendly land management measures, including the adoption of organic farming practices (Best, 2010; Burton *et al.*, 2003; Burton, 2014; Kings & Ilbery, 2009).

The qualitative analysis also reveals similar findings, where most organic farmers claimed they are more concerned about the state of the environment. They were also found to be more supportive towards nature. This is a finding common in other studies, most notably Sullivan *et al.*, (1996) who highlight the same trend, that most organic farmers show an appreciation for and an awareness of nature. They claimed that organic farmers are more blended with nature and more supportive of the notion that humans should live in harmony with the natural world. Their findings corroborate the results from the organic farmers in this study.

Alongside their lower environmental concerns, conventional farmers exhibit greater levels of risk aversion towards organic farming. This result was also found by Läpple (2012), who indicated that organic farmers are less risk averse than conventional farmers. This finding is consistent with other studies as well (Gardebroek, 2006; Läpple, 2010; Sodjinou *et al.*, 2015; Flaten *et al.*, 2005). Läpple (2012) explained that this situation might happen due to organic farmers being exposed against certain risks; for instance yield reduction, restriction of using chemical fertiliser or even locating a new market outlet. In the Malaysian context, by considering the fact that organic farmers have to familiarise themselves with new markets (in this case larger outlets like hypermarkets or special organic retailers), it seems plausible that they are less risk averse than their conventional counterparts. Furthermore, the size of farms also played a major role, where the majority of organic farmers have a small farm compared to conventional. The smaller the farm size, the less risk farmers will face. However, the findings of the thesis study contradict from those of Serra *et al.*,

(2008) where the organic farmers are found to be highly risk averse when compared to conventional. The main reason for this was that most of the organic farmers sampled were wealthier than the conventional farmers and were willing to take more risks. This finding corroborates the idea that farmers with higher incomes are more likely to use higher risk technologies compared to lower income farmers (Okon & Idiong, 2016). Based on Lampkin & Padel (1994), lower risk aversion can be associated with the conversion process and the risk of yield reductions. Furthermore, farm conversion can be particularly more risky for some farm types, like intensive poultry or fruit production (Padel, 2001). The findings support this. In Malaysia, the less risk averse attitude can be linked to the dominance of mushroom cropping systems which are more natural and less involving intensive production systems compared to poultry or fruit production.

In addition, attitudes towards profit in the thesis also produces similar results to Läpple (2012), where most conventional farmers are found to be more profit oriented than organic farmers. This result contradicts several studies which highlighted the observation that economic motives are an important driver for conversion to organic production (Lampkin & Padel, 1994; Nandi *et al.*, 2015; Sahm *et al.*, 2012). Padel (2001) declared that the economic advantage of conversion might increase over time, due to markets becoming better established and support for organic farming being more consistent. However, these results differ from another study which indicates that both organic and conventional farmers have similar attitudes to profit, particularly in specialised markets offering premium prices (Pornpratansombat *et al.*, 2011).

Lampkin & Padel (1994) highlighted some of the financial constraints surrounding organic conversion, including the absence of price incentives and recognition, lack of investment for conversion, as well as cost gathering information. However, Nandi et al., (2015) suggested that the driving economic factors for organic conversion can be to obtain better access to the market and awareness of increasing demand for organic produce. Other studies have indicated the importance of organic subsidy payments in encouraging organic conversion (Pietola and Lansink, 2001; Läpple and Kelley, 2013). On the contrary, in the Malaysian context, organic farmers are not occupied with the subsidies, in fact most of them rely on their personal finances. The subsidies are targeting only conventional farmers, with subsidies for fertiliser and other inputs used. For organic farmers, the government only provides their assistance in term of extension services as well as incentives in the form of infrastructure.

Mean attitude scores for the organic and conventional groups were not so different in terms of information sharing attitudes, which suggests that gathering relevant information is important for both groups in the Malaysian context. This encouraging result suggests that information is crucial for farmers to develop their knowledge and build their confidence to improve agricultural practices, or adopt new technologies. By contrast, Läpple (2012) found that organic farmers gave information gathering higher priority than conventional farmers, because organic farming is an information intensive farming technique which requires extensive knowledge and information acquisition (Padel, 2001). By gathering the information, it can reduce the degree of uncertainty and raise awareness towards a new method of adoption (Rogers, 2003). This encouraging result suggests that information is crucial for farmers to develop their knowledge and build their confidence to improve agricultural practices, or adopt new technologies. By contrast, Läpple (2012) found that organic farmers gave information gathering higher priority than conventional farmers, because organic farming is an information intensive farming technique which requires extensive knowledge and information acquisition (Padel, 2001).

The interview results also highlight the same issue, whereby the majority of organic farmers agreed that knowledge exchange and information sharing are important in developing their interest in organic farming. This encouraging result suggests that information is crucial for all farmers to develop their knowledge and build their confidence in improving agricultural practices or adopting new technologies. As Bachhav (2012) asserted, information is the most important element in enhancing agricultural productivity to ensure that it remains competitive in a changing world. The adoption of new methods, particularly organic farming, needs farmers to be well-prepared and farmers will need to collect and assess a variety of information when making the decision of whether or not to convert to organic production (Hill, 2009). This finding is consistent with Ajzen (1991) who emphasised that human action is guided by knowledge and information, both of which are essential in the process of converting to organic farming (Aker *et al.,* 2005). Sumane *et al.*, (2016) also highlighted the importance of farmers' local knowledge that enables them to farm successfully in specific local conditions, which often links to their skills and experience. Local knowledge is relevant to sustainable agriculture practices, which take social, environment and economic aspects of nature into consideration. By building on local knowledge, organic agriculture may improve their self-reliance and revitalise the traditional customs (Hattam & Nadia El-Hage, 2000).

Table 7.4 shows the summary of the results by this thesis, Läpple's (2012) study and qualitative themes. Läpple's (2012) study is important to become the basis of this study, as this study adapted some of the behavioural items in the questionnaires. By comparing the results, it is evident that they are not much different except for the information seeking behaviour, due to differences in the cultural and demographic contexts of each country.

Table 7.4 Summary of the Results

Type of Behaviour	This Thesis (2018) (Quantitative)	Läpple (2012) (Quantitative)	This Thesis (2018) Qualitative Themes
Environmental concern	Organic > Conventional	Organic > Conventional	Environmental awareness towards nature
Profitable attitude	Organic < Conventional	Organic < Conventional	
Risk averse	Organic < Conventional	Organic < Conventional	
Information seeking	Organic ~ Conventional	Organic > Conventional	Information gathering and knowledge sharing are essential to develop farmers skills

7.5 Summary

This chapter presents findings on farmers' behaviour and attitudes regarding organic farming practices. An interesting finding emerged, where organic farmers are found to have greater environmental concern compared to their conventional counterparts. This suggests that encouraging greater environmental awareness among farmers should be the main priority and should not be overlooked. Of the two groups, both emphasised the importance of knowledge sharing among farmers. These findings are encouraging in the Malaysian context, as this demonstrates that both types of farmer are open to developing their knowledge and expertise. This suggests that those responsible for extension services will have a receptive audience for high quality information on new practices and technologies.

Understanding the behaviour of both groups of farmers might help to suggest how farmers' attitudes or awareness could be changed, in order to increase the number of organic farmers in the long term (Läpple, 2010). These behavioural result will be brought forward to the next analysis which is in the Logit Modelling, in order to answer the main objective of this PhD study; identifying factors that lead farmers to adopt organic farming practices.

CHAPTER 8. FACTORS INFLUENCING THE DECISION TO FARM ORGANICALLY

8.1 Chapter Outline

This chapter explores farmers' motivations for adopting organic farming practices. It is based on the three phases of data collection (discussed in Chapter 4). Results from the semi-structured interviews with the key informants are presented in Section 8.2. These results are then used as a basis for the quantitative survey instrument in Phase 2. The results from the questionnaire survey are detailed in Section 8.3, where the descriptive results and the Principal Component Analysis (PCA) are used to model the adoption of organic farming practices. In order to identify what factors influence farmers to adopt organic farming, a logistic regression model is then estimated. The logit model will help to identify some of the underlying factors that may influence organic adoption. The follow-up interview results in Phase 3 are discussed in Section 8.4 to explore further information regarding farmers' decisions to farm organically. All the sources of information are triangulated, as discussed in Section 8.5. It is important to understand the factors that lead to the organic adoption decision as this has been found to be a key component in designing a policy intervention (Burton *et al.*, 2003).

8.2 Results from Phase 1 (Semi-Structured Interview with Key Informants)

Table 8.1 shows the summary of the key themes identified from the key informants' interviews. These findings have been discussed and critiqued in academic forum: for example in Mohamed Haris (2016), a paper presented at the Agriculture Economic Society (AES) Annual Conference in 2016.

Table 8.7 Initial Codes based on Key Informants' Interviews

Themes/ Respondent	Respondent 1 (Department of Agriculture, Certification)	Respondent 2 (Department of Agriculture, Fresh & Horticulture Crop)	Respondent 3 (Ministry of Agriculture)	Respondent 4 (Organic Research Institution, MARDI)	Respondent 5 (NGO, CETDEM)	Respondent 6 (NGO, OAM)	Respondent 7 (Organic Market Supply Chain, AEON)
Role/contributions towards organic movement	Accreditation of organic certification & assisting the process (so far 146 farms)	Promoting organic, assisting farmers in cultivation practices (training on growing organic vegetables) & applying allocation for organic development	Applying budget/ allocation for organic development	Doing research/ experiments regarding organic cultivation (mostly vegetables)	Promoting organic methods to farmers (training on the ground & improving community awareness)	Assisting certification on imported products (as agent) & marketing organic products	Promoting organic products to consumers (have a specific area that sells organic & does promotions on the branding)
Factors which contribute to farmers adopting organic farming	1. High integrity & high commitment	1. High awareness about food safety 2. Family background	1. High awareness among consumers 2. Support from government	1. High awareness 2. Training and support from government 3. Need passion	1 Land ownership 2 Subsidies/loans from the government 3 Labour force 4 Provide more training on the ground	1. Land ownership 2. Government intervention 3. Have their own market	1. Demand from cancer patients 2. Need passion to be organic 3. Government & NGOs intervention to support local producers 4. Farmer training 5. Clear information to educate the consumer
Future observations	Great opportunities, need further subsidies/ allocation from government & to create more awareness (i.e. in the middle-class community)	Great awareness from the consumer (need a greater promotion of food safety from the government)	Good future, need more farmers to become involved	Bright future, as long as it gets support from government and other institutions, including research institutes	The movement is still slow, but people are getting more aware of organic food	Organic development will achieve more success as long as they have a large demand from consumers & market support from government	People are starting to buy organic and the demand is getting higher, need continued support from government & NGOs

From the codes for what factors contribute to farmers' adoption, the emerging themes and analysed data led to the identification of **six main factors** that are relevant to farmers considering moving to organic production, these are:

1. Political context, where farmers need support from various agencies and NGOs, especially government. This can include financial support, such as loans or subsidies, or training and advice.

2. High awareness among consumers regarding organic products. Even though current demand for organic produce is skewed towards particular groups like cancer sufferers or more educated individuals, key informants proposed that all consumers should be aware about organic produce and its potential benefits.

3. Farming organically requires high commitment, passion and integrity. Farmers need to have a positive attitude to gain trust from consumers and buyers and they have to be able to withstand a rigid certification process.

4. Labour. Farmers need a greater force to help them manage the farm. This is only relevant in larger organic enterprises.

5. Family support. Family background plays an important role in success especially today when it is difficult to encourage young people to move into agriculture.

6. Land ownership (most relevant in Pahang). Most farmers in Pahang are tenants (and this makes it hard for them to get certification, as they need the owner of the land to apply. Some who farm organically in this area apply the certification from another country (e.g. the USA or Australia) and some of them sell their produce to big companies that have their own certification.

8.3 Results from Phase 2 (Survey Questionnaire)

Results from the first phase informed the questionnaire, where organic farmers were asked about the reasons for their initial conversion to organic methods. By contrast, conventional farmers were asked what might influence them to shift from conventional to organic farming. A five point Likert scale was adopted, with different questions used for organic and conventional farmers.

8.3.1 Descriptive Results

Based on Table 8.2, the most influential reason for organic farmers adopting this practices in the first place, were health concerns (mean 4.49). Results also suggested the importance of their belief in the organic concept (mean 4.38), consumer health awareness (mean 4.26) and environmental principles (mean 4.24).

Table 8.2 Why Organic Farmers Converted to Organic Production

No	Reason for converting	Frequency (%)					Mean (score)	Std. Dev
		Very Unimportant	Unimportant	Unimportant nor important	Important	Very Important		
1	Support from government & agencies	1.2	9.8	28.0	34.1	26.8	3.76	1.001
2	Consumer awareness	-	2.4	4.9	57.3	35.4	**4.26**	0.663
3	Influence from other farmers	-	45.1	13.4	34.1	7.3	3.04	1.048
4	Farming without chemical	6.1	14.6	3.7	29.3	46.3	3.95	1.285
5	Reduced production cost	1.2	25.6	19.5	45.1	8.5	3.34	0.997
6	Environmental principle	-	4.9	1.2	58.5	35.4	**4.24**	0.713
7	Unhappy with conventional farming	9.8	43.9	7.3	29.3	9.8	2.85	1.228
8	Belief in organic concept	-	-	4.9	52.4	42.7	**4.38**	0.580
9	Producer and family health concern	-	1.2	-	47.6	51.2	**4.49**	0.572
10	Marketing strategy	-	19.5	18.3	32.9	29.3	3.72	1.092
11	Continue from parent	11	45.1	29.3	11.0	3.7	2.51	0.959

The results from conventional farmers regarding reasons why they might convert, were slightly different from those of organic farmers. "*Consumer awareness*" had the highest score with a mean of 4.38 (Table 8.3), followed by "*Producer and family health concerns*" (mean 4.23) and "*Support from government*" (mean 4.19).

Table 8.3 Why Conventional Farmers Might Convert to Organic Farming

No	Variables (Factors)	Frequency (%)					Mean (score)	Std. Dev
		Very Unimportant	Unimportant	Unimportant nor important	Important	Very Important		
1	Support from government & agencies	-	8	56.8	-	35.2	**4.19**	.800
2	Consumer awareness	-	-	3.4	55.7	40.9	**4.38**	.553
3	Influence of other farmers	1.1	20.5	11.4	56.8	10.2	3.55	.970
4	Farming without chemical	-	33	14.8	39.8	12.5	3.32	1.067
5	Reduced production cost	1.1	31.8	43.2	13.6	10.2	3.00	.959
6	Environmental principle	-	2.3	2.3	76.1	19.3	**4.13**	.543
7	Unhappy with conventional farming	5.7	78.4	10.2	4.5	1.1	2.17	.647
8	Belief in organic concept	-	9.1	38.6	39.8	12.5	3.56	.828
9	Producer and family health concern	-	-	1.1	75	23.9	**4.23**	.448
10	Marketing strategy	2.3	48.9	22.7	17	9.1	2.82	1.045
11	Continue from parent	3.4	59.1	25	10.2	2.3	2.49	.816

8.3.2 PCA

In this study, PCA is used on the qualitative data summarised in the previous section to reduce the data into a set of composite factors that will be used in the subsequent logit modelling. Initially, all 11 variables based on Likert scores were subjected to PCA. Prior to this, data screening was performed for univariate outliers, and no missing data were found. Drawing on Pallant (2013), there are two main issues that need to be considered in this analysis: 1) sample size and 2) the strength of the relationship between variables.

The first concern is regarding sample size. As a general rule, in PCA it is necessary to have at least five times as many observations as the number of variables to be analysed. Hair *et al.*, (2014) argue that a more acceptable sample size would be based on a ratio of 10 observations to one variable. Tabachnick & Fidell (2007) suggest that a smaller sample size (e.g. 150 cases) should be sufficient as long as the solutions have a higher loadings marker variable (above 0.8). Guadagnoli & Velicer (1988) agreed that factors with 10 or more loadings greater than 0.40 (in this doctoral study, all factors with 10 loadings are higher than 0.40) are reliable if the sample size is greater than 150.

Even though it was not a great fit, it can be considered as susceptible because this study managed to employ 170 observations and 11 variables exceeds the ratios suggested above.

The second issue to be addressed concerns the strength of the intercorrelations between variables. Tabachnick & Fidell (2007) recommended inspection of the correlation matrix for evidence of correlation coefficients greater than 0.3. Here, the correlation matrix revealed the presence of many coefficients of 0.3 or above, suggesting that a reasonable factor analysis could be performed. Secondly, the Kaiser-Meyer-Olkin value was 0.644 which slightly exceeded the recommended value of 0.6 (Kaiser, 1974) and Bartlett's test of Sphericity (Bartlet, 1954) was statistically significant ($p < 0.05$). Finally, the communalities were all above 0.3 (see Tables 7.3 & 7.4) which demonstrate that each item shared some common variance with other items.

The PCA revealed the presence of four components with eigenvalues greater than 1, explaining 23.6%, 17.6%, 12.8% and 9.75% of the variance respectively. An inspection of the scree plot revealed a clear break after the components for further investigation. Catell's (1966) Scree Test (refer to Figure 8.1), demonstrates that the slope of the scree plot changes dramatically suggesting that as many as six factors may be appropriate when considering the changes in eigenvalues (i.e., identifying the "elbow" in the eigenvalues). However, for the fifth and sixth factors, the eigenvalues can be considered as low (at 0.824 and 0.600 respectively) in relation to the latent root criterion value of 1.00 and therefore can be safely ignored (Hair *et al.*, 2014).

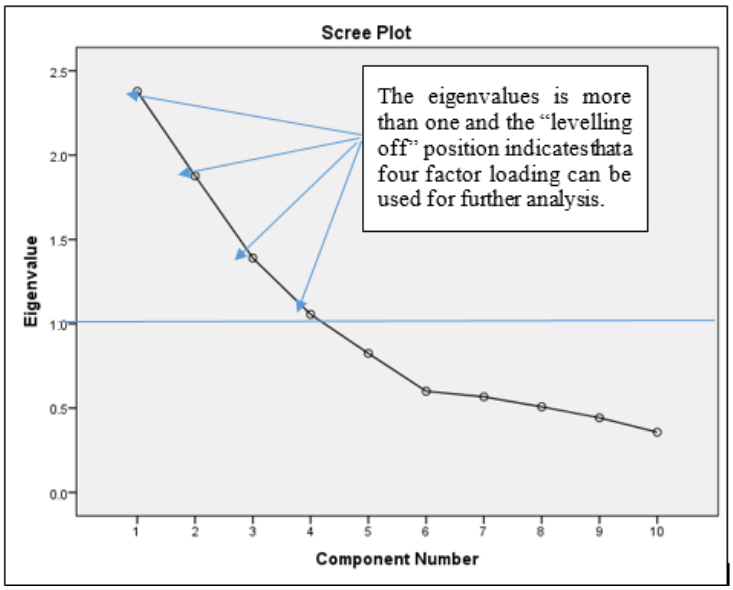

Figure 8.1 Scree Plot Test for Factor Analysis

The four remaining components represent 63.79% of the variance of the 11 factors and are sufficient to explain the total variance (Table 8.4).

Table 8.4 VARIMAX-Rotated Common Factor Matrix (11 variables)

	Component[13]				Communality
Full sets of 11 variables	**1**	**2**	**3**	**4**	
FAC_{10} Marketing strategy	0.843				0.732
FAC_5 Reduced cost	0.767				0.592
FAC_8 Belief organic concept	0.753				0.591
FAC_9 Household health		0.789			0.466
FAC_7 Unhappy with conventional		0.753			0.658
FAC_2 Consumer awareness		0.685			0.593
FAC_3 Influence of other farmers			0.789		0.712
FAC_6 Environmental principle			0.742		0.600
FAC_1 Government support	0.413		0.420		0.657
FAC_4 Farming without chemical				0.816	0.650
FAC_{11} Continue from parent				0.707	0.765
Eigenvalues	2.597	1.939	1.409	1.072	**Total** 7.017
% of variance	**23.606**	**17.631**	**12.806**	**9.745**	**63.789**

To aid in the interpretation, Oblimin and Varimax rotations of the factor loadings are used. Three, five and six factor solutions have also been examined, however the four component solution which explained 63.79% (see table 7.4) of the variance was preferred considering that eigenvalues were greater than one and the "levelling off" the scree plot test (as shown in Figure 7.1 earlier).

There was little difference between the Oblimin and Varimax rotation solutions, thus the Varimax (orthogonal) rotation was applied for the final solution (as the factors are expected to be independently rotated). Table 7.4 shows the results of Varimax rotation of 11 variables. However, over several steps, one factor was eliminated: "*Factor 9 Household Health*". This shares the same amount of variance as two other components and failed to meet a minimum criteria of having a primary factor loading of 0.4 or above. Hence, the final component solution consists of ten variables, with the Component 1 contributing 23.78%, Component 2 contributing 18.78%,

[13] Component 1: Business & Environment, Component 2: Organic Lifestyle, Component 3: Support & awareness, Component 4: Influence from Others

Component 3 contributing 13.9% and Component 4 contributing 10.56%, which explained 67.02% of the variances (slightly higher than the previous loadings) (see Table 8.5).

Table 8.5 VARIMAX-Rotated Common Factor Matrix (10 variables)

	Component				Communality
Item (10 Factors)	**Business & Environment**	**Organic Lifestyle**	**Support & Awareness**	**Influence from Others**	
FAC_{10} Marketing strategy	0.855				0.752
FAC_5 Reduced cost	0.779				0.641
FAC_7 Unhappy with conventional	0.760				0.657
FAC_4 Farming without chemical		0.787			0.650
FAC_6 Environmental principle		0.763			0.612
FAC_8 Belief organic concept		0.702			0.633
FAC_1 Government support			0.834		0.716
FAC_2 Consumer awareness			0.714		0.559
FAC_{11} Continue from parent				0.834	0.782
FAC_3 Influence of other farmers				0.680	0.701
Eigenvalues	2.378	1.878	1.390	1.056	**Total** 6.702
% of variance	**23.784**	**18.776**	**13.896**	**10.562**	**67.019**
Chronbach's alpha (α)	0.741	0.619	0.436	0.360	

**Factor loadings less than .40 have not been printed and variables have been sorted by loadings by each factor*

Data reduction based on this factor analysis is used in subsequent statistical analysis. Based on Hair *et al.*, (2014), there are three methods where factor analysis can be used to assist in reducing the number of variables namely: 1) by selecting surrogate variables to represent the entire factor; 2) by creating a summated scale for a set of variables; and 3) by calculating factor scores for each component where each variable contributes to the score based on factor loadings (p. 121). Hair *et al.,* (2014) further suggested that the summated scale would probably be the best of these three data reduction alternatives. A summated scale is a composite value for a set of variables calculated by taking the average of the variables in the scale.

Hence, based on the results, it is suggested that four summated scales should be constructed and the dimension of each scale evaluated for reliability and validity. The reliability of summated scales is best measured by Chronbach's alpha, the value of which is shown in the last row of the Table 7.5. Based on the values, 0.741 represents Factor 1, 0.619 Factor 2, 0.436 Factor 3 and 0.360 Factor 4. The recommended level of alpha is 0.70, so factor 1 is acceptable. However, Kline (1999) notes that values of 0.7 and below can be accepted when dealing with psychological constructs because

of the diversity and the complexity of the constructs being measured. Nunnally (1978) even suggested that 0.5 is sufficient in the early stages of research. The primary reason for the low reliability value for factors 3 and 4 is that they are based around only two variables and it is known that the value of alpha depends on the number of variables used in the component (in general as the number of variables decreases, then alpha will also decrease) (George & Mallery, 2001).

Instead of calculating summated scales, the factor scores have been considered. These differ from the summated scales, as they are based directly on the factor loadings (Hair *et al.*, 2014). This means that in factor analysis every variable contributes to the factor score based on the loading size. Further assessment was done to measure the consistency between factor scores and summated scales based on the correlation matrix shown in Table 8.6. Based on the correlation matrix, a high degree of similarity between factor scores and summated scores was found, with correlations ranging from 0.290 to 0.985 with 0.01 level of significance. These results further support the use of summated scales as valid substitutes for factor scores.

Table 8.6 Correlations between Factor Scores and Summated Scales

	Factor score 1	**Factor score 2**	**Factor score 3**	**Factor score 4**
Scale 1	**0.965****	0.133	-0.077	0.025
Scale 2	0.151*	**0.985****	0.024	0.057
Scale 3	-0.029	-0.084	**0.609****	0.093
Scale 4	-0.056	0.074	0.829**	**0.290****

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

Therefore, the variables that cluster on the same component suggest that **Factor 1** represents "**Business and Environment**", **Factor 2** represents "**Organic Lifestyle**", **Factor 3** represents "**Support and Awareness**" and **Factor 4** represents "**Influence from others**" where:

i. **Factor 1** comprises three variables "Marketing strategy", "Reduced cost" and "Unhappy with conventional";

ii. **Factor 2** comprises three variables related to environment and organic beliefs, "Farming without chemicals", "Environmental principles" and "Belief in organic concept";

iii. **Factor 3** comprises only two variables, namely "Government support" and "Consumer awareness"; and

iv. **Factor 4** comprises two variables associated with support from parents and other farmers "Continue from parent" and "Influence of other farmers."

Hence, the data reduction based on this factor analysis is used in subsequent statistical analysis which is logit modelling.

8.3.3 Logit Modelling

Adoption of organic farming can be categorised through a dichotomous or binary dependent variable defined by the alternatives of the 'adoption' or 'non-adoption' of organic methods. Logistic regression is a commonly used method for modelling binary dependent variables due to its robustness, flexibility, and ease of interpretation (Hair *et al.*, 2014). Logistic regression was considered to be the best analytical tool to explore why farmers adopt organic farming in Malaysia because it can predict the probability of adoption based on a set of independent variables using a maximum likelihood estimation (MLE) approach (Greene, 2013). Instead of minimising the squared deviations (as in multiple linear regression), logistic regression maximises the likelihood that an event will occur.

This study explores the factors that influence whether or not farmers will adopt organic farming. This logit model has been used widely in adoption studies, particularly in identifying the factors that influence farming decisions (Burton *et al.*, 1999; D'Souza, 1993; Feder *et al.*, 1985; Geta *et al.*, 2013; Läpple & Rensburg, 2011). A value of 1 was assigned to farmers who stated that their farming operation used only organic methods and 0 to farmers who either do not apply organic methods (conventional farming) or who use both conventional and organic methods. The logistic regression estimates the odds of an individual being an adopter or non-adopter based on the values of the independent variables. The odds are defined as the probability of a particular outcome occurring divided by the probability of the outcome not occurring (Gujarati & Porter, 2009). The maximum likelihood method estimates the parameters of the logit model.

By following Gujerati & Porter (2009) and Tiwasing (2016), in order to generate an odds ratio, a probability model is required to satisfy the condition as follows:

$$\mathrm{P_i} = \mathrm{E}\ (\mathrm{OADOPT_i} = 1/\mathrm{Z_i}) = \frac{1}{1 + e^{-Z_i}} \tag{1.1}$$

Where:

- **P** is the probability of the $_i^{th}$ factor being adopt given by **Z**
- **Z** is a vector of explanatory variables, where Z = 1 if adopting organic practices and Z = 0 otherwise
- **OADOPT** refers to organic adoption, and
- $\boldsymbol{e}$ is an error term

$\mathrm{Z_i}$ is a function of independent variables (like X_i) which can be expressed in linear form as:

$$Z_\mathrm{i} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon_\mathrm{i} \quad (_i = 1, \ldots \mathrm{n}) \tag{1.2}$$

Equation 1.2 can rewritten as:

$$P_\mathrm{i} = \mathrm{E}\ (\mathrm{OADOPT_i} = 1/\mathrm{Z_i}) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon_\mathrm{i})}} \tag{1.3}$$

If P_i - the probability of adopting organic farming - is given by Equation 1.2, then $(1 - P_i)$, the probability of not adopting organic farming is:

$$1 - P_\mathrm{i} = 1 - \frac{1}{1 + e^{-Z_i}} = \frac{(1 + e^{-Z_i}) - 1}{1 + e^{-Z_i}} = \frac{e^{-Z_i}}{1 + e^{-Z_i}} \tag{1.4}$$

Therefore, by dividing equation (1.1) by (1.4), we can obtain an odds ratio (OR) of adopting organic farming, *i.e.* that the ratio of the probability that a farmers will adopt organic farming to that of not adopting organic farming:

$$ln(\frac{P_\mathrm{i}}{1 - P_\mathrm{i}}) = \ln(e^{Z_i}) = Z_\mathrm{i} \tag{1.5}$$

In (1.5), $\mathrm{P_i}$ is non-linear, not only in $\mathrm{Z_i}$ but also in the parameters β_i which may lead to an estimation problem. Taking natural logarithms (ln) of the equation 1.6 gives:

$$\ln(\frac{\mathrm{P_i}}{1 - P_\mathrm{i}}) = Z_\mathrm{i} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon_\mathrm{i} \tag{1.6}$$

The log of the odds ratio in the equation 1.7 is now linear in variables and parameters and this is the logit model. The logit model can be rewritten as:

$$\text{Logit}\,(P_i) = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon_i \qquad (1.7)$$

A test for multicollinearity was performed, in order to measure any inter-correlations among the variables. Based on the collinearity statistics, the value of VIF is in the range 1 to 2, meaning that multicollinearity was not a significant issue in the data (i.e. if the VIF value is in the range 1 to 10 there is no multicollinearity).

To interpret the logistic regression, it is necessary to calculate the value of the odds ratio for each of the variables and then calculate the change in odds of the dependent variable that would be caused by a unit change in the value of the independent variable (Papadopoulos *et al.*, 2015). This can be used to estimate the impact of a 1% increase in an independent variables on the value of the dependent variable (Fu & Simonoff, 2014).

The procedure used in this study followed that adopted by Papadopoulos *et al.*, (2015). The selection of independent variables was informed by the existing literature, using a process of backwards elimination on the candidate variables, removing any variables that had an insignificant impact on the dependent variable and repeating the process until no further improvement in model fit is possible.

(1) Model I (Including all variables)

In equation 1.8, the logit specification is based on the probability of a farmer adopting organic farming. Here, the 19 independent variables used in the model include socio-economic data (i.e. demographic factors including enterprise type), social factors (derived from the earlier PCA results) and farmers' attitudes (i.e. environmental, profit-orientated, risk and information seeking attitudes).

