

Title: Impacts of hydroclimate change on climate-resilient agriculture at the river basin management

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Abstract: This paper focuses on exploring the potential of Climate resilient agriculture (CRA) for river basin-scale management. Our analysis is based on long-term historical and future climate and hydrological datasets within a GIS environment, focusing on the Ajoy River basin in West Bengal, Eastern India. The standardized anomaly index (SAI) and slope of the linear regression (SLR) methods were employed to analyse the spatial pattern of the climate variables (precipitation, Tmax and Tmin) and hydrological variables (actual evapotranspiration (AET), runoff (Q), vapor pressure deficit (VPD), potential evapotranspiration (PET), and climate water deficit (DEF)) using the TerraClimate dataset spanning from 1958 to 2020. Future climate trend analysis spanning 2021 to 2050 was conducted using the CMIP6 based GCMs (MIROC6 and EC-Earth3) dataset under shared socio-economic pathway (SSP2-4.5, SSP5-8.5 and historical). For spatiotemporal water storage analysis, we relied on Gravity Recovery and Climate Experiment (GRACE) from the Center for Space Research (CSR) and the Jet Propulsion Laboratory (JPL) data, covering the period from 2002 to 2021. Validation was performed using regional groundwater level data, employing various machine learning classification models. Our findings revealed a negative precipitation trend (approximately -0.04 mm/year) in the southern part, whereas the northern part exhibited a positive trend (approximately 0.10 mm/year).

Keywords: Agricultural adaptability, Climate change, Climate-resilient agriculture, Food security, Hydroclimatic change

DOI: <https://doi.org/10.2166/wcc.2023.656>