

PhD Thesis Defense

On **Thursday July 31st at 9.00 am**, in the classroom **H**, Via Santa Sofia 100

Serena Guarrera (XXXVII cycle)

Will discuss his PhD theses titled

INNOVATIVE SUSTAINABLE APPROACHES FOR MANAGING THE SOIL AND WATER RESOURCES IN MEDITERRANEAN AGRICULTURAL CONTEXT

Thesis Abstract

The adoption of innovative agricultural practices is essential for the rational management of the cropping system, to improve the resilience to drought of the agroecosystems and to optimize the use of soil and water resources under climate change scenarios. In this sense, the goals of my PhD research activity were linked to assessing the effects due to the combined application of soil conservation practices and irrigation regimes, such as the use of organic mulching (OM) and the application of regulated deficit irrigation (RDI) strategies. On this basis, a three-year study was conducted in an orange grove located in Sicily (insular Italy) for appraising the responses of different soil management strategies (SM, bare soils vs mulched soils) and water regimes (WR, full irrigation vs RDI). Innovative monitoring protocols of the main soil-plant-atmosphere continuum (SPAC) variables were developed and applied to observe the relative effects, in terms of soil chemical-physical characteristics, crop water status (CWS), crop productivity, and analysis of soil carbon dioxide (CO₂) fluxes at different spatial scales. Specifically, for the analysis of soil CO₂ fluxes, a custom-designed, low-cost closed-volume dynamic accumulation chamber was applied and the CO₂ fluxes measured by the eddy covariance technique was acquired at the agroecosystem scale. The above-mentioned approach was applied at two Case studies, as follows:

- In the first Case study, the effects of the application of sustainable soil and water conservation practices (SWCM) were appraised in terms of plant physiology, water saving, crop productivity and soil chemical-physical characteristics; and
- In the second Case study, the responses due to the application of SWCM were evaluated in terms of soil CO₂ fluxes in combination with ancillary SPAC system data.

Overall, the results of this PhD thesis demonstrated the effectiveness of the innovative monitoring protocol that allowed to understand the complex mechanisms acting within the SPAC system in relation to the application of the applied sustainable SWCM. Furthermore, it was possible to verify how the application of these techniques brings benefits to the agroecosystem by making crops more resilient to climate change without compromising their productivity.

Advisors:

Prof. Daniela Vanella

Co-advisors:

Prof. Simona Consoli

Prof. Mirco Milani