The model is specified as follows:

$$\begin{aligned}\text{Logit}\,(\mathrm{P_i}) = {} & \beta_0 + \beta_1 AGE + \beta_2 \mathrm{EXP} + \beta_3 \mathrm{FSIZE} + \beta_4 \mathrm{TRN} + \beta_5 \mathrm{EDU} + \beta_6 \mathrm{OWN} + \beta_7 \mathrm{MUSH} \\ & + \beta_8 \mathrm{LIVE} + \beta_9 \mathrm{SUB} + \beta_{10} \mathrm{VEG} + \beta_{11} \mathrm{MMBER} + \beta_{12} \mathrm{BUSENV} + \beta_{13} \mathrm{LIFE} \\ & + \beta_{14} \mathrm{SUP} + \beta_{15} \mathrm{INF} + \beta_{16} \mathrm{ENV} + \beta_{17} \mathrm{PRFT} + \beta_{18} \mathrm{RISK} + \beta_{19} \mathrm{INFO} + \mathcal{E}_\mathrm{i}\end{aligned}$$

Where:

- P_i = Adoption of organic farming
- β_0 = Intercept
- AGE = Age of farmers (Dummy, takes the value 1 if below 50 and 0 above 50 years)
- EXP = Farm Experience (years)
- FSIZE = Farm size (ha)
- TRN = Farm training attended (Dummy, takes the value 1 if attended and 0 otherwise)
- EDU = Level of education (Dummy, takes the value 1 if higher education and 0 schooling)
- OWN = Farm ownership (Dummy, takes the value 1 if own farm and 0 otherwise rented farm)
- MUSH = Cultivating mushrooms as the main crop (Dummy, takes the value 1 if mushrooms are the main crop and 0 otherwise)
- LIVE = Practise integrated farming system, including livestock (Dummy, takes the value 1 if practised and 0 otherwise)
- SUB = Subsidies (Dummy, takes the value 1 if received or 0 otherwise)
- VEG = Cultivating vegetables as the main crop (Dummy, takes the value 1 if vegetables are the main crop and 0 otherwise)
- MMBER = Membership of farmers' organisation (Dummy, takes the value 1 if a member, or 0 otherwise)
- BUSENV = Business and environment factor (summated scores)
- LIFE = Organic lifestyle (summated scores)
- SUP = Support from others (summated scores)
- INF = Influence of others (summated scores)
- ENV = Environmental attitude (summated scores)
- PRFT = Profitable attitude (summated scores)
- RISK = Risk attitude (summated scores)
- INFO = Information seeking attitude (summated scores)
- $\mathcal{E}_\mathrm{i}$ = Error term

In order to measure the overall model fit, the Omnibus chi-square test, Classification tables and Pseudo-R^2 indices provide the most useful information (Osborne, 2015). Based on the Omnibus Chi-square test, the model was found to be statistically significant, where χ^2 (19, N=170) = 175.992, ($p < 0.001$) indicating that there is a difference in the probability of the adoption of organic farming depending on all predictors used as independent variables. The Pseudo-R^2 value explains between 64.5% (Cox and Snell R^2) and 86% (Nagelkerke R^2) of the variance in adoption, whereas this model correctly classified 92.4% of cases in the sample (i.e. a 40.6% increase from the baseline model after the inclusion of the independent variables).

Table 8.7 Logit Model Results for Model I (Include all variables)

	Variables	B (S.E)	Odds Ratio
Socioeconomic status	Dum Age (AGE)	-.0782 (0.939)	.457
	Experience (EXP)	**0.094*** (0.057)	**1.099**
	Farm_size (FSIZE)	-0.030 (0.086)	.971
	Training (TRN)	1.572 (1.187)	4.816
	DumEdu (EDU)	-0.749 (0.907)	.473
	Farm ownership (OWN)	**2.881**** (1.315)	**17.830**
	DumMush (MUSH)	**5.988***** (1.488)	**398.476**
	Livestock (LIVE)	1.751 (1.119)	5.760
	Subsidies (SUB)	-1.469 (0.923)	0.230
	DumVeg (VEG)	**4.464***** (1.496)	**86.853**
	Farmers Membership (MMBER)	**-2.142**** (0.901)	**0.112**
Social factors	**FAC1_BusinessEnviroment (BUSENV)**	**1.546***** (0.585)	**4.691**
	FAC2_Organic lifestyle (LIFE)	**2.472***** (0.947)	**11.850**
	FAC3_Support (SUP)	-1.146 (0.771)	0.318
	FAC4_Influenceothers (INF)	-0.291 (0.560)	0.748
Attitudes	**Environmental_Attitude (ENV)**	**4.229***** (1.414)	**68.661**
	Profit_Attitude (PRFT)	**-3.620***** (1.414)	**0.027**
	Risk_Attitude (RISK)	**-2.478**** (1.164)	**0.084**
	Info_Attitude (INFO)	1.961 (1.283)	7.109
	Constant	-14.951 (8.822)	0.000

Notes:
1. Standard errors for estimates are provided in parenthesis.
2. *, ** and *** denote significant at 10%, 5% and 1% level of probability respectively.

By examining the effects of individual variables (see Table 8.7), 10 variables (highlighted in parenthesis) were found to be statistically significant; with five based around socio economic status (experience, farm ownership, cultivating mushrooms, cultivating vegetables and membership of farmers' organisations), two variables represent social factors (i.e. business environment and organic lifestyle) and three are attitudinal factors (environmental, profit orientated and risk attitudes). The other variables included in the model are not significant, but can be used to complement the model output as a whole (Hair *et al.*, 2010).

The estimated coefficients (β_i) of the logit model are not directly interpretable, and Greene (2013) suggested that the marginal effects of the regressors should be calculated to explain changes that happen in the value of each regressor. This marginal effects can be obtained using the the Odds Ratio (OR) (Gujerati & Porter, 2009). The odds ratio (OR) or "Exp (B)" in SPSS is the exponential of the logit which makes interpretation relatively straightforward (Osborne, 2015).

The odds ratio (OR) can be interpreted as the change in odds of outcome when the predictor increases by one unit. Therefore, an OR is greater than 1 reflects the increase in the odds of an outcome of 1 following a unit increase in the predictor; alternatively, if the OR is less than 1, this reflects a decrease in the odds of an outcome following a unit increase in the predictor (Tabachnick & Fidell, 2014; p. 507). Hence, based on the OR results, the strongest predictors of adopting organic farming were '*cultivating mushrooms (MUSH)*' with an odds ratio of 398.48, followed by '*cultivating vegetables (VEG)*' with an odds ratio of 86.85 and '*environmental attitude (ENV)*' with an odds ratio 68.66. This could be bias, as most of the sample in this study are cultivating more mushrooms and vegetables as the main crops.

In contrast, membership of farmer organisations (MMBER) has a negative coefficient, suggesting that farmers who are converting to organic farming are less involved in these organisations. Besides, social factors, namely business and environment (BUSENV) and organic lifestyle (LIFE), all tend to have a positive influence on farmers' decisions to be organic. The variables were significant at the 0.01% level, showing the importance of attitudinal factors on farmers' decisions to shift to organic farming in Malaysia.

(2) Model II (Modification by excluding the enterprise predictors)

The criteria for including variables in the model may vary based on the purposes and aims of a particular study. Traditional statistical model building involves seeking a parsimonious model that still accurately reflects the true outcome experience of the data (Hosmer & Lemeshow, 2013). The more variables included in the model, the greater the estimated standard errors become and the more dependent the model is on the observed data. However, a common rationale for minimising the number of variables, is that this should result in a numerically stable model which can more easily to be adopted for use in a practical context (Hosmer & Lemeshow, 2013).

Therefore, by modifying the model and removing some of the enterprise-based factors such as cultivating mushrooms or vegetables as a main crop, livestock and subsidies from the model, it is observed that some socio-economic factors become significant (see Table 7.9). The main reason for omitting enterprise predictors, is because in the Malaysian context, farmers who grow mushrooms or vegetables and keep livestock as part of their integrated practices, are already known to be more likely to already farm organically. Including these as predictors in the model would therefore add little to our understanding of why farmers' engage in these predominantly organic enterprises, besides reducing the bias in the sample for this study. Receipt of subsidies is eliminated as an explanatory variable because they are usually only given to conventional farmers.

Hence, the preferred model contains only 15 independent variables, including seven socio-economic variables, four based on social factors and the remaining four variables based on farmers' attitudes. Based on the results, all variables are statistically significant, where χ^2 (15, N=170) = 139.625, (p <0.001) and the model explained between 56% (Cox and Snell R^2) and 74.7% (Nagelkerke R^2) of the variance in adoption, correctly classifying 88.8% of cases. Even though this is slightly lower than the previous model, however the level of correct prediction can still be considered as high because the increase is about 37% (compared to 40% in Model I) from the baseline model after the inclusion of the independent variables.

Referring to the earlier equation 1.7, the logit model can be specified as below:

$$\begin{aligned}\text{Logit}\,(\mathrm{P_i}) = {} & \beta_0 + \beta_1 EXP + \beta_2 \mathrm{FSIZE} + \beta_3 \mathrm{TRN} + \beta_4 \mathrm{EDU} + \beta_5 \mathrm{OWN} + \beta_6 \mathrm{DUMAGE} \\ & + \beta_7 \mathrm{MMBER} + \beta_8 \mathrm{BUSENV} + \beta_9 \mathrm{LIFE} + \beta_{10} \mathrm{SUP} + \beta_{11} \mathrm{INF} + \beta_{12} \mathrm{ENV} \\ & + \beta_{13} \mathrm{PRFT} + \beta_{14} \mathrm{RISK} + \beta_{15} \mathrm{INFO} + \mathcal{E}_\mathrm{i}\end{aligned}$$

Table 8.8 Model II (Logit Model by Enterprise Exclusion)

	Variables	B (S.E.)	Odds ratio
Socioeconomic Status	**Experience (EXP)**	**0.061*** (0.036)	**1.062**
	Farm_size (FSIZE)	-0.022 (0.030)	0.978
	Training (TRN)	**1.595**** (0.733)	**4.930**
	DumEdu (EDU)	**-1.130*** (0.655)	**0.323**
	Farm ownership (OWN)	**1.620**** (0.727)	**5.053**
	DumAge (DUMAGE)	-0.750 (0.665)	0.472
	Membership farmers organisation (MMBER)	**-1.831***** (0.630)	**0.160**
Social Factors	**FAC1_BusinessEnviroment (BUSENV)**	**1.562***** (0.435)	**4.767**
	FAC2_Organic Lifestyle (LIFE)	**1.510***** (0.530)	**4.528**
	FAC3_Support (SUP)	-0.228 (0.524)	0.796
	FAC4_OthersInfluence (INF)	**-0.777**** (0.395)	**0.460**
	Environmental_Att (ENV)	**2.730***** (0.828)	**15.336**
Attitudes	**Profitable_Att (PRFT)**	**-2.817***** (0.843)	**0.060**
	Risk_Att (RISK)	**-1.775**** (0.729)	**0.169**
	Info_Att (INFO)	**1.799**** (0.893)	**6.044**
	Constant	-8.334 (4.720)	0.000

Notes:
1. Standard errors for estimates are provided in parenthesis.
2. *, ** and *** denote significant at 10%, 5% and 1% level of probability respectively

Where:

- P_i = Adoption of organic farming
- β_0 = Intercept
- EXP = Farm Experience (years)
- FSIZE = Farm size (ha)
- TRN = Farm training attended (Dummy, takes the value 1 if attended and 0 otherwise)
- EDU = Level of education (Dummy, takes the value 1 if higher education and 0 schooling)
- OWN = Farm ownership (Dummy, takes the value 1 if own farm and 0 otherwise rental farm)
- DUMAGE = Age of farmers (Dummy, takes the value 1 if less than 50 years old, and 0 is more than 50 years)
- MMBER = Membership of farmers organization (Dummy, takes the value 1 if member or 0 otherwise)
- BUSENV = Business environment factor (summated scores)
- LIFE = Organic lifestyle (summated scores)
- SUP = Support from others (summated scores)
- INF = Influence from others (summated scores)
- ENV = Environmental attitude (summated scores)
- PRFT = Profitable attitude (summated scores)
- RISK = Risk attitude (summated scores)
- INFO = Information seeking attitude (summated scores)
- $\mathcal{E}_i$ = Error term

The model in Table 8.8 contains more significant independent variables than the previous model (three additional significant predictors). Training, level of education and influence from others are all now found to be statistically significant. The positive sign on TRN indicates that appropriate training is important for the adoption of organic farming practices. Based on the earlier discussion regarding this, insufficient training might limit the ability to convert to organic farming. Hence, enhancing the available training maybe an important determinant for encouraging more farmers to convert from conventional to organic production.

By contrast, EDU and INF both have a negative impact on adoption. This suggests that the decision to adopt organic farming is negatively influenced by a farmers' level of education and advice received from other people. The negative sign for EDU suggests that less well-educated people tend to take up organic farming compared to conventional farming. This might be because most of the organic farmers in this study (63%) are middle aged (41 to 60 years) and were mostly educated only to a secondary certificate level (as was common at the time). Additionally, the simplicity of low-input organic techniques may appear a more straightforward option for less well-educated farmers than conventional alternatives that require a greater technical understanding. However, the apparent importance of training suggests that farmers still need to improve their skills and knowledge.

Environmental attitude makes the highest contribution to the odds ratio (OR) with 15.336, followed by information attitude (6.044) and farm ownership (5.053). This indicates that farmers' attitudes and the ownership of the farm increases the likelihood of adopting organic farming practices in Malaysia. This model can be considered a more appropriate model than the previous one in terms of its greater parsimony and ability to better reflect the reality of the Malaysian situation.

Two factors (PRFT and RISK) had significant negative coefficient values. This suggests that organic farmers are not always driven by profit motives. In terms of risk behaviour, the negative sign indicates that, in general, organic farmers are risk averse, though this differs across individuals. Table 8.9 shows the comparison of significant variables and odds ratio between both models.

Table 8.9 Comparison between Model I and Model II

	Variables	Model I (Enterprise)		Model II (Without Enterprise & Subsidies)	
		Coefficient (Std. Error*)	**Odds Ratio (OR)**	**Coefficient (Std. Error*)**	**Odds Ratio (OR)**
Socioeconomic Status	Age (AGE)	-0.0782 (0.939)	0.457	-0.750 (0.665)	0.472
	Experience (EXP)	0.094 (0.057)*	1.099	0.061 (0.036)*	1.062
	Farm_Size (FSIZE)	-0.030 (0.086)	0.971	-0.022 (0.030)	0.978
	Training (TRN)	1.572 (1.187)	4.816	1.595 (0.733)**	4.930
	Edu (EDU)	-0.749 (0.907)	0.473	-1.130 (0.655)*	0.323
	Farm Ownership (OWN)	2.881 (1.315)**	17.830	1.620 (0.727)**	**5.053**
	Mushroom (MUSH)	5.988 (1.488)***	**398.476**	-	-
	Livestock (LIVE)	1.751 (1.119)	5.760	-	-
	Subsidies (SUB)	-1.469 (0.923)	0.230	-	-
	Veg (VEG)	4.464 (1.496)***	**86.853**	-	-
	Farmers Membership (MMBER)	-2.142 (0.901)**	0.112	-1.831 (0.630)***	0.160
Social factors	FAC1_BusinessEnvironment (BUSENV)	1.546 (0.585)***	4.691	1.562 (0.435)***	4.767
	FAC2_OrgLifestyle (LIFE)	2.472 (0.947)***	11.850	1.510 (0.530)***	4.528
	FAC3_Support (SUP)	-1.146 (0.771)	0.318	-0.228 (0.524)	0.796
	FAC4_InfluenceOthers (INF)	-0.291 (0.560)	0.748	-0.777 (0.395)**	0.460
Attitudes	Environmental_Attitude (ENV)	4.229 (1.414)***	**68.661**	2.730 (0.828)***	**15.336**
	Profitable_Attitude (PRFT)	-3.620 (1.414)***	0.027	-2.817 (0.843)***	0.060
	Risk_Attitude (RISK)	-2.478 (1.164)**	0.084	-1.775 (0.729)**	0.169
	Info_Attitude (INFO)	1.961 (1.283)	7.109	1.799 (0.893)**	**6.044**
	Constant	-14.951 (8.822)	0.000	-8.334 (4.720)	0.000
		-2 Log likelihood ratio (-2LL) = 59.466 LR Chi2 = 175.992 Pseudo R2 = (Cox & Snell R2 = 0.645; Nagelkerke R2 = 0.860)		-2 Log likelihood ratio (-2LL) = 95.833 LR Chi2 = 139.625 Pseudo R2 = (Cox & Snell R2 = 0.560; Nagelkerke R2 = 0.747)	

