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A novel agricultural drought monitoring framework using remote sensing products

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Among natural hazards, droughts are known to be very complex and disastrous owing to their creeping nature and widespread impacts. Specifically, the occurrence of agricultural droughts poses a threat to the productivity and socio-economic development of countries such as India. In this study, we propose a novel framework for agricultural drought monitoring integrating the different indicators of vegetation health, crop water stress and soil moisture, that are derived from remote sensing satellite data. The drought monitoring is performed over Odisha, India, for the period 2000-2019. Soil moisture and land surface temperature datasets from GLDAS Noah Land Surface Model and surface reflectance data from MODIS (MOD09GA) are used in this study. We compared the utility of popular indices: (i) soil moisture condition index, soil moisture deficit index and soil wetness deficit index to represent the soil moisture level; (ii) temperature condition index, vegetation condition index and normalised difference water index to indicate vegetation health; (iii) short wave infrared water stress to represent crop water stress condition. Correlation analyses between these indices and the seasonal crop yields are performed, and suitable indicators are chosen. The popular entropy weight method is then used to integrate the indices and develop the proposed composite drought index. The index is then used for monitoring the agricultural drought condition over the study area in drought periods. The proposed framework for week- to month-scale monitoring have potential applications in identification of agricultural drought hotspots, analysis of trends in drought severity, and drought early warning for agricultural water management.