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A more sustainable way for agricultural water use

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The growing water scarcity and the misuse of available water resources are nowadays major threats to sustainable development for most arid and semiarid areas in the Mediterranean regions. The agricultural production is very vulnerable to the weather conditions and may be strongly influenced by the future climate change projections (IPCC, 2007). Changes in precipitation patterns, intensity and frequency of extreme events, changes in soil moisture, runoff and evapotranspiration fluxes, have already been observed and more important changes are expected for the future (Bates et al., 2008). A correct irrigation management can provide a way to regulate the seasonal availability of water to match agricultural needs, thereby reducing the risks for crops during periods of low rainfall or drought. In Sardinia Island (Italy), the agricultural sector requires the largest amount of water resources and uses more than 60% of the total water supplies. The irrigated agriculture contributes for about the 50% to total agricultural production.
Climate change scenarios developed recently for Sardinia (Mereu et al., 2010) allowed to estimate a good level of certainty reduced average rainfall varies from -10% for 2025 up to -30% for 2075, with extreme values that can reach -50% with future scenarios particularly severe. In this context it is necessary to improve our knowledge and research to improve irrigation management strategies and agricultural practices to establish farmer advisory schemes and implement policy measures.
The objective of our work was to assess the crop water requirement of the main Sardinia agricultural crops using SIMETAW model. The model was developed at the University of California, Davis, (Snyder et al., 2004). It computes the irrigation schedules and avoid water losses due to excessive irrigation treatments, The analysis was conducted in the framework WASSERMed European project where Sardinia represents one of the five case studies of the project.

SIMETAW estimates reference evapotranspiration (ET) of applied water (ETaw) for particular soil, crop and climate conditions under known management. Based on input soil, crop and management data, SIMETAW is able to compute crop evapotranspiration (ETc) and daily water balance, including effective rainfall (Er). Then ETaw is calculated as ETaw = CETc – CEr, where CETc and CEr are the cumulative total ETc and Er values. The model uses daily rainfall, soil water holding characteristics, effective rooting depths, and ETc to generate hypothetical irrigation schedules, to estimate seasonal and annual evapotranspiration of applied water (ETaw). SIMETAW allows to investigate how climate change may affect water demand in European regions. All ETaw calculations are done on a daily basis, so the estimation of effective rainfall and, hence, ETaw is greatly improved respect to others methods. In addition, the ETaw accuracy is improved in SIMETAW model, by using the Penman-Monteith equation for reference evapotranspiration (ETo) calculation and using an improved methodology to apply crop coefficients for estimating crop evapotranspiration.
In the first step, SIMETAW model was applied to estimate seasonal and annual reference and crop ET using actual climate data at Euro-Mediterranean level. SIMETAW output and Geographic Information Systems (GIS) were linked to obtain maps of evapotranspiration for some of the most important crops in the Mediterranean area.

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