Notes: *** = Significant at 1% level of probability
** = Significant at 5% level of probability
* = Significant at 10% level of probability
Number of Observation = 170

8.4 Results from Phase 3 (Follow up interview with farmers)

The results of the interviews with several organic farmers in phase three slightly contradict the model proposed above. The themes emerged as follow:

8.4.1 Health and Environmental Concern

Most of the interviewees claimed that health was the main reason for them to grow organic crops. One farmer stated that organic food is the best choice for people wishing to improve their health. He also affirmed:

> *Firstly, we start to farm organically because we believe that organic will make us healthier in a natural way. (OF7)*

Several farmers also highlighted these concerns during the interviews:

> *Consumers have a right to get the best they can, … All this can be achieved through organic herbs, which can make them healthier, because the ingredients and active compounds are all natural. (OF9)*

> *Organic crops need natural ways of cultivation, therefore they produce healthy and safe food (OF8)*

> *Organic is not only for health but also to protect the environment. (OF7)*

8.4.2 Support from others

The qualitative interviews revealed that many farmers found out about organic farming from their parents or friends, rather than at school or college. This may also explain why so few farmers in Malaysia focus on organic farming. As one farmer put it:

> *When I was in school (40 years ago), there was nothing thought about organics. The focus was more on conventional ways… how to achieve mass production without considering the environment. But now, farmers have more choice… (OF10)*

In addition, other farmers were important in influencing them to become organic. This is supported by a farmer suggesting that:

> *My friend told me that when planting vegetables and fruit there was no need to use pesticides or anything chemical because it is very harmful to our health as a producer and also for the family. So from there I began learning organic methods. (OF6)*

In contrast, as one of the organic farmers argued, organic farmers should have a specialised support group or organisation that can help them through the journey to conversion. By setting up such a group or organisation, knowledge can be shared more easily and members may then be able to collaborate for marketing purposes:

> *Organic farmers really need agencies or organisations that can help them to sell their products. As a group, the product can easily penetrate a big market like a hypermarket because we could sell it in large volumes (OF3)*

This may be the reason that education has not supported the adoption of organic farming so far (as stated in Model II above). Farmers tend to learn about organic production from their friends and family members. Some farmers argued that there is a need to offer more basic education in organic farming, by including it in the syllabus from primary school up to university level.

> *This is the time to educate more people about organics. … Might start from beginning, propose that the university has specific coursework or programmes on organic methods (OF4)*

8.4.3 Type of Crops

Some farmers claimed that the crops themselves benefit from organic cultivation techniques compared to more conventional methods. For instance, mushroom cultivation needs organic media for better growth. As one of the farmers stated:

> *We are using organic materials like rice instead of soil or sawdust (as a growth medium) for our mushrooms … So far, we're happy with the growth, it looks so vibrant! (OF1)*

These results are also supported by subsequent qualitative findings, where other organic mushroom farmers suggest that organic mushroom farming is relatively straightforward e.g.:

It's easy with mushrooms to maintain organic farming, because the inputs that we have used so far all are organic and we never use any pesticides. In fact we're using natural repellents like lemongrass and bamboo for controlling the pests. (OF7)

8.4.4 Experience and Knowledge

Furthermore, farmers who really want to get involved in organic production need to develop experience and knowledge in the field in the first place. As few farmers agreed:

To be organic, farmers need experience in handling organic crops and a full desire to learn organic ways. That's the way to develop the skills and confidence among organic farmers. (OF10)

Personally I think organic farmers cannot sustain their businesses because they lack experience and manpower (OF2)

8.4.5 Organic Lifestyle

Organic Lifestyle was also found to play an important role in farmers' decisions to adopt organic farming practices. The majority of organic farmers claimed that aspiring to an organic lifestyle was an important influence in their decision to farm organically and encouraged them to behave in a more environmentally friendly way. One of the organic farmers mentioned the importance of having an organic lifestyle and noted that this made him more confident that organic production was a better choice for him and the community:

I was always confident that the organic lifestyle was best for me and my family. By balancing environment (organic farming), healthy mind, body and soul, this complete cycle may lead you to become a different person… I'm sure this will suit with the whole community (OF7)

8.5 Discussion

Based on the quantitative results, two models have been estimated to explore the factors influencing Malaysian farmers' decisions to adopt organic practices. The preferred model, (Model II), included four additional significant predictors compared to the alternative. This model suggested that experience was an important factors that positively influenced adoption. This result

is also in line with qualitative findings, which suggested the same response that experience and knowledge become essential in adopting organic practices. Farmers agreed that experience contributes to greater confidence in applying organic methods. This finding is also supported by Padel (2001) and Läpple (2010) who suggested that the increased skills and knowledge that come with experience can be helpful in supporting conversion. Other studies have also found that farming experience influences organic production e.g. in the UK, Nigeria and Thailand (Burton, 2014; Okon & Idiong, 2016; Pinthukas, 2015).

Farmers who own their land are found to be more likely to adopt organic production. This result was expected because, in order to apply for *MyOrganic* certification, farmers need to attach their farm land certificate to the application. This result is similar to findings in Nepal and Bangladesh, where land ownership is the most important determinant when switching to organic farming (Karki & Dhakal, 2009; Sarker & Itohara, 2008). In these examples[14], land ownership determines the economic status of an individual and farmers who own larger farms generally have more capital to support conversion and pay for the certification. Thus, the larger the farm, the more likely it is to be organic. However, this situation is unlikely to happen in Malaysia where land ownership is a pre-requisite to apply for *MyOrganic* certification scheme, and there are no limitations regarding farm size. As long as land is held in the farmer's name, or under a ToL approval, then farmers can apply for *MyOrganic* certification.

This study also showed that membership of farmers' organisation had a negative impact on adoption in the model, which suggests that these organisations are mainly for conventional farmers. This contradicts several studies where the membership of organisations increases the likelihood of adopting organic farming (Karki, Schleenbecker & Hamm, 2011; Pinthukas, 2015; Okon & Idiong, 2016). This model also contradicts the interview results where organic farmers claimed that support from others (i.e. family and friends) was very important in organic adoption. Support from sources, such as farmers groups may therefore be important in encouraging conversion to organic farming. Such groups might increase networking among farmers and provide relevant extension programmes that encourage more farmers to move to organic methods (De Souza Filho *et al.*, 1999; Singh *et al.*, 2015).

[14] Referring to Nepal and Bangladesh

As discussed earlier, education has been shown to have a negative impact on the adoption of organic farming practices. Many previous studies have reported that organic farmers tend to be better educated than their conventional counterparts (Padel, 2001; Rigby, Young and Burton, 2001; Koesling, Flaten and Lien, 2008; Mzoughi, 2011a; Pinthukas, 2015); however, this study revealed that, in Malaysia, education makes it less likely that farmers will convert to organic farming. Various other studies (e.g. Hattam & Holloway 2005; Karki *et al.*, 2011; Sodjinou *et al.*, 2015) have produced similar findings. Singh *et al.,* (2015) attributed this to the older generations being reluctant to change and thus having a lower tendency to shift to low input organic farming by default. Burton (2014) suggested that these results might reflect the way in which education is measured. Most studies, including this one, use the number of years in education, or the highest qualification achieved as an indicator of educational attainment, but other studies have suggested that the content of education is more important. Here, interview data provide some insights into why increasing levels of education make farmers less likely to farm organically. Results suggest that formal education in Malaysia has little to say about organic farming and that most organic farmers learn from the experiences of their family and friends. By contrast, conventional agriculture's greater reliance on technology means that better educated farmers may have an advantage, whereas for those adopting organic farming learning by example may have a greater impact.

These findings should be viewed with some caution as most of the farmers in the sample were only educated to secondary level and most of them have continued to farm in the same way as their parents, which may lead them to continue to use traditional methods (which tend to be low input and by default organic). In addition, many of the farmers in this study are from more remote areas, with more limited access to educational facilities. These individuals are more reliant on informal education and knowledge sharing among colleagues to gain information. Also, due to their lower levels of education, farmers might find it hard to understand and adopt new technology and practices. In contrast, the more educated farmers in the sample tend to farm conventionally and are on average younger than their organic counterparts. These more-educated farmers were found to be more profit-oriented, while organic farmers are more environmentally driven.

Training also shows significant predictors in the model. Training allows farmers to improve their knowledge in organic methods and previous studies have shown that the provision of training has been linked to the growth of farmers' adoption of organic farming (Salazar, 2014). This is supported by Karki *et al.*, (2011) who argued that training was the main source for improving Nepalese farmers' knowledge, as less educated and illiterate farmers cannot make use of information without assistance from extension services. Altenbuchner *et al.*, (2016) also highlighted similar issues, where access to training and advisory services had a greater impact on adoption than organic price premium incentives.

Based on the odds ratio (OR) presented in Model II, environmental concerns was the most influential factor when converting to organic farming. This was not unexpected as, although the government has been providing various incentives to encourage farmers to become organic including free certification, relatively few farmers have converted. Interestingly, the interview results also revealed similar results, whereby health and environmental awareness inspired farmers to convert. Most of the farmers agreed that organic farming would keep them healthier and at the same time might safeguard the environment. Therefore, environmental attitudes can be seen as a more important driver in converting to organic, a finding which is consistent with other studies (Burton *et al.*, 2003; Darnhofer *et al.*, 2005; Läpple, 2012). Reimer *et al.*, (2012) report that farmers who are motivated by off-farm environmental benefits tend to adopt organic methods, while those who are focused on business and are more concerned about profits are less likely to adopt such practices.

Finally, the tendency of farmers to seek information is also important in increasing the likelihood of their converting and as they learn more about the benefits of organic agriculture they develop the confidence to adopt organic practices. This result is also in line with the qualitative results where knowledge and experience make farmers more confident in adopting organic farming. Padel (2001) suggested that organic farmers preferred information sources that specifically addressed issues from well-established organic sources like other organic farmers, specialist magazines, and organic advisors. Hence, the process of seeking information and gaining knowledge may lead to social networking, where farmers are willing to connect with other farmers or even share their experience or knowledge with other farmers. Greater participation across the farming community

would provide benefits for the farmers, but also may improve marketing channels, labour provision or even expand on funding (Pattanapant & Shivakoti, 2009; Sarker and Itohara, 2009).

8.6 Summary

This chapter has discussed factors that influence farmers to adopt organic farming practices. Overall, the main attraction for organic farmers is the relationship between organic farming and health, followed by their belief in the organic concept and the importance of consumer awareness. However, for conventional farmers consumer awareness is the major concern, followed by health impacts and governmental assistance.

To summarise, Table 8.10 presents the results from both methods for several factors that influence farmers in adopting organic farming in the first place. The results suggest that there is no major difference between the quantitative and qualitative results, in fact some of the themes from the qualitative methods might explain the quantitative model. Hence, all of these factors can be considered as determinants for influencing farmers to adopt organic farming and also inform initiatives to encourage conventional farmers to convert to organic.

Table 8.10 Comparison between Quantitative and Qualitative Results

Quantitative Results (Model II)	Qualitative Results (Themes)
• Environmental attitude (+) • Information sharing behaviour (+) • Farm ownership (+) • Experience (+) • Training (+) • Education (-) • Farmers' membership (-) • Organic lifestyle (+) • Business environment (+) • Influence from others (-) • Profitable attitude (-) • Risk behaviour (-)	• Health and environmental concern • Support from others (family and friends) • Experiences and knowledge • Type of Crops (mushroom) • Organic Lifestyle

Results from the quantitative methods in particular suggest that in this sample, environmental and information attitudes are the most influential elements in leading farmers to adopt organic methods. These findings confirm that the adoption of organic farming is not only a question of economic prospects, but also reflects behaviour and lifestyle attitudes. Other non-economic factors such as experience, training, farm ownership, and personal beliefs were also found to play a major role in farmers' decisions to shift to organic farming. While conventional farmers were found to be more highly educated than their organic counterparts, training retains a vital role in improving farmers' knowledge. Concerns around profits and risk are found to be more prevalent among conventional farmers, while environmental concerns and information seeking attitudes are found to have a positive influence on conversion. The way the data are structured may induce an element of bias, as most of the organic farmers were from remote areas and the conventional farmers are largely in close-to-urban areas. However, this situation can be accepted as this sample reflects the wider farming population in Malaysia, where most of the organic farmers are from Pahang, and most of the conventional farmers in the central regions closer to centres of population.

CHAPTER 9. SUMMARY AND CONCLUSIONS

9.1 Introduction

The analysis and discussion of the results presented in the three previous chapters have highlighted the current status of organic farming in Malaysia. The results have been validated by contextual evidence provided by expert and farmer interviews, and supported by a literature review providing a detailed insight into the organic decision process. This study determines the factors that influence farmers' decisions to farm organically and alongside this investigates the various policies and practices that have been used in Malaysia to encourage the growth of organic production. By combining insights from quantitative and qualitative data, this provides a more comprehensive means of answering the research problem (outlined in an earlier chapter in page 4).

This chapter provides a final overview of this research (Section 9.2), reflects on its specific findings (Section 9.3) and contribution (Section 9.4), as well as putting these findings into a broader context which then leads to policy recommendations (Section 9.5). It is also important to highlight some of the limitations of this study and recommendations for future research (Section 9.6). The chapter concludes with some final remarks (Section 9.7).

9.2 Summary of Key Findings

9.2.1 Background

This thesis set out to shed light on the development of organic farming in Malaysia, focusing on factors influencing the decision to farm organic practices. While the development of commercial agriculture in Malaysia was based on oil palm and rubber plantations producing for export markets, the approach has shifted to one dominated by small-scale farmers focussing on the needs of domestic markets. As described in Chapter 3, the active promotion of organic farming in Malaysia has been going on since 1998, and can be seen as a potential pathway towards more sustainable agriculture. There have been a variety of initiatives and interventions from government designed to improve farmers' uptake of organic farming, including free accreditation to new entrants converting to organic methods and incentives, offered to organic farmers who demonstrate high

levels of commitment to organic farming. In addition, the growing demand for organic food, alongside an increasing consumer awareness of the importance of a healthy diet, has also contributed to the growth of the organic sector. However, many farmers seem impervious to the importance of these issues and the opportunities that they bring and the number of farmers converting to organic remains low. In fact, the production of organic food in Malaysia is generally low and the country must rely on imports to satisfy the demand for organic produce. In addition, prices for organic products are relatively high, sometimes as much as three times higher than their conventional equivalents. Therefore, this thesis provides important insights into factors that inhibit farmers from farming organically and on how policymakers can encourage more farmers to move into the sector. Hence, the specific aims of this study were to:

i. Investigate the barriers underpinning the adoption of organic farming
ii. Examine the attitudes of both conventional and organic farmers to organic farming
iii. Identify factors that influence the adoption of organic farming practices

To achieve these aims the study adopted a mixed method approach to data collection involving three stages. As explained in Chapter 4, the first stage involved exploratory interviews with seven key informants to provide an in-depth understanding of policy measures and government interventions designed to support the growth of organic production. This also provided essential information for the subsequent survey stage. In this second stage, a questionnaire survey was administered and a total of 170 farmers were interviewed, comprising 82 organic farmers and 88 conventional. This survey was carried out in all four regions of peninsular Malaysia (Northern, Central, Southern, and East Coast), using a sampling frame based on lists of farmers provided by the Department of Agriculture (DoA). This approach was undertaken to gather relevant data regarding farm households, farm enterprises, farmers' attitudes and organic adoption. Finally, a series of more in-depth interviews was conducted with a smaller sample of farmers (consist of ten organic farmers) to explore some of the underlying factors that enabled them to adopt organic farming. The key results for each objective are discussed below.

