Summer School in Irrigation Management

Title
Smart technologies and practices for sustainable irrigation management (*Theory&Practice* or *Theory module*) (Edition 1 – Irrigation scheduling methods and tools; Surface irrigation and eco-hydrological implications)

Attendees
Theory&Practice (T&P): Max 25 participants. (A minimum of 20 participants is required for the module.)
The module is open to graduate students (Ph.D. and MS students, recent Bachelor graduates) in water resource science/engineering/management; Scientists and professional researchers; Irrigation specialists, water resource managers, crop and irrigation advisors, irrigation consultants and practitioners (personnel from water user associations, water planning/management agencies, regional administrations, irrigation industry, private sector, focus groups, farmers unions, etc.).
The T&P will be offered only with in-person format.
Participants will be selected on the basis of their short CV (max. 2 pages) by a committee of UniMi and UCDavis researchers.

Theory Module (T): Max 100 participants. (A minimum of 30 participants is required for the module.)
The module is open to graduate students (Ph.D. and MS students, recent Bachelor graduates) in water resource science/engineering/management; Scientists and professional researchers; Irrigation specialists, water resource managers, crop and irrigation advisors, irrigation consultants and practitioners (personnel from water user associations, water planning/management agencies, regional administrations, irrigation industry, private sector, focus groups, farmers unions, etc.).
The T course will be offered in a blended mode (both in-person and online). Interaction with lecturers and experts for online participants will be ensured by means of breakout rooms.
Participants will be selected on the basis of their short CV (max. 2 pages) by a committee of UniMi and UCDavis researchers.

Official Language
Both the T&P and T module will be offered in English. ENG/ITA - ITA/ENG translation service is provided for T module.

Costs for participants
T&P (in-person): Euro 500. T module (in-person or online): Euro 300

Certificate of Completion
A certificate of completion will be delivered by the organizing institutions following a final written test.

Location
Italy, Milan, Via Celoria 2 – Department of Agricultural and Environmental Sciences (University of Milan)

Dates
15-19 April 2024 (T&P). 15-18 April 2024 (T Module)

Duration
T&P: 5 days (from Monday to Friday). Mornings: 4 hours of theory, Afternoons: 4 hours of practice
T Module: 4 days (from Monday to Thursday). Mornings: 4 hours of theory.

Objective of the summer school

The impact of climate change on the future availability and quality of freshwater resources, as well as on crop yield response and productivity, requires a paradigm shift towards the use of new climate-adaptive practices and tools supported by digital technologies and automated operations to increase the resource efficiency, adequacy, productivity, cost-effectiveness, and environmental sustainability of irrigation practices. The *Summer School in Irrigation Management - Smart technologies and practices for sustainable irrigation management (T&P* or *T Module)*, is organized in three consecutive editions, aiming to illustrate theoretical concepts and practical implementations and tools that can be used to improve the irrigation performance while maintaining crop yields, production quality, and minimize environmental degradations. Through theoretical presentations, field and laboratory visits and demonstrations, data analysis and interpretation, as well as data-driven and conceptual modelling activities, participants will learn about novel technologies, methods, practices and tools, to improve water productivity and pursue sustainable irrigation water management in agriculture, spanning from gravity irrigation methods to sub-surface drip irrigation, and from field to irrigation district and basin scales.

Edition 1 – Irrigation scheduling methods and tools. Surface irrigation and eco-hydrological implications *(field-farm scale)* (Year 2024)

Future editions in progress:

Edition 2 – Irrigation scheduling methods and tools. Sprinkler irrigation and micro-irrigation (*field-farm scale*) (Year 2025)

Edition 3 – Large-scale irrigation planning, storage, conveyance, and delivery systems *(irrigation district-basin scale)* (Year 2026)

