



Master's Programme in Sustainable Water and Land Management in Agricultural Ecosystems

Academic Year 2025 – 2026

Jointly organized by CIHEAM Bari and Politecnico di Bari

DESCRIPTION

The Master's programme aims at preparing the new generation towards professional and academic careers and enabling their effective contribution to the sustainable management of water and land resources, and to the socio-economic development thereof, in view of important challenges that include water scarcity, land degradation, demographic pressures and climate change.

A major focus is on the increase of cross-sectoral coherence between Sustainable Development Goals and the application of modern technologies and tools that integrate agronomic, engineering, environmental and socio-economic aspects of water and land management.

Students follow theoretical and practical sessions and acquire the necessary skills to apply integrated approaches of water and land management for sustainable agriculture, under significant challenges of climate change, resource scarcity, environmental degradation, and societal changes.

The programme presents the basic principles and the latest scientific and technological achievements in irrigation systems at farm and large-scale level, taking into consideration the application of innovative "green" management solutions.

At the end of the programme, the students acquire the following competencies:

- ❖ management of water resources with a view to land conservation and water use efficiency increase in Mediterranean agroecosystems,
- ❖ management of a range of alternative water resources including saline and reclaimed water, and water harvesting systems for irrigation purposes,
- ❖ planning and evaluation of irrigation projects, at farm and large-scale level to optimize water/land/nutrient use, considering societal/institutional aspects and economic criteria,
- ❖ knowledge of the latest technologies and tools for a sustainable management of water resources at different scales and in different agroecosystems.

A variety of teaching strategies, including practical activities, assignments and technical visits accommodate the needs of students with diverse learning styles, abilities, backgrounds and experiences.

The programme is carried out in collaboration with renowned Italian and foreign lecturers, academics and practitioners.

ORGANIZATION

First Year: 60 ECTS

Second-Level University Master - CIHEAM Bari and Politecnico di Bari

Duration: October 2025 - June 2026

Second Year: 60 ECTS

Master of Science - CIHEAM

Duration: November 2026 - October 2027

CANDIDATES' PROFILE

Courses are addressed to new graduate students and young professionals with a university background on agricultural engineering and related sciences including, irrigation, land management, socio-economics and environmental conservation.

Requirements:

- Holding a University degree awarding min. 240 ECTS (diploma awarded after the completion of four or five years of University studies).
- Good knowledge of spoken and written English.
- Personal access to computer facilities.

ADMISSION

Selection of students is based on:

1. Screening of documents uploaded online by candidates to support their application.
2. Online interviews.
3. Admitted students will be also registered to the Esse3 Italian University platform and will have to produce a legalized copy of their diploma and the Declaration of Value.

APPLICATIONS through the CIHEAM Bari Platform

Deadline: 31 May 2025

COSTS

Registration fee: 400.00€/year.

Tuition fee: 3,600.00€ (travel, accommodation and insurance expenses not included).

SCHOLARSHIPS

CIHEAM Bari grants full or partial scholarships to candidates according to a ranking list. Priority is given to students coming from CIHEAM Member countries and other Mediterranean, Western-Balkan, African and Middle Eastern Countries

LANGUAGE OF INSTRUCTION: English

Second-Level University Master Programme (60 ECTS)

Preparatory Unit - Foundations of Sustainable Irrigation and Water Management (distance learning). This teaching unit, inspired by a series of webinars, reflects the comprehensive nature of the master's program in sustainable water management. It covers critical aspects of the field, including technological innovations, economic considerations, and governance structures essential for effective water management. The unit is designed to provide students with a holistic understanding of how water resources can be managed sustainably across various sectors and contexts.

Unit I - From Soil Genesis to Sustainable Practices: A Comprehensive Approach. This unit describes land and water resource status in Mediterranean environments and the main challenges for their use in agriculture. Key concepts for resources classification and survey are accomplished by technical field visits and practical examples. Linkages between rainfall patterns, soil properties, land degradation, desertification, drought and land use planning will be discussed. Moreover, the unit focuses on conceptual and quantitative understanding of surface and groundwater hydrological processes and explores the practices, approaches and tools, with regards to an integrated surface and groundwater management in agricultural environments.

Unit II - Soil-Plant-Atmosphere Dynamics in Sustainable Irrigation. This unit focuses on the soil-plant-atmosphere interaction at the farm scale and aims to enhance students' capacities to apply sustainable water management practices and tools under different pedo-climatic conditions and contexts considering agronomic, engineering and environmