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Impacts of climate variability on rice yield and diseases in coastal Bangladesh: A systematic literature review with climate and crop data analysis

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Climate change has given a new dimension to the unpredictability of rice yields. Climate variability and change impact rice yield directly through the variation of climatic variables. Rice yield is also affected by pests and disease occurrences. However, climatic impacts on rice pests and diseases are not well known. This study aims to investigate the impact of climate variability on rice yield and diseases in coastal Bangladesh through systematic literature review (SLR), complemented by climate-crop data analysis. Mann-Kendall (MK) tests were conducted to assess the trends in climatic variables, while a mixed-effects model was employed to evaluate the influence of climatic variables on rice yield. Logit models were also used to identify the most critical weather parameters influencing the disease occurrences. SLR indicated that 61% of studies reported negative effect while 18% reported positive effect of climate variability on rice yield. Historical climate-crop data analysis indicates that both temperature (0.04°C/year) and humidity (0.14 %/year) have significantly increased. Despite a short-term positive effect of temperature and humidity on rice yield, a chronic cumulative negative effect was found over 38 years. Moreover, there was a positive correlation of rice yield with temperature and humidity. Additionally, trends of climatic variables had a negative effect (-10.9%) which is equivalent to a yield reduction of 140 kg/ha/year. Due to increased temperature and humidity, the occurrence of sheath blight disease was increasing higher than that of blast and bacterial blight disease. These findings are consistent with SLR. Sustainable rice production therefore needs better adaptation strategies at the farmers' level. It is suggested that the agricultural extension department should provide training to farmers regarding climatic parameter changes and their impact on rice diseases and yield, usage of climate information services, as well as climate-smart rice production, is imperative for better adaptation to climate change.