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Can Effective Drought Index (EDI) successfully characterise meteorological drought and seasonal agricultural losses?

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The nature and characteristics of drought are not like a flood, cyclone or storm surge since droughts cannot easily be tracked and are difficult to quantify as a distinct event. In this study, we examined the characteristics of meteorological drought occurrence and severity using the Effective Drought Index (EDI), including the drought events, drought chronology, onset and ending of drought, consecutive drought spells, drought frequency, intensity and severity, using North-Bengal of Bangladesh as a case study. The rainfall and temperature dataset of Bangladesh Meteorological Department (BMD) for the study region throughout 1979-2018 is utilised. The trends of drought are detected by using the Mann-Kendall test and Sen Slope estimation. We evaluated the performance of EDI using the Standardized Precipitation Index (SPI), historical drought records and rice production. The study finds that seasonal and annual droughts have become more frequent in all seasons except pre-monsoon. In addition, the largest decrease in seasonal EDI is found in the monsoon in both Teesta floodplain and Barind tract. In decades prior to the late 2000s, a drought spell typically started between March to May (± 15 days) and ended with the monsoonal rainfall in June/July. In the years since the last 2000s, monsoon and post-monsoon droughts spells have significantly increased. Overall, the peak intensities of droughts are higher in the Barind tract than in the Teesta floodplain, and the frequency and severity of moderate to severe drought are increasing significantly in the Barind tract. Though EDI is strongly correlated with the SPI index, EDI and rice production have a non-linear relationship and are not significantly correlated. Hence, this research suggests that there are other significant influences on yield rather than just climatological drought (e.g. irrigation, lack of technology and management etc.).