Determinants of Smallholder Farmers' Awareness of Crop Insurance in Kedah, Malaysia

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Abstract: Agriculture is a major source of income for humans and has become an agro-food commodity. However, this industry is vulnerable to a wide range of dangers, including climate change, natural disasters, illnesses, and pests. Crop insurance is not a new concept in advanced economies since it has been recognized as an efficient instrument for mitigating agricultural risks and encouraging farmers to employ modern technology and innovation. This research investigates the determinants of smallholder farmers' awareness of crop insurance in the agricultural landscape of Kedah, Malaysia. Therefore, this study examines the relationship between knowledge, risk attitude and farm size on the farmers' awareness of crop insurance. The study, based on a sample of 100 farmers, utilizes a non-probability sampling technique to collect data through structured questionnaires. The research employs reliability analysis, correlation analysis, and regression analysis to evaluate the raw data and uncover the factors influencing farmers' awareness of crop insurance. The study conclusion shows a strong correlation between farmers' knowledge levels and farm size as important indicators of crop insurance awareness. The analysis emphasizes how crucial it is to increase farmers' understanding through focused educational programs and customized awareness campaigns that take farm size dynamics into account. Policymakers and agricultural extension services can enable smallholder farmers to make well-informed decisions about using crop insurance as a strategy to manage agricultural risks and guarantee financial stability by making information and resources easily accessible.

Keywords: *Crop Insurance, Agricultural Insurance, Risk Management, Risk Attitude*

1. Introduction and Background

Agriculture accounts for over 7.4% of Malaysia's GDP, and at least one-third of the country's population relies on it for a living (Wahab et al., 2023), with nearly 16% employed on farms and plantations (Abidin et al., 2022). Climate change will have an impact on output, the social and economic conditions of farmers, and the country's overall economy. Climate change impacts crop production, causing variability, physical damage, harvest loss, and decreased output. According to the report, the 2006-2007 floods in Malaysia (Johor) displaced 110,000 people, damaged an estimated RM 0.35 billion in infrastructure, caused RM 2.4 billion in economic losses, and damaged or lost an estimated RM 84 million in agricultural produce, affecting approximately 7,000 farmers (Austin & Baharuddin, 2012). Further, Deputy Agriculture and Food Security Minister Chan Foong Hin stated that the 2021 floods caused the agricultural, fisheries and livestock sectors losses of more than RM90 mil, affecting some 7,578 agro-food industry players (Gerard Gimino et al., 2023). Natural disasters affecting Malaysia's agriculture sector include floods, landslides, droughts, typhoons, hurricanes, and seasonal diseases.

Climate change poses a significant threat, causing crop variability, physical damage, and economic losses. Aside from that, farmers require financial support, particularly for food and income crops. Crop insurance is crucial for managing losses and assisting small farmers in coping with financial risks associated with weather conditions affecting crop yields in Malaysia. Further, it is a cost-effective way to cope with the financial impacts of climate and weather-related hazards, supports climate change adaptation by covering residual risks not covered by other risk reduction mechanisms like irrigation systems and best management practices, and stabilizes rural incomes, reducing the negative effects of income fluctuation and socio-economic deprivation (Afroz et al., 2017). Nonetheless, in Malaysia, crop insurance is a crucial aspect of risk management for agricultural activities, particularly in countries like Malaysia, where the agricultural sector plays a significant role in the economy. Despite neighboring countries like Thailand, the Philippines, and Indonesia having national crop insurance schemes in place, Malaysia has yet to implement such a system (Salleh et al., 2021).

Concerning the insurance industry in Malaysia, crop insurance has been offered by private insurance companies. According to Prabhakar et al. (2013), among the insurance company that offers crop insurance are LONPAC Insurance Bhd and Syarikat Takaful Malaysia Berhad. However, this insurance policy has been emerging and more insurance companies are providing crop insurance in recent years. In 2022, the establishment of Agro-Food Takaful Insurance by the Malaysia government, in collaboration with the Ministry of Agriculture and Food Industries (MAFI), is set to bring significant benefits to approximately 189,500 rice farmers (*Agro-Food Takaful Insurance Scheme Gives New Hope to Malaysian Farmers*, 2022). This insurance initiative aims to provide coverage in stages, extending its reach to various sectors such as fisheries and other sub-sectors within the food industry. The comprehensive coverage is expected to fortify and support the agricultural and food sectors, fostering resilience and security for those involved in these vital industries.

