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THE ROLE OF AGE IN MODERATING THE IMPACT OF EXTREME WEATHER ON MENTAL HEALTH AMONG PADDY FARMERS

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Abstract:

Paddy farmers are frequently exposed to various environmental and occupational challenges. With over 485,000 workers in the agricultural sector, paddy farmers often face mental health risks due to unpredictable weather, long working hours, heavy physical labour, economic uncertainty, social isolation, exposure to hazardous chemicals and lack of access to mental health services. Older farmers may be more severely affected, making them more vulnerable to mental health issues. The objective of this study is to examine the relationship between extreme weather on the mental health of paddy farmers in Kedah, and to explore whether age moderates the relationship between extreme weather and mental health outcomes. The study employs a quantitative approach using purposive sampling. A questionnaire will be used to gather data on weather and the mental well-being of farmers. Statistical analysis will be conducted to understand the direct effects of independent variables (extreme weather) and the dependent variable (mental health), as well as the role of moderators (young vs older paddy farmers). The anticipated findings suggest that extreme weather might have a significant negative impact on the mental health of paddy farmers, irrespective of age. The moderating role of age might highlight that different age groups are affected by different mental health outcomes when exposed to extreme weathers. This study is expected to make

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a meaningful contribution to the development of more effective policies and strategies in improving the mental well-being of workers in the agricultural sector, thereby contributing to the overall safety and well-being of the people. This research aligns with the 8th Core of the National Security Policy 2021-2025, which emphasizes People's Security, and supports Sustainable Development Goal (SDG) 3, which promotes mental health, and SDG 8, which encourages safe working environments.

Keywords:

Mental Health, Extreme Weather, Age, Paddy, Farmers

Introduction

The agricultural sector in Malaysia plays a crucial role in the national economy, employing over 485,000 workers, including 220,000 local workers and 265,397 registered foreign workers as of 2023 (Hassan, 2023). However, this sector is also one of the most challenging physically and mentally, with difficult working environments such as extreme weather, long working hours, heavy physical labour, economic uncertainty, social isolation, and exposure to hazardous chemicals (Yazd et al., 2019; MOH, 2020). These factors collectively can lead to serious mental stress among agricultural workers, particularly paddy farmers who are among the most vulnerable groups. A study conducted by the Ministry of Health in 2015 found that 26.7% of the 2 million residents in Kedah experienced mental health problems (Adnan, 2024). However, there is no specific data showing if paddy farmers are included in these statistics, despite working in a high-risk environment for mental health. This lack of data hinders efforts to fully understand the impact of the work environment on the mental health of paddy farmers and to identify appropriate approaches to address this issue. Given the significant role of paddy farmers in Malaysia's agricultural sector and the potential mental health risks they face, it is crucial to investigate the factors that influence their psychological well-being, particularly focusing on how age may moderate the impact of extreme weather conditions on their mental health (Yazd et al., 2019; Adnan et al., 2020).

Literature Review

Agriculture is widely recognized as one of the most perilous occupations globally, posing diverse health and safety challenges to its workers (Irani et al., 2021). The National Institute for Occupational Safety and Health (NIOSH) reports that farmers are at very high risk for fatal and nonfatal injuries, which also affect family members who share similar working activities and living premises (NIOSH, 2023). In 2022, the U.S. Bureau of Labor Statistics reported 21,020 injuries in agricultural production requiring days away from work, although more cases are expected due to high rates of underreporting (BLS, 2024). Similarly, in Malaysia, the Department of Occupational Safety and Health (DOSH) reported 1,064 occupational accidents in the agriculture, forestry, and fishery sector from January to October 2023, with expectations of higher actual numbers due to underreporting (DOSH, 2023). Von Essen and McCrudy (1998) categorized agricultural health risks into ten distinct categories, including traumatic injuries, hearing loss, respiratory disease, cancer, chemical poisoning, dermatoses, zoonoses, heat and cold stress, musculoskeletal disorders (MSD), and green tobacco sickness (GTS). These risks are associated with various aspects of farming activities, including those specific to paddy farming.

