Spatio-Temporal Dynamics of Rice Cultivated Area over Three Decades in an Irrigated Canal Command of India

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Information on temporal and spatial distribution of rice cultivated area provides a unique opportunity to monitor water stress as rice is one of the highest water consuming crop. The present study focuses on Boro rice cultivation in Damodar canal command of eastern India. A long term mapping of Boro rice cultivated area at an annual frequency was carried out over the period of thirty years (1988-2018). Time series data of Landsat 5, 7, 8 and Sentinel 2 from 1988 to 2018 were analyzed for the months of Feb-Mar (cropping season of Boro rice). Cropping pattern was extracted based on the performance of two spectral indices (NDVI and EVI) and Iterative Self-Organizing Data Analysis (ISODATA) clustering algorithm. Resulting cropping pattern was validated with the field observations for the years 2017 and 2018 along with high-resolution Google earth images. The quantitative analysis of resultant Boro rice map sequence revealed that the average growth rates were 7.03 km^2/year, 3.12 km^2/year and 2.64 km^2/year during 1988-1998, 1998-2008 and 2008-2018 respectively. Over three decades the overall increase in the area under Boro rice cultivation was obtained as 29%. It was also observed that time series imageries of Landsat 5, 7, 8 and Sentinel 2 have higher capabilities of mapping large scale rice cultivating area in data scarcity region. The results can be used for simulating future land cover dynamics and planning of various water management scenarios in Damodar canal command.

Keywords: Time series, Rice mapping, Change detection