PADDY FARMERS PERCEIVED THE IMPACTS OF CLIMATE CHANGE ON SOCIO-ECONOMIC IN PASIR MAS, KELANTAN

by

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DECLARATION

I declare that this thesis entitled "Paddy Farmers Perceived The Impacts Of Climate Change On Socio-Economic In Pasir Mas, Kelantan" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : _____

Name : _____

Date : _____

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Paddy Farmers Perceived The Impacts Of Climate Change On Socio-Economic In Pasir Mas, Kelantan

ABSTRACT

Agricultural sector is the main source of rural household's food and revenue besides contributing approximately 7.3% to the national gross domestic product (GDP). It is also the third driver of economic growth of this country. However, the issue of climate change nowadays causing this sector to become the most affected sector since climate is the primary determinant of agricultural productivity. This study focused on paddy sector and was undertaken to identify the level of knowledge and awareness of the paddy farmers about the climate change and its impact. It also was conducted to determine their level of preparedness and to determine the critical factors that influence the awareness of the paddy farmers about climate change. This study was conducted in Pasir Mas, Kelantan, where questionnaire survey was used as a main research instrument with 119 respondents participate in it. Descriptive and inferential analysis where percentage and chi-square were used to analyse the results obtained. The results from descriptive analysis show almost 80% of the respondents know and aware (94%) about the climate change. Most of them also did some preparation to deal with the climate change. The inferential analysis revealed that the farming experience as the factor that influence the awareness of the paddy farmers about climate change. Study findings indicate adaptation and mitigation measures are needed to avoid future climate change effects and the government as the policy and law-making authority has the most important role to play in ensuring climate adaptation and mitigation at all rates.

Kesedaran Pesawah Padi Tentang Kesan Perubahan Iklim Terhadap Sosio-Ekonomi di Pasir Mas, Kelantan.

ABSTRAK

Sektor pertanian merupakan sumber utama makanan dan pendapatan isi rumah luar bandar selain menyumbang kira-kira 7.3% kepada keluaran dalam negara kasar (KDNK). Ia juga merupakan pemacu ketiga ekonomi negara. Walaubagaimanapun, isu perubahan iklim pada masa kini telah menyebabkan sektor ini mejadi sektor yang paling terjejas kerana iklim merupakan penentu utama produktiviti pertanian. Kajian ini fokus kepada sektor padi dan dijalankan untuk mengenal pasti tahap pengetahuan dan kesedaran pesawah padi tentang perubahan iklim. Kajian ini juga bertujuan untuk menentukan tahap persediaan mereka dan faktor kritikal yang mempengaruhi kesedaran para pesawah tentang perubahan iklim. Kajian ini dijalankan di Pasir Mas, Kelantan, di mana tinjauan soal selidik digunakan sebagai instrumen kajian dengan 119 responden mengambil bahagian di dalamnya. Analisis deskriptif dan inferensial dimana peratusan dan *chi-square* digunakan untuk menganalisis hasil yang diperolehi. Hasil daripada analisis deskriptif menunjukkan hamper 80% daripada responden tahu dan sedar (94%) tentang perubahan iklim. Kebanyakkan mereka juga melakukan beberapa persediaan untuk menangani perubahan iklim. Analisis inferens menunjukkan pengalaman bertani sebagai faktor yang mempengaruhi kesedaran para pesawah mengenai perubahan iklim. Hasil kajian ini menunjukkan langkah penyesuaian dan mitigasi diperlukan bagi mengelakkan kesan perubahan iklim pada masa hadapan, dan kerajaan sebagai badan yang mewujudkan polisi dan undang-undang mempunyai peranan yang paling penting dalam memastikan langkah penyesuaian dan mitigasi dari setiap sudut.

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LIST OF ABBREVIATIONS

CFC_s	Chlorofluorocarbons
CH_4	Methane
CO_2	Carbon Dioxide
GDP	Gross Domestic Product
ENSO	El Niño-Southern Oscillation
IADA	Integrated Agricultural Development Area
IPCC	Intergovernmental Panel on Climate Change
NGO	Non-governmental organization
PPK	Pertubuhan Peladang Kawasan

LIST OF SYMBOLS

%	Percentage
°C	Temperature (degree Celcius)
±	Plus-minus
H_0	Null hypothesis
H_a	Alternative hypothesis
<	Less than
>	Greater than
χ^2	Chi-square
p	Level of marginal significance

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Agriculture plays a crucial role in the food and fibre supply process for humans. It also become a significant economic, social and cultural activities besides contributing to a broad range of ecosystem services. In Malaysia, the agriculture sector can be categorised into plantation co-existence and sub-sectors of smallholder (Fahmi et al., 2013). Later, it is classified into food and industrial products. The food sectors include paddy, fruits, vegetables, fish and meats. The industrial commodities include rubber, cocoa and palm oil. After the post-independence in the first few decades, it is observed that the agriculture contribute to the Malaysia economic growth because of high agricultural export revenues such as rubber and palm oil (Fahmi et al., 2013). In the early 90s, the government of Malaysia decided to start investing heavily in industrial sectors such as electricity, electronics and automobiles because they believed that these sectors could generate more revenue and have a greater impact on Malaysia's economic growth (Fahmi et al., 2013). These sectors, however, faced severe declines during the 1997 global economic and financial crisis, and the agriculture sector acts as saviour of the Malaysian economy as it contributed to GDP growth from RM17.1 billion in 1995 to RM18.2 billion in 2000 (8th Malaysia Plan). After the manufacturing and service sectors, agriculture is now known as the third driver of economic growth (Wong, 2007).

1.2 Problem Statement

In facing one of the most challenging and threatening environmental issue today, which is the climate change, agriculture become the most affected sector since the main determinant of agricultural productivity is climate (Adams et al., 1998). For instance, with its associated cycle of droughts and flooding events, the El Niño Southern Oscillation phenomenon explains between 15% and 35% of global yield variations in wheat, oilseeds and coarse grains (Ferris, 1999). That is, the changing climate can adversely affect the agriculture and may subsequently threaten the income of the farmers and the future food supply. Act as country's staple food, the paddy and rice industry in Malaysia often receives massive attention and is highlighted by the government because of its strategic importance. Not only do they become the main source of income for paddy farmers, but they also play an important role in agriculture in the country. This study is important because there is limited scientific research about how the change in climate affecting the paddy farmers' socioeconomic and how they cope with the climate change. Also, this study is intended to provide a reliable details that could be used by the paddy farmers in managing their paddy plant.

1.3 Research Question

In this study, the questions that need to be resolved are:

1. What are the level of knowledge and awareness of the paddy farmers on the impact of climate change?
2. How is their preparedness to adapt with the climate change?

3. What are the factors that could influence the paddy farmers' awareness on climate change?

1.4 Objectives

The objectives of this study are:

1. To identify the level of knowledge and awareness of the paddy farmers about the climate change and its impact.
2. To determine their level of preparedness to climate change.
3. To determine the critical factors that influence the awareness of the paddy farmers about climate change.

1.5 Scope of Study

This study mainly focuses on the knowledge and awareness of the paddy farmers about the climate change, their level of preparedness in facing the effect of climate change and the factors that influence the paddy farmers' awareness about climate change in Pasir Mas, Kelantan. Quantitative approach was adopted in this study where questionnaire consisting a series of questions were used as a main research instrument. Descriptive and inferential analysis were executed to answer the research questions.

1.6 Significant of Study

There is no denying that climate change is affecting the world today. The consequences brought by it include lack of rainfall, high temperatures and unforeseen weather (Chamhuri et al., 2009). In term of Malaysian crop yields, the unpredicted climate change have had a major impact on it. From this study, a better understanding of the perceptions of the paddy farmer and perceive on climate change and how is their existing adaptation approaches in facing the threat are expected so that a better adaptation practices could be offer that meet the paddy farmer's need based on what they know and feel about climate change.

CHAPTER 2

LITERATURE REVIEW

2.1 Climate Change

According to "The Science of Climate Change: Questions and Answers" (2015), climate change is the alteration in the patterns of weather and changes in oceans, surfaces of land and ice sheets that occur over decades or longer due to a combination of natural and human-induced causes. The natural causes usually involve volcanic eruptions, solar radiation variation, crustal plate movement, and El Niño-Southern Oscillation (ENSO). On the other hand, the human-induced causes mainly due to the burning of fossil fuels such as coal and oil, which has risen the atmospheric concentration of carbon dioxide (CO_2). What is more, land clearing has further increased greenhouse gas concentrations such as methane (CH_4), nitrous oxide (N_2O) and chlorofluorocarbons (CFC_s) for agriculture, industry and other human activities. (Twardy, 2007). Climate change has become increasingly obvious in the last decade and will continue to occur and give adverse effects on the livelihood of people (Parry et. al., 2007). People will have to change their way of life, either because the consequences of climate change give no option to them, or specific adaptations will substantially reduce the losses associated with these impacts. According to IPCC (2013), climate change in many places is not merely a progressive change in the average condition, but a change in the frequency and intensity of extreme events like heavy rainfall or drought or extreme heat or cold.

Malaysia is one of the developing countries in the world that transformed in the 1970s from a resource-based producer into a multi-sector economy, in particular the manufacturing and service sectors in the 1990s (Chik & Rahim, 2014). This changes was driven by strong economic development, mostly driven by manufactured product exports. This good economic development has had an effect on increased energy usage and CO_2 emissions. Malaysia relies mostly on non-renewable energy such as fossil fuels and coal to generate production activities, but if the economy is too reliant on this energy, CO_2 emissions will increase. As a result, the increase of CO_2 emissions associated with the provision and utilization of energy is responsible for climate change.