9.2.2 What are the differences between organic and conventional farmers in the study?

This study involves both organic and conventional farmers and in the questionnaire survey, the proportions of organic and conventional farmers were very similar (48% and 52% respectively), with almost all organic farmers in the sample certified. The number of participants in this study can be considered as representative, as the numbers correspond with the population of farmers that was provided by the DoA.

Most of the organic farmers sampled in this study were Malay and only educated up to certificate level; where finish their secondary level of education. The majority were aged between 41 and 50, with the oldest 70 years old. Most had up to 10 years farming experience and in general were more experienced than the conventional farmers in the sample. The organic farms in the sample were generally small (around 1 ha) and the majority were located in the East Coast region, which shows a higher density of organic farmers than other areas of Peninsular Malaysia. In term of ownership, most organic farmers in the sample owned their farms, which is a requirement of *MyOrganic* certification. In terms of supply chain marketing, organic farmers in the sample preferred to do business with regular buyers from specialised organic shops, local people and restaurants, or hypermarkets. Most of them cultivated mushroom or vegetables as their main crops. Many had previously applied for credit or loans to support their businesses.

In contrast, the sample of conventional farmers was considerably different from the organic one. The majority of conventional farmers in the sample were Chinese, most were aged between 51 and 60 and educated up to Diploma or University level. Farm sizes were generally larger than their organic counterparts (> 2 ha of land) but usually rented rather than owned. The majority of conventional farmers in the sample were drawn from the Central Region and where they cultivated fruit as well as other crops such as vegetables. They are more likely to supply their produce to middle-men, wholesalers or local consumers. They tend to apply for subsidies from the government and become members of cooperatives or farmers' associations.

9.2.3 Why farmers resist adopting organic farming

The conventional farmers in the sample were asked to rank the challenges that constrain them from becoming organic. These ranks were converted into scores and the mean rank was calculated. Based on the results, the highest scores were: lack of assistance from the government (for instances lack of support from extension services); followed by drop in volume of production; marketing and rigid certification processes. The interview results also corroborate this, where government intervention, market orientation, land ownership and rigid certification processes become the main consideration in converting to organic practices. As a further refinement, all of these obstacles can be categorised into three major groups namely: institutional and support barriers; market issues; and on-farm problems (Refer to Figure 9.1). The constraints reported by farmers were related to those observed in the literature review and similar obstacles are faced by farmers in both developed and developing countries at their early stages of organic adoption. Hence, this study may provide lessons about encouraging the adoption of organic methods that could be more broadly relevant.

Figure 9.1 Main Barriers to Organic Adoption

9.2.4 How to promote organic adoption

Apart from external contribution, the literature review supported the notion that farmers' attitudes are a particularly important determinant in their decision to farm organically (e.g., Burton, et al., 2003; Altenbuchner et al., 2016; Okon & Idiong, 2016). In order to explore farmers' attitudes and perceptions around organic farming, the questionnaire survey included 25 Likert-scale questions adapted from Läpple (2012) study, exploring issues like environmental concern, profit orientation, risk aversion, information seeking behaviour and farmers' perceived ability to adopt organic farming practices.

The results can be divided into two distinct perspectives representing organic and conventional viewpoints respectively. As might be expected, organic farmers showed greater environmental concern than conventional farmers, whereas the latter exhibit a greater tendency to prefer profit-maximising and risk averse behaviour. Interestingly, both groups have positive attitudes towards sharing information, specifically agricultural information and knowledge. This is the only result that differ (the information sharing attitude) from the original author (Läpple, 2012), whereby this shows how the importance of information sharing to both categories of farmers in relation to the differences in the cultural and demographic setting of each country. In term of their ability to adopt organic methods and apply for organic certification, organic farmers unsurprisingly show a greater capability and interest towards organic practices and certification processes compared with conventional farmers. By understanding their behaviour and uptake of organic farming, this might provide lessons on how to motivate conventional farmers into organic practices, as well as the behaviour and awareness which could be changed based on their preferences (Darnhofer *et al.*, 2005; Läpple, 2010).

9.2.5 What factors influence the adoption of organic farming?

In measuring the factors that influence farmers to adopt organic practices, three sub-categories were identified following key informant interviews and literature review. The sub-categories namely socioeconomic status, social factors and farmers' attitudes, were incorporated into a logistic regression (logit) model of the binary outcome of whether or not a particular farmer had adopted organic farming practices. The results demonstrated two significant outcomes: first, based on enterprise type the cultivation of mushrooms or vegetables is found to increase the likelihood of a farmer adopting organic farming practices. Second, when enterprise variables were excluded from the models, it was revealed that pro-environmental and information sharing attitudes were the factors that had the greatest influence in increasing the probability of being an organic farmer. This model was identified as the most useful for this study, as it offered a greater number of significant variables (12 significant predictors in Model I compared to 10 significant predictors in Model I) linked to the decision to farm organically than other models that were estimated based on the same data.

The qualitative analysis was validated by the quantitative part, where it provided further understanding of the context of the study. Therefore, the main results show that besides farmer attitudes, other individual-specific variables like farming experience, training and farm ownership, as well as social factors including lifestyle preferences and the influence of others, also contribute to the adoption of organic farming practices.

(1) The link between socio-economic status and organic farming

Apart from farmers' attitudes, socio-economic factors also play a major role in influencing the adoption of organic farming, as reported above, the model suggests that organic farmers are likely to be more experienced and more likely to own their farm than conventional farmers. Older or more experienced farmers may convert to organic methods because they are uneasy about the potential impacts of conventional framing methods on the environment and health. Farmers who have more experience may also be more confident about changing their farming practices. These results corroborate with other researchers as well, where the farming experience influences the adoption of organic farming practices, like in the Europe, Nigeria and Thailand respectively (Burton, 2014; Okon & Idiong, 2016; Pinthukas, 2015).

Farm ownership was also identified as a key element in identifying organic farmers in the sample. This is a consequence of the conditions underlying organic certification which requires farmers to have a land ownership certificate. If farmers do not have ownership evidence, they can apply for a Land Certificate from the state government. As long as they have a proof that shows the land is under their name, then farmers can apply for the certification. However, if farmers want to farm organically without certification then land ownership is not an issue.

Training also appeared to be an important element if farmers wanted to move from conventional to organic farming. Training on organic methods is not generally available through formal routes, like school, college or university, although it may be an element of some agricultural courses particularly in higher education. Consequently, the results indicated that lack of training could be a barrier to organic adoption. This suggests that it may be important to make relevant training courses available through existing extension services to support the conversion process and to update the skills of existing organic farmers who have little or no formal training in organic methods.

While a lack of training was a barrier to organic farming, the model suggested that lack of formal education makes it more likely that farmers will farm organically. This is a surprising result and contrasts with much of the literature, which indicates that most organic farmers are well educated. This is a particularly dominant characteristic of organic farming in most western countries (Padel, 2001; Rigby, Young and Burton, 2001; Koesling, Flaten and Lien, 2008; Mzoughi, 2011a; Pinthukas, 2015). However, the model also suggests that organic farmers are likely to be less well educated than their conventional counterparts, and this might be due to their respective family and friends, who persuaded the farmers to adopt organic farming practices. The interview results indicated that the farmers are more reliant on family and friends to introduce them to organic farming.

Furthermore, the model also indicated that more educated farmers tend to be conventional and younger, compared to organic farmers who are less educated and mostly older. The former tended to focus more on profit, while the latter had a greater focus on health and environment. There are also possible confounding factors in interpreting these results. For example, many of the organic farmers in the sample are from remoter East Coast Region where there may have been a lack of educational facilities when the (generally older) farmers were young. Most of them are continuing from their parents, which may lead them to continue to use traditional methods which tend to be low input or organic

In addition, the findings show membership of farmers' organisations is not a good predictor of organic farming. In the sample more conventional farmers were found to be interested in farmers association, cooperatives and subsidies compared with organic farmers. Organic farmers tend to focus more on access to credit and loans. This suggests that organic farmers, especially those growing traditional crops, can operate without broader support networks but because they do not receive subsidies that may be available to some conventional farmers they are keen to access credit. Several organic farmers' associations, including one for mushroom farmers, exist but are currently small and unable to cater for the geographically dispersed population of organic farmers.

The type of cropping systems also influenced the adoption of organic farming in the model. This may, however, simply reflect the fact that a large proportion of organic farmers in the sample cultivate mushrooms as their main crop. However, the qualitative results also indicated the same results, as farmers suggested that traditional organic methods were well-suited to growing mushrooms and other inputs were unnecessary.

(2) Are social factors relevant?

Relevant social factors influencing the decision to farm organically were identified early in the study during key informant interviews. Eleven factors were derived from these interviews and incorporated into the questionnaire survey where farmers were asked about what factors influenced them in adopting organic methods. The results were summarised and regrouped into similar components through a Principle Components Analysis (PCA). This helped to reduce the number of variables available for the logit model of these four factors.

Of factors after PCA has been conducted, three of them (namely: business and environment; organic lifestyle; and influence from others) are contributing to the adoption of organic farming (only one, that is support and awareness, appeared not to be important in influencing farmers to farm organic practices). It is worth considering that business (for example, marketing and costing) and environmental principle (for example, belief that chemical input would give a negative impact to environment and health) are important determinants in motivating farmers to shift to organic farming. However, influence from others seems less important, further denoting that other people do not affect their decision to do organic; it really depends on the individual determination, whether they are brave enough to change and take the risk or continue with their traditional methods (organic farming).

By further examining significant factors, such as organic lifestyle, through the follow-up qualitative interviews, it was found that many organic farmers are simply continuing the traditional farming methods practised their parents and consequently. Preferences for an organic lifestyle were revealed not only by growing organic crops, but through a belief that organic products have significant health benefits.

(3) How do farmers' attitudes influence the decision to farm organically?

A range of governmental initiatives have tried to attract more farmers to shift to organic production, and, when coupled with increasing consumer demand, this raises the question of why so few farmers have converted over the years. What measures or behaviours are more likely to influence farmers to farm organically? These questions kept emerging during the study and suggested that there must be something in farmers' behaviour that constrains them from becoming organic.

This study has shown that farmers' attitudes are the most important determinants that motivate them to farm organic. Positive environmental attitudes and openness to information sharing leads to a greater probability of organic farming. Farmers who are more environmentally concerned are clearly more likely to be open to adopting organic methods. Similarly, farmers who routinely share knowledge with their peers, may be more confident about shifting from conventional to organic farming.

However, farmers who are risk averse and profit-orientated are more likely to farm conventionally. Conventional farming may be perceived as being more profitable and less risky. This may reflect farm size, with most organic farms around 1ha, whereas conventional farms in the sample are usually at least 2ha. Conventional farmers with larger farms may need to be more cautious before shifting to a new method of organic farming because the decision will have a large impact on their farms. By contrast, organic farms are mostly small and it may be easier to change methods without too great an impact on profits. Mills *et al.*, (2017) asserted that encouraging these three approaches (through voluntarism, incentives and regulation) might influence behavioural change in farmers and encourage their involvement in environmental activities.

Therefore, to conclude, the results from the quantitative perspectives elicit the details of the organic farming decision, and the qualitative interviews bring more explanation and understanding about the situation. Knowing the barriers to conversion can suggest solutions to policy makers and related agencies that can help to overcome these obstacles. These solutions can also be informed by an understanding of the behaviour and attitudes of organic and conventional farmers. Consequently, in order to motivate farmers to adopt organic practices, a range of issues need to be considered, not only economic but also social and behavioural.

9.3 Contribution of the Thesis

The key strength of this study is that it extends knowledge of organic farming in Malaysia by providing critical insights about the adoption decision and those factors that constrain or encourage farmers to farm organically. This contribution is important because very little research has been conducted so far in this area in Malaysia. Furthermore, most of the literature about decision-making regarding organic farming is contextualised in western and developed contexts. Consequently, the results are important because of the developing context, and because organic farming has the potential to promote sustainability in Malaysia. Now that the government has made special budgetary provision to support organic farming, this shows its importance in the future development of the country.

The study makes an original contribution to the literature. Firstly, in terms of the growing body of literature in Malaysia, most studies relate to organic farming from a consumer perspective, like the demand for organic produce and consumer preferences towards organic food. However, no previous study investigates the factors that influence farmers' adoption of organic methods. In addition, previous research has concentrated on either conventional or organic farmers rather than both, while this study combines both groups to provide more meaningful insights around the research questions. In terms of the results of the factors that influence farmers' adoption decision, education is an interesting finding because most of the existing literature indicated the opposite direction (organic farmers tend to be better educated, while Malaysian situation are contradict with this). This is probably due to differences in the Malaysian context, and this could contribute to the existing body of knowledge regarding developing countries.

Secondly, in the adoption decision literature, most studies highlight the adoption of sustainable agricultural practices (SAPs) and new technologies (e.g. crop variety, weed management, harvest management), but there is little focus on organic farming. Burton *et al.*, (1999) started to raise the issue of factors that influence farmers' adoption of organic farming in 1990 in the UK and this was followed by other researchers from around the world. The current study has, for example, adapted attitudinal questions from the work of Läpple (2012). However, the results differ because of the analysis that has been used: this thesis applied logit analysis to reveal the factors behind organic adoption, whereas Läpple had applied the Theory of Planned Behaviour model. In developing this

literature, the researcher presented her first paper (Mohamed Haris, 2016) at the Agriculture Economic Society (AES) Annual Conference (PhD Seminar) in 2016, explaining the preliminary key interviews results. The researcher has also developed another paper, which discussed the factors of determining farmers to farm organically at the Agriculture Economic Society (AES) Annual Conference in April 2018 (as a paper presented in discussion sessions). The researcher plans to send a paper to a reputable journal particularly in the extension agriculture field or agricultural economics. This may contribute to the gap of knowledge in relation to organic farming adoption and decision, in the perspective of developing countries.

Moreover, this thesis includes an original mixed methods approach. As Tashakkori & Teddlie (2003) argue, the strength of mixed methods designs is to allow the research to develop a comprehensive approach to data collection. The first phase of data collection aimed to provide insights into the status of the organic movement in Malaysia from key informants, as well as their opinions about factors that might influence farmers' adoption of organic methods. This information was used in the design of the questionnaire survey. The quantitative data from the survey was then modelled and semi-structured interviews were used to provide more in depth explanation and understanding of the model findings. This is the advantage of applying mixed methods, where the reason and the reality behind the models might only be apparent through the analysis of the relevant qualitative data.

9.4 Policy Recommendations

An important contribution has been made by the Malaysian government since 2011, in order to support the organic movement in Malaysia. The establishment of the free certification scheme and renewal processing, delivering extension programmes for organic farmers and also providing assistance in the form of infrastructure shows how serious and relevant the Malaysian government is in assisting organic development. However, at the moment, the movement is still in its infancy, exhibiting relatively slow development compared to conventional farming. However, as long as the demand for organic produce keeps increasing and government support is provided, this sector has the potential to expand.

9.4.1 Government Intervention

As this study highlighted earlier, many potential organic farmers face constraints around the inadequacy of government assistance and extension services. It can be argued that the government should provide an opportunity for the organic movement to develop, as organic farming offers potential advantages, including health benefits, environmental improvement, and income generation for smallholder farmers. Furthermore, similar action has been adopted in developed countries, and it was proven that the policy intervention really works well in improving the organic movement in their countries. Hence, this section will become a basis to form a brief report and will be proposed to the Ministry of Agriculture (MoA) for further action in improving the organic agriculture movement.

