



Remote sensing monitoring of soil water buffering in Agricultural Terraced Landscapes: an application of OPTRAM methodology in Tuscany Region, Italy

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Terraces systems around the world have been proven to support multiple Ecosystem Services, including erosion control, runoff reduction, biomass accumulation, nutrient enhancement and soil water recharge. Their effect in terms of water retention can support climate regulation and mitigate meteorological droughts, especially in arid areas. Most of the studies, however, have been based on point measurements that have been mainly carried out during experiments in test plots, and that can be difficult to retrieve in remote and arid areas. Spatialized measures, thus, can consistently inform landscape planning and produce new knowledge on moisture dynamics. The present study adopts an optical method, based on visible and near-infrared radiation, the Optical Trapezoidal Method (OPTRAM) developed by Sadeghi et al. (2017). The OPTRAM is based on an optical scatter plot on which the parameters for reflectance-soil moisture transformation can be calculated. The method can be universally parametrized for a given location, since the scatter plot has an identical shape for each location and it is not affected by environmental factors, and it can predict the soil moisture content in the first 5 cm of soil with an accuracy of $0.04\text{-}0.05\text{ cm}^3\text{ cm}^{-3}$. The method has been implemented based on Sentinel-2 imagery, with 10 m spatial resolution. The study has been carried on Lamole terraced landscape, Tuscany, Italy, located in Greve catchment, by comparing the average soil moisture values in a terraced and a non-terraced vineyard. The work demonstrates the influence of terracing on soil moisture retention during the dry season. Results were confirmed by an uncertainty analysis on model parameters, showing a higher soil moisture in terraced vineyard for every set of parameters analysed. The work also confirmed OPTRAM basic hypothesis of a universal parametrization for each study area.

Keywords: Sentinel-2, soil moisture, Ecosystem Services, drought mitigation