Lecturers and affiliations

- ✓ Dr. Eduardo Bautista [USDA – Agriculture Research Service Maricopa]
- ✓ Prof. Enrique Playán [CSIC – Spain]
- ✓ Dr. Khaled Bali [UC ANR - Kearney Agricultural Research and Extension Center in Parlier]
- ✓ Dr. Giovanni Munoz [UN-FAO - Investment Center, Rome]
- ✓ Prof. Pierfranco Costabile and Prof. Carmen Costanzo [University of Calabria]
- ✓ Dr. Marco Romani [ENR - Italian National Rice Center]
- ✓ Dr. Gladys Lucchelli, Dr. Fabio Olivotti, Dr. Stefano Roverato [ANBI Lombardia]
- ✓ Dr. Pasquale Steduto [Former Chief of Water Development and Management UN - FAO]
- ✓ Dr. Laura Foglia [UC Davis, LAWR Department]
- ✓ Dr. Andrea Toreti [JRC at European Commission]
- ✓ Prof. Chris Henry [UofA - University of Arkansas]
- ✓ Dr. Elia Scudiero [UC Riverside]
- ✓ Prof. Jaehak Jeong [Texas A&M University]
- ✓ Prof. Isaya Kisekka [UC Davis - LAWR Department]
- ✓ Prof. Daniele Zaccaria [UC Davis - LAWR Department]
- ✓ Prof. Daniele Masseroni, Prof. Arianna Facchi, Prof. Claudio Gandolfi, Dr. Antonia Moreno, Dr. Michele Rienzner, Dr. Fabiola Gangi, Dr. Darya Tkachenko and Dr. Pietro Mascherpa [University of Milan – DiSAA Department]

Credits

T&P*:* 4 ECTS (CFU) (4 hours of theory x 4 days + 4 hours of practical x 4 days + 8 hours of didactical visit).

T module*:* 2 ECTS (CFU) (4 hours of theory x 4 days).

All teaching materials will be released to participants at the end of the school.

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Program

Day 1	Alignment			
Session	**Time**	**Topic**	**Location**	**Lecturer**
	8:00 – 8:30	Registration of participants and welcome	Class	Head of DiSAA Department (UniMi)
Theory (coordinated by Daniele Masseroni - UniMi)	8:30 – 9:00	Climate change scenarios and their effect on SW/GW availability.	Class	Andrea Toreti (JRC)
	9:00 - 09:30	Concepts of irrigation system fundamentals and components: intake structures, storage, conveyance, and distribution systems, gravity and pressurized networks, irrigation delivery schedules, irrigation delivery performance, irrigation advisory service.	Class	Claudio Gandolfi (UniMi)
	9:30 – 10:00	CeDaTer (The advanced data centre for the collection and processing of information on the water resources of the Lombardy Padana plain.)	Class	Gladys Lucchelli (ANBI)/Fabio Olivotti (ANBI)/Stefano Roverato (ANBI)
	10:00 -10:20	"Setting the Scene", definition of the main concepts (water conservation, saving, efficiency, productivity, product quality, etc.). Criteria, methods, and practices for water budgeting and accounting.	Class	Pasquale Steduto (Former FAO)
	10:20 – 10:40	*Case study* Practical examples of water budgeting approaches (Examples from various irrigated areas worldwide).	Class	Pasquale Steduto (Former FAO)
	10:40 – 11:00	Q&A and Session Break		
Theory (coordinated by Arianna Facchi - UniMi)	11:00 – 11:30	Agricultural hydrology (soil hydrology, soil-plant-atmosphere relations).	Class	Isaya Kisekka (UCD)
	11:30-12:00	Crop water requirements and water use efficiency/crop water productivity indices.	Class	Pasquale Steduto (Former FAO)
	12:00 -12:30	Q&A and Session Break	Class	
	12:30 – 13:30	Private Companies' videos/presentations		
LUNCH	**13:30 – 14:30**			
Practical (coordinated by Arianna Facchi - UniMi)	14:30 – 18:30	The participants are involved in field, lab, and data processing experiences; in sequence:	Lab + Field	
		Field		Michele Rienzner (UniMi) &

		Soil sampling for soil hydrology analysis. In situ soil hydraulic conductivity measurements. Design and installation of stations for monitoring of soil-crop variables.		Elia Scudiero (UCR)
		Soil Lab Determination of soil texture and soil retention curves.		Antonia Moreno (UniMi) & Michele Rienzner (UniMi)
		Computer Lab Analysis and interpretation of soil-crop experimental datasets (e.g. soil moisture, crop physiological information, weather data etc.)		Daniele Zaccaria (UCD) & Elia Scudiero (UCR)& Khaled Bali (UC ANR)
Online coordinated by Daniele Zaccaria (UCD)				