Recent research has highlighted the vulnerability of Malaysian farmers to various natural disasters and challenges such as drought, crop diseases, flooding, hail, climate change, pest outbreaks, and windstorms. These factors significantly impact agricultural productivity and the livelihoods of farmers in Malaysia. For instance, studies have shown that climate change-induced drought has adverse effects on crop production, leading to significant economic losses (Muralikrishnan et al., 2021). Furthermore, the impact of weather fluctuations on fungal disease incidence in rice fields has been noted, affecting farmers' net income (Chiu et al., 2022). To ensure crop safety and prevent natural disasters, it is necessary to understand the fundamentals of crop insurance and identify factors that influence farmers' awareness of crop insurance (Prabhakar et al., 2013).

Further, a current study has been conducted to assess farmers' awareness of crop insurance schemes and their satisfaction with these schemes(Vashisht & Singh, 2020). The study focused on understanding the extent to which farmers are informed about available crop insurance options and their perceptions of these risk management tools, highlighting the importance of educating farmers about crop insurance schemes to enhance their understanding and encourage participation in such programs(Vashisht & Singh, 2020). However, to the best of my knowledge, the studies on the determinants of farmer awareness in the context of Malaysia are limited. Realizing this, this study tested additional variables such as knowledge, risk attitude, and farm size. Hence, it enriches more literature on crop insurance and expands knowledge by enriching the determinants that caused the farmer's awareness of crop insurance.

2. Literature Review

Smallholder Farmers' Awareness of Crop Insurance: Global natural disasters induced by extreme weather events like droughts, floods, and frosts have been occurring more frequently according to Alimonti et al. (2022), all of these natural disasters contribute to various risk exposures. Risk is the potential for negative outcomes resulting from vulnerabilities, which proactive actions can mitigate. Risk consists of uncertainty and exposure. If both are absent, there is no risk. Risk can be categorized as systematic, non-systematic, or disastrous. Systematic risk is linked to recurring incidents that may be measured and predicted. It can be assessed to determine the probability of different events (Johari et al., 2024). Furthermore, most dangers encountered by farmers were related to output. This result aligns with the research by Salimonu and Falusi (2009), which identified price fluctuation, drought, pest and disease attacks, and irregular rainfall as the primary risks encountered by farmers. Crop insurance serves as a crucial formal document for rural farmers in developing economic systems to mitigate alternative risks associated with production disruptions caused by climate variability (Patt et al., 2010). Socioeconomic factors such as education, money, farm size, and natural disasters like drought, hail, and flood influence farmers in protecting their farms. Farm-specific variables like cultivated area size and socioeconomic variables like age and household size positively impact the demand for crop insurance(Sarris, 2002).

Knowledge: Farmers' knowledge significantly impacts the successful adoption and usage of crop insurance. Research indicates that farmers who are knowledgeable about crop insurance are more inclined to utilize it as a risk mitigation strategy(Fadhliani et al., 2019). It is understood that farmers with knowledge of crop insurance would comprehend the advantages of crop insurance in safeguarding their investments and ensuring revenue stability under unexpected circumstances. Knowledgeable farmers can also make better judgments regarding insurance coverage, rates, and claims, resulting in more successful risk management techniques (Johari et al., 2024). Furthermore, Education and expertise are crucial for farmers to promptly recognize the

potential risks associated with hesitating to purchase crop insurance. Treerattanapun (2011) suggested that education increases risk awareness and promotes financial stability, aiding in the comprehension of insurance advantages. Park and Lemaire (2012) concur and showed a direct correlation between education levels and the demand for non-life insurance across 82 countries over a decade. Therefore, it is theorized that:
H1: There is a relationship between knowledge and smallholder farmers' awareness.