Some recommendations about how government intervention might improve the organic sector in Malaysia follow:

i. As the assistance from the government, specifically the Department of Agriculture (DoA), around areas like the provision of training has been noted as a constraint, this should be highlighted as the main concern for the DoA and related stakeholders. The government and relevant NGOs should consider the provision of appropriate training for farmers, both to improve the skills of existing farmers and to increase the confidence of potential new entrants. The training materials have to be up-to-date and interesting in order to attract farmers. Indeed, training must not restrict to the farmers but also be offered to the extension officers who work with them and will take on the training role in future.
ii. Difficulty in selling products, specifically obtaining premium prices, was also noted as an important challenge for organic conversion. Hence the government, specifically the Federal Agricultural Marketing Authority (FAMA), must play a role in controlling market prices, perhaps through contract marketing or public procurement agreements. As one of FAMA's aims is to increase the exposure of local products to local market, this can be very useful in helping organic farmers to maximise this opportunity to market their products. In fact, a study highlighted by Rezai *et al.*, (2016) showed a significant impact of contract marketing from FAMA to motivate farmers to opt for organic.

iii. The uncertainty around organic markets and the costs of conversion may be alleviated by the provision of additional credit access to farmers to help them through the harder times. The government might collaborate with banks to provide greater assistance in this regard.

iv. In order to educate the community about the benefit of organic products, the awareness should started through promoting healthy lifestyle. Education can play an important role in promoting organic farming to the community, especially at a young age. Organic farming and food could be promoted at schools to encourage healthier lifestyles for future generation. Higher education also might play a role by introducing courses or modules that relate to organic farming. This specific courses might include placements with organic farmers or in the community to create greater awareness of organic products.

v. Lack of community awareness is also one of the constraints that limit organic adoption. Even though the demand for organic produce keeps increasing, there are still some people who are unaware of, or uninterested in organic products. Government, NGOs, related agencies and stakeholders could all play their part in promoting the organic movement to increase the awareness of organic products. There are a lot of resources that can be used to promote organic produce, for example the internet, television, and social media, spreading the message of their environmental and health benefits. Furthermore, this PhD thesis will be used further in disseminating the information through DoA or NGOs blog, and contribute in an article in Malaysian Farmers extension magazine, under the Department of Agriculture (DoA). Recently, the researcher has collaborated with the NGO (CETDEM) in sharing some of the information regarding organic movement so far, and this will be published in their annual magazine by the end of this year.

vi. In terms of the certification process, the relevant agencies, particularly DoA, must actively encourage farmers to apply for certification. Only organic farmers who register for *MyOrganic* Certification will obtain premium prices and customers rely on this logo when purchasing organic products. Also, the rigid certification process could be made simpler with less documentation and a shorter approval time. The DoA should also review the land requirement conditions for certification, as this issue has become a major problem in a certain region like the Cameron Highlands in Pahang. Facilities should also not be overlooked and the DoA should have their own laboratory for running soil and other tests. In addition, the one year renewal might be too short for farmers to reapply for certification.

Instead of a yearly renewal application, it is suggested that monitoring should be implemented regularly for at least two years before renewal is required. Regular monitoring is important to ensure the credibility of organic farming in Malaysia.

9.4.2 Smallholder farmers' participation

Farmers' participation in organic schemes should also not be forgotten, as this is a key issue for the future of the organic movement. As the results of this study reveal, organic farmers tend to be less risk averse and less profit-orientated than conventional farmers. Organic farms tend to be small and the risks for most existing farmers have probably been relatively small. The expansion of the sector will require the participation of larger farms with more risk-averse owners. Organic farmers also need to make good use of any resources provided by the government, in order to increase their profit. A more proactive marketing approach could create a higher awareness of their products among consumers. Farmers' organisation also play a vital role in helping other farmers, especially newcomers, in adjusting to organic farming systems. By setting up their own organic-growers' organisations, farmers can share their ideas, build better links with NGOs and stakeholders, as well as helping each other in promoting their products.

For certified farmers, the integrity of organic produce is vital. Even though it's quite hard to follow the organic rules and regulations, these must be maintained to build a good rapport with the DoA and other related agencies. Farmers should provide the required documentation to the DoA as this is crucial for monitoring purposes.

Conventional farmers who have ambitions to farm organically must show strong determination. They can learn how to do farm organically from various resources but the lack of formal education in this area may mean that they require further support and assistance from the DoA and other organic farmers. Through their involvement in relevant farmers' organisation, individuals could build their confidence towards applying organic methods and applying for certification.

9.5 Limitations and recommendations for Future Research

A number of important limitations in this study need to be considered. Firstly, the current investigation was limited by a non-random sample where the numbers of respondents involved were primarily dependent on the list of organic farmers provided by the DoA, supplemented by snowball sampling to identify uncertified organic farmers. Most of the conventional farmers were also identified using snowball sampling methods in order to ensure that the samples of organic and conventional farmers shared geographic locations where possible. As mentioned in Chapter 4, the limitations of a non-random sample might restrict the generalisation of the results. Nevertheless, the sampling approach adopted ensured that the sample was proportionate to the population of farmers and the qualitative results provide an explanation of the context within which the data was collected. Hence, future research could attempt to improve the coverage of the research by improving the sampling frame.

Secondly, the geographic location of some organic farms in remoter areas meant that they were excluded from the sample. It is important to acknowledge this as this research focuses on the central and south regions, where most of the farms were easier to travel to. Again, future studies could ensure that these remoter organic farms are included in the sample as they may have different characteristics when compared to their counterparts in the sample.

Thirdly, language barriers meant that some of the Chinese farmers had difficulty understanding some of the questions, even with the assistance of the extension officer. Nevertheless, most respondents were highly cooperative and sometimes asked their children to read and translate a word for them. Also, difficulties were faced in translating some of the original words and phrases in the empirical material. The researcher is fluent in both languages (Malay and English) but not an expert as a qualified translator or a linguist. This should not be overlooked in future research and ideally the researcher would provide a translator to support for data collection and analyses.

For future work, it might also be worth looking at different variables or determinants that may influence the adoption of organic farming, for instance market segmentation, costing, supply chain issues, health concerns, or another related behaviour. This would create a deeper understanding of the factors that might encourage the wider adoption of organic farming.

As this research employed a mixed method approach and used both organic and conventional farmers as respondents, future works might concentrate solely on organic farmers. This may permit a deeper and broader understanding of how their involvement in organic farming evolved and what endogenous and exogenous factors influenced their actions. Further exploration of obstacles and behaviours could also provide further insights, particularly at a regional level.

9.6 Concluding remarks

This thesis employed a mixed methods approach where both quantitative and qualitative methods were applied. Understanding of the Diffusion of Innovation Theory by Rogers (2003) and the Theory of Planned Behaviour by Ajzen (2005) underpinned the theoretical framework of this study. Both theories help to improve our understanding of the evolution of organic farming in the Malaysian context, as the TPB focuses on the behavioural aspects of farmers (i.e. the attitude and farmers' beliefs towards adoption), while Diffusion of Innovation highlights decision-making process when adopting an innovation. The Five Stages Model of the Innovation-Decision Process (Rogers, 2003) provides a structured means of understanding the learning process and how individuals' attitudes inform their decisions (in the context of this study, whether or not to adopt organic farming).

These findings confirm the assumption that the adoption of organic farming is not only a question of economic necessity but also reflects beliefs, behaviour and lifestyle choices. While this builds on findings from other countries, the adoption factors in this particular context offer original insights. Several non-economic factors, such as experience, skills and personal beliefs, were found to play a major role in farmers' decisions to shift to organic farming. However, profit-orientation was not a big driver of the decision to farm organically, while environmental concerns were a significant consideration.

To increase participation in organic farming, a holistic approach led by government agencies, NGOs and community groups could probably change perceptions of organic farming and promote the organic movement supporting future sustainable development. Farmers' adoption of organic practices is a key priority in increasing organic production of organic products and increased production could stabilise market prices and reduce imports from other countries. Consequently,

consumers would have more confidence in choosing organic products which would be more competitively priced and locally sourced.

Finally, to persuade more conventional farmers to switch to organic farming in the future is a considerable challenge. Policy makers need not only to get the economic incentives right but, more importantly, they need to ensure that the non-economic and technical factors prompting farmers to convert are part of their strategy for reaching their targets for organic farming in Malaysia in the future.

APPENDIX 1: AUTHORS RELATED TO ADOPTION DECISION STUDIES

No	Analysis	Authors
1	Bivariate analysis (Logit/ Probit model)	Burton *et al.* (1999) Dimara & Skuras (2003) Hattam & Holloway (2005) Alexopoulos *et al.*, (2010) Mzoughi (2011) Läpple & Rensburg (2011) Koesling *et al.*, (2012) Finger & El Benni (2013) Latruffe & Nauges (2014) Singh *et al.*, (2015) Sodjinou *et al.*, (2015) Lapple & Kelley (2015)
2	Duration Analysis	De Souza Filho *et al*. (1999) Burton *et al.* (2003) Kallas *et al.* (2010) Läpple (2010)
3	Multivariate analysis – PCA/ Discriminant analysis	Greiner *et al.* (2009) Sarker & Itohara (2009) Karki *et al.*, (2011) Läpple (2012) Läpple & Kelley (2013) Rezai *et al.*, (2014) Nandi *et al.* (2015)
4	Qualitative (interview)	Darnhofer *et al.* (2005) Padel & Foster (2005) Barrow (2009) Kings & Ilbery (2009) Kings & Ilbery (2010) Kings & Ilbery (2012) Sutherland & Darnhofer (2012)

		Tiraieyari *et al.* (2014) Jamal *et al.*, (2014) Salazar (2014) Kings & Ilbery (2015)
5	Structural Equation Modelling (SEM)	Bayard & Jolly (2007)

APPENDIX 2: AUTHORS AND FACTORS INFLUENCING FARMERS ADOPTION

No	Authors (Years)	Factors/ Determinants Influence Adoption Organic Farming								
		Economic	Social	Socioeconomic	Farmers Characteristics	Institutional	Environmental/ Agroecology	Behavioural Approach	Farm Structure	Additional factor
1.	Sodijou *et. al.*, (2015)	*		*		*	*		*	
2.	Nandi *et al.*, (2015)	*				*	*			Sociocultural Farmers objective
3.	Mzougi (2011)	*	*		*					Moral (guilt)
4.	De Sauza *et al.*, (1999)	*	*			*	*		*	(SAP)
5.	Lapple & Kelley (2013) – using TPB							*		
6.	Lapple (2013)	*	*		*		*			Attitude
7.	Lapple & Kelly (2015) – Spatial dependence									-Farm -Household -Information -Attitude
8.	Tey *et al.* (2012)			*		*	*	*		-Information -Perceived attribute (SAP)
9.	Hattam & Holloway (2007)	*	*							Management
10.	Finger & Benny (2013)				*				*	
11.	Burton *et al.* (2003)	*								Non-economic
12.	Padel (2001)									Motivation
13.	Burton *et al.*, (1999)	*			*		*		*	-Information -Attitude

14.	Greiner & Greg (2011)				*					Motivation
15.	Soltani *et al.* (2013)				*	*				
16.	Edward Jones (2006)	*							*	-Socio-demographic -Psychology (Decision Making)
17.	Kallas *et al.* (2010)	*			*		*		*	-Farmers objective -Attitudes
18.	Duram (1999)				*					-Farmers motivation & attitude
19.	Mrinila *et al.* (2015)			*	*					

APPENDIX A: PHASE 1 DATA COLLECTION (KEY INFORMANTS INTERVIEW)

A1. List of Key Informants Interviewed

Participant	Key Informants & Profile	Venue
Key Informant 1	Mrs Saleha ssaleha@moa.gov.my	**Ministry of Agriculture and Agro-Based Industry (MoA)** Blok 4G1 Wisma Tani, No.28 Persiaran Perdana, Presint 4, Pusat Pentadbiran Kerajaan Persekutuan 62624 Putrajaya Malaysia
Key Informant 2	Mrs Siti Saudah Hassim saudah@doa.gov.my	**Department of Agriculture (DoA)** Aras 7-17, Wisma Tani, No. 30 Persiaran Perdana, Persint 4, Pusat Pentadbiran Kerajaan Persekutuan, 62624 Putrajaya Malaysia
Key Informant 3	Mrs Khazana khazana@doa.gov.my	**Department of Agriculture (DoA)** Aras 7-17, Wisma Tani, No. 30 Persiaran Perdana, Persint 4, Pusat Pentadbiran Kerajaan Persekutuan, 62624 Putrajaya Malaysia
Key Informant 4	Mrs. Illani Zuraihah Ibrahim illani@mardi.gov.my	**Malaysian Agricultural Research and Development Institute (MARDI)** Headquarters Address: MARDI Headquarters Persiaran MARDI-UPM 43400 Serdang, Selangor
Key Informant 5	Mr Ong Kung Wai director@organicmalaysia.com.my	**Organic Alliance Malaysia (OAM)** 3, Halaman York, 10450 Penang, Malaysia Tel: +60124232920
Key Informant 6	Ms. Tan Siew Luang, Email: of@cetdem.org.my	**Centre of Environment, Technology & Development Malaysia (CETDEM)** No. 17 Jalan SS2/53, Petaling Jaya, Malaysia Tel: +603-78757767 Fax: +603-78754039
Key Informant 7	Mrs Jamie Mok feedback@aeonretail.com.my	**AEON Co. Bhd.** 3rd Floor, AEON Taman Maluri Shopping Centre, Jalan Jejaka, Taman Maluri, Cheras, 55100 Kuala Lumpur.

APPENDIX B: PHASE 2 DATA COLLECTION (SURVEY QUESTIONNAIRE) - SUPPLEMENTARY MATERIALS

B1. Questionnaire survey

ID				

Location: _____

The Adoption of Organic Farming Practices in Malaysia

The purpose of this study is to understand the adoption of organic farming practices among all farmers in Malaysia. Organic farming practices refer to the ways of growing crops without damaging the natural environment and the wider community.

This survey will take **approximately 45 minute** to complete. Your participation is voluntary. During the interview, you are free not to answer any question you are not comfortable with. Your valuable input will help us to improve the promotion of organic farming activities in Malaysia.

All of your answers will be strictly confidential and anonymous.

Thank you in advance for participating in this survey. If you have any doubts, questions or comments, please don't hesitate to contact me as follows;

Nur Bahiah Mohamed Haris (Mrs.)
PhD Student
School of Agriculture, Food and Rural Development
Agriculture Building, Newcastle University,
Newcastle upon Tyne
NE1 7RU, United Kingdom.
Tel: (+6)0122859855
Email: n.b.b.mohamed-haris1@ncl.ac.uk
bahiaharis@gmail.com

SECTION B. YOUR FARM PRACTICES

*Please tick (**√**) your farm practices in the space provided*

1. **Is your farm operating using organic methods?** YES ☐ NO ☐

   If **YES**, is your farm certified/ to be certified under *MyOrganic* scheme? YES ☐ NO ☐
   Please proceed to Section B1 (Yes- organic, No- noncertified organic farmers)

   If **NO**, is your farm certified/ to be certified under *MyGAP*? YES ☐ NO ☐
   Please proceed to Section B2 (Conventional farmers)

2. **Reasons for conversion to organic farming**
   *How important were the following reasons in your decision to do organic? Please think about the initial reason to convert – **not your current preferences** – and express your level of importance by circling one number in each line*

SECTION B1 - FOR ORGANIC (CERTIFIED & NON-CERTIFIED) FARMERS ONLY

	Very unimportant	Unimportant	Unimportant nor Important	Important	Very important
1. Support from government & agencies (*e.g. subsidies*)	1	2	3	4	5
2. Consumer health awareness	1	2	3	4	5
3. Influence by other farmers	1	2	3	4	5
4. Farming without chemicals	1	2	3	4	5
5. Reduced production costs *(e.g. saving on fertilizer costs)*	1	2	3	4	5
6. Environmental principle	1	2	3	4	5
7. Unhappy with conventional farming	1	2	3	4	5
8. Interested/believe in organic concept	1	2	3	4	5
9. Producer and family (household) health	1	2	3	4	5
10. Marketing strategy	1	2	3	4	5
11. Continue from parent	1	2	3	4	5
12. Other reasons: (please specify)					

3. Current usage of organic practices

Which of the following practices do you currently use on your farm?

