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Factors Influencing the Awareness to Adopt Permaculture Practices among Harumanis Farmers in Perlis

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ABSTRACT

In rapid advancing technology and increasing globalization, human are becoming more sophisticated in their ability to develop and execute technology in the food sector. To meet the demand for food and battle the issue of food security and sustainability, inventive solutions were taken. However, the present agricultural system has certain unintended negative consequences for both the environment and human health. The use of chemicals, expansion into new territory, reduction in soil fertility, and other practices were all part of the conventional agriculture system (CAS). Permaculture is an approach to planning that looks at the whole picture. Its goal is to build long-lasting systems that mimic the patterns and relationships of natural ecosystems. Therefore, this study investigates the factors which are knowledge, cost and attitudes in influencing the awareness to adopt permaculture practices among Harumanis farmers in Perlis using regression analysis. A set of questionnaires developed in the Google form has been distributed via online platforms to the 63 Harumanis farmers in Perlis and the completed data was then analyzed using SPSS software. The results of this study show that all the variables which are knowledge, attitudes and cost had a significant relationship with the awareness to adopt permaculture practices. It can be concluded that there were other external factors that contributed to the awareness to adopt permaculture such as type of plant and planting area. Hence, the study suggests that the government or any non-government organization should hold more campaigns or talks regarding the benefits of permaculture practices and should give more guidance on how to start and maintain the permaculture garden. In this way many people will acknowledge the importance of permaculture and they will be persuaded to start the permaculture practices.

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1. INTRODUCTION

The concept of permaculture refers to a set of design principles that can be applied to the creation of sustainable human settlements as well as agricultural systems. It was initially outlined in Bill Mollison and David Holmgren's book titled "Permaculture One," which was published in 1978. Working with nature rather than against it is one of the core tenets of permaculture, as is the creation of resilient, self-sufficient, and regenerative systems. It is a method that takes a holistic view that takes into account aspects of ecology, agriculture, architecture, and community development. Permaculture is a holistic design concept that strives to construct sustainable systems that imitate the patterns and interdependencies of natural ecosystems.

The word "permaculture" is a portmanteau that was created by combining the words "permanent" and either "agricultural" or "culture." The practise of permaculture places an emphasis on the usage of patterns that are present in natural ecosystems and applies them to the design of agricultural systems and human settlements. It involves the implementation of practises such as crop rotation, intercropping, and agroforestry, as well as the incorporation of animals and natural elements into the design, such as ponds and swales.

Among the advantages of permaculture is enhanced biodiversity. Permaculture designs frequently incorporate a wide variety of plant and animal species, which can contribute to an increase in biodiversity and increased resistance to environmental disturbances. Subsequently, permaculture can enhance soil health. By increasing organic matter, stimulating beneficial microbial activity, and decreasing erosion, permaculture practices such as utilizing cover crops, composting, and limiting tillage can improve soil health. Water conservation is one of permaculture's benefits. Permaculture designs frequently include strategies for catching and preserving water, such as rainwater harvesting and swales, which can aid in reducing the need for irrigation and increasing water availability during dry periods (Didarali & Gambiza, 2019).

Permaculture can serve as a model for integrating knowledge and practice from other disciplines of study to facilitate collaboration between scholars, stakeholders, and land users from diverse backgrounds. Through the practice of permaculture, an applied form of ecological literacy is promoted. Clearly and concisely explain a variety of complex socioecological concepts that can be understood by a broad audience. In the field of agroecosystem research, the design orientation of permaculture offers a unique perspective that points researchers in the direction of prospective inquiry avenues. Last but not least, these characteristics are reflected in a transnational movement that operates primarily without the support and influence of established institutions, which suggests opportunities for participatory action research as well as the mobilization of popular inquiry and support (Ernesto Méndez et al., 2013).