Risk Attitude: Farmers' risk attitudes significantly influence their decisions on whether to adopt crop insurance. A farmer's decision to obtain insurance coverage can be strongly affected by their level of risk aversion, risk neutrality, or risk-seeking behavior (Johari et al., 2024). Farmers and the government have implemented various management strategies to reduce or alleviate the risks linked to production. These strategies include informal practices like avoiding high-risk crops and diversifying incomes, as well as formal measures such as insurance (Abdullah et al., 2015). However, individuals who are risk-neutral or risk-seeking may be less likely to invest in insurance due to their increased tolerance for uncertainty and perception of insurance premiums as an unnecessary expense (Johari et al., 2024). Therefore, comprehending the varied risk attitudes in farming communities is crucial for designing insurance programs and marketing tactics. Customized strategies that cater to the distinct requirements and preferences of various risk profiles can lead to increased acceptance rates and improved agricultural risk mitigation (Johari et al., 2024). Hence, it is hypothesized that:
H2: There is a relationship between risk attitude and smallholder farmers' awareness.

Farm Size: Farmers with bigger average acres face greater risk exposure and are more inclined to utilize crop insurance, as indicated by Enjolras et al. (2012). Farmers with larger land holdings have higher yield targets and increasing debt obligations. Large farms have significant investments that boost the rate of return to cover costs and rates due to the heightened risk exposure. This is the reason they must either transfer or diminish the risk. Farmers operating larger farms face increased risks and are, therefore, more inclined to purchase insurance (Enjolras et al., 2012). Brånstrand and Wester (2014) revealed that Swedish farmers who own larger farms are more inclined to get insurance. Due to the substantial investments and increased production expectations associated with larger farms, farmers often seek methods to mitigate the impacts of crop failure. Larger farmers are also more likely to pay for insurance than smaller, less wealthy farmers due to the different risks they confront. They are so more inclined to concentrate on insurance(Afroz et al., 2017). Thus, it is hypothesized that:
H3: There is a relationship between farm size and smallholder farmers' awareness.

3. Research Methodology

Sekaran and Bougie (2016) define a population as a collection of individuals, occasions, or objects that researchers hope to study. This group of people is essential to the study since they must complete the offered questionnaire to submit an answer. A survey design was used to accomplish the study's goals. Convenience sampling is a non-probability sampling technique that depends on the judgment of the researcher(Saunders et al., 2019), and it was utilized in this study. Using this selection technique, a set of responders with similar traits is chosen to determine the smallholder farmers' awareness of crop insurance in agriculture. This study focuses on paddy farmers in Kodiang, Kedah. The sample size was 100, and a list of paddy farmers' names was obtained from PPK (Pertubuhan Perladangan Kawasan). The study used the smallholder farmers' awareness of crop insurance as the dependent variable, with knowledge, risk attitude, and farm size as independent variables. The survey employed a five-part questionnaire. Respondents' questionnaire responses used a Likert-typed scale ranging from 1 (strongly disagree) to 5 (strongly agree). The data from the questionnaire are statistically analyzed using the Statistical Package for Social Science (SPSS v. 27). To address each objective, the respondent's knowledge, risk attitude, and farm size were determined using correlation, multiple linear regression, and ANOVA analysis.

4. Results

This result summarises an analysis that included descriptive analysis, reliability analysis, correlation analysis, and regression analysis. This section presents sets of results relating to the profile of respondents' awareness of crop insurance, the characteristics of the overall sample, and the comparison of respondents' experiences

based on demographic and geographic characteristics (gender, age, level of education, level of income and farm size). Table 1 displays the frequency of socioeconomic factors among respondents that were researched to understand how they affect farmers' awareness of crop insurance. It shows that 82% of respondents were men and 18% were women. Males are predicted to perform better than females since men are more capable of performing strenuous tasks than women, and rice production requires more energy. The age range recorded is between 30 and 70 years old. The majority, 51%, are farmers between the ages of 41 and 50, with the minority being farmers aged 61 to 70. Most farmers only study at the SPM (Sijil Pelajaran Malaysia) level, which accounts for 65% of their education, indicating that farmers do not have a high level of education, such as a diploma or degree, while just 8% of 100 farmers graduate from university. This degree of education will demonstrate how many farmers understand and are aware of crop insurance.