No.	Practices	Yes	No
1.	Cover crops / mulches		
2.	Intercropping / alternate crop / multiple crop		
3.	Crop rotation		
4.	Conservation tillage		
5.	Organic fertilizer (*e.g. compost, Bokashi, IMO*)		
6.	Eco-friendly chemical fertilizer		
7.	Biological control (*e.g.* cinnamon)		
8.	Mechanical & physical controls		
9.	Cultural control		
10.	Eco-friendly chemical pesticides		
11.	Natural pesticides (*e.g.* lemongrass/ *Lantana Camara*)		
12.	Other (Please specify)		

4. General questions about organic farming

General questions about organic farm conditions

1. From where/whom did you hear about organic farming?
   - i. Agronomist ☐
   - ii. Family ☐
   - iii. Friends ☐
   - iv. Other producers ☐
   - v. Others (please specify) _____
2. Have you received any additional certification besides *MyOrganic* certification from Department of Agriculture (DoA)?
   Yes ☐ No ☐ Others (Please specify) _____
3. When did you start farming organically (*i.e. 2012*)? _____
4. In which year did you applied for certification (*i.e. 2012*)? _____
5. In which year did you have granted for the certification (*i.e. 2012*)? _____
6. Do you still have your organic certification until now? Yes ☐ No ☐
   6a. If **YES**, please proceed to Question 8 & 9 in this section
   6b. If **NO**, for how long did you have the organic certification? _____ Year
7. Why you are **not certified** currently? Please mention in order of importance the ***three (3) most importance reasons***

i.	Lack of support from government/ related agencies	
ii.	Rigid certification process	
iii.	Problem hiring labor	
iv.	Could not sell the produce	
v.	Lack of training & extension services	
vi.	Facing problems with land ownership	
vii.	Drop in volume of production	
viii.	Could not obtain the inputs	
ix.	Drop in quality of produce	
x.	Others (Please specify): _____	

8. Have you renewed the certification? Yes ☐ No ☐

9. What changes would you need to make before renewing the certification? (*e.g. more labor, improve soil condition, record keeping*) _____

5. Sources of information and support

*Which of the following sources of information influenced your decision in converting to organic farming? Please tick (**√**) in the space provided.*

Extension officer from Department of Agriculture (DoA)	
Other government agency (e.g. FAMA)	
Research bodies (e.g. MARDI)	
Retailers/ hypermarket (e.g. AEON)	
Universities	
NGO's (e.g. CETDEM)	
Workshops/ seminars/ forums	
Mass media (e.g. books/ magazines/ TV/ radio)	
Internet	
Other farmers	
Family members	
Friends	
Other (e.g. suppliers, buyers, please specify:)	
None	

6. i. If **non-certified**, do you sell any of your produce to another certified farm?

Yes ☐ No ☐ If **YES**, please specify _____

ii. If **certified**, do you buy in any produce from other non-certified farmers?

Yes ☐ No ☐ If **YES**, please specify _____

SECTION B2 - FOR CONVENTIONAL/ MyGAP/ TKPM

7. Do you use methods you consider as organic in the management of your farm?

Yes ☐ No ☐ Not sure ☐ If **NO/NOT SURE**, please proceed to Question 9.

8. If **YES**, which methods have you applied ever?

No.	Farming Practices	Yes	No
1.	Cover crops / mulches		
2.	Intercropping / alternate crop		
3.	Crop rotation		
4.	Conservation tillage		
5.	Organic fertilizer		
6.	Eco-friendly chemical fertilizer / Foliar spray		
7.	Biological control		
8.	Mechanical & physical controls		
9.	Cultural control		
10.	Eco-friendly chemical pesticides		
11.	Others (Please specify):		

9. If you want to do organic, what might influence you to do so?

	Very unimportant	Unimportant	Unimportant nor Important	Important	Very important
1. Support from government & agencies (*e.g. subsidies*)	1	2	3	4	5
2. Consumer health awareness	1	2	3	4	5
3. Influence of other farmers	1	2	3	4	5
4. Farming without chemicals	1	2	3	4	5
5. Reduced production costs *(e.g. saving on fertilizer costs)*	1	2	3	4	5
6. Environmental principle	1	2	3	4	5
7. Unhappy with conventional farming	1	2	3	4	5
8. Interested/believe in organic concept	1	2	3	4	5
9. Producer and family health	1	2	3	4	5
10. Have enough labor for organic farming	1	2	3	4	5
11. Animal health & welfare	1	2	3	4	5
12. Other reasons: (please specify)					

10. Sources of information

*Which of the following sources of information do you think might help in converting to organic farming? Please tick (**✓**) in the space provided.*

Extension officer from Department of Agriculture (DoA)	
Other government agency (e.g. FAMA)	
Research bodies (e.g. MARDI)	
Retailers/ hypermarket (e.g. AEON)	
Universities	
NGO's (e.g. CETDEM)	
Workshops/ seminars/ forums	
Mass media (e.g. books/ magazines/ TV/ radio)	
Internet	
Other farmers	
Other (please specify)	
Family members	
Friends	
Other (e.g. suppliers, buyers, please specify)	
None	

11. Have you consider and decided to convert to organic farming? Yes ☐ No ☐

12. If you have consider to do that, which of the **barrier** that does not allow you to produce organic farming? Please mention in order of importance ***three (3) most importance reasons.***

i.	Lack of support from government/ related agencies	
ii.	Rigid certification process	
iii.	Problem hiring labor	
iv.	Could not sell the produce	
v.	Lack of training & extension services	
vi.	Facing problems with land ownership	
vii.	Drop in volume of production	
viii.	Could not obtain the inputs	
ix.	Drop in quality of produce	
x.	Others (Please specify): _____	

SECTION C. MEASURING FARMERS ATTITUDES & OBJECTIVES

ALL CATEGORIES

13. Measuring farmers attitudes & perceived behavioral control

Please consider the following statements carefully and then express your agreement or disagreement with each statement by circling one number in each line.

Farmers Preferences	Disagree strongly	Disagree	Disagree nor Agree	Agree	Agree strongly
Environmental					
1. It is important to be sensitive to the environmental impacts of farming by reducing input use on the farm	1	2	3	4	5
2. The use of chemical inputs has a negative impact on the health of people and animals	1	2	3	4	5
3. It is important to take the environment into consideration, even if it lowers profit	1	2	3	4	5
4. It is important to farm in an environmentally friendly way	1	2	3	4	5
5. The impact of fertiliser run-off is worse than generally imagined	1	2	3	4	5
6. Organic farming is better for the environment than conventional farming	1	2	3	4	5
Profit Orientation					
7. It is important to receive the highest possible prices for produce	1	2	3	4	5
8. It is important to make the largest possible profit from farming	1	2	3	4	5
9. It is important to try new ways to increase profit	1	2	3	4	5
10. Farming is about maximizing profits from the farm business	1	2	3	4	5
11. To survive in farming, a farmer has to adapt to changing and new technologies	1	2	3	4	5
Risk Behaviour					
12. Before applying different farming practices they first need to be proven on other farms	1	2	3	4	5
13. It is important to be cautious about adopting new ideas	1	2	3	4	5
14. It is important to minimise all risks when running a farm	1	2	3	4	5
15. Before adopting new ways of doing things it is important to learn from other farmers	1	2	3	4	5
Information Sharing					
16. It is important to discuss farming options with other farmers/friends	1	2	3	4	5
17. It is important to have a knowledge about good farming practices	1	2	3	4	5

Farmers Preferences	Disagree strongly	Disagree	Disagree nor Agree	Agree	Agree strongly
18. It is important to have good contact with extension officers to discuss related issues	1	2	3	4	5
19. It is important to visit other farms to look at their farming methods	1	2	3	4	5
20. It is important to seek advice before making farm decisions	1	2	3	4	5
Perceived Behaviour Control					
21. I am confident in learning organic farming, if I want to	1	2	3	4	5
22. I am confident I can find buyers easily if I plant organic	1	2	3	4	5
23. I can obtain organic certificate easily if I want to	1	2	3	4	5
24. I can train my staff to plant organic if I want to	1	2	3	4	5
25. I am confident that I manage to do organic documentation easily	1	2	3	4	5

SECTION D. FARM EXPECTATIONS

14. Further expectations of farm development

How do you see your farm in the next 10 years? (Please tick one box only)

Farm Expectations	Disagree strongly	Disagree	Neutral	Agree	Agree strongly
1. No plan to convert to organic farming	1	2	3	4	5
2. Continue with organic farming	1	2	3	4	5
3. The whole/part of farm will be converted	1	2	3	4	5
4. Sold/rented out for agricultural purposes	1	2	3	4	5
5. Sold/rented out for non-agriculture purposes	1	2	3	4	5
6. Don't know	1	2	3	4	5

SECTION E. FARM BUSINESS

15. *General questions about you and your farm business*

1. What is your role in the farm business? (Tick one box)
   Director/ manager/ owner ☐ Others (Please specify): _____
2. What is the **total area** that your farm? _____ Acre _____ Hectares
3. For how long has you **has been farming**? _____ years
4. Most of your farmland is _____ ☐ owned ☐ rented ☐ TOL
   If **owned**, will it be passed on to the next generation? Yes ☐ No ☐
5. Do you have any **off farm** job? Yes ☐ No ☐

6. How many people work in your business, including yourself and your family?

	Full-time (year round)	Part-time (year round)
You and your family		
Employees		

7. Taking all of your income sources into account, how would you describe the current economic position of your farm business? (Tick one only)
   Poor ☐ Fair ☐ Good ☐ Excellent ☐
8. What are the **type of commodities** cultivated on your farm? 1._____ 2. _____
9. Other than vegetables, do you grow other organic crops (e.g. fruit)? Yes ☐ No ☐
   If **YES**, please specify _____
10. Do you practice integrated farming system (with livestock)? Yes ☐ No ☐
    If **YES**, what kind of livestock do you keep? _____

SECTION F. FARM SUPPLY CHAIN & CREDIT ACCESS

16. ***General questions about farm operation***

Farm supply chain		**YES**	**NO**
1.	Does your farm supply to a few main customers (*e.g. hypermarket/ supermarket*)? If **YES**, please state:		
	If **NO**, do you plan to supply to a few main costumer in the next 3 years?		
2.	Does your farm export produce to foreign market? If **YES**, please state the place:		
	If **NO**, do you plan to export produce to foreign market in the next 3 years?		
Farm credit access		**YES**	**NO**
3.	Are you a member of cooperative(s)?		
4.	Are you a member of farmers association(s)?		
5.	Do you have credit access for input supplies?		
6.	Do you have any loan access for farm investment?		
7.	Do you received any incentive/ subsidy from the government?		

SECTION G. PERSONAL INFORMATION

1. Age (in 2016): _____ years
2. Gender : ☐ Male ☐ Female
3. Status : ☐ Single ☐ Married
4. Ethnicity: ☐ Malay ☐ Chinese ☐ Indian or Others (_____)
5. What is the highest level of education you achieved?
   ☐ Primary School ☐ Diploma ☐ STPM (Cert)
   ☐ Secondary School ☐ Degree ☐ Postgraduate or Others (_____)
6. Do you have formal education/training in agriculture? Yes ☐ No ☐
   If **YES**, where did you get the formal education/ training? _____
7. How many people live in your **household** in total? _____

8. How many of them are **under 16**? _____
9. Do you have any other suggestions or comments?

   _____
   _____
   _____
   _____

10. We are keen to have more organic farmers involved in our study. Can you recommend any farmers who you think might be willing to participate in the study?

    _____
    _____
    _____
    _____

Thank you for your cooperation in completing this questionnaire!☺

Would you be willing to be contacted again as part of this research? This might involve taking part in another interview session.

Yes ☐ No ☐

Would you like to be informed of the results of our research?

Yes ☐ No ☐

If **YES**, would you prefer to be contacted by post or email?

Post/ email:

B2. Ethical Approval

Full Ethical Approval Form

As part of its assurance and compliance processes the University ensures that all appropriate projects, including student research and consultancy projects, undergo appropriate ethical review before commencement. This form is used to elicit more detail where a project has been identified as high risk and must be considered for approval by one of the University ethical approval committees. Additional guidance can be found on the University ethics toolkit.

This form is to be used where preliminary ethical assessment has indicated that full ethical review is required. You will be asked to transcribe the high risk flags from your preliminary application and then be prompted to provide additional information.

If you have not completed a preliminary ethics assessment then you should do so through the MyProjects Proposals system (for externally funded projects) or use the Preliminary Assessment form (for unfunded projects).

Once completed a copy must be emailed to the relevant committee along with any supporting documentation. No research should begin until approval has been granted.

Section 1: Applicant Details
This section must be completed in all instances.

Applicant Name	**Nur Bahiah Mohamed Haris**
Contact Email	n.b.b.mohamed-haris1@ncl.ac.uk
Academic Unit	**School of Agriculture, Food and Rural Development (AFRD)**
Applicant Type	▫Staff ▫Undergraduate ▫Postgraduate Taught ▪Postgraduate Research

Section 2: Project Details
This section must be completed in all instances.

Project Title	The Adoption of Organic Farming Practices in Malaysia
MyProjects Reference	-
Already has ethical approval	▫Yes ▪ No
Project Funder(s)	Ministry of Higher Education Malaysia
Other organisations involved	-
MyProjects Ref (where known)	-
Proposed Start / End Date (dd/mm/yyyy)	Start Date 05/01/2015 End Date 05/01/2018
Category	▫ Staff Research ▪ Postgraduate Research ▫ Course
High risk flags – from Preliminary form	▫ Animals ▫ Environment ▪ International (non EEA) ▫ NHS ▫ Data ▫ Humans Non-Clinical
Supervisor name & email *(Student Research projects only)*	Guy Garrod – guy.garrod@newcastle.ac.uk

Who is responsible for the overall management of the research? Name & post.	Nur Bahiah Mohamed Haris PhD Student (under supervision)
Who designed the research? Name & post.	Nur Bahiah Mohamed Haris PhD Student (under supervision)
Who is conducting the research? Name & post.	Nur Bahiah Mohamed Haris PhD Student (under supervision)
Is this a re-approval of an existing project?	☐Yes ■ No Ref:
Has Peer Review taken place	☐Yes By:_____ ■ No

Section 3: Project Outline & Proposed Research methods

This section must be completed in all instances.

Project outline & aims

In everyday language, briefly explain the aims of this research including the anticipated benefits and risks. In cases where the use of technical or discipline specific terms is unavoidable, please explain their meaning clearly. *Please use no more than 500 words.*

Project Background

Improvements in lifestyles and associated changes in consumption are increasing the global demand for food, with the consequence that the need to develop genuinely a sustainable food production system becomes stronger every year. The limitations of arable land, which are mainly to the result of soil degradation, increased development, and climate change, threaten the productivity of conventional farming systems. Hence, farming systems with lower reliance on external inputs offer some promise of greater sustainability. One well-known and widely adopted practices is organic farming, where the practices are rely more on environmentally sustainable methods of agricultural production.