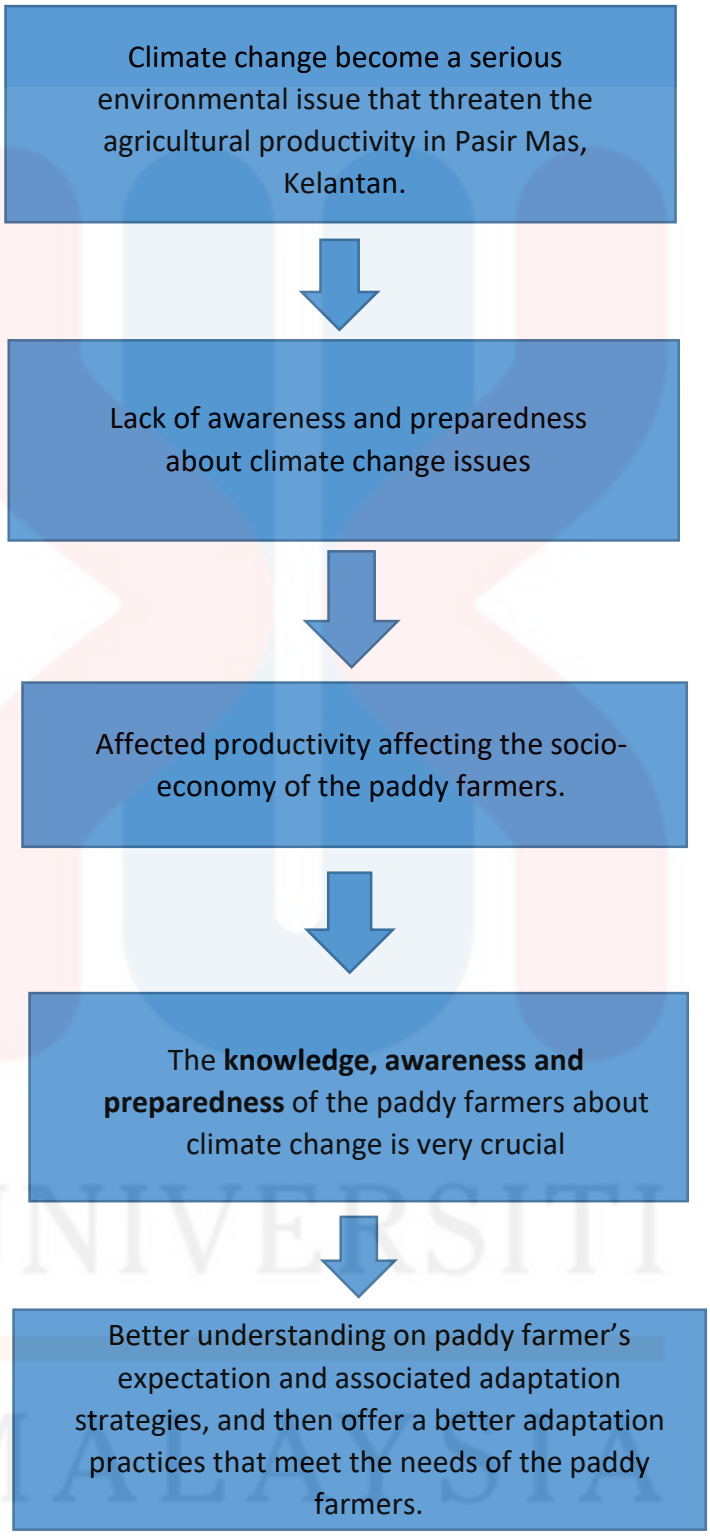

Figure 2.1 Research framework

2.2 Climate Change Threaten the Agricultural Activity

Malaysia is the 26th largest greenhouse gas emitter in the world with a total population of approximately 27 million (UNDP, 2007). The increasing rate of emission in the country may cause the list to move up rapidly. The high greenhouse gas emission brought a negative impact which will raise the temperature by 0.3-4.5^{o}C. The natural greenhouse gas already increased the global average surface temperature by about 30^{o}C (Gregory, 2007). Increasing the greenhouse gas concentration by the human activity tend to increase the surface temperature which eventually lead to the widespread decrease in glaciers and ice, thus contributing to the rise of sea level. There is also a change in the pattern of rainfall which it may fluctuate from -30% to +30% (Alam et al., 2012). The adverse effects of changes in the atmosphere are currently felt and are expected to deteriorate in the future. Table 2.2.1 shows the principal findings of the Fourth Assessment Report of the IPCC (IPCC, 2007). An increase in temperature is already detected in most regions as it can be seen by fewer cold days and more frequent hot days and will exacerbate in the future.

Table 2.2.1 Principal conclusions of the IPCC Fourth Assessment Report (IPCC, 2007)

Climate change impact and direction of trend	Probability of trend	
	Recent decades	Future
Warmer and fewer cold days and nights over most land areas	Very likely	Virtually certain
Warmer and more frequent hot days and nights over most land areas	Very likely	Virtually certain
Frequency of warm spells / heat wave increases over most land areas	Likely	Very likely
Frequency of heavy precipitation events increases over most land areas	Likely	Very likely
Areas affected by drought increases in many regions	Likely	Likely
Intense tropical cyclone activity increases in some regions	Likely	Likely

This trend, which for future conditions is considered almost certain has significant impacts for agricultural production. According to study conducted by NAHRIM (2006), by 2050, Pahang, Kelantan and Terengganu's maximum monthly rainfall will increase up to 51% while the minimum rainfall will decrease by 32-61% for the whole Peninsular Malaysia. That being so, the annual rainfall in Terengganu, Pahang, Kelantan and North-West Coast will increase by 10% while in Johor and Selangor will decrease by 5%.

Table 2.2.2 Future rainfall and temperature change projections in Peninsular Malaysia by 2050 (NAHRIM, 2006)

Area	Projected change* in maximum monthly value	
	Temperature (°C)	Rainfall (%)
North East Region – Terengganu, Kelantan, Northeast-coast	+1.88	+32.8
North West Region – Perlis (west coast), Perak, Kedah	+1.80	+6.2
Central Region – Klang, Selangor, Pahang	+1.38	+8.0
Southern Region – Johor, Southern Peninsula	+1.74	+2.9

This pattern would definitely disturb the production of the rice since precipitation also plays an important role in paddy rice production. That is, too much precipitation that can cause flood and result in higher yield loss or too little precipitation with higher temperature that may cause heat stress for the rice plants. All these climatic factors will cause the paddy plant in Malaysia to be vulnerable.

2.3 Climate Change Affecting the Productivity of Paddy Plant

Asia become the region which produce most of the rice, contributing to the 94% of the total world production, and monsoonal East Asia is one of the most intensive areas of rice production within Asia (Kim et al., 2013). Climate change harms the productivity of the paddy plant and the performance of agricultural strategy (Mikhail et. al., 2011). Changes in rainfall pattern and temperature in particular pose the major risk, rising uttermost climatic incidents such as floods and droughts around the world (Petley, 2012). Several findings in South East Asia showed that climate change can adversely affects the production of rice. Amien et. al. (1996) was one of the earliest researcher to prove the impact of climate change on paddy production in

South East Asia. In Malaysia, where there were about 296,000 rice producers in 2010 (Firdaus et al., 2012), the place where the rice grow, mainly in Peninsular Malaysia and accounting for 85.5% of the total production of paddy in Malaysia (Firdaus et al., 2012) have an average atmospheric temperature of about 26°C. According to Tashiro & Wardlaw (1989), with the current changing in climate, temperature exceed 25°C may reduce the grain mass by 4.4% per 1°C rise in temperature while Baker & Allen (1993) stated that the grain yield may decrease up to 10% per 1°C rise. Singh et al. (1996) said that due to the present CO_2 level, there was a decrease in the rice yield for about 4.6-6.1% per 1°C rise in temperature. A recent study discovered that an increase in atmospheric temperature of 1°C would lead to a reduction in the current paddy yield for about 3.44% and that for about 0.03% in the next season, while an increase of 1% rainfall reduced the current paddy yield by 0.12% and that for 0.21% in the next season (Alam et al. 2010). Apart from that, an increase in CO_2 and other greenhouse gases causing the surface air temperature to increase and hence further aggravating abiotic stress for crop production. The effects of climate change now threaten the production of rice in Asia with declining yields from floods and droughts (Masutomi et al., 2009).

Tisdell (1996) noted that the unstable pattern of rainfall rise the level of environmental stress that influence the system's capacity to maintain productivity. **Table 2.3** shows the country paddy yield production projection (NRS, 2001). Any positive or negative variation in rainfall and temperature of more than 0.4% will reduce the paddy production yield by 2020. Taking into account a positive or negative variation of over 0.7% in both rainfall and temperature by 2040, paddy yield tends to decline further and this negative trend in paddy yield is expected to continue by 2060, considering the variation (±) above 1% (Alam et. al., 2013). These clearly

show a very high level of vulnerability to paddy productivity due to climate change in the coming decades. This shows that climate change has a negative impacts on Malaysia's agriculture.

Table 2.3 Projection of paddy yield (Kg/Ha) with different variations of temperature and rainfall at certain level of CO_2 (NRS, 2001)

Paddy yield										
Year 2020 (at 400 ppm)				Year 2040 (at 600 ppm)				Year 2060 (at 800 ppm)		
Variation in Rainfall (%)	Variation in Temperature (°C)			Variation in Rainfall (%)	Variation in Temperature (°C)			Variation in Rainfall (%)	Variation in Temperature (°C)		
	0.3	0.85	1.4		0.4	1.4	2.4		0.6	2	3.4
14	6,156	5,806	5,586	23	7,342	6,942	6,542	32	8,619	8,059	7,499
7	6,646	6,306	6,086	11	8,200	7,800	7,400	15	9,834	9,274	8,714
0.4	7,202	6,862	6,642	0.7	9,042	8,642	8,242	1	10,962	10,402	9,842
0	7,202	6,862	6,642	0	9,042	8,642	8,242	0	10,962	10,402	9,642
0.4	7,202	6,862	6,642	-0.7	9,042	8,642	8,242	-1	10,962	10,402	9,642
-7	6,698	6,382	6,177	-11	8,047	7,961	7,335	-15	9,318	8,842	8,366
-14	6,194	5,901	5,712	-23	6,962	6,654	6,346	-32	7,454	7,073	6,693

2.4 Productivity Affecting the Socio-Economic of the Paddy Farmers

With just two reasons, paddy can be said as the most crucial crop in the food sub-sector. Firstly, Malaysian consumption per capita accounted for between 500 and 799 calories per day, making rice as the main staple food in Malaysia (Nguyen, 2004). Secondly, the crop provides an income source for small-scale farmers who rely solely on paddy growing (Firdaus et al., 2012). The climatic factors which include the amount of sunshine hours, temperature, amount of rainfall, relative humidity and the length of the drought period affect the economic and social sustainability of the farmers either directly or indirectly (Alam et al., 2012). Low productivity, damaged crop and high production cost are a few of the effects brought by the climate change that may lead to the loss of income for farmers, rise in their poverty level and increase their seasonal unemployment rate (M. M. Alam, Chamhuri Siwar, Molla, Toriman, & Talib, 2011; M. M. Alam, Siwar, Talib, Molla, & Toriman, 2010; Chamhuri Siwar et al., 2009). This is due to dependence of the farmers on agriculture. In 2009, around 300,000 rice farmers are depended on rice cultivation as their primary source of income (Norsida & Ismaila, 2016). Malaysia (2006) and NAHRIM (2006) stated that the most tenable vulnerable states in Malaysia in terms of poverty rates were Perak with 4.9%, Kedah with 7%, Perlis with 6.3%, Kelantan with 10.6%, Terengganu with 15.4%, Sabah with 23% and Sarawak with 7.5%. All these states also having a high projected temperature and rainfall changes.

The unpredictable behaviour of climate conditions also has negative effects on health aspect of the farming community. According to the study of Alam et al. (2013), 73.7% of 198 respondents farmers mentioned that they faced several health problems due to the climate change, including water-borne, vector-borne and respiratory diseases. Other incidences due to climate change include skin disease,

diarrhea, dengue fever, malaria, malnutrition, dehydration and heat stress. All these happened to the paddy farmers and effecting their health, making them incapable to do their work and thus affecting the production of the paddy plant. Since rice cultivation is their primary source of income, things like this would definitely affecting their economy. Based on the study of Alam et al. (2010) in the area of Integrated Agricultural Development Area (IADA), North-West, Selangor about the paddy farmer's perception on the socioeconomic impacts of climate changes, over 68% of 198 respondents of the paddy farmers either agree or strongly agree that the paddy cultivation is no longer profitable because of low productivity. At the moment, 17.2% of them are involved in part-time agriculture. Many farmers are trying to reduce their involvement in agriculture form full-time engagement to part-time workers because 56.6% of the paddy farmers believe that full-time engagement is less profitable than part-time engagement.

2.5 Knowledge, Awareness and Preparedness of Paddy Farmers towards Climate Change

Climate change is a complex climate alteration, subtle and continuous, but extremely important because of its effects on various types of vegetation that thrived in constant or relatively unchanged climates (Venkateswarlu & Shanker, 2009). To improve policy to address the challenges of climate change, it is important to have climate change knowledge and awareness, coping methods and mechanism options, and related barriers to adaptation to climate change. According to Nelson et al. (2010), climate change adaptation is interpreted as the decision-making process and a set of actions to maintain the capacity to cope with current or future changes predicted. Adaptation strategies are not only actions that reduce or prevent the effects of

specific changes in the environment, but also opportunities for well-being and survival (Cooper et al., 2008). Adaptation is necessary to return to, maintain or attain the desired state on the basis of awareness that conditions have changed or will change (Thornton & Manasfi, 2010).

Adjusting to climate change can significantly cut down the negative impacts of climate change as well as reduce vulnerability and promote sustainable growth in order to improve the wellbeing of the paddy farmers (Smit & Pilifosova, 2001). In fact, adapting is considered as a way to reduce vulnerability, increase resiliency and mitigate the danger brought by the climate change on lives and livelihood. Empirical evidence acknowledges that climate change adaptation can probably decrease its adverse effects, protect poor farmers' livelihoods and reinforce any potential benefits it can bring (Gandure et. al., 2013; Wheeler et. al., 2013).

Alam et. al. (2013) found that most of Malaysia's farmers lag behind understanding the issues of climate change. Rice producers are generally exposed to these climatic risks and have low capacity for adaptation (Alam et al., 2013). Zsóka et. al. (2013) and Bardsley & Rogers (2011) agreed that a clear understanding of climate change issues could help to generate positive attitudes to address the adverse effects of climate change. There is no doubts about the significance to minimise the impacts of climate change on the agriculture, thus the perceptions of the paddy farmers about climate change and their adaptation strategies need to be better understood.

2.6 Factors Influencing Paddy Farmers' Awareness and Preparedness about Climate Change

There are few possible factors that could influence the awareness and preparedness of the paddy farmers about climate change. The first factor is extension. It provides farmers with training on best farming practices, thereby increasing technology adoption levels. A study conducted by Fosu-Mensah et. al. (2012) showed that access to extension services has a positive and significant impact on adaptation in the face of rising temperature and declining precipitation due to climate change. This suggests that farmers are educated on climate change with extension services and were also advised on how to mitigate their impact on crop yield. Studies by Gbetibouo (2009) and Deressa et. al. (2009) also reported the same things in Limpopo River Basins of South Africa and Nile Basins of Ethiopia respectively. Access to extension services is assumed to be positively linked to the adoption of new technologies as farmers are exposed to new knowledge and practical skills (Adesina, 1995).

The second factor is income. Farm income is highly significant and positively linked to climate change adaptation (Arunrat et. al., 2017). Increasing farm income significantly increases the probabilities of all adaption method. This shows that farmers with higher incomes are more willing to adapt their practices due to reserve money and sufficient income to cope with the risk of adaptation options, as well as more investment and ways of earning more income. This positive relationship between higher income and more active adaptation is supported by Habiba et. al. (2012) and Gbetibouo (2009).

Next is knowledge. Highly educated farmers are more aware of the adverse effects of climate change opposed to those with less education (Masud et al., 2017). Those with high education would be better adapted to climate change because they are more exposed to new knowledge and technologies, and because they also have more labour resources to carry out agricultural activities. Hence, different level of education have a substantial effects on adaptation practices.

Another factor that influencing the paddy farmers' awareness and preparedness about climate change is farm size. According to Arunrat et. al. (2017), farm size are also major determinant of adaptation to climate change. Increasing farm size and land ownership makes it easier for farmers to decide on adaptation strategies, because they earn more capital, have large farm areas and have the right to exercise new farming methods on their land. Larger farm households means they are well-resourced and tend to select adaptation more frequently and earlier than smaller households, (Alauddin & Sarker, 2014).

Last but not least, farming experience. It is a very important variable for increasing the likelihood of adaptation (Arunrat et al., 2017). This indicates that farmers have more knowledge of farming and its environment. Hence, the more agricultural experience they have, the more likely they are to think of and adopt adaptation strategies (Maddison, 2007). Arunrat et al. (2017) also found that farmers with more farming experiences tend to have more expertise in practicing crop rotation.

2.7 Better Adaptation Strategies to Face the Effect of Climate Change

The farming community has been identified as the most vulnerable group to climate change due to their dependence on paddy production for their livelihoods (Morton, 2007). The inability of farmers to adapt to climate change could lead to serious hardships such as displacement, social disruption, disease and death (Mearns & Norton, 2009). Hence, in order to provide an informed framework for addressing climate change, it is essential to explore the perception and adaptation strategies of farmers. The ability of farmers to see the causes of climate change is a profound precondition for the selection of adaptation strategies. Localised forms of perception of climate change strongly depend on societal, ethnic and economic situations in which people experience risk as perceptions influence behaviour (Patt & Schröter, 2008). A profound understanding of farmers' perception about climate change is significant for policy-makers when determining adaptation strategies (Antwi-Agyei et al., 2014). Climate-related natural disasters can impair crop productivity, which can lead to instability in the nutrition chain and threaten food safety in the future (Al-Amin et al., 2010). Thus, this adverse impacts of climate change could therefore increase the feeling of being affected, leading to more attitudinal change. Masud et al. (2013) found that climate change awareness, knowledge and perception of risks have an impact on the development of favourable climate change attitudes.

This study intends to have a better understanding of the paddy farmer' expectation about climate change and how is their existing adaptation strategies. From there, a better adaptation practices that meet the needs of the paddy farmers could be provided. Apart from that, a reliable information could be offered to the paddy farmers on how to manage their paddy plants in midst of climate change.

CHAPTER 3

MATERIALS AND METHOD

3.1 Research Area

This study was conducted in Pasir Mas, Kelantan. Pasir Mas is one of the 10 territories in the great state of Kelantan, located in the north, bordering Tumpat territory, with Tanah Merah to the south, Sungai Kelantan and Kota Bharu territory to the east, and Sungai Golok, Thailand to the west (MDPM, 2019).

Figure 3.1 Map of Pasir Mas, Kelantan

(retrieved from Google, n.d.)

3.2 Research Design

This study adopted quantitative method in order to obtain information regarding the climate change impact perceived by the paddy farmers. Quantitative method illustrate objective measurement and statistical, mathematical or numerical analysis of data obtained through polls, questionnaires and surveys, or by using computational techniques to manipulate pre-existing statistical data (Labaree, 2019). The objective of quantitative study is to determine the relationship between one thing (an independent variable) and another within a population (a dependent variable). Quantitative method is chosen instead of qualitative method because it focuses more on the ability of statistical analysis to be completed (Mersdorf, 2016). Each respondent is asked to answer the same questions with quantitative studies.

For sampling, a technique called quota sampling was used for this study. It is a non-probability sampling technique in which the assembled sample has the same proportions of individuals with respect to known characteristics, traits or focused phenomenon as the entire population (Explorable.com, 2009).

In this study, 150 respondents were chosen from three Pertubuhan Peladang Kawasan (PPK) as the sample size. The three PPK are Kubang Sepat, Kubang Bunut and Alor Mas (KADA, 2018).

3.3 Research Instrument

Questionnaire survey was used as a main research instrument in this study. The questions was divided into three part, Section A, Section B and Section C. Section A comprises closed-ended questions that focuses on demographic information of the paddy farmers including gender, age, education, income and etc., and it have multiple choices answer. In Section B, the questions focused on the knowledge and awareness of the paddy farmers about climate change and associated impacts. The questions can either be answered by a simple "yes" or "no" and also with multiple choices answer. In Section C, the questions are focused on the preparation done by the paddy farmers in order to deal with climate change. In this section, Likert Scale was used with 5 options given ranging from Strongly Disagree (1) to Strongly Agree (5) so that a holistic view of the paddy farmer's opinion could be obtained. The Likert Scale also include a mid-point (3) for those who are neutral on the subject matter. For this section, the Cronbach's alpha reliability coefficient is 0.814. The closer Cronbach's alpha coefficient is to 1.0, the greater the internal consistency of the items in the scale, where the coefficient normally ranges between 0 and 1 (Gliem & Gliem, 2003).

3.4 Research Analysis

Two types of analysis were used, which are descriptive and inferential analysis.

3.4.1 Descriptive Analysis

Descriptive analysis where percentage was used to measure the knowledge, awareness and the level of preparedness of the paddy farmers towards climate change.

3.4.2 Inferential Analysis

Inferential analysis was used to determine the factors that influence the paddy farmers' knowledge and awareness about climate change.

Chi-Square Test was used to test whether there is a relationship between two variables, which are dependent and independent variables. The dependent variable would be the awareness of paddy farmers about climate change, while the independent variables are the critical factors. The test begins by considering two hypotheses which are null hypothesis (H_0) and alternative hypothesis (H_a). Both hypotheses contain opposing viewpoints. According to Karin (2018), null hypothesis is a hypothesis which shows no statistical significance between two variables in the experiment, while alternative hypothesis is simply the inverse, opposite of null hypothesis. In this study, the null hypothesis is that there is no significant relationship between the awareness and critical factors. When the null hypothesis is rejected, it shows that there is relationship between the two variables.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Profile of Respondents

The sample size of this study consists of 97% males and 3% females, as shown in **Table 4.1**. The findings revealed that most of the paddy farmers (57.2%) were in age of 50 years and above. It shows that most of them are aged farmers. Only 10.1% of them are younger generations who were interested in agriculture sector. A total of 83.2% of the paddy farmers had farm area less than 10 acres, 15.1% of the paddy farmers' farm area is in the range between 10 and 49 acres and 1.7% of them have an area of more than 50 acres. Majority of the paddy farmers have secondary education (60.5%), while 21.8% of the paddy farmers have primary education and only 2.5 of them have higher education. The result also shows that majority of the paddy farmers' income level is in the range between RM601 and RM1000 (31.9%). As for the farming experience, 35.3% of the paddy farmers have been involved in the agriculture sector for more than 16 years and only 17.6% of them having experience less than five years.