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Paddy farming activities encompass a range of tasks from land preparation and seed planting to harvesting and post-harvest processing (NaCRRI, 2010; Kalvani et al., 2022). Throughout these activities, paddy farmers in Malaysia are frequently exposed to extreme weather conditions. The beginning of the year saw El Niño phenomena causing daily temperatures to exceed 35°C, severely affecting paddy and other crop plantations (Mutalib, 2024). Conversely, at the end of the year, heavy floods in the Northern Region of Malaysia affected 5,388.63 hectares of paddy fields (Sumali, 2024). These extreme weather events, which significantly impact paddy production, can lead to mental health disturbances among paddy farmers. Farmers may experience stress and anxiety due to crop losses, economic uncertainty, and damage to equipment (Kalvani et al., 2022). Moreover, the constant pressure of dealing with unpredictable weather can result in burnout and exhaustion (Yazd et al., 2019). Mental health impacts are often exacerbated by factors such as financial difficulties, isolation, and limited access to mental health services in rural areas (Yazd et al., 2019). The effects of extreme weather on mental health may vary based on factors such as age, with studies showing high rates of mental health problems among both older and younger farmers (Riethmuller et al. 2023, Rudolphi et al., 2023). A study of 122 farm families reported a high prevalence of farm adults experiencing at least mild symptoms of anxiety and depression, with nearly a quarter meeting the criteria for mild to moderate depression and 11.5% for moderately severe depression (Rudolphi et al., 2023).

Age can significantly influence how paddy farmers experience and cope with extreme weather conditions, affecting their mental health (Riethmuller et al. 2023). Older farmers may be more vulnerable to heat-related illnesses and mental health impacts from extreme heat, with studies showing an increased risk of suicide among rural males aged between 30 and 49 years old during drought conditions (Hanigan et al., 2012). The reliance on weather forecasts for planning, coupled with the frustration of unreliable predictions, can exacerbate stress levels across all age groups, but may be particularly challenging for older farmers who have long-established routines (Ellis & Albrecht, 2017). Younger farmers might feel more pressure to adapt to changing climate conditions, potentially leading to increased anxiety and stress, while older farmers may struggle more with the physical and cognitive demands of adapting to new farming practices necessitated by extreme weather (Wheeler et al., 2021). Additionally, the long-term psychological impact of repeated exposure to adverse weather events can lead to chronic stress and mental health issues, affecting farmers' well-being for years after initial incidents, with potential differences in resilience and coping strategies across age groups (Yazd et al., 2019).

Definition of Extreme Weather

Extreme weather refers to unusual, severe, or unseasonal weather events that are at the extremes of a location's historical distribution, typically falling in the most unusual 10% (IPCC, 2012). These events include heat waves, cold waves, heavy precipitation, storms, tropical cyclones, and droughts (National Academies of Sciences, Engineering, and Medicine, 2016). The Intergovernmental Panel on Climate Change (IPCC) defines an extreme weather event as "an event that is rare at a particular place and time of year" (IPCC, 2012). Extreme weather events are often based on a location's recorded weather history and can have significant impacts on human society and ecosystems, including economic costs, loss of life, and environmental damage (Walsh et al., 2014). Climate change is making some extreme weather events more frequent and intense, particularly heat waves and heavy rainfall events (Lindsey, 2016).

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Definition of Mental Health

According to World Health Organization, mental health is a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community. It is an integral component of health and well-being that underpins our individual and collective abilities to make decisions, build relationships and shape the world we live in. Mental health is a basic human right that are crucial to personal, community, and socio-economic development (WHO, 2022). As for the Centres for Disease Control and Prevention (CDC), mental health is defined as an important part of overall health and well-being. Mental health includes human's emotion, psychological, and social well-being. It affects the way human think, fuel, and act. It also helps determine how human handle stress with its relation to other human's interaction and their decision-making abilities. Mental health is important at every stage of life, from childhood and adolescence through adulthood (CDC, 2024).

Definition of Age

Age is a multidimensional concept that encompasses various aspects of an individual's life span and development. Age can be understood through chronological, biological, psychological, social, and functional perspectives (Wilmoth & Ferraro, 2006; Novak, 2012; Settersen & Godlewski, 2023). Chronological age, defined as the measure of the time elapsed from date of live birth to a specific point in time, is the most commonly used measure (Australian Bureau of Statistics, 1999).

Relationship Between Mental Health and Extreme Weathers

Extreme weather events, which are increasing in frequency and intensity due to climate change, have significant direct impacts on the mental health of paddy farmers. Studies have shown that exposure to such events can lead to a range of mental health issues among farmers, including post-traumatic stress disorder (PTSD), anxiety, depression, and substance abuse (Yazd et al., 2019). For instance, research on rice farmers in Thailand found that those who experienced severe flooding reported higher levels of stress and anxiety, with 37.3% showing symptoms of PTSD (Askland et al., 2018). Similarly, a study of paddy farmers in India revealed that 87% of respondents experienced moderate to severe stress due to drought conditions, with 39% reporting symptoms of depression (Vins et al., 2015).

