



The impacts of drought in agricultural productivity. An analysis at different scales for the two major rain-fed crops in Spain.

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Drought events are considered of great importance in most of Mediterranean climate regions because of the diverse and costly impacts that they cause over the economic and environmental sectors among others. Problems derived by the lack of precipitations are more obvious in semi-arid regions where the absence of these often leads to medium to long-term droughts events. This scenario usually results on a reduced of water supply and water quality which deteriorate the environment and cause severe damages to agriculture. The effects of this natural hazard are more evident in rain-fed crops, for this reason in this work, authors assess the analysis of the impacts of drought over the two more representative rain-fed crops widely cultivated in Spain, wheat and barley.

As agriculture is a vulnerable sector to drought, it is especially important to identify the appropriate tools for monitoring the extent of the drought events. Drought indices stand as the most effective tool for that purpose. Several scalar and multi-scalar drought indices [the Standardized Precipitation and Evapotranspiration Index (SPEI); the Standardized Precipitation Index (SPI); the Palmer Drought Indices (PDSI, Z-Index, PHDI, PMDI) and the Standardized Palmer Drought Index (SPDI)] have been performed at different time scales to provide an assessment of the direct relationship between drought episodes and crop yields diminishing in Spain. Three different data sets of crop yield records at different spatial scales for the available period 1995- 2014 were considered in the analysis. Data comes from different crop agencies and insurance companies in Spain Results show an agreement between the most important drought events in Spain and the crop response. Nevertheless, this agreement vary depending on the drought index applied. Authors found a higher competence of the drought indices calculated at different time scales (SPEI, SPI and SPDI) identifying the begging and end of the drought events and the correspondence with the crop failures more accurately than the other indices evaluated. The response to drought among the multi-scalar indices also shows different patterns of response depending on the region, month and time scale.