

PhD School on Agriculture, Environment and Bioenergy

http://sites.unimi.it/dottorato_aab/

(XL cycle, 2025-26)

Project draft

1. Field of interest

AGR/08

2. Project title

Advanced Methodologies for Planning and Managing Water for Irrigation

3. Tutor (membro del Collegio dei Docenti)

Claudio Gandolfi – Daniele Masseroni

4. Relevance of the topic and state of the art:

Climate change will severely affect freshwater availability across much of Europe by the end of the 21st century. In a warmer climate, many river basins, especially in Southern Europe and the Mediterranean region, are likely to become more prone to periods of water scarcity, with projections indicating up to a 40 percent reduction in minimum streamflow by the 2080s in this area (Forzieri et al. 2014). The cost of drought in Europe, which amounted to over 9 billion euros per year (Naumann et al., 2021), will considerably increase as future droughts are expected to be more severe and long-lasting (Samaniego et al., 2018). How to deal with these climate change effects is not a long-term planning problem; it is rather a short/medium-term management challenge, which has already manifested its potential negative impact in several situations (Masante et al., 2019). In this context, the PhD project aims to increase the drought resilience of the irrigated areas of the Padana Plain through the investigation of different solutions such as the implementation of water storage infrastructures, the revision of lakes/reservoirs operating space, the application of best management irrigation practices etc..

5. Layout of the project (draft)

5.1. Materials & Methods:

The PhD student will be involved in one of the multidisciplinary projects of the Agricultural Water Management group of the University of Milan, covering one or more of the following topics: (i) traditional, new and transitional technologies and practices for the management, control and actuation of irrigation at different spatial scales; (ii) integration of climate change scenarios and weather forecasts into agro-hydrological models and decision support systems; (iii) adoption of precision irrigation technologies and methods to improve the sustainability of irrigated systems;

The student at the end of the PhD program will be able to: (i) describe, model and measure hydrological processes in soil-vegetation-atmosphere systems at different spatial scales;

(ii) use instruments for monitoring agro-hydrological variables (e.g. irrigation flows, soil water content, evapotranspiration, etc.); (iii) design and manage experimental sites; (iv) accompany and support farmers, irrigation specialists and authorities in the planning, management and control of irrigation.

5.2. Schedule and major steps (3 years):

The doctoral activity is divided into three macro steps. In general, the first one (1 year) is dedicated to the definition of the main objective of the doctoral project in collaboration with the tutor and co-tutor. During the first year, the student will analyze the scientific literature, get in touch with the local realities, identify the field of study. The second year (2 years) will be dedicated to on-field experiments, data acquisition, modeling simulations, while the third year (3 years) will be dedicated to data elaboration, statistical analysis and writing the thesis. A stay abroad is planned as part of the doctoral project.