Day 2	**Irrigation scheduling**			
Session	**Time**	**Topic**	**Location**	**Lecturer**
Theory (coordinated by Daniele Masseroni – UniMi)	08:30 – 09:30	Irrigation scheduling methods and tools	Class	Daniele Zaccaria (UCD)
	09:30 – 10:30	Overview on Decision Support System (DSS) tools to assess when and how much to irrigate.	Class	Isaya Kisekka (UCD)
	10:30 – 10:35	Display of Private Companies' videos (max 2 spots)		
	10:35 – 11:00	Q&A and Session Break		
Theory (coordinated by Isaya Kisekka – UCD)	11:00-11:30	*Case study* Impact of flexible irrigation scheduling on water saving and crop productions (example on surface irrigation).	Class	Fabiola Gangi (UniMi)
	11:30-11:50	*Case study* Impact of flexible irrigation scheduling on water saving and crop productions (example on sprinkler irrigation).	Class	Arianna Facchi (UniMi)
	11:50 – 12:10	*Case study* flexible delivery schedules in coastal irrigated area (Arco Jonico, Puglia)	Class	Daniele Zaccaria (UCD)
	12:10-12:30	*Case study* Implementation of alternative deficit irrigation strategies and results in term of crop performance (production).	Class	Khaled Bali (UC ANR)
	12:30 -13:00	Q&A and Session Break		
	13:00 – 13:30	Private Companies' videos/presentations		
LUNCH	**13:30 – 14:30**			
Practical (coordinated by Daniele	14:30 – 16:00	*Computer Lab* Irrigation scheduling with a DSS based on the FAO-56 approach.	Lab	Daniele Masseroni (UniMi)
	16:00 – 16:30	Q&A and Session Break		

Zaccaria – UC ANR)	16:30 -18:30	*Computer Lab* Irrigation scheduling with AquaCrop.	Lab	Pasquale Steduto (Former FAO)
Online coordinated by Arianna Facchi (UniMi)				

Day 3	**Surface irrigation**			
Session	**Time**	**Topic**	**Location**	**Lecturer**
Theory (coordinated by Daniele Masseroni - UniMi))	08:30 – 09:30	Irrigation modernization & rehabilitation projects: evaluation criteria and cost analysis.	Class	Giovanni Munoz (FAO)
	09:30-10:30	*Case study* Example of surface irrigation systems and their modernization.	Class	Enrique Playán (CISC)
	10:30 – 10:35	Private Companies' videos/presentations		
	10:35 – 11:00	Q&A and Session Break		
Theory (coordinated by Daniele Zaccaria – UCD ANR)	11:00-11:30	Performance evaluation of border and furrow irrigation to improve system design and management.	Class	Eduardo Bautista (USDA)
	11:30-12:00	General overview on modelling surface irrigation (example of 1D-2D modelling).	Class	Pierfranco Costabile (UniCal) & Carmen Costanzo (UniCal)
	12:00-12:30	*Case study* Modelling surface irrigation for improving water management: a case study in northern Italy.	Class	Daniele Masseroni (UniMi)
	12:30-13:00	Automation and control of surface irrigation systems (economic investment, maintenance, etc.).	Class	Khaled Bali (UC ANR)
	13:00 – 13:05	Showing Private Companies' spots (2 spots)		
	13:05 – 13:30	Q&A and Session Break		
LUNCH	**13:30 – 14:30**			
Practical (coordinated by Daniele Masseroni – UniMi)	14:30 – 16:00	*Computer Lab* How variations of irrigation flow rate and duration could affect border irrigation performance? A didactical case study using WINSRFR USDA 1D.	Lab	Eduardo Bautista (USDA)
	16:00-16:30	Q&A and Session Break		
	16:30 -18:30	*Computer Lab* How variations of field geometry could affect border irrigation performance? A didactical case study using WINSRFR USDA 1D.	Lab	Eduardo Bautista (USDA)
Online coordinated by Isaya Kisekka (UCD)				
SOCIAL DINNER				