Table 4.1: Profile of respondents

Basic information	Group	No. of respondents	Percentage (%)
Gender	Male	115	96.6
	Female	4	3.4
Age	< 20 years	3	2.5
	20 – 29 years	12	10.1
	30 – 39 years	13	10.9
	40 – 49 years	23	19.3
	50 – 59 years	34	28.6
	> 60 years	34	28.6
Farm area	< 10 acres	99	83.2
	10 – 19 acres	7	5.9
	20 – 29 acres	10	8.4
	40 – 49 acres	1	0.8
	> 50 acres	2	1.7
Education	Primary school	26	21.8
	Secondary school	72	60.5
	Certificate/SPM/STPM	17	14.3
	Diploma	2	1.7
	Degree/Master/PHD	1	0.8
	Others	1	0.8
Income of household (RM/month)	< RM600	27	22.7
	RM601 – RM1000	38	31.9
	RM1001 – RM2000	29	24.4
	RM2001 – RM3000	14	11.8
	RM3001 – RM4000	8	6.7
	> RM4001	3	2.5
Farming experience	< 5 years	21	17.6
	6 – 10 years	34	18.6
	11 – 15 years	22	18.5
	> 16 years	42	35.3

4.2 Farmers' Knowledge and Awareness

4.2.1 Level of Knowledge of Paddy Farmers About Climate Change

Most of the farmers in Pasir Mas, Kelantan know about the climate change and 96.6% of them believe that the climate change is really exist. Even though they did not have higher level of education but the experience working as farmers might have help them in knowing about the issue since many of them have been involved in agriculture sector for more than 16 years.

Table 4.2.1.1 Knowledge and belief of paddy farmers about climate change

Aspect	Group	Percentage (%)
Knowledge about climate change	Yes	79.8
	No	20.2
Belief on the existence of climate change	Yes	96.6
	No	3.4

Figure 4.2.1 shows that almost 91% of the total paddy farmers interviewed agreed in increase in temperature and only 9% of them does not agreed. When they were asked about the decrease in temperature, only 39.5% of them agreed with the statement and the rest does not agreed. From this, it shows that the paddy farmers only understand the rise in temperature as the effect of climate change, and not both of it.

As for the rainy season, only 39.5% agreed that there has been an increased in it since most of the paddy farmers noticed about the rise in temperature. For them, rise in temperature is equal to decrease in rainy season, hence the 63.9%, which more than half of the total respondents. For the increase and decrease in amount and

frequency of rain, the number of paddy farmers who agreed to both are quite balance. More than half is agreed with the statement.

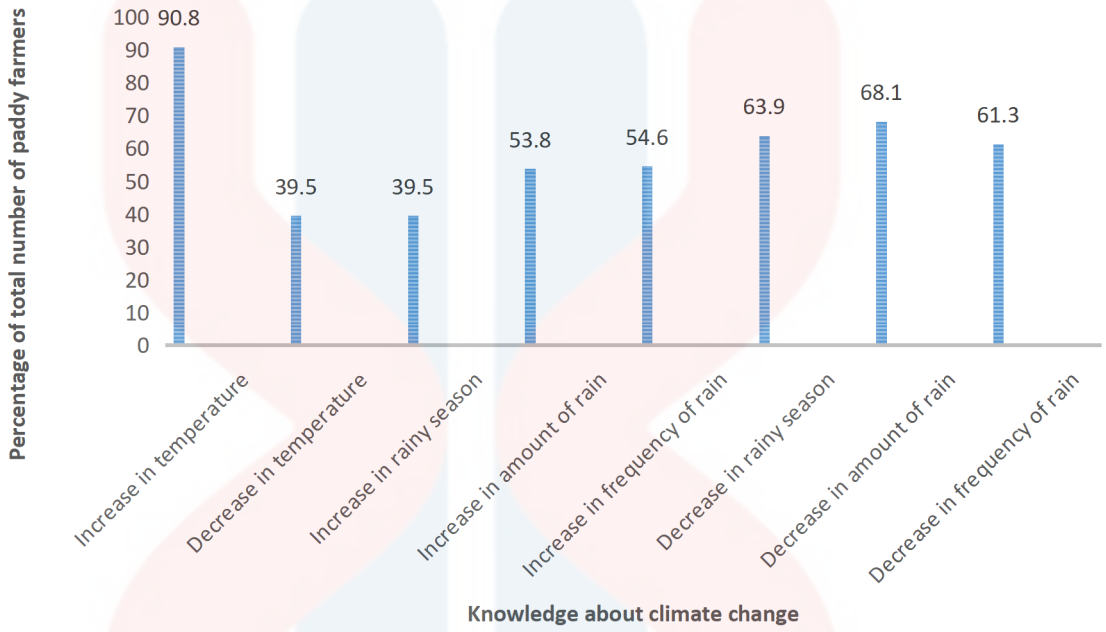

Figure 4.2.1 Percentage of total number paddy farmers based on their knowledge towards climate change

Table 4.2.1.2 Level of knowledge of paddy farmers about climate change

Very low	Low	Moderate	High	Very high
0 – 20%	21% - 40%	41% - 60%	61% - 79%	80% - 100%

Based on the Table 4.2.1.2, the level of knowledge of the paddy farmers about climate change was moderate. This was measured by adding up all the percentage and divided by the total aspects. The result was 58.9%.

4.2.2 Level of Awareness of Paddy Farmers About Climate Change

Figure 4.2.2.1 shows that majority of the total paddy farmers interviewed in Pasir Mas, Kelantan are aware with the issue of climate change that will affect the paddy plant.

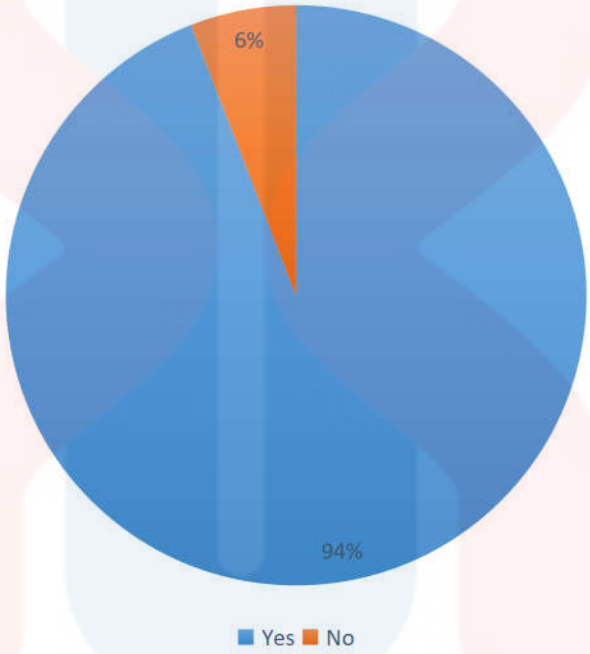

Figure 4.2.2.1 Awareness of paddy farmers about climate change

Figure 4.2.2.2 shows the level of changes felt by the paddy farmers in the past 30 years. 36 out of the total respondents said that the climate change has brought significant changes towards their paddy plants and only 8 of them did not know about it. This might be due to less experience in agriculture sector that he/she could not observe much of the changes.

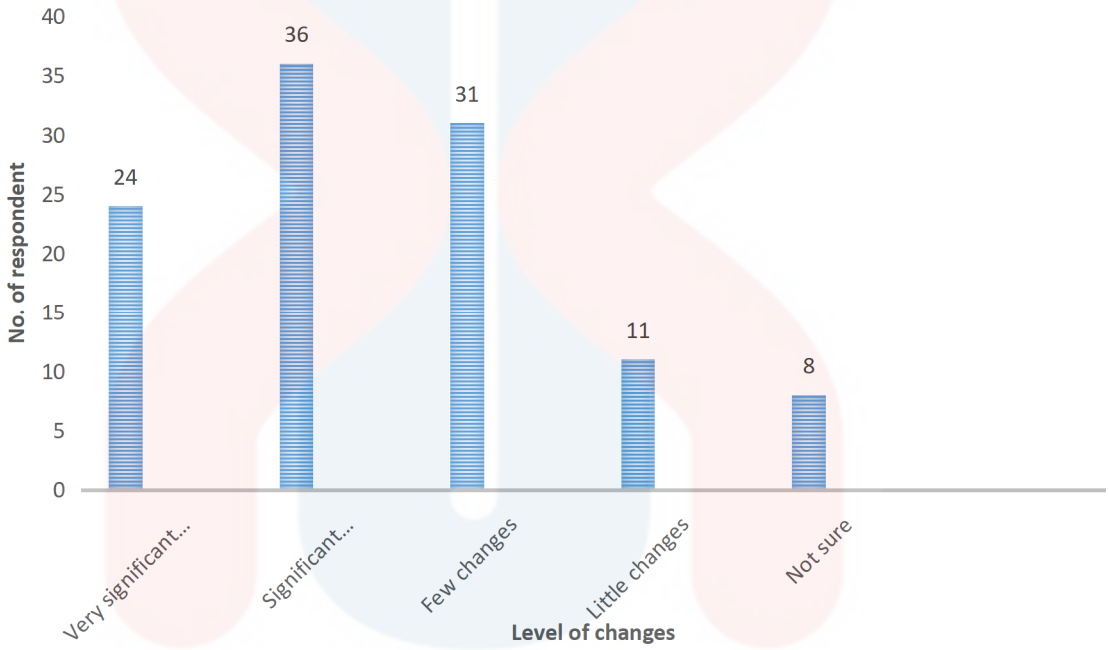

Figure 4.2.2.2 Level of changes felt by the paddy farmers in the past 30 years

Table 4.2.2 Changes felt by the paddy farmers in the past 30 years

Changes	Yes	No
Change the time and distribution of rainfall	69 (58%)	41 (34.5%)
Sudden changes in harvest season	87 (73.1%)	23 (19.3%)
Reduction of crop yield	72 (60.5%)	38 (31.9%)
Increased frequency of drought	77 (64.7%)	33 (27.7%)
Increased frequency of floods in ranches/fields	38 (31.9%)	72 (60.5%)
Damage of harvest	78 (65.5%)	32 (26.9%)
Increased the rate of pesticide irritation	63 (52.9%)	47 (39.5%)
Increased the prevalence of plant disease	68 (57.1%)	42 (35.3%)
Soil erosion in ranches/fields	54 (45.4%)	56 (47.1%)
Increased cost of crop management	73 (61.3%)	37 (31.1%)
Damage of junction at the ranches/fields	58 (48.7%)	52 (43.7%)
Water pollution in ranches/fields	67 (56.3%)	43 (36.1%)

Table 4.2.2 shows the changes felt by the paddy farmers in 30 years. 58% of the paddy farmers agree that climate change has change the time and distribution of rainfall while 34.5% of them does not felt that way. For the sudden changes in harvest season, a total of 73.1% of them agree with that statement and the rest seems

disagree. 60.5% of the paddy farmers agree that the reduction of crop yield is one of the changes due to the climate change, while the 31.9% of them disagree with that. Most of the paddy farmers (64.7%) seems agree that climate change has increased the frequency of drought and only 27.7% of them did not agree with the statement. Contrary with the increased of drought's frequency, only 31.9% agree that climate change increased the frequency of floods since most of them seems to disagree. For damage of harvest as the changes due to climate change, 65.5% of the paddy farmers agree with that and only 26.9% disagree with the statement. 52.9% paddy farmers does agree that climate change has increased the rate of pesticide irritation, while the rest of them disagree. For prevalence of plant disease, climate change indeed increase them and 57.1% of paddy farmers agree with that. Only 35.3% of the paddy farmers seem disagree. 45.4% of the paddy farmers agree that climate change has cause soil erosion, while 47.1% of them disagree with that. A total of 61.3% of the paddy farmers agree climate change has increased the cost of crop management and the rest disagree with that. 48.7% paddy farmers agree that climate change has damaged the junction at the ranches, while 43.7% disagree. Last but not least, a total of 56.3% of the paddy farmers agree that climate change has cause water pollution in ranches and only 36.1% of them disagree.

