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# Drought monitoring/prediction using remotely-sensed data and SSP climate change scenarios in a Tunisian olive orchard

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## Abstract

The increasing impact of climate change on agricultural and horticultural practices in northern Africa necessitates better predictive drought models. In this study, remotely sensed data and techniques, more specifically, analysing satellite imaginary and unmanned aerial vehicle (UAV) were applied to determine agricultural drought conditions in an olive orchard in Jemmal, in western Tunisia, using a spectral index, called vegetation cover index (VCI). Moreover, long term time series of monthly precipitation has been used to calculate standard precipitation index (SPI) with different time scales, namely, 3,6-months, as meteorological drought index. The study utilised Landsat8/9 imagery to calculate VCI as an agricultural drought index, with over 50 images obtained over three years (2020–2022). The monthly mean VCI values were considered representative of drought conditions in the presented olive orchard. The cross correlation between agricultural and meteorological drought indices was calculated with different lag times. The results showed that the agricultural drought occurred after the meteorological drought. This study used wavelet transform (WT) integrating with adaptive neuro-fuzzy inference system (ANFIS) model to simulate and predict VCI (output of machine learning model) based on SPI values with several lag times as inputs. The calibrated hybrid Wavelet-ANFIS model was then used to predict VCI using 35 climate change models under different shared socioeconomic pathway (SSP) scenarios which is developed with respect to the sixth IPCC report. Present study focuses on SSP based scenarios – span a range from sustainable and green pathway (SSP1) to ongoing growth in emissions by development of fossil-fuel (SSP5) – which are incorporated in coupled model intercomparison project-6 (CMIP6). The results can be used by farmers to plan appropriate irrigation schedules or adapted agricultural practices for upcoming droughts in semi-arid western Tunisia. Understanding the situation helps agricultural water planners to develop better insight into management policies to minimise losses in water scarcity conditions.

**Keywords:** Climate change, CMIP6, drought, Landsat, olive, Tunisia, wavelet-ANFIS model

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