Techniques from the field of permaculture have been put to use in Malaysia in a wide variety of contexts, most notably in the realms of environmentally friendly agriculture and community building. Agroforestry is one of the instances of technology from the permaculture movement that has been used in Malaysia. This entails planting trees and other plants in and around agricultural fields, which results in the creation of a diverse and sustainable ecosystem that is beneficial to both the crops and the environment. In addition to that, there is the practise of crop rotation and intercropping. By rotating different crops over the same land and growing several crops in the same region, these methods can enhance crop yields while also improving the health of the soil. Rainwater harvesting, as well as the construction of swales and terraces, are two strategies that are utilized as a part of water management in order to both save water and use it in a manner that is more effective. In addition, permaculture has been utilized in Malaysia in order to establish environmentally friendly communities and enhance the standard of living of the country's native population. This covers activities such as the dissemination of information regarding community gardens and the implementation of permaculture principles into community-based tourism (Ali et al., 2015).

According to Yusuf et al. (2018), the practise of permaculture has the potential to contribute to the country's efforts towards sustainable development. Permaculture may be an effective method for addressing

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challenges such as social injustice, food insecurity, and environmental degradation. In addition, the government of Malaysia has acknowledged the significance of permaculture and is actively working to spread the use of environmentally responsible farming techniques. For instance, the Ministry of Agriculture and Agro-based Industries has initiated programmes to promote organic farming and minimize the application of pesticides and fertilizers in an effort to lessen their environmental impact. Nonetheless, in spite of these efforts, the majority of people in Malaysia are still only vaguely familiar with the concept of permaculture. In order to spread knowledge about permaculture techniques and the advantages they offer, there is a pressing requirement for more educational and awareness- raising initiatives.

In Malaysia, efforts are being made to encourage farmers to engage in permaculture practices through the use of a variety of different culture. The promotion of agroforestry systems that incorporate permaculture methods is one example of this type of strategy. Agroforestry systems that combine permaculture methods have the potential to improve soil quality, increase crop yields, and promote biodiversity. According to the Nath (2022), fostering the adoption of such systems among farmers in Malaysia may help to improve the prevalence of permaculture methods. Farmers are receiving instruction and education on various permaculture principles as part of yet another approach that is currently being put into action. Farmers can learn the principles and practices of permaculture through organizations in Malaysia such as PAM and Permablitz Malaysia, which hold workshops and participate in training programmes. Additionally, the government of Malaysia has established a number of programmes to encourage farmers to adopt sustainable agriculture practises such as permaculture. For instance, the Department of Agriculture in Malaysia offers financial assistance in the form of grants and subsidies to farmers that engage in environmentally responsible agricultural practices such as permaculture (Hussain et al., 2020).

Freshwater is important for humans and all other living things, but it varies from place to place, and climate change is making these differences worse. Fresh water is in high demand, but its supply is becoming less certain. More than 10 billion people don't have enough freshwater to meet their basic needs, and about 40% of the world's population doesn't have easy access to basic hygiene infrastructure (Mishra et al., 2017). More people want to eat and more people want to grow crops for energy. This has led to more people wanting freshwater and more competition for it. There are more worries about water shortages and the quality of water being hurt by farming practices. When it comes to permaculture, there is a wide variety of ways to reduce one's water consumption. These strategies enable the soil to properly absorb the water and distribute it across the surface, ensuring that all areas of the land receive an equivalent quantity of moisture. On a permaculture farm, one of the most effective ways to save water is to collect rainwater and store it for later use. There are a few straight forward approaches that might be utilized in order to incorporate it into a garden or farm. Rain barrels are able to collect water and store it in a huge container for later use on your garden or other plants (Jaafreh & Nagy, 2020).

Therefore, the previous study indicates that, permaculture practices can help in increasing soil fertility through the organic approach, increasing biodiversity by the planting technique and also can increase the freshwater content that will be used for the plant by collecting and preserving the rainwater. Hence, this research was done to investigate the factor influencing the awareness to adopt permaculture for Harumanis farmers in Perlis.

2. LITERATURE

2.1 Permaculture Contribute to Agroecological

Permaculture can serve as a template for integrating knowledge and practice from other fields of study in order to facilitate collaboration across diverse groups of scholars, stakeholders, and land users. Permaculture offers a simplified and understandable summary of intricate socioecological ideas, which

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enables it to make a contribution to an applied kind of ecological literacy. The design orientation of permaculture provides a unique perspective that points researchers in the direction of potential inquiry routes in the field of agroecosystem research (Ferguson & Lovell, 2019).