Day 4	Basin irrigation and Managed Artificial Recharge			
Session	**Slot**	**Topic**	**Location**	**Lecturer**
Theory (coordinated by Arianna Facchi - UniMi)	8:30-9:30	Basin irrigation and other irrigation methods and strategies for rice. Furrow irrigation of rice through the lay-flat systems.	Class	C.G. Henry (UofA)
	9:30-10:00	Advantages and drawbacks of different rice irrigation strategies on yield, product quality and the environment. Alternate wetting and drying (AWD) irrigation.	Class	Marco Romani (ENR)
	10:00-10:30	Modern rice irrigation systems with gate automation.	Class	Daniele Masseroni (UniMi)
	10:30 – 10:35	Display of Private Companies' videos (max 2 spots)		
	10:35 – 11:00	Q&A and Session Break		
Theory (coordinated by Arianna Facchi - UniMi)	11:00-11:20	Ag-MAR (Agricultural Managed Aquifer Recharge) in California.	Class	Laura Foglia (UCD)
	11:20 – 11:40	Use of surface irrigation for crop production and groundwater recharge	Class	Khaled Bali (UC ANR)
	11.40-12:00	Effect of Alternate Wetting and Drying (AWD) on water resources.	Class	Arianna Facchi (UniMi)
	12:00-13:00	Private Companies' videos/presentations		
	13:00-13:30	Q&A and Session Break		
LUNCH	**13:30 – 14:30**			
Pratical (coordinated by Arianna Facchi – UniMi)	14:30 – 16:00	*Field* Installation and use of sensors to support rice irrigation management (in field or greenhouse)	Field	Darya Tkachenko (UniMi) e Pietro Mascherpa (UniMi)
	16:00-16:30	Q&A and Session Break		
	16:30 -18:00	*Computer Lab* Agro-hydrological models to support rice irrigation management and planning (e.g. SWAT and SWATplus).	Lab	Jaehak Jeong (Texas A&M University)
	18:00 – 18:30	*Computer Lab* FINAL TEST		
Online coordinated by Daniele Masseroni (UniMi)				

Day 5	Field Visits
Starting from DiSAA via Celoria 2 at 7:00 am. Bus service free of charge Lunch free of charge	(Place 1) Gate automation in a rice farm (Cascina Ca' Granda Milano); (Place 2) Gravity irrigation system: multifunctionality (Consorzio Muzza Bassa Lodigiana). Cassano D'Adda hydraulic node (diversion infrastructure); hydro and thermoelectric power plants; depression springs in Settala; Paullo hydraulic node and water house; surface irrigation practices in a typical farm; canal network enhancement for environmental and social purposes.

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To register for T&P, follow the instructions on the link:

https://www.unimi.it/en/international/study-abroad/international-opportunities/bando-summer-school-smart-technologies-and-practices-sustainable-agricultural-water-management

To register for T Module, follow the instructions on the link:

https://www.unimi.it/en/international/study-abroad/international-opportunities/bando-summer-school-smart-technologies-and-practices-sustainable-agricultural-water-management-0

DEADLINE FOR APPLICATION
March 4th, 2024 - h 11.59 pm (Italian Time)

If you have any doubts or problems with the registration, please do not hesitate to write to antonia.moreno@unimi.it or contact the proponents.

L'evento partecipa al programma di formazione professionale continua dei Dottori Agronomi e dei Dottori Forestali per 5 CFP con riferimento al Regolamento CONAF n. 162/2022.

The school has been organized with the scientific and financial support of the INCIPIT project (Research project MIUR PRIN 2017 - 2017XWA834)

SCHOOL PROPONENTS & CONTACTS

	**Daniele Masseroni** **Role:** Associate Professor in Agricultural Water Management **Specialization** :agro-hydrological modelling, irrigation engineering, sensors, automation. **Affiliation:** Department of Agricultural and Environmental Sciences - University of Milan **Contact:** daniele.masseroni@unimi.it
	**Arianna Facchi** **Role:** Associate Professor in Agricultural Water Management **Specialization**: agro-hydrology, modelling, sensors. **Affiliation:** Department of Agricultural and Environmental Sciences - University of Milan **Contact:** arianna.facchi@unimi.it
	**Daniele Zaccaria** **Role:** Associate Professor and Agricultural Water Specialist in Cooperative Extension **Specialization**: Irrigation engineering; agricultural water management. **Affiliation**: Department of Land, Air, and Water Resources - University of California, Davis. **Contact:** daniele.zaccaria@ucdavis.edu
	**Isaya Kisekka** **Role:** Full professor Agricultural Water Management and Irrigation Engineering **Specialization**: agro-hydrology, irrigation, sensors, modelling **Affiliation**: Department of Land Air and Water Resources - University of California, Davis **Contact:** isaya.kisekka@ucdavis.edu

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