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Assessing and Mitigating the Global Freshwater Crisis (6)

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REMOTE SENSING FOR IMPROVED IRRIGATION EFFICIENCY IN SOYBEAN FARMING

Abstract

Freshwater availability represents an increasing concern in various regions of the world, due both to climate change and the projected increase in demand. Agriculture is by far the sector with the highest freshwater consumption, being responsible for about 70% of its use worldwide, generating a lot of interest in the development of new, more efficient, irrigation practises and technologies. This work focuses on the use of multispectral data, acquired from both satellite and UAV imagery, to evaluate the health and growth of a soybean culture subjected to controlled deficit irrigation, integrating them with in-situ measurements of the physiological parameters of the plants. The study is conducted on two fields in northern and central Italy, with an extension of 160 x 40 m. Each field is subdivided into four 40 x 40 m plots, two of which are irrigated at 100% of the Crop Water Requirement, while the other two are subjected to deficit irrigation, receiving 70% of the CWR. Satellite data is retrieved from the PlanetScope constellation, which can provide a ground resolution of 3 meters in 8 different spectral bands in the visible and near infrared wavelengths, with a daily temporal resolution. A tethered balloon, equipped with commercial cameras and filters selected in order to match the satellite spectral bands, is used to acquire data with a higher resolution, both spatial and temporal. Different vegetation indices (NDVI, ENDVI, GNDVI, NDRE) are computed and their correlation with in-situ data is analysed. The paper presents the methodology and the results obtained, integrating data acquired during two growing seasons. This study is a step towards the development of an irrigation management based on the actual needs of the plants and the current local climate conditions, rather than on predefined tables, resulting in an increased water use efficiency.