2.2 Attitudes

According to the principles of permaculture, alternative ways of living and ways of thinking may only become practicable once they are implemented in everyday life. These concepts have a novel quality known as "small is enticing, and the compilations of several minor activities go near modifying the total," which essentially means "small things can have a big impact." These concepts would not be imposed from on high by decision-makers or politicians; rather, those who are actively working to improve their local community would put them into action. Self-awareness and self-sufficiency are encouraged through the realization of patterns in nature, not through following an organized management plan of how to survive to be sustainable in our own lives, and in our society, which required dedication and more endeavor – an innovative manner of living, resulting as of a vision of individuality in perspective within a system of interactions and of individual development in service to humanity, as our own resilience. Self-awareness and self-sufficiency are encouraged through the realization of patterns in nature (Akhtar et al., 2015). People are more likely to implement permaculture if they feel a strong connection to both their local community and the natural world. By observing the various patterns, processes, and cycles found in nature, humans can develop a sense of place (Mang & Reed, 2012). To stop degrading and begin restoring the quality of our landscapes, the human race must realign its objectives and actions with the development of natural systems.

2.3 Knowledge

The term "permaculture" refers to an exceedingly intricate design for land management and lifestyle that is built on ecosystems. The interaction between man and nature is the foundation of permaculture and its most visible connection to local ecology and knowledge (Hinton et al., 2021) . One way in which this relationship can be understood is through the interdependence of human livelihoods on the health and productivity of ecosystems. It is possible for natural systems to be employed in a positive or negative way, depending on how the local knowledge is being used in the planning and design of an ecosystem; however, human stewardship surprisingly plays a crucial role in molding the environment, as humans are an intrinsic part of nature.

In other situations, zones of permaculture should be created based on natural patterns and the necessities of elements in a step-by-step process that include observation, visioning, planning, development, and implementation in order to avoid causing harm to humans as well as the environment. However, results-oriented knowledge was found to be associated with the highest performance. These results are founded on information that is widely available and shared among farmers, who rely on the usefulness, type, and origin of particular information in order to share their knowledge. Therefore, in order to acquire an effective approach to societal innovation, one must go beyond vital areas, stages of detailed analysis, and techniques in order to identify the strategies, tactics, and philosophies that must be modified in order to implement a sustainable and fruitful approach (Adnan et al., 2018).

2.4 Cost

Permaculture is a design philosophy and set of techniques that strives to produce sustainable and self-sufficient systems, typically in the setting of agriculture. The word "permaculture" comes from the word "permanent," which refers to the state of being permanent. One of the fundamental tenets of permaculture is to model human-designed systems after natural ecosystems in order to build something that is both more effective and more robust. This can lead to a reduction in the costs associated with traditional farming methods, such as the need for external inputs like fertilizer and water. Additionally, this can lead to an increase in the yield of the crop. The permaculture approaches have the potential to contribute to a reduction

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in the costs that are connected with conventional farming techniques. According to the findings of the study, farmers that used permaculture techniques observed a decrease in their reliance on labour while simultaneously experiencing an increase in their agricultural production. In addition, the research indicated that traditional agricultural techniques had a greater negative impact on the environment than did permaculture methods (Hinton et al., 2021).

3. METHODOLOGY

The population in this study is the Harumani farmer in Perlis. There are 6 Harumanis farms are namely Chuping, Mata Ayer, Beseri, Kangar, Padang Besar and Arau. There are total of 200 farmers registered under Department of Agriculture (DOA) Perlis as end of 2021. Three Harumanis farm area has been selected for this study which are, Arau, Chuping and Mata Ayer by using cluster sampling. Thus, the sample of this study is 63 farmers was chosen from the Department of Agriculture of Perlis. According to Halim and Ishak (2014) it is noted that a sample size that fell somewhere between 30 to 500 would be suitable for the most of the research. This sample size offers enough information to meet the study's goals, even though it may restrict the findings' applicability to a larger population. The data collection method used in this study is a direct questionnaire. This questionnaire was modified from Hinton et al. (2021) consists of five sections which are stated in Table 1 below. In the first section, the respondent was asked some questions on the demographic profile such as gender, age, marital status, occupation, race, highest education level, living area, and monthly income. In the second section, the respondent was asked some question regarding the knowledge of Harumanis farmers towards permaculture practices. In the third section the respondent was asked on their attitude. In the fourth section, the respondent was asked regarding the cost that related to permaculture. In the last section, the respondent was asked about their awareness towards permaculture practices. Using a 5- point Likert scale, the respondents was asked to score each statement according to its perceived relevance (1 = strongly disagree and 5 = strongly agree). In spite of the fact that there has been a great lot of debate on the appropriate number of answer categories for scales of the Likert type, it has been determined that there must be a minimum of five answer categories in order to guarantee the validity and reliability of the scale. A greater degree of granularity on the scale provides not only more accurate data but also a higher score variance, more significant statistical conclusions, and fewer responses that are neutral. SPSS software was used to conduct frequency analysis, reliability analysis, correlation analysis and regression analysis.