The mental health impacts of extreme weather events on paddy farmers are not limited to acute disasters but can also result from chronic environmental stressors. For example, prolonged heat waves and unpredictable rainfall patterns have been associated with increased psychological distress among rice farmers, affecting their decision-making abilities and overall well-being (Berry et al., 2011). Moreover, the psychological distress caused by extreme weather events can persist long after the immediate threat has passed. A study of Australian farmers, including those cultivating rice, found that the mental health impacts of drought conditions could last for years, with farmers reporting ongoing anxiety about future weather patterns and financial stability (Austin et al., 2018). These findings underscore the complex and enduring relationship between extreme weather events and mental health among paddy farmers, highlighting the need for comprehensive and long-term mental health support in agricultural communities facing climate change challenges.

Moderation Effect of Age

Age is one of the key risk factors that could affect the mental health of paddy farmers when working under extreme weathers, predominantly heat waves and heavy rainfall (Riethmuller et

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al. 2023). Young paddy farmers may experience heightened anxiety and stress due to their potentially limited experience in coping with severe weather conditions and crop losses. They might feel more pressure to adapt to changing climate patterns, leading to increased psychological distress (Wheeler et al., 2021). Additionally, younger farmers may be more susceptible to eco-anxiety or climate anxiety, as they anticipate long-term impacts on their livelihoods and future farming prospects (Hayes et al., 2018). This age group might also face unique challenges in accessing mental health support, particularly in rural areas where such services may be limited.

Older paddy farmers, on the other hand, may exhibit different vulnerabilities to extreme weather events. Their long-established routines and potential difficulties in adapting to rapidly changing climate conditions can lead to increased stress and anxiety (Ellis & Albrecht, 2017). Older farmers may be more susceptible to heat-related illnesses during extreme temperature events, which can exacerbate existing mental health conditions or lead to new ones (Hansen et al., 2008; Hanigan et al., 2012). However, older farmers may also demonstrate greater resilience due to their accumulated experience in dealing with weather variability over their farming careers. The long-term psychological impact of repeated exposure to adverse weather events can lead to chronic stress and mental health issues affecting farmers' well-being for years, with potential differences in coping strategies across age groups (Yazd et al., 2019).

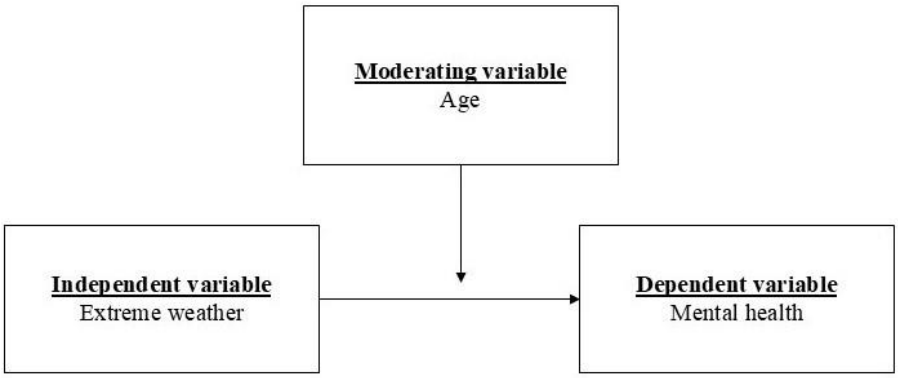

Figure 1: Research Framework

Affective Events Theory (AET)

Affective Events Theory (AET), developed by Weiss and Cropanzano (1996), provides a valuable framework for understanding how extreme weather events can impact mental health, with age acting as a moderating factor. AET posits that workplace events trigger emotional reactions, which in turn influence attitudes and behaviours. In the context of paddy farmers, extreme weather events can be considered as significant "affective events" that elicit strong emotional responses. These weather-related events, such as droughts, floods, or heatwaves, can trigger a range of emotions including anxiety, stress, and helplessness, which may ultimately affect farmers' mental health (Hayes et al., 2018). The theory suggests that the accumulation of these emotional responses over time can lead to more stable work attitudes and behaviours. However, in the case of farmers that is exposed to extreme weather, these conditions could lead to chronic stress or depression.

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The role of age as a moderator in this relationship can be understood through AET's consideration of personal dispositions. Age-related factors such as experience, physical resilience, and adaptive capacity can influence how farmers perceive and react emotionally to extreme weather events. Older farmers might have developed more effective coping strategies over time, potentially buffering the negative emotional impact of extreme weather (Hanigan et al., 2012). Moreover, they may also be more vulnerable due to physical limitations or concerns about long-term financial security. Younger farmers, while potentially more adaptable to change, might experience heightened anxiety about the future impacts of climate change on their livelihoods (Wheeler et al., 2021). AET's emphasis on the cumulative effect of affective events also suggests that the impact of extreme weather on mental health may differ across age groups based on their history of exposure and emotional responses to such events.