According to Sani and Haruna (2011), the socioeconomic features of farmers contribute to improving their public presentation when adopting techniques for danger identification. They assist farmers in developing entrepreneurial skills in their decision-making processes for risk management, particularly in the agricultural enterprise system. Only 42%, or 15 nations, in East Asia and the Pacific have agriculture insurance. The two low-income countries are the Democratic People's Republic of Korea and Vietnam. Countries with low average incomes include China, Indonesia, Mongolia, the Philippines, and Thailand. Malaysia is an upper middle-income country, while the seven high-income countries are Australia, French Polynesia, Guam, Hong Kong SAR (China), Japan, the Republic of Korea, and New Zealand(World Bank, 2010).

This study was carried out in the Muda Agricultural Development Authority (MADA) district of Kedah, Malaysia. MADA is located under the Muda Irrigation Scheme. The Muda irrigation scheme covers roughly 125,155 hectares. In this area, rice farming accounts for around 56% of the land, or 2,658 acres. This neighborhood is home to an estimated 1,505 families. This area accounts for 15% of Malaysia's total rice production (MADA, 2015). Approximately 55% of respondents own paddy fields ranging in size from 3 to 4 hectares, the largest rate among all respondents.

Profile of Respondents: Table 1 displays a summary of the characteristics of a total sample of smallholder farmers who participated in the study.

Table 1: Demographic and Geographic Information About Smallholder Farmers

VARIABLES	FREQUENCY	PERCENTAGE (%)
GENDER		
MALE	82	82
FEMALE	18	18
AGE (YEARS)		
30 – 40	21	21
41 – 50	51	51
51 – 60	21	21
61 – 70	7	7
EDUCATION		
PMR	27	27
SPM	65	65
UNIVERSITY	8	8
INCOME (MYR)		
1 – 1,500	4	4
1,501 – 2,000	30	30
2,000 – 3,000	53	53
3,001 – 4,000	15	15

FARM SIZE (HA)

1 − 2	28	28
3 − 4	55	55
5 − 6	13	13
7 AND ABOVE	4	4

Descriptive Statistics: According to Sekaran and Bougie (2016), descriptive analysis is a statistic that uses frequency, mean, and standard deviation to provide descriptive information about a set of data. The mean is used to calculate the central tendency, which provides an overall picture of the data. The standard deviation is a measure of data distribution or variability.

Table 2 describes the mean scores and standard deviations for each variable included in the study. The means scores and standard deviations refer to farmers' awareness about crop insurance due to factors such as knowledge, risk attitude, and farm size. All the means scores are within the range of 3 and 4. It indicates that the independent variables of risk attitude have the highest mean (ɱ=4.2525, sd=.90975), followed by knowledge (ɱ=4.1675, sd=.81731) and farm size (ɱ=4.1200, sd=.88512). For the dependent variable, farmer's awareness (ɱ=3.8614, sd=.81888). Most of the respondents nearly agreed that risk attitude is the dominant factor that determines the smallholder farmers' awareness of crop insurance. The standard deviation results suggest that risk attitude has the greatest score (0.90) when compared to other factors. Meanwhile, smallholder farmers' awareness had the lowest standard deviation score, at 0.82. All the variables in this study had a standard deviation value smaller than one, indicating that they were more in agreement with each other.