Table 1: Instruments of sections in the questionnaire

Section	Title
A	Demographic
B	Knowledge on Permaculture
C	Respondent Attitude
D	Cost on Permaculture
E	Awareness on Permaculture

4. RESULT AND DISCUSSIONS

4.1 Frequency Analysis

In the fields of statistics and data science, a process known as descriptive analysis is utilized to summarize and organize data. Table 2 explains and summarizes the demographic profile of the Harumanis farmers in the three districts that had responded. 44 (69.8%) of the respondent were male and 19 (30.2%) of the respondent were female. The highest group age of the respondent was 41-50 (30.2%) which was represented by 19 respondents. Meanwhile, the lowest group age of the respondent was 61-70 (4.8%) which was represented by 3 respondents out of the 63 respondents. Besides that, the number of respondents that

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are married was the highest which is 41 (65.1%) and the rest was single which is 22 (34.9%). Then, the majority of the respondent works in the government sector as much as 23 (36.5%) and the lowest types of occupation was others (domestic manager) which only consist of 1 (1.6%). As for the race, out of 63 respondent, 59 (93.7%) were Malay while 3 (4.8%) were Chinese and 1 (1.6%) was Indian. Apart from that, the highest education level among the respondent was Tertiary level which takes up to 53 (84.1%) respondents and the rest 10 (15.6%) was at Secondary level. Moreover, as many as 34 (54.0%) respondents live in the city while 19 (30.2%) respondents live in the rural area and 10 (15.9%) respondents live in the suburbs area. Lastly, the highest income range of the respondent was RM 3000 and less than RM 5000 which takes up to 25 (39.7%) respondents. The lowest income range of the respondent was RM 5000 and above which as many as 18 (28.6%) respondents.

Table 2: Demographic profile of the respondent

Demographic	Frequency	Percentage
	Gender	
Male	44	69.8
Female	19	30.2
Total	63	100.0
	Age	
20-30	14	22.2
31-40	18	28.6
41-50	19	30.2
51-60	9	14.3
61-70	3	4.8
Total	63	100.0
	Marital Status	
Single	22	34.9
Married	41	65.1
Total	63	100
	Occupation	
Government	23	36.5
Non-government	22	34.9
Retired	6	9.5
Business	11	17.5
Others	1	1.6
Total	63	100.0
	Race	
Malay	59	93.7
Chinese	3	4.8
Indian	1	1.6
Total	63	100.0
	Education level	
Secondary	10	15.6
Tertiary	53	84.1
Total	63	100.0
	Living area	
City	34	54.0
Rural	19	30.2
Suburbs	10	15.9
Total	63	100.0
	Income	
RM 1000 and RM 3000	20	31.7
RM 3001 and RM 5000	25	39.7
RM 5001 and above	18	28.6
Total	63	100

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4.2 Reliability Analysis

The consistency and dependability of a system or process can be evaluated with the help of a technique known as reliability analysis, which was utilized in engineering, statistics, and other domains. It is used to determine the chance that a system or process will perform correctly over a specific amount of time and under a set of conditions that have been established. Cronbach's Alpha is used to measure the reliability and validity of the items and the level was shown in Table 3 (Sheakh, 2014). From Table 4, it shows that Cronbach's Alpha for all the variables were higher than 0.8. This shows that all of the items were reliable and valid. The Cronbach's Alpha value for Awareness, Knowledge and Cost was 0.963, 0.930 and 0.904 respectively, which was excellent for the study. Meanwhile, the value of the Cronbach's Alpha for Attitude was 0.833 which was considered as very good for the study.

