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Climate risk assessment of coastal rice farming in eastern India

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Abstract

Odisha, located on the eastern coast of India, is among the most climate vulnerable states, where nearly 80 per cent of the geographical area is exposed to natural hazards and about 40 per cent of the population is affected by floods, cyclones and drought. Among the affected, the worst off are the rice farmers, since their livelihoods are closely linked with vulnerable ecosystems and unpredictable weather, making every season a struggle for survival and recovery. Considering these realities, the present study aims to assess the climate risk faced by rice farmers in the flood and cyclone prone districts of Puri and Ganjam by calculating the Climate Risk IndexFlood (CRIF) and evaluating its robustness through sensitivity analysis. Following the Intergovernmental Panel on Climate Change (IPCC) framework, the CRIF integrates three dimensions of risk, i.e. hazard, vulnerability, and exposure, where vulnerability includes sensitivity and adaptive capacity. Based on this framework, 13 major components and 68 indicators were identified, and primary data was collected from 256 rice farmers using a semi-structured interview schedule. The CRIF, standardised from 0 (no risk) to 1 (high risk), showed that although Puri and Ganjam recorded similar values for hazard (0.59 and 0.563) and exposure (0.471 and 0.453), they differed in sensitivity and adaptive capacity, with Puri having higher sensitivity (0.466) and lower risk to adaptive capacity (0.377), while Ganjam showed lower sensitivity (0.341) and higher risk to adaptive capacity (0.441). The major components indicate that farmers in Puri are more vulnerable due to poor drainage, saline intrusion, and prolonged water logging, whereas in Ganjam, frequent flash floods and higher dependence on erratic rainfall are critical concerns. The leave-one-out sensitivity analysis validated the robustness of the CRIF and showed that water and natural disaster impacts significantly affected overall risk. Overall, the study shows that CRIF captures farmers' realities and provides a pathway for targeted interventions such as improving water management in Puri and strengthening rainfed farming resilience in Ganjam to enhance livelihoods in Odisha's climate vulnerable landscape. The CRIF proposed in this study is replicable in other coastal and flood prone regions with suitable refinement of indicators.

Keywords: Climate change, climate risk index, hazard, sensitivity, vulnerability

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