Table 2: Descriptive Statistics

Variables	Mean	Std. Dev.
Knowledge	4.1675	.81731
Risk Attitude	4.2525	.90975
Farm Size	4.1200	.88512
Smallholder Farmers' Awareness	3.8614	.81888

Reliability Analysis:
Cronbach's alpha is a reliability coefficient that measures how effectively elements in a collection correlate positively with one another(Sekaran & Bougie, 2016). In this study, a reliability test is required because it will determine whether the instrument used is appropriate or not. The closer the Cronbach alpha is to one, the more consistent the inner reliability (Sekaran & Bougie, 2016). Nunnally (1994) claimed that variables can only be considered acceptable if Cronbach's alpha value is more than 0.60. Cronbach's alpha was used to determine the dependability of the scale utilized. As shown in Table 3, risk attitude had high Cronbach's Alpha values (0.945), indicating that the items in the variables have strong internal consistency. The farm size, knowledge, and smallholder farmers' awareness items also demonstrated rather strong internal consistency, with scores of 0.887, 0.884, and 0.865, respectively.

Table 3: Reliability Analysis

Variables	Number of Items	Item Deleted	Cronbach's Alpha
Knowledge	4	-	.884
Risk Attitude	4	-	.945
Farm Size	4	-	.887
Smallholder Farmers' Awareness	7	-	.865

Correlation Analysis:
The correlation analysis analyses how strong a relationship exists between two or more quantifiable variables. It measures the strength of the link between the dependent and independent variables. Pearson's correlation will show the direction, strength, and significance of the bivariate relationship between all variables assessed at the interval or ratio level. The coefficient can take any value between plus and minus one. The sign of the

correlation coefficient, positive (+) or negative (-), determines the direction of the link. Table 4 displays that all variables exhibited a moderate correlation coefficient with smallholder farmers' awareness. Knowledge has a correlation coefficient of 0.518, risk attitude has a correlation coefficient of 0.639, and farm size has a correlation coefficient of 0.606. All factors showed a positive correlation score, indicating a favorable relationship with smallholder farmers' awareness. Thus, as one variable grows, the other variable also increases. This is consistent with a study done by Johari et al. (2024) which discovered that farmers' awareness of purchasing crop insurance is significantly influenced by their risk attitude, particularly their level of risk aversion. Also, a study conducted by Gouraram et al. (2022) suggested that farmers are more inclined to get crop insurance when they are well-informed about its advantages compared to those who are not.

Table 4: Correlation Analysis

	Knowledge	Risk Attitude	Farm Size	Smallholder Farmer's Awareness
Knowledge	1			
Risk Attitude	.639**	1		
Farm Size	.621**	.689**	1	
Smallholder Farmers' Awareness	.518**	.639**	.606**	1

Analysis of Variance (ANOVA): Table 5 indicates that the p-value of the F-test is 0.000, which is below the significance level of 0.05. This indicates that the whole model is statistically significant in smallholder farmers' awareness. The F-test is significant with a value of 32.401, indicating that the combination of knowledge, risk attitude, and farm size strongly explains the difference in smallholder farmers' awareness.

Table 5: Analysis of Variance (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	33.400	3	11.133	32.401	.000[b]
Residual	32.986	96	.344		
Total	66.386	99			

Regression Analysis:
According to Sekaran and Bougie (2016), regression analysis is a statistical technique for determining the relationship between variables. It is also developed because of the correlation coefficient measurement. According to Malhotra et al. (2017), regression is a powerful and versatile tool for analyzing relationships between independent and dependent variables. This research was carried out to determine which independent variable contributes the most to the dependent variable. In this study, the independent variables were knowledge, risk attitude, and farm size, which were used to see if they had any link with the dependent variable, smallholder farmers' awareness, using simple regression analysis. The results of a multiple regression analysis in Table 6 demonstrate the association between knowledge, risk attitude, and farm size toward smallholder farmers' awareness. R^2, the square root of the R-squared value, indicates the correlation between the observed and anticipated values of the dependent variable. The coefficient of determination is 0.503. 50.3% of the difference in smallholder farmers' awareness can be attributed to knowledge, risk attitude, and farm size. Approximately 40.7% of the variation remains unexplained by the parameters examined in this study.