The most obvious changes felt by the paddy farmers in 30 years is the sudden changes in harvest season where 73.1% of them agree with this. In Peninsular Malaysia, most farmers plants and harvests rice more or less the same period, which for the main season, planting is between September and October, and harvesting is from December until March, while for the second season, planting is between March and April, and harvesting is from June to August (FAO, 2002). However, the changing climate nowadays has already altered the length and quality of the growing

season as well as the harvesting season since the weather has become unpredictable besides becoming worsen to the point where it could affect the crops.

Next, damage of harvest where 65.5% of the paddy farmers agree with this statement. Climatic factors such as temperature, rainfall, atmospheric CO_2 and solar radiation play an important role in the production of rice (Nyang'Au et. al., 2014). Temperature above threshold decrease the crop duration of rice and it also results in increased spikelet sterility (Jagadish et. al., 2008), reduced grain filling duration (J. Kim et al., 2011), increased respiratory rate (Mohammed & Tarpley, 2009) and lower the quality of rice grain (Fitzgerald & Resurreccion, 2009). Changes in temperature, atmospheric carbon dioxide (CO_2), and the frequency and intensity of extreme weather could have significant impacts on crop yields (EPA, 2017) as agreed by the paddy farmers.

Last but not least, 64.7% of the paddy farmers agreed that climate change has increased the frequency of drought. According to Center for Climate and Energy Solutions (2019), the effect of drought can be exacerbated by warmer temperature, where increased temperatures increase soil evaporation, making periodic droughts worse than in cooler conditions. Almost 91% of the paddy farmers said that there has been increase in temperature, and for them that will eventually lead to drought (Figure 4.2.1).

4.3 Farmers' Preparations to Deal with Climate Change

4.3.1 Preparation in terms of Knowledge

Table 4.3.1 shows the preparation done by the paddy farmers in terms of knowledge where it consists of four aspects, which are, have attended any course/program, has basic knowledge, receive any information and receive leaflets of information.

Table 4.3.1 Preparation done by the paddy farmers in terms of knowledge to deal with climate change

Aspect	Group	No. of respondent	Percentage (%)
Have attended any course/program to deal with climate change	Strongly agree	8	6.7
	Agree	53	44.5
	Moderate	18	15.1
	Disagree	22	18.5
	Strongly disagree	18	15.1
Has basic knowledge on how to deal with climate change	Strongly agree	6	5.0
	Agree	30	25.2
	Moderate	35	29.4
	Disagree	30	25.2
	Strongly disagree	18	15.1
Receive any information on how to deal with climate change	Strongly agree	13	10.9
	Agree	28	23.5
	Moderate	31	26.1
	Disagree	29	24.4
	strongly disagree	18	15.1
Receive leaflets of information on how to deal with climate change from government/non-government agencies	Strongly agree	7	5.9
	Agree	29	24.4
	Moderate	24	20.2
	Disagree	37	31.1
	Strongly disagree	22	18.5

Table 4.3.1 shows the preparation done by the paddy farmers in terms of knowledge to deal with climate change. First of all, attended any course/program as a way to help deal with climate change and 6.7% strongly agree, 44.5% agree, 15.1% moderately agree, 18.5% disagree and 15.1% strongly disagree. Secondly, has basic knowledge on how to deal with climate change. 5.0% strongly agree, 25.2% agree, 29.4% moderately agree, 25.2% disagree and 15.1% disagree. Next, received any information on how to deal with climate change, where 10.9% of the paddy farmers strongly agree, 23.5% agree, 26.1% moderately disagree, 24.4% disagree and 15.1% strongly disagree. Last but not least, received leaflets of information on how to deal with climate change from government/non-government agencies. 5.9% of them strongly agree, 24.4% agree, 20.2% moderately agree, 31.1% disagree and 18.5% strongly disagree.

For the preparation in terms of knowledge, a total of 51.2% of the total paddy farmers said that they did attended any course/program that could help them to deal with the climate change, while 33.6% of them disagree. Since majority of the paddy farmers (**Figure 4.2.2.1**) seems aware with the issue of climate change that could affect their paddy plants, this may be the reason why they attended the course/program held in order to obtain useful mitigation measure about climate change. About having a basic knowledge about the way to deal with climate change, only 30.2% of the paddy farmers agreed to this while 40.3% disagree. The fact that almost 61% of them (**Table 4.1**) only have secondary education might have contribute to less number of them having basic knowledge that could help them to deal with the climate change. When they were asked about having receiving any information or leaflet of information on how to deal with climate change from

government/non-government agencies, majority of them said they did not receive any (39.5% and 49.6% respectively).

4.3.2 Preparation in terms of Technical

Table 4.3.2 shows the preparation done by the paddy farmers in terms of technical where it consists of four aspects, which are, using the latest technology, switched to suitable type of paddy, ready to switch to more resistant plants and ready to use rice crop techniques that are more susceptible to climate change.

Table 4.3.2 Preparation done by the paddy farmers in terms of technical to deal with climate change

Aspect	Group	No. of respondent	Percentage (%)
Use the latest technology to deal with climate change	Strongly agree	8	6.7
	Agree	11	9.2
	Moderate	40	33.6
	Disagree	41	34.5
	Strongly disagree	19	16.0
Switched to suitable type of paddy to deal with climate change	Strongly agree	15	12.6
	Agree	50	42.0
	Moderate	23	19.3
	Disagree	21	17.6
	Strongly disagree	10	8.4
Ready to switch to more resistant plants to deal with climate change	Strongly agree	3	2.5
	Agree	39	32.8
	Moderate	32	26.9
	Disagree	25	21.0
	Strongly disagree	20	16.8
Ready to use rice crop techniques that are more susceptible to climate change	Strongly agree	18	15.1
	Agree	53	44.5
	Moderate	28	23.5

	Disagree	6	5.0
	Strongly disagree	14	11.8

Table 4.3.2 shows the preparation done by the paddy farmers in terms of technical to deal with climate change. Firstly, using the latest technology to deal with climate change where 6.7% of the paddy farmers strongly agree, 9.2% agree, 33.6% moderately agree, 34.5% disagree and 16.0% strongly disagree. Secondly, switched to suitable type of paddy to deal with climate change. 12.6% of them strongly agree, 42.0% agree, 19.3% moderately agree, 17.6% disagree and 8.4% strongly disagree. Next, ready to switch to more resistant plants to deal with climate change. Only 2.5% of the paddy farmers strongly agree with this, 32.8% agree, 26.9% moderately agree, 21.0 disagree and 16.8% strongly disagree. Last but not least, ready to use rice crop techniques that are more susceptible towards climate change where 15.1% strongly agree, 44.5% agree, 23.5% moderately agree, 5.0% disagree and 11.8% strongly disagree.

For the preparation in terms of technical, only 15.9% of the paddy farmers said they are using the latest technology as a way that could help them to deal with climate change while 50.5% of them did not. According to the respondent's profile (**Table 4.1**), majority of the paddy farmers (79%) having an income of less than RM2000 per month. This could be the factor why they did not using the latest technology since they could not afford to do so. For switching to suitable type of paddy, a total of 54.6% of the paddy farmers said they did switch to other type of paddy. This might due to they attending the course/program held to help them deal with climate change, and switching to more suitable paddy plant may be one of the mitigation measures provided. They also said they are ready to use a rice crop

techniques that are susceptible to climate change (59.6%). According to them, paddy is their main source of income, hence they are willing to do anything that are beneficial to their paddy plant to ensure their paddy plant are not affected by the climate change. When they were asked about changing to other type of plants that are more resistant toward climate change, only 35.3% of them agree to do so. 37.8% disagree because for them, it will take some time for they to get used to new plants and for them, it is such a nuisance that they are willing to stick only to the paddy plant.

4.3.3 Preparation in terms of Financial

Table 4.3.3 shows the preparation done by the paddy farmers in terms of financial where it consists of four aspects, which are, have financial savings, have insurance coverage, have side work and received financial assistance.

Table 4.3.3 Preparation done by the paddy farmers in terms of financial to deal with climate change

Aspect	Group	No. of respondent	Percentage (%)
Have financial savings	Strongly agree	7	5.9
	Agree	28	23.5
	Moderate	39	32.8
	Disagree	29	24.4
	Strongly disagree	16	13.4
Have insurance coverage in case of crop damage to climate change	Strongly agree	8	6.7
	Agree	13	10.9
	Moderate	21	17.6
	Disagree	55	46.2
	Strongly disagree	22	18.5
Have side work	Strongly agree	10	8.4
	Agree	36	30.3
	Moderate	23	19.3
	Disagree	34	28.6
	Strongly disagree	16	13.4
Received financial aid	Strongly agree	12	10.1
	Agree	20	16.8
	Moderate	35	29.4
	Disagree	30	25.2
	Strongly disagree	22	18.5

Table 4.3.3 shows the preparation done by the paddy farmers in terms of financial to deal with climate change. The aspects that have been asked are, first, if they have financial savings and only 5.9% of them strongly agree, 23.5% agree, 32.8% moderately agree, 24.4% disagree and 13.4% strongly disagree. Second, if they have insurance coverage in case of crop damage due to climate change and 6.7% of them strongly agree, 10.9% agree, 17.6% moderately agree, 46.2% disagree and 18.5% strongly disagree. Next, if they have side work. Only 8.4% of the paddy farmers strongly agree, 30.3% agree, 19.3% moderately agree, 28.6% disagree and 13.4% strongly disagree. Last but not least, if they received financial aid. 10.1% strongly agree, 16.8% agree, 29.4% moderately agree, 25.2% disagree and 18.5% strongly disagree.