Methodology

This study employs a quantitative approach using a structured survey questionnaire to examine the relationship between extreme weather conditions and mental health among paddy farmers in Kedah, with age as a moderating factor. Respondents who are regularly exposed to extreme weather is chosen through the use of purposive sampling, guaranteeing representation in three age groups: young (18–35 years), middle-aged (36–50 years), and older (51 years and above). The questionnaire is designed in the Malay language. It encompasses two primary measures which are exposure to extreme weather and mental health status. Extreme weather exposure is assessed using a Likert scale adapted from Mamun et al. (2021), and Rodríguez-Cruz and Niles (2021) to capture the frequency and intensity of such events, while mental health is measured with the General Health Questionnaire (GHQ-12) developed by Banks et al. (1980), focusing on psychological symptoms such as stress and anxiety.

A pilot test involving a minimum of 30 respondents will be conducted to ensure the clarity, reliability, and validity of the questionnaire. Feedback from the pilot test will be used to refine the questionnaire items to enhance the clarity and alignment with the study's objectives. Cronbach's alpha will be calculated during the pilot test to evaluate the preliminary internal consistency of the scales, with a value of 0.7 or higher considered acceptable. The data from the main study will be analysed using SPSS software. Descriptive statistics will summarize the demographic characteristics of respondents, including their age, gender, and level of exposure to extreme weather. Following this, reliability testing will be conducted to assess the internal consistency of the finalized scales and confirm the dataset's readiness for further analysis by examining the data's overall distribution, including means, standard deviations, and frequencies. Pearson correlation analysis will be performed to identify the strength and direction of the relationship between extreme weather exposure and mental health outcomes. For the moderation analysis, an interaction term between extreme weather exposure and age will be created by standardizing the variables and multiplying them. This interaction term will then be included in a hierarchical multiple regression model alongside the independent variable (extreme weather exposure) and the moderator (age) to test for the moderating effect. The results will determine the presence and significance of the moderating effect by examining the statistical significance of the interaction term.

Discussion

The study anticipates a significant negative relationship between extreme weather events and the mental health of paddy farmers in Kedah, with age playing a moderating role. Specifically, farmers exposed to more frequent or severe extreme weather events are likely to report higher levels of stress, anxiety, and depression (Hayes et al., 2018). The moderating role of age is

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expected to reveal that older farmers (aged 50 and above) may experience more severe mental health impacts compared to younger farmers (below 50 years old). This could be attributed to older farmers' potentially reduced physical resilience and greater difficulty in adapting to changing environmental conditions (Wheeler et al., 2021). Conversely, younger farmers might report heightened levels of eco-anxiety or climate anxiety, reflecting concerns about long-term impacts on their livelihoods (Cianconi et al., 2020).

The anticipated findings of this study can be interpreted through the lens of Affective Events Theory (AET), which provides a framework for understanding how extreme weather events impact farmers' mental health, with age as a moderating factor. AET posits that workplace events trigger emotional reactions that influence attitudes and behaviours (Weiss & Cropanzano, 1996). In the context of paddy farming, extreme weather events such as droughts, floods, or heatwaves can be viewed as significant "affective events" that elicit strong emotional responses from farmers. These weather-related events are likely to trigger a range of emotions, including anxiety, stress, and helplessness, which may ultimately affect farmers' mental health (Rice & Usher, 2024). The cumulative effect of these emotional responses over time could lead to more stable negative attitudes and behaviours, manifesting as chronic stress or depression among farmers repeatedly exposed to extreme weather. The role of age as a moderator in this relationship aligns with AET's consideration of personal dispositions. Age-related factors such as experience, physical resilience, and adaptive capacity may influence how farmers perceive and react emotionally to extreme weather events (Yazd et al., 2019). Older farmers might have developed more effective coping strategies over time, potentially buffering the negative emotional impact of extreme weather. However, they may also be more vulnerable due to physical limitations or concerns about long-term financial security, especially as they approach retirement age (Wheeler et al., 2021). Conversely, younger farmers, while potentially more physically resilient and adaptable to change, might experience heightened eco-anxiety about the future impacts of climate change on their livelihoods (Cianconi et al., 2020).

Conclusion

This study is expected to provide valuable insights into the complex relationship between extreme weather events, mental health, and age among paddy farmers in Kedah, viewed through the framework of Affective Events Theory. By highlighting the differential impacts of extreme weather on farmers of various age groups, the research can inform more targeted and effective mental health interventions and policy measures. These findings could guide the development of age-appropriate coping strategies, support systems, and climate adaptation measures for paddy farmers. The study's alignment with national security policies and Sustainable Development Goals underscores its potential to contribute to broader efforts in promoting occupational health, mental well-being, and sustainable agriculture in Malaysia. Future research could explore additional moderating factors, such as socioeconomic status or access to resources, to provide a more comprehensive understanding of farmers' resilience to climate-related mental health challenges within the AET framework.

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