Climate Change and Paddy Farming in Malaysia: Unveiling Growth-Stage Impacts Using a Ricardian Approach

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Abstract:

Malaysia's paddy sector is highly vulnerable to climate change, presenting challenges to national food security. This study quantitatively analyzes the effects of climatic variables—temperature and precipitation—on paddy yields across the country's eight granary areas. Employing a Ricardian regression model, the analysis is based on secondary panel data spanning nine years (2013–2022) and covering two planting seasons annually, resulting in 144 observations. The findings highlight the critical influence of climate variables during specific paddy growth stages, particularly the vegetative and maturity phases. Maximum temperature is identified as a key determinant, with rising temperatures during these stages significantly reducing yields, even in well-irrigated areas. The vegetative stage is especially vulnerable to thermal stress, as elevated temperatures hinder crop development and nutrient uptake, while excessive heat during the maturity stage disrupts grain formation and reduces harvest quality. In contrast, precipitation shows an insignificant impact on yields, likely due to the mitigating role of irrigation in buffering water-related stress. These results underscore the need for targeted, stage-specific adaptation strategies to counteract the adverse effects of climatic variations. Developing heat-tolerant rice varieties, optimizing planting schedules to avoid peak temperature periods, and enhancing irrigation management are essential measures. Policymakers should incorporate detailed climatic risk assessments into agricultural planning to bolster resilience at the granary level. This study provides actionable insights into the dynamic relationship between climate and paddy yields, emphasizing the importance of growth-stage-specific interventions to ensure sustainable rice production under changing climatic conditions.

Keywords:

Climate change, granary area, growth stages, paddy yields, Ricardian model.