Table 6: Multiple Regression-Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.709[a]	.503	.488	.58618

According to Saunders et al. (2019), based on the unstandardized coefficient beta, a 1-unit increase in the independent variable will result in a 1-unit increase in smallholder farmers' awareness as the dependent variable. Table 7 indicates that the knowledge variable received a beta coefficient of .085 and a t-value of .923. This indicates that knowledge did not have a substantial impact on smallholder farmers' awareness, as the p-value was .358, which is above the 0.05 significance level (95%). The results align with prior research where Wąs and Kobus (2018) discovered that education level or knowledge does not play a significant role in the

decision to obtain crop insurance in Poland. It is also consistent with research by Johari et al. (2024) found that knowledge is negatively correlated with farmers' intention to pay for crop insurance. The risk attitude coefficient is β = .423 with a t-value of 4.789. The value was highly significant at .000. Therefore, risk attitude greatly influenced smallholder farmers' awareness. A study conducted by Johari et al. (2024) emphasized that more risk-averse farmers are more likely to buy crop insurance because they see it as an effective way to deal with the uncertainty they encounter. Meanwhile, the scores for farm size were β = .281 and t = 2.849. This indicates that farm size has a substantial impact on smallholder farmers' awareness. Brånstrand and Wester (2014) discovered that Swedish farmers with larger farms are more likely to purchase insurance. Further, farm size was found to be one of the determinants of farmers' willingness to adopt crop insurance(Ngango et al., 2022).

Table 7: Multiple Regressions – Coefficients

Model	Unstandardised Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.577	.343		1.683	**.096**
Knowledge	.085	.092	.094	.923	**.358**
Risk Attitude	.423	.088	.423	4.789	**.000**
Farm Size	.281	.099	.304	2.849	**.005**
a. Dependent Variable: Smallholder Farmers' Awareness					

(*$p<0.05$; **$p<0.001$)

Discussion
This study aims to determine the factors that impact smallholder farmers' awareness. The analysis of the study, which included reviewing journals and publications and collecting questionnaires, revealed that risk attitude and farm size are significant predictors of smallholder farmers' awareness. Hypothesis 2 and hypothesis 3 are supported, whereas hypothesis 1 is rejected due to lack of significance. The study finds that risk attitude is a significant independent variable in determining smallholder farmers' awareness (Johari et al., 2024). The study also revealed a significant correlation between farm size and smallholder farmers' awareness (Johari et al., 2024). This aligns with research conducted by Ngango et al. (2022), which indicated that the size of the farm would influence the farmers' willingness to pay for crop insurance; thus, shows that the farmers are aware of the importance of crop insurance. However, no significant correlation was discovered between knowledge and smallholder farmers' awareness in this study, which is similar to research conducted by Johari et al. (2024).

5. Managerial Implications and Recommendations

Policymakers should develop and implement crop insurance policies that better align with farmers' requirements and preferences. This may result in higher engagement in crop insurance programs. Furthermore, policymakers may also create specialized educational programs to educate farmers on crop insurance and its benefits. It will motivate less educated farmers to support the implementation of crop insurance. As for financing purposes, banks should come out with a comprehensive crop financing scheme. This is because, according to Johari et al. (2024), banks are only providing information about crop insurance to farmers who take agricultural loans. However, farmers who do not take loans from banks are unable to access this benefit. Therefore, banks can find ways to help small and poor farmers as their influence and willingness to pay for crop insurance grows. Crop insurance is important in helping smallholder farmers. Agricultural economics expert, Prof Datuk Dr. M Nasir Shamsudin concurs and suggests that the government should introduce crop insurance and early warning systems to strengthen the agriculture industry (NST, 2023).

Conclusion
This article aimed to investigate the relationship between knowledge, risk attitude and farm size on the farmers' awareness of crop insurance. This study demonstrated a robust and favorable correlation between risk attitude and farm size with the farmers' awareness of crop insurance as the dependent variable. Knowledge did not exhibit a significant correlation with ethical behavioral intention. The regression study showed that

farmers' risk attitude is a strong predictor of their awareness of crop insurance, as it may influence their decision-making and conduct. Therefore, purchasing crop insurance is a crucial element of the agricultural industry. Crop insurance is essential for mitigating losses and supporting small farmers in dealing with financial risks caused by weather conditions impacting crop production in Malaysia.

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