In terms of financial, 29.4% of the paddy farmers said they did have financial savings while 37.8% disagree. This is because most of them having an income of less than RM2000 per month that they could not afford to do some financial savings. According to Sherraden et. al. (2003), it is often suggested that very poor people might not be able to save money because their income is so small that there is nothing left to save after the purchase of necessities. Same things happen with the insurance coverage in case of crop damage due to climate change. 64.7% of them could not afford to get the insurance due to their income. Most of them also did not receive financial aid (43.7%) that can help them to deal with climate change. When they were asked about having a side work, only 38.7% of them did have side work. This may due to their age where most of them are aged farmers (**Table 4.1**) and could not afford to do many work anymore due to their health state. A study conducted by Amshoff & Reed (2005) indicates that continued performance of tasks could place them at high risk of injury.

4.4 Factors Influencing Paddy Farmers' Awareness About Climate Change

To determine the factor that influencing the paddy farmers' awareness about climate change, chi-square test of independence is conducted to see whether there is a relationship between two categorical variables. First off all, the age of the paddy farmers and the awareness about climate change.

Table 4.4.1 Crosstabulation of age and awareness

			Awareness		Total
			Yes	No	
Age	< 20 years	Count	2	1	3
		Expected Count	2.8	0.2	3.0
		% within Age	66.7%	33.3%	100.0%
	20 – 29 years	Count	11	1	12
		Expected Count	11.3	0.7	12.0
		% within Age	91.7%	8.3%	100.0%
	30 – 39 years	Count	13	0	13
		Expected Count	12.2	0.8	13.0
		% within Age	100.0%	0.0%	100.0%
	40 – 49 years	Count	23	0	23
		Expected Count	21.6	1.4	23.0
		% within Age	100.0%	0.0%	100.0%
	50 – 59 years	Count	31	3	34
		Expected Count	32.0	2.0	34.0
		% within Age	91.2%	8.8%	100.0%
	> 60 years	Count	32	2	34
		Expected Count	32.0	2.0	34.0
		% within Age	94.1%	5.9%	100.0%
Total		Count	112	7	119
		Expected Count	112.0	7.0	119.0
		% within Age	94.1%	5.9%	100.0%

Table 4.4.2 Chi-Square Tests of age and awareness

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.995[a]	5	0.221

Based on the **Table 4.4.2**, there is no significant relationship between age of the paddy farmers and awareness about climate change, χ^2 (5, N = 119) = 6.995, p > 0.05. Hence, age does not influence the awareness towards climate change even though the percentage within age shows a high number. This might due to the lack of experience in agricultural sector. Most of them are aged farmers. However, some of them started to involve in this sector quite late, hence they are lacking in the experience and thus are not very well aware about the climate change.

Secondly, the income of the paddy farmers and the awareness towards climate change.

Table 4.4.3 Crosstabulation of income and awareness

			Awareness		Total
			Yes	No	
Income	< RM600	Count	27	0	27
		Expected Count	25.4	1.6	27.0
		% within Income	100.0%	0.0%	100.0%
	RM601 – RM1000	Count	36	2	38
		Expected Count	35.8	2.2	38.0
		% within Income	94.7%	5.3%	100.0%
	RM1001 – RM2000	Count	27	2	29
		Expected Count	27.3	1.7	29.0
		% within Income	93.1%	6.9%	100.0%
	RM2001 –	Count	12	2	14

	RM3000	Expected Count	13.2	0.8	14.0
		% within Income	85.7%	14.3%	100.0%
	RM3001 – RM4000	Count	8	0	8
		Expected Count	7.5	0.5	8.0
		% within Income	100.0%	0.0%	100.0%
	> RM4000	Count	2	1	3
		Expected Count	2.8	0.2	3.0
		% within Income	66.7%	33.3%	100.0%
Total		Count	112	7	119
		Expected Count	112.0	7.0	119.0
		% within Income	94.1%	5.9%	100.0%

Table 4.4.4 Chi-Square Tests of income and awareness

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.137[a]	5	0.149

Based on Table **4.4.4**, there is no significant relationship between income of the paddy farmers and awareness about climate change, χ^2 (5, N = 119) = 8.137, p > 0.05. Hence, income does not influence the awareness about climate change. Higher income means a better access to climate information (Ado et. al., 2018) since they are afford to obtain accurate and relevant climate information, which will enhance their awareness about climate change (Debela et. al., 2015).

Thirdly, the education of the paddy farmers and the awareness about climate change.

Table 4.4.5 Crosstabulation of education and awareness

			Awareness		Total
			Yes	No	
Education	Primary School	Count	23	3	26
		Expected Count	24.5	1.5	26.0
		% within Education	88.5%	11.5%	100.0%
	Secondary School	Count	68	4	72
		Expected Count	67.8	4.2	72.0
		% within Education	94.4%	5.6%	100.0%
	Sijil / STAM / STPM	Count	17	0	17
		Expected Count	16.0	1.0	17.0
		% within Education	100.0%	0.0%	100.0%
	Diploma	Count	2	0	2
		Expected Count	1.9	0.1	2.0
		% within Education	100.0%	0.0%	100.0%
	Ijazah / Sarjana / PHD	Count	1	0	1
		Expected Count	0.9	0.1	1.0
		% within Education	100.0%	0.0%	100.0%
Total		Count	112	7	119
		Expected Count	112.0	7.0	119.0
		% within Education	94.1%	5.9%	100.0%

Table 4.4.6 Chi-Square Tests of education and awareness

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.829[a]	5	0.726

Based on **Table 4.4.6**, there is no significant relationship between education of the paddy farmers and awareness about climate change, χ^2 (5, N = 119) = 2.829, p > 0.05. Hence, education does not influence the awareness about climate change. Majority of the paddy farmers only have secondary education and they were not able

to develop better understanding about climate change. In creating awareness, education plays an important role because educated people are better equipped to source information (Idrisa et. al., 2012).

Next, the farm size of the paddy farmers and the awareness about climate change.

Table 4.4.7 Crosstabulation of farm size and awareness

			Awareness		Total
			Yes	No	
Farm Size	< 10 acres	Count	94	5	99
		Expected Count	93.2	5.8	99.0
		% within Farm Size	94.9%	5.1%	100.0%
	10 – 19 acres	Count	6	1	7
		Expected Count	6.6	0.4	7.0
		% within Farm Size	85.7%	14.3%	100.0%
	20 – 29 acres	Count	9	1	10
		Expected Count	9.4	0.6	10.0
		% within Farm Size	90.0%	10.0%	100.0%
	40 – 49 acres	Count	1	0	1
		Expected Count	0.9	0.1	1.0
		% within Farm Size	100.0%	0.0%	100.0%
	> 50 acres	Count	2	0	2
		Expected Count	1.9	0.1	2.0
		% within Farm Size	100.0%	0.0%	100.0%
Total		Count	112	7	119
		Expected Count	112.0	7.0	119.0
		% within Farm Size	94.1%	5.9%	100.0%

Table 4.4.8 Chi-Square Tests of farm size and awareness

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.510[a]	4	0.825

Based on **Table 4.4.8**, there is no significant relationship between farm size of the paddy farmers and awareness about climate climate change, χ^2 (4, N = 119) = 1.510, $p > 0.05$. Hence, farm size does not influence the awareness towards climate change.

Last but not least, the farming experience of the paddy farmers and the awareness towards climate change.

Table 4.4.9 Crosstabulation of farming experience and awareness

			Awareness		Total
			Yes	No	
Farming Experience	< 5 years	Count	19	2	21
		Expected Count	19.8	1.2	21.0
		% within Farming Experience	90.5%	9.5%	100.0%
	6 – 10 years	Count	29	5	34
		Expected Count	32.0	2.0	34.0
		% within Farming Experience	85.3%	14.7%	100.0%
	11 – 15 years	Count	22	0	22
		Expected Count	20.7	1.3	22.0
		% within Farming Experience	100.00%	0.0%	100.0%
	> 16 years	Count	42	0	42
		Expected Count	39.5	2.5	24.0
		% within Education	100.0%	0.0%	100.0%

Total		Count	112	7	119
		Expected Count	112.0	7.0	119.0
		% within Farming Experience	94.1%	5.9%	100.0%

Table 4.4.10 Chi-Square Tests of farming experience and awareness

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.284[a]	3	0.026

Based on **Table 4.4.10**, there is a significant relationship between farming experience of the paddy farmers and awareness about climate change, χ^2 (3, N = 119) = 9.284, $p < 0.05$. Paddy farmers with more than 10 years experience are more likely to be aware about the climate change than those with experience less than 10 years based on the percentage within farming experience (**Table 4.4.9**). Hence, farming experience does influence the awareness about climate change, since the farmers are supposed to have a high level of local climate awareness due to their long-term farming experience. A regression test in the study conducted by Ado et. al. (2018) reveals that an increase in farming experience by one year increases the likelihood of awareness by one unit. This means that the higher the farming experience, the better the chance the paddy farmer will be aware of climate change. The interpretation of the results is based on coefficients of regression and ratios of probabilities. A positive sign indicates that the higher value of the variables increases awareness likelihood, while a negative sign indicates a decrease in awareness probability.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study intended to identify the level of knowledge, awareness and preparation done by the paddy farmers in order to deal with climate change and also to determine the critical factors influencing the awareness and preparedness of the paddy famers. Based on the results of the study, it shows that most of the farmers know about the issue of climate change and are aware about what is happening around them and also the changes brought by the climate change that will affect their paddy plant. This study also revealed that farming experience is the most significant factor in influencing the awareness of paddy farmers towards climate change and farm size as the factor that influencing the preparation done by the paddy farmers in order to deal with climate change. Farming experience indicates that the farmers have more knowledge about farming and its environment. The more experience they have, the more likely they are to be aware about climate change.

5.2 Recommendations

Climate change is a continuous and long term phenomenon, where its consequences and remedies are time and effort consuming process. Most of the warming over the next 30 years will be attributed to the already existing pollution and over the longer term, the degree and pace of warming are largely dependent on current and near future emissions (Nicholas, 2007). According to Alam et. al. (2013), mitigation is the best way to avoid future climate change effects, and it will reduce mitigation costs. Hence, any delay in emission reduction mitigation policy will increase adaptation needs and costs and also increase the risk of being the target of global climate change. However, he also said that there are arguments for adaptation to be considered as a response measure even though adaptation is not a substitute of mitigation since mitigation effects may take several decades to manifest where most adaptation activities take immediate effect. Mitigation is necessary but adapting to future risk is more important. Government as the policy and law-making authority has the most important role to play in ensuring climate mitigation and adaptation at all rates (Alam et. al., 2012). It is the government's primary duty to provide sufficient support to enable farmers to adapt to different climatic conditions and make them self-sufficient rather than dependent on subsidies. Appropriate authorities also need to carefully define government's subsidy and incentive programs to influence production, practices and financial management at the farm level. Government needs to define and ensure the compensation, minimum income protection and insurance facility for the affected groups. Proper mitigation policies are urgently required to avoid the negative impacts of climate change on agricultural sector.