In Malaysia, farmers are involved in both types of organic farming activities. Farmers who wish to apply for certification, need to submit their applications through the Department of Agriculture (DoA) and they need to renew it every year. However, even though various strategies to encourage the growth of organic farming have been implemented by the Malaysian government, numbers of certified farmers still remain low (Tiraieyari, Hamzah, & Abu Samah, 2014). In fact, the increasing demand from consumers for organic produce cannot be met by local producers and as a result the country needs to import organic goods, mostly from Australia and the US (Stanton et al., 2011).

Studies including Tiraieyari, et al. (2014) and Assis and Mohd Ismail (2011) indicate that organic farming is practiced by a minority of farmers and farmers' perceptions towards organic agriculture are mainly negative. Therefore this study will provide recommendations for government and policy makers to strengthen the development of organic farming in Malaysia. The results of this study will help to increase on farmers' awareness and acceptance of organic farming, by identify the factors associated with a successful organic enterprise and encourage more farmers to consider converting to this method of production. Furthermore, this study also will review existing planning and policy issues regarding organic farming in Malaysia.

Research Aim and Objectives

In general, the aim of this study is to determine the factors that influence farmers to adopt organic farming, and to investigate the policy and government practices that encourage the growth of organic production.

The specific objectives are:

1)To identify the main factors that affects farmers' decisions to adopt organic farming practices
2)To explore the contribution made by government and policy makers in the development of organic farming in Malaysia
3)To make appropriate policy and practices recommendations based on the research findings

Research Questions

In order to achieve these objectives, this study will answer the following questions:
1. What are the main factors that will support farmers to adopt organic farming?
2. From where do farmers access the information, knowledge and support necessary to inform their decisions about adopting organic methods?
3. Do farmers have social network support for developing organic farming practices?
4. Why are some farmers resistant to the adoption of organic farming practices? What are the barriers?
5. Do policy makers and government contribute towards the development and adoption of organic farming in Malaysia?
6. What institution that encourage the adoption of organic farming?

Proposed research methods (Experimental design)
In everyday language, please provide an outline of the research methods in a clear step by step chronological order. Noting any pertinent information such as whether the research involves overseas partners and how you will handle the research data. *Please use no more than 500 words.*

This study will employed mix method approaches, where qualitative and quantitative will take place. Data will be gathered through a structured questionnaires survey to the organic farmers. Since the Department of Agriculture (DoA) indicates that there are three categories of organic farming, i.e. registered, non-renewed (elapsed from the certified approval), and also conventional, this study will adapt the cross-sectional survey conducted by Burton et al. (1999). Based on their approach, differences between these three groups can be explored using multinomial logit models.

This study will be carried out in all four regions of peninsular Malaysia (Northern, Central, Southern, and East Coast), where there are lists of registered and non-renewed farmers that can be obtained from Department of Agriculture Malaysia (DoA).

After completion of the questionnaires survey, an interview of farmers will be conducted. Farmers will be ask about their opinion regarding organic movement in Malaysia. The discussion will clarify and explore in more depth some of the underlying factors that not may be identified in the quantitative modelling.

Section 4: Animals

Complete this section only if the project was flagged 'animals' at the preliminary stage

Home Office (HO) License

Will the work be covered by an existing Home Office license?	▫Yes	▫ No
If so, what is the reference?	Ref:	
If the work is not covered by a Home Office license, do you intend to apply for one?	▫Yes	▫ No
Have you discussed you project with the Director of the Comparative Biology Centre or the Home Office?	▫Yes	▫ No
IF your project uses wild caught animals, have you obtained the appropriate permissions	▫Yes	▫ No

Why is it necessary to use animals in this project? *Please use no more than 500 words.*

N/A

What are the kinds of animals to be used and how many of each? *Please use no more than 300 words.*

N/A

What will happen during and after the project? *Please use no more than 500 words*

N/A

Who will be carrying out the project? Briefly describe the relevant experience / expertise of the persons involved? *Please use no more than 500 words*

N/A

Where will the animal be housed or located? If animals are being observed in the wild or in establishments such as zoos has permission been obtained from the appropriate authority? For any work outside the UK do the standards of animal care and accommodation comply with UK codes of practice? If not explain how they differ. *Please use no more than 500 words.*

N/A

What checks are to be made on the animals, how frequently and by whom? What actions will be taken if there are any adverse effects on the animals? *Please use no more than 500 words*

N/A

Section 5: Human participants in a Non-Clinical Setting

Complete this section only if the project was flagged 'Human Participants in a Non-Clinical Setting' at preliminary review

Participant Details

Does this research specifically target participants recruited who are:	■ Adults (over the age of 18 years and competent to give consent) □ Children/legal minors (anyone under the age of 18 years)

Select all that apply	☒ People from non-English speaking backgrounds ☐ Persons incapable of giving informed consent ☐ Prisoner or parolee ☐ Recruited through a gatekeeper ☐ Welfare recipients
How many participants do you plan to recruit?	Approximately 250

From what source and by what means do you plan to recruit your participants? *Please use no more than 250 words.*

The participants involved in 3 groups of farmers, where;
1) Listed and granted as organic farmers by Department of Agriculture (DOA) Malaysia
2) Non-renewed and un-registered organic farmers
3) Conventional farmers

The first and second group is based on the list provided by Department of Agriculture (DoA) Malaysia, whereas the third group is using a snowball sampling methods, where it involves contacting a member of population (farmers) and asking them whether they know anyone else with the same characteristic.

Participant Information	YES	NO
Will you inform participants that their participation is voluntary?	☒	☐
Will you inform participants that they may withdraw from the research at any time and for any reason?	☒	☐
Will you inform participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	☒	☐
Will you provide an information sheet that will include the contact details of the researcher / research team?	☒	☐
Will you obtain written consent for participation?	☒	☐
Will you debrief participants at the end of their participation (i.e., give them an explanation of the study and its aims and hypotheses)?	☒	☐
Will you provide participants with written debriefing too?	☒	☐

	Yes	No	NA
If using a questionnaire, will you give participants the option of omitting questions that they do not want to answer?	☒	☐	☐
If an experiment, will you describe the main experimental procedures to participants in advance, so that they are informed about what to expect?	☐	☐	☒
If the research is observational, will you ask participants for their consent to being observed?	☐	☐	☒

Participant consent
Please describe the arrangements you are making to inform potential participants, before providing consent, of what is involved in participating in your study and the use of any identifiable data, and whether you have any reasons for withholding particular information. Due consideration must be given to the possibility that the provision of financial or other incentives may impair participants' ability to consent voluntarily. *Please use no more than 300 words.*

An information sheet (see Appendix 1) will be given to the respondents (farmers) beforehand and collaboration with the extension officer as well as NGO to make an initial arrangement with the farmers.

Participants should be able to provide written consent. Please describe the arrangements you are making for participants to provide their full consent before data collection begins. If you think gaining consent in this way is inappropriate for your project, please explain how consent will be obtained and recorded. *Please use no more than 300 words.*

Participants will be asked to complete an informed consent form at the beginning of the interview and survey (see Appendix 2)

A copy of your consent form must be provided with your submitted application

Participant debriefing
It is a researcher's obligation to ensure that all participants are fully informed of the aims and methodology of the project, that they feel respected and appreciated after they leave the study, and that they do not experience significant levels of stress, discomfort, or unease in relation to the research project. Please describe whether, when, and how participants will be debriefed. *Please use no more than 300 words.*

Participant will be debriefed before the survey or interview begin. A debrief letter (see Appendix 3) will be given to participants, and the researcher (me) will address any issues, questions or concerns that arise from the participants.

A copy of your debriefing sheet must be provided with your submitted application

Potential risk to participants and risk management procedures
Identify, as far as possible, all potential risks (small and large) to participants (e.g. physical, psychological, etc.) that may be associated with the proposed research. Please explain any risk management procedures that will be put in place and attach any risk assessments or other supporting documents. Please answer as fully as possible. *Please use no more than 300 words.*

Risk for researcher has been identified and is addressed in the attached risk assessment (see Appendix 4). There is harmless and very low risk associated with this project for researcher and participants.

Section 6: Data

This section must be completed in all instances

Please describe how data will be accessed, how participants' confidentiality will be protected and any other considerations. Information must be provided on the full data lifecycle, from collection to archive.

1) Consent form: Written consent will be sought at the beginning of the survey/ interview. These will be kept in hardcopy form in a locked cupboard.
2) Data access: The survey questionnaire will be anonymised (see Appendix 5). Respondent will be assigned a number to protect the identification of participants. The hardcopy of the questionnaire then will be kept in a locked cupboard.
3) Voice recording (for the interview purposes): The voice recording and following transcription will be saved in a separate password protected research folder in the School's T-Drive. The recording of the discussions then will be deleted in the following submission of final thesis (post-viva).

Alternatively please send a copy of your data management plan to the ethics committee. Please note that you plan to do this in the box below. If you do not have a data management plan, funder-specific plans are available from the Digital Curation Centre. See https://dmponline.dcc.ac.uk/

Section 7: Environment

Complete this section only if the project was flagged 'environment' at preliminary review.

Please provide the locations in which your research will take place, together with the anticipated risks (destruction of habitat or artefacts/emissions, etc.), potential damage and mitigating measures planned. *Please use no more than 700 words.*

N/A

Section 8: International (non EEA)

Complete this section only if the project was flagged 'International (non EEA)' at preliminary review.

Overseas: For any research conducted outside the EEA the researcher is responsible for ensuring that local ethical considerations are complied with and that the relevant permissions are sought. Please state the location(s) where your research will take place.

Malaysia (Peninsular Malaysia)

Have the appropriate local ethical considerations been complied with and relevant permissions sought?	☐Yes (awarded) - Please note in 'Permissions' ☐Yes (pending) - Please note in 'Permissions' ■ No ■ No - not required

Section 9: Permissions

This section must be completed in all instances

Please use the table below to record details of licenses or permissions required and / or applied for e.g. LEA, governing body, etc. Ensure you include the reference, status and the date it was granted (if applicable).

Permission / License	Award Body	Reference Number	Date of Permission	Status e.g. Granted / Pending

Section 10: Risk Considerations & Insurance
This section must be completed in all instances

Newcastle University must have in place appropriate insurance cover for its legal liabilities for research studies. Dependent upon the nature of the research and how it is governed cover will either come under Clinical Trials Insurance or Public Liability Insurance. Please refer to the supplementary guidance "When does the Insurance Office need to be notified of a research proposal?" for clarification.

What are the potential risks to researchers themselves? This may include: personal safety issues, such as those related to lone or out of normal hours working or to visiting participants in their homes; travel arrangements, including overseas travel; and working in unfamiliar environments. Please explain any risk management procedures that will be put in place and attach any risk assessments or other supporting documents. *Please use no more than 300 words.*

Please see attached Risk Assessment (Appendix 4)

Please attach a risk assessment or any other appropriate documents as required.

Section 11: Supporting documentation
This section must be completed in all instances

Please supply copies of any applicable and documents in support of your answers. Ensure that attached files have appropriate file names.

Document	Attached
Participant consent form	☒Appendix 2
Participant information sheet	☒Appendix 1
Participant debriefing document	☒Appendix 3
Questionnaire(s)	☒Appendix 5
Outline protocol	☐
Project risk assessment	☒Appendix 4
Travel risk assessment	☐ N/A (Nur is returning home)

Original ethical assessment (re-approval only)	☐ (N/A)
Data management plan	☐
Peer review evidence (Internal / non funded)	☐
Local permissions / licenses (non EEA)	☐
Other ethical review forms	☐
Others (please list):	☐
None	☐

Section 11: Declaration

This section must be completed in all instances

I certify that:

☒the information contained within this application is accurate.

☒the research will be undertaken in line with all appropriate, University, legal and local standards and regulations.

☒I have attempted to identify the risks that may arise in conducting this research and acknowledge my obligation to (and rights of) any participants.

☒no work will begin until all appropriate permissions are in place.

Name of Principal Investigator:	Nur Bahiah Mohamed Haris
Signed:	
Date:	8/8/2016

Please forward a copy of your completed application together with any relevant attachments to the appropriate ethics committee.

Animal Welfare Ethics Review Board:
Paul.Dearden@ncl.ac.uk

Faculty of Humanities & Social Sciences:
Wendy.Davison@ncl.ac.uk

Faculty of Medical Sciences Ethics Committee:
fmsethics@newcastle.ac.uk

Faculty of Science, Agriculture & Engineering Ethics Committee:
SAGE.Ethics@newcastle.ac.uk

Any general ethics queries can be directed to:
res.policy@ncl.ac.uk

APPENDIX C: PHASE 3 DATA COLLECTION (INTERVIEWING ORGANIC FARMERS) - SUPPLEMENTARY MATERIALS

C1. List of Respondent and Coding Details

Abbreviation Used	Details / Particulars of Respondents
ORGANIC FARMERS (OF)	
OF1	She is a Chief Executive Officer of Ligno Biotech Sdn Bhd. Age around 40 years. She's a Chinese lady. The only one of the organic mushroom farm that propagates the mushroom using in-vitro method (laboratory works) in Malaysia, in order to get higher yield without depleting the active ingredient in the mushroom. Produce organically mushroom for health concern, since 2010. Starts applying organic certification from 2011 until now.
OF2	Man, age 27 years. Managed a mushroom farm as an Executive of R&D. The farm size is around 3.5 ha. Have a variety product of organic mushroom. Starts farming mushroom organically since 2007 until now. The first mushroom farm in the country that runs the health-tourism and agro-tourism at the same time.
OF3	Doing organic farm and conducting research at the same time. Malay woman, age 36 years. The farm is used by Department of Agriculture (DOA) for training purposes. Granted organic certification from 2015 until now. The farm focus on vegetables and fruits.
OF4	She's a Chinese woman, manage the farm with his partner. The farm is entirely organic, where they make their own compost by using the organic matters which are obtained from their farms such as cut grass, plant residue, and food processing residue. They are planting vegetables and fruits as the main crop. One of the pioneers that opened the organic farms in Malaysia. Starts farm organically since 1995 (22 years). Apply certification since 2009 but until now didn't get any. The market is focused on the trusted people (local people) and also organic shops near Klang Valley. Apart from farming, they are also doing educational farm visit.
OF5	He's farming fruits organically. He is a Malay and around 35 years old. Started farming organic in the year 2011. Had applied organic certification in 2012 and still certified until now. The farm's size is about 0.9 ha.
OF6	He's a Chinese man, who is actively promoting organic through an educational visit to his farm. He started farming organic since 2009, and granted the certification in 2012. His farm size is about 2ha and he produces vegetables as the main crop. He has 17 years of experience in farming.

OF7	He's managing the farm with his wife, and now together with his sons. Basically, it's a Chinese family farm business. One of the pioneers in opening the organic farms. Started doing organic since 2000, applying organic certification in 2006 and still certified until now. The only farm that obtains both international certifications (NASAA and USDA) and having their own fertiliser factory. Now open the farm for edu-tourism.
OF8	She and her husband are the founders of several non-governmental bodies that related to organic farming, and often embark on efforts to champion green initiatives. She is also doing organic farms but not in a bigger size. She actively advocates community to involve in organic through training courses and open day.
OF9	This farm is planting organic herbs and it is used for medical purposes. This medical herb is commonly known as Sabah Snake Grass (SSG). The farm is managed by Malay farmers, and collaborate with his partner (Chinese man) for a better marketing channel. They start farming organic in 2011, and granted the certification in 2013. The farm is still certified until now. This farm also opens for a visit from student and other community.
OF10	He's managing an organic farm on his own. Basically he produces vegetables as the main crop. His farm size is about 1 ha. He has experience on conventional methods before this, and just converting to organic farming 2 years before. He is a Malay farmer and age of 37 years old.

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