

Title: Control of Hydrological Regime on the Cropping Pattern in the Context of Climate Change in Mahanadi Delta

Abstract

The climate system that surrounds our very lives is changing. Extreme climate events, such as tropical cyclones, floods, and storm surges, pose challenges for the agriculture sector in the deltas and are difficult to manage. The Mahanadi Delta is one of the important deltas that faces the same challenges in the agricultural sector. The objective of this study was to assess the effects of climate change on agricultural practises in the Mahanadi Delta. SAR data was used to create flood maps to study the effects of flooding in the delta, while IMD rainfall data was used to study the return period. Using flood maps for a variety of return periods, the risk of flooding was calculated. The TCRM model was used to simulate the win behaviour, which resulted in cyclone-related risk in the Delta. The LISS IV images were used to create a land cover map for the agricultural land damage assessment. In addition, storm surge effects on crops were modelled. A total of 72 soil samples were gathered from the delta region in order to determine the appropriateness of the region's soil for agriculture. To create the spatial distribution of soil attributes, the soil data were interpolated. The CNRM-CM5 model was chosen to obtain climate projection data. The Aquacrop crop model was used to evaluate crop water requirements using downscaled data for two RCPs (4.5 and 8.5). The dry spell duration in the kharif season was calculated using projected rainfall data. The result showed that flooding is one of the most common extreme weather events in the Delta. The administrative blocks of the Kendapara and Bhadrak districts are mostly affected. Due to the low, flat topography in the northern half of the delta, storm surge flooding is a typical occurrence in the delta during cyclones. The most frequent destructive force in the Mahanadi Delta is cyclonic wind. The northern portion of the delta is susceptible to nearly all extreme occurrences, including floods, storm surge, high cyclonic wind speeds, and significant precipitation. The delta is suited for growing a variety of crops. The analysis of the projected climate revealed that the yield rate fluctuation of paddy is greater in the distant future (2080s) under RCP 8.5. On the other hand, RCP4.5 predicts a higher yield rate in the distant future, notably after 2040. The length of dry periods was found to be one of the most important criteria for the kharif harvest. Across all decades studied, a maximum dry period of 13 days occurred on average.

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