For future study, it is suggested for the researcher to collaborate with educational institutions, media, business and non-governmental organization (NGO), focusing on the relevant knowledge, information and best practice regarding adaptation that can be offered to the paddy farmers.

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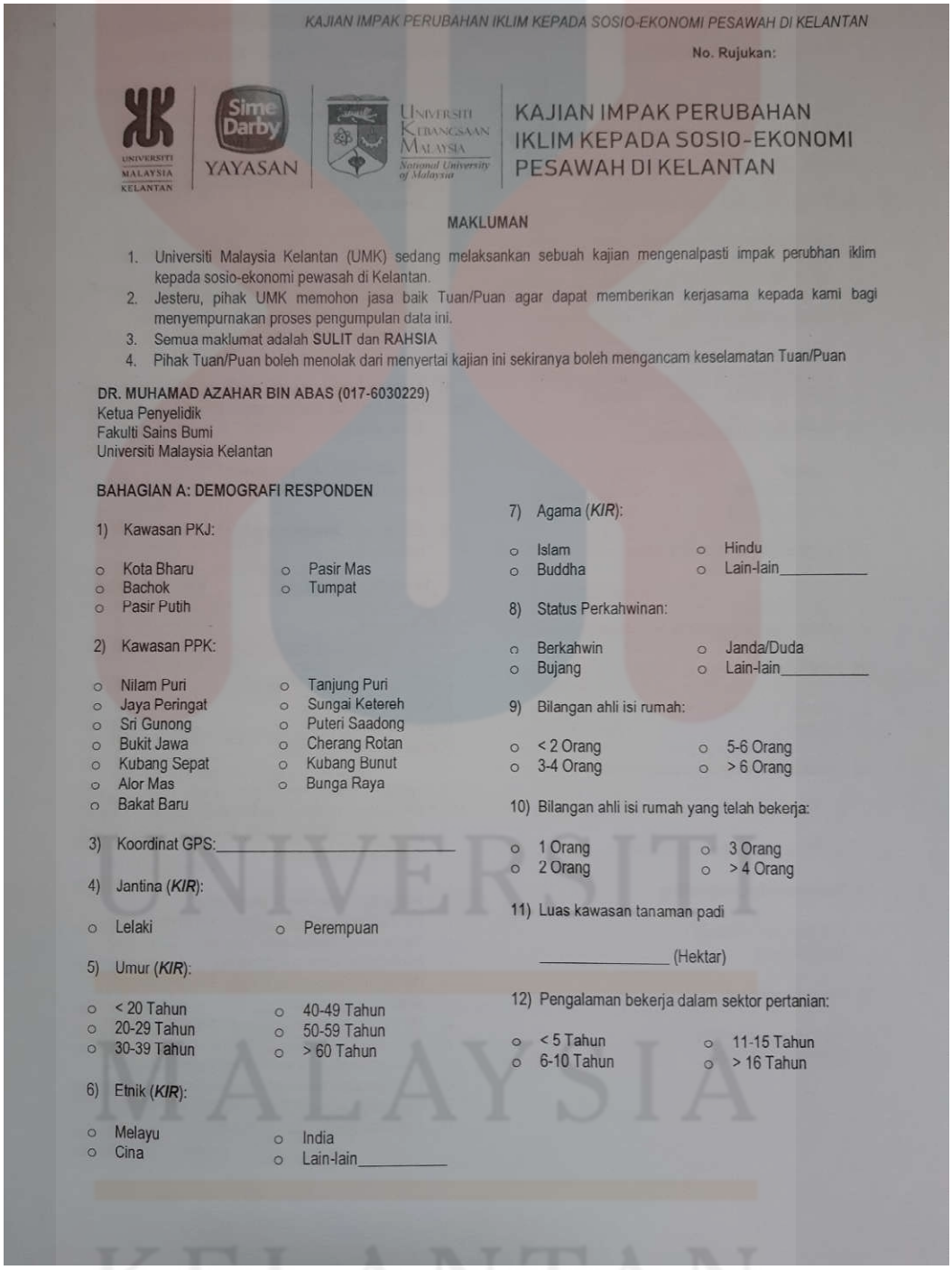
APPENDICES

APPENDIX A

Questionnaire page 1



KAJIAN IMPAK PERUBAHAN IKLIM KEPADA SOSIO-EKONOMI PESAWAH DI KELANTAN

No. Rujukan:

UNIVERSITI MALAYSIA KELANTAN | Sime Darby YAYASAN | UNIVERSITI KEBANGSAAN MALAYSIA National University of Malaysia

KAJIAN IMPAK PERUBAHAN IKLIM KEPADA SOSIO-EKONOMI PESAWAH DI KELANTAN

MAKLUMAN

1. Universiti Malaysia Kelantan (UMK) sedang melaksankan sebuah kajian mengenalpasti impak perubhan iklim kepada sosio-ekonomi pewasah di Kelantan.
2. Jesteru, pihak UMK memohon jasa baik Tuan/Puan agar dapat memberikan kerjasama kepada kami bagi menyempurnakan proses pengumpulan data ini.
3. Semua maklumat adalah **SULIT** dan **RAHSIA**
4. Pihak Tuan/Puan boleh menolak dari menyertai kajian ini sekiranya boleh mengancam keselamatan Tuan/Puan

DR. MUHAMAD AZAHAR BIN ABAS (017-6030229)
Ketua Penyelidik
Fakulti Sains Bumi
Universiti Malaysia Kelantan

BAHAGIAN A: DEMOGRAFI RESPONDEN

1) Kawasan PKJ:

o Kota Bharu o Pasir Mas
o Bachok o Tumpat
o Pasir Putih

2) Kawasan PPK:

o Nilam Puri o Tanjung Puri
o Jaya Peringat o Sungai Ketereh
o Sri Gunong o Puteri Saadong
o Bukit Jawa o Cherang Rotan
o Kubang Sepat o Kubang Bunut
o Alor Mas o Bunga Raya
o Bakat Baru

3) Koordinat GPS:_____

4) Jantina (***KIR***):

o Lelaki o Perempuan

5) Umur (***KIR***):

o < 20 Tahun o 40-49 Tahun
o 20-29 Tahun o 50-59 Tahun
o 30-39 Tahun o > 60 Tahun

6) Etnik (***KIR***):

o Melayu o India
o Cina o Lain-lain_____

7) Agama (***KIR***):

o Islam o Hindu
o Buddha o Lain-lain_____

8) Status Perkahwinan:

o Berkahwin o Janda/Duda
o Bujang o Lain-lain_____

9) Bilangan ahli isi rumah:

o < 2 Orang o 5-6 Orang
o 3-4 Orang o > 6 Orang

10) Bilangan ahli isi rumah yang telah bekerja:

o 1 Orang o 3 Orang
o 2 Orang o > 4 Orang

11) Luas kawasan tanaman padi

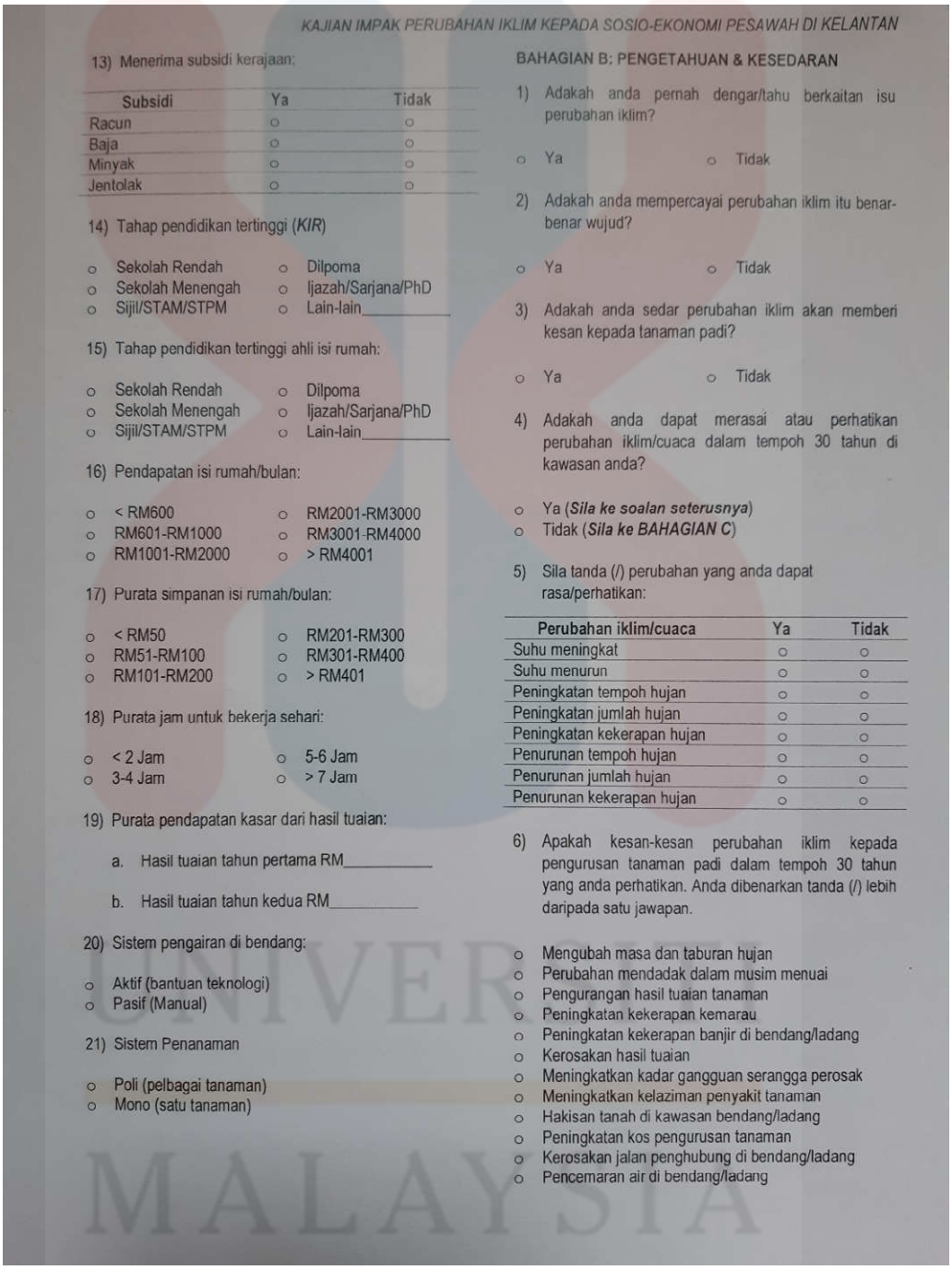
_____ (Hektar)

12) Pengalaman bekerja dalam sektor pertanian:

o < 5 Tahun o 11-15 Tahun
o 6-10 Tahun o > 16 Tahun

APPENDIX B

Questionnaire page 2



KAJIAN IMPAK PERUBAHAN IKLIM KEPADA SOSIO-EKONOMI PESAWAH DI KELANTAN

13) Menerima subsidi kerajaan:

Subsidi	Ya	Tidak
Racun	o	o
Baja	o	o
Minyak	o	o
Jentolak	o	o

14) Tahap pendidikan tertinggi (*KIR*)

o Sekolah Rendah
o Sekolah Menengah
o Sijil/STAM/STPM
o Dilpoma
o Ijazah/Sarjana/PhD
o Lain-lain_____

15) Tahap pendidikan tertinggi ahli isi rumah:

o Sekolah Rendah
o Sekolah Menengah
o Sijil/STAM/STPM
o Dilpoma
o Ijazah/Sarjana/PhD
o Lain-lain_____

16) Pendapatan isi rumah/bulan:

o < RM600
o RM601-RM1000
o RM1001-RM2000
o RM2001-RM3000
o RM3001-RM4000
o > RM4001

17) Purata simpanan isi rumah/bulan:

o < RM50
o RM51-RM100
o RM101-RM200
o RM201-RM300
o RM301-RM400
o > RM401

18) Purata jam untuk bekerja sehari:

o < 2 Jam
o 3-4 Jam
o 5-6 Jam
o > 7 Jam

19) Purata pendapatan kasar dari hasil tuaian:

a. Hasil tuaian tahun pertama RM_____

b. Hasil tuaian tahun kedua RM_____

20) Sistem pengairan di bendang:

o Aktif (bantuan teknologi)
o Pasif (Manual)

21) Sistem Penanaman

o Poli (pelbagai tanaman)
o Mono (satu tanaman)

BAHAGIAN B: PENGETAHUAN & KESEDARAN

1) Adakah anda pernah dengar/tahu berkaitan isu perubahan iklim?

o Ya o Tidak

2) Adakah anda mempercayai perubahan iklim itu benar-benar wujud?

o Ya o Tidak

3) Adakah anda sedar perubahan iklim akan memberi kesan kepada tanaman padi?

o Ya o Tidak

4) Adakah anda dapat merasai atau perhatikan perubahan iklim/cuaca dalam tempoh 30 tahun di kawasan anda?

o Ya (***Sila ke soalan seterusnya***)
o Tidak (***Sila ke BAHAGIAN C***)

5) Sila tanda (/) perubahan yang anda dapat rasa/perhatikan:

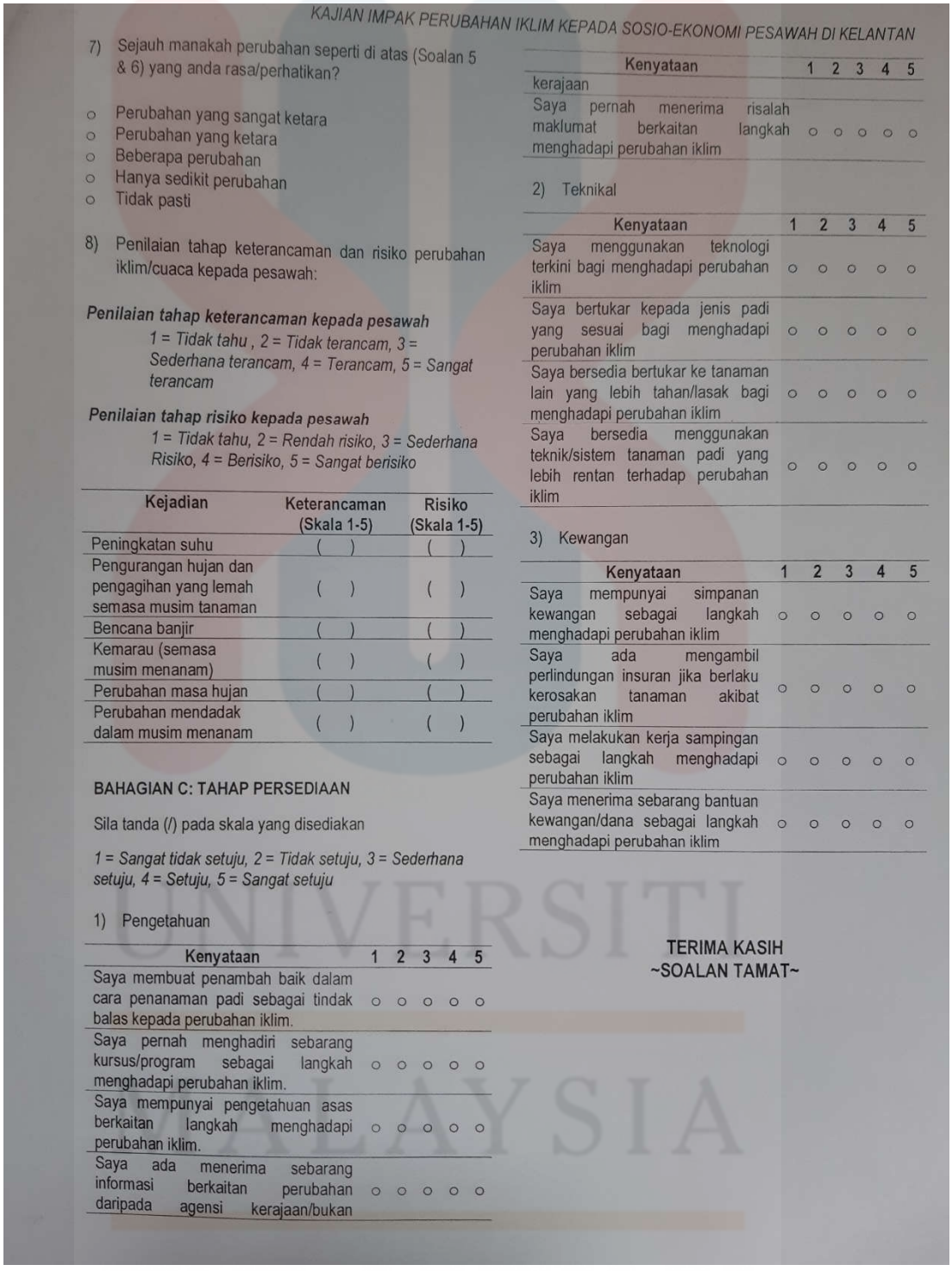
Perubahan iklim/cuaca	Ya	Tidak
Suhu meningkat	o	o
Suhu menurun	o	o
Peningkatan tempoh hujan	o	o
Peningkatan jumlah hujan	o	o
Peningkatan kekerapan hujan	o	o
Penurunan tempoh hujan	o	o
Penurunan jumlah hujan	o	o
Penurunan kekerapan hujan	o	o

6) Apakah kesan-kesan perubahan iklim kepada pengurusan tanaman padi dalam tempoh 30 tahun yang anda perhatikan. Anda dibenarkan tanda (/) lebih daripada satu jawapan.

o Mengubah masa dan taburan hujan
o Perubahan mendadak dalam musim menuai
o Pengurangan hasil tuaian tanaman
o Peningkatan kekerapan kemarau
o Peningkatan kekerapan banjir di bendang/ladang
o Kerosakan hasil tuaian
o Meningkatkan kadar gangguan serangga perosak
o Meningkatkan kelaziman penyakit tanaman
o Hakisan tanah di kawasan bendang/ladang
o Peningkatan kos pengurusan tanaman
o Kerosakan jalan penghubung di bendang/ladang
o Pencemaran air di bendang/ladang

APPENDIX C

Questionnaire page 3



KAJIAN IMPAK PERUBAHAN IKLIM KEPADA SOSIO-EKONOMI PESAWAH DI KELANTAN

7) Sejauh manakah perubahan seperti di atas (Soalan 5 & 6) yang anda rasa/perhatikan?

- ○ Perubahan yang sangat ketara
- ○ Perubahan yang ketara
- ○ Beberapa perubahan
- ○ Hanya sedikit perubahan
- ○ Tidak pasti

8) Penilaian tahap keterancaman dan risiko perubahan iklim/cuaca kepada pesawah:

Penilaian tahap keterancaman kepada pesawah

1 = Tidak tahu , 2 = Tidak terancam, 3 = Sederhana terancam, 4 = Terancam, 5 = Sangat terancam

Penilaian tahap risiko kepada pesawah

1 = Tidak tahu, 2 = Rendah risiko, 3 = Sederhana Risiko, 4 = Berisiko, 5 = Sangat berisiko

Kejadian	Keterancaman (Skala 1-5)	Risiko (Skala 1-5)
Peningkatan suhu	( )	( )
Pengurangan hujan dan pengagihan yang lemah semasa musim tanaman	( )	( )
Bencana banjir	( )	( )
Kemarau (semasa musim menanam)	( )	( )
Perubahan masa hujan	( )	( )
Perubahan mendadak dalam musim menanam	( )	( )

BAHAGIAN C: TAHAP PERSEDIAAN

Sila tanda (/) pada skala yang disediakan

1 = Sangat tidak setuju, 2 = Tidak setuju, 3 = Sederhana setuju, 4 = Setuju, 5 = Sangat setuju

1) Pengetahuan

Kenyataan	1	2	3	4	5
Saya membuat penambah baik dalam cara penanaman padi sebagai tindak balas kepada perubahan iklim.	○	○	○	○	○
Saya pernah menghadiri sebarang kursus/program sebagai langkah menghadapi perubahan iklim.	○	○	○	○	○
Saya mempunyai pengetahuan asas berkaitan langkah menghadapi perubahan iklim.	○	○	○	○	○
Saya ada menerima sebarang informasi berkaitan perubahan daripada agensi kerajaan/bukan kerajaan	○	○	○	○	○
Saya pernah menerima risalah maklumat berkaitan langkah menghadapi perubahan iklim	○	○	○	○	○

2) Teknikal

Kenyataan	1	2	3	4	5
Saya menggunakan teknologi terkini bagi menghadapi perubahan iklim	○	○	○	○	○
Saya bertukar kepada jenis padi yang sesuai bagi menghadapi perubahan iklim	○	○	○	○	○
Saya bersedia bertukar ke tanaman lain yang lebih tahan/lasak bagi menghadapi perubahan iklim	○	○	○	○	○
Saya bersedia menggunakan teknik/sistem tanaman padi yang lebih rentan terhadap perubahan iklim	○	○	○	○	○

3) Kewangan

Kenyataan	1	2	3	4	5
Saya mempunyai simpanan kewangan sebagai langkah menghadapi perubahan iklim	○	○	○	○	○
Saya ada mengambil perlindungan insuran jika berlaku kerosakan tanaman akibat perubahan iklim	○	○	○	○	○
Saya melakukan kerja sampingan sebagai langkah menghadapi perubahan iklim	○	○	○	○	○
Saya menerima sebarang bantuan kewangan/dana sebagai langkah menghadapi perubahan iklim	○	○	○	○	○

TERIMA KASIH
~SOALAN TAMAT~