Table 3: The Cronbach's Alpha Reliability Levels

Cronbach's Alpha	Internal Consistency
Less than 0.6	Poor
0.6-0.7	Moderate
0.7-0.8	Good
0.8-0.9	Very Good
0.9 and above	Excellent

Table 4: The result of reliability analysis

Variable	No of item	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Strength Of Association
Awareness	5	.963	.964	Excellent
Knowledge	7	.930	.930	Excellent
Attitude	5	.833	.833	Very Good
Cost	5	.904	.907	Excellent

4.3 Pearson's Correlation Analysis

The Pearson correlation analysis was done to find out how strong the relationship was between the independent and dependent variable. The correlation coefficient (r) runs from -1 to 1, with -1 indicating a perfect negative correlation, 0 indicating no correlation, and 1 indicating a perfect positive correlation. A positive correlation indicates that as one variable increases, so does the other, whereas a negative correlation indicates that as one variable increases, the other declines (Mondal & Mondal, 2017).

Table 5 shows the result for correlation analysis. For the first independent variable, the research findings shows that there is a positive correlation between knowledge and the awareness to adopt permaculture practices with an r-value of 0.530. This also indicates the strength this correlation is a moderate. This proven that, according to Hussain and Ahmad (2012), the foundation of permaculture is the interaction between man and nature. This relationship is also the most apparent connection that permaculture has to the local ecosystem and knowledge.

The second variable also shows a positive moderate correlation between attitude and the Harumanis farmers' awareness to adopt permaculture practices with an r-value of 0.591. Alternative methods of living and ways of thinking may only become realistic once they are implemented in day-to-day life, according to the principles of permaculture. Moreover, the value of correlation between cost and Harumanis farmers' awareness to adopt permaculture practices is 0.657. This shows that the correlation between these variables is positively moderate. According to the findings of the study by Ferguson and Lovell (2019), farmers who employed permaculture approaches saw a reduction in their reliance on labour while simultaneously seeing an increase in their agricultural productivity. This was one of the benefits that permaculture provided to farmers.

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Table 5: Pearson's Correlation Analysis

Variables	Pearson Correlation
Knowledge	0.530
Attitude	0.591
Cost	0.657

4.4 Regression Analysis

Regression analysis was used to indicate whether there was a significant relationship between the dependent and independent variables, and also test the hypothesis for the factors that influence the awareness to adopt permaculture practices. Table 6 indicates the outcome of regression analysis between the independent variables which were knowledge, attitude and cost with the dependent variable which was the awareness to adopt permaculture practices.

Table 6: Regression analysis

Independent variable	β	t	*p*-value
(Constant)	0.636	1.573	.121
Knowledge	.194	2.626	.011
Attitude	.332	3.065	.003
Cost	.374	3.108	.003
F-value	24.895	24.895	0.000

The result of the regression analysis showed that the *p*-value for the independent variable of knowledge was 0.011, attitude was 0.003 and cost was 0.003 are less than 1% of significant level. This showed that the independent variable had a significant relationship with the dependent variable. Which is awareness to adopt permaculture practices.

The result shows that the β value for knowledge was β=0.194, p=0.011<0.01 is positive and significant relationship between knowledge and awareness to adopt permaculture practices as the knowledge increase, the awareness to adopt permaculture practices will increase by 0.194. Any type of practices including permaculture practices required knowledge, this is because knowledge was needed so that a person know about the practices that they are doing. In order to start doing permaculture practices or set up permaculture garden, one should have the basic knowledge about permaculture.

Other than that, the β value for attitude was β=0.332, p=0.003 <0.01 indicate that there is a positive and significant relationship between attitude and awareness to adopt permaculture practices as the attitude increase, the awareness to adopt permaculture practices will increase by 0.332. Attitude of a person such as a positive mindset and self-awareness plays a vital role in permaculture practices. One should believe in what they are doing and should be hardworking in doing the permaculture practices. In this way, they will realize the benefits of permaculture practices and they will continue to pursue their permaculture practices.

The β value for cost was β=0.374, p=0.003<0.01 shows that there is a positive and significant relationship between cost and awareness to adopt permaculture practices as the cost increase, the awareness to adopt permaculture practices will increase by 0.374. Permaculture is a sustainable and self-regenerative system. Therefore, the use of chemical and fertilizer is no longer needed in permaculture practices so it will reduce the cost of pesticides and fertilizer. Since the usage of pesticides and fertilizer is no longer needed, the number of workers will also decrease because there will be no labour to apply the pesticides and the fertilizer. According to the results of the study Didarali and Gambiza (2019), farmers who adopted permaculture practices witnessed a reduction in costs while concurrently seeing an increase in their agricultural productivity. Other than that, permaculture practices have the potential to contribute to a reduction in the costs that are associated with conventional farming techniques.

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The *p*-value for F-statistic was lower than 0.01, thus, the regression model is significant then the independent variable, knowledge, cost and attitude should remain in the model.

5. CONCLUSION AND RECOMMENDATIONS

The focus of this research was to find out what variables influence the awareness to adopt permaculture practices among Harumanis farmers in Perlis. The dependent variable in this research was the awareness to adopt permaculture practices among Harumanis farmers in Perlis. The independent variable was knowledge, attitude and cost. A review of the relevant literature was incorporated into the process of formulating hypotheses, doing theoretical research, and organizing the technique. Additionally, it demonstrates that there is a connection between the independent variable and the dependent variable that was investigated in this study. The focus population in this study was Harumanis farmers in Perlis. The total number of respondents was 63 were from 3 district which was, Arau, Chuping and Mata Ayer. There were a few details analysis was used in this study which is reliability test, descriptive analysis, regression analysis and Pearson's Correlation analysis.

Majority of the respondent is male with a percentage of 69.8% while female is 30.3%. The highest group age of the respondent was 41-50 with a percentage of 30.2%. Out of the 63 respondents, 41 respondents were married. Majority of the respondents works as government servant with a percentage of 36.5%. 93.7% of the respondents were Malay. The highest type of education level of the respondents was tertiary with a percentage of 84.1%. Most of the respondents, 54.0% live in the city. The highest monthly income range for the respondents was RM 3000 and less than RM 5000 with a percentage of 39.7%. This study concluded that all the independent variables which are knowledge, attitudes and cost have a significant relationship with the dependent variable, awareness to adopt permaculture practices.

Based on the results of the study, knowledge was one of the main factors in influencing awareness to adopt permaculture practices. Government or any non-government organization should hold more campaigns or talks regarding the benefits of permaculture practices and should give more guide how to start and maintain the permaculture garden. Therefore, many farmers will acknowledge the importance of permaculture and they will be influenced to start the permaculture practices. Furthermore, attitudes also play a major role in influencing awareness to adopt permaculture practices. People should care more about the environment. They should have a sense of love towards the nature in order to preserve the earth. People should contribute more to increase the quality of the environment. Other than that, people should put more effort to decrease any activity that leads towards pollution such as air pollution, water pollution or soil pollution. People should start permaculture practices as it is one of organic farming technique. Without using any types of chemicals, surely the world would become a better place. Meanwhile, cost is proven to be one of the important factors that influenced the awareness to adopt permaculture practices. Government and any non-government organization can play a major role by providing funds to any permaculture activist. The government also can help by providing some loans to anyone who wants to start a permaculture garden. In this way, many farmers will be interested to start in permaculture practices. Apart from that, farmer also should decrease their use of fertilizer and pesticides so that they can instantly lower their cost of maintenance of crops.

In conclusion, the results of the study helped to identify the main factors that influence the awareness to adopt permaculture practices among Harumanis farmers in Perlis. From this study, many organizations can focus on the factors to increase the awareness among the people in order to increase permaculture practices.

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7. CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

8. AUTHORS' CONTRIBUTIONS

Zaim Farhan: Conceptualisation, methodology, formal analysis, investigation and writing-original draft; **Siti Nor Nadrah**: Conceptualisation, methodology, and formal analysis; **Nur Ilani**: Conceptualisation, formal analysis, and validation; **Nur Syuhada**: Conceptualisation, supervision, writing-review and editing, and validation.

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