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Design of a Combined Drought Index for the Creation of an Early Warning System in Grasslands. Case Study in the Sierra de Guadarrama

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Pastures are one of the most crucial land covers from the ecological and agricultural point of view. In Spain, pasture areas are being especially more vulnerable to the effects of climate change, which highlights the need to have tools for assessing and characterizing pastures, to understand the vegetation behaviour better, and anticipate potential risks such as events of drought or frosts mitigating the negative impacts that take place both in the crop and at an economic level for the farmers.

This work aims to establish an early warning system in pastures and evaluate the combined drought index by studying the behaviour of the NDVI (vegetation index) with the temporal dynamics of temperature and precipitation in two areas in north-central Spain (Ávila and Segovia). For this, the grass areas were selected, the behaviour of the climatic patterns and the vegetation index were studied, *pastograms* were analyzed to characterize and evaluate the amount of grass produced, and correlations were made to assess the behaviour of precipitation and the NDVI between development phases over 20 years.

The data analyzed and the methodologies followed for the study areas determine two highlighting points in the growth of the grasses, autumn and spring. There is also a linear relationship between cumulative precipitation and cumulative NDVI in both zones, which, together with the pastures model, allow obtaining the production estimate to characterize them. With this information obtained from the analysis for both Ávila Zone – ZAV and Segovia Zone – ZSE, a combined drought index and alarm system is proposed based on the values of the standard curves and scores of the meteorological and physiological index for each zone during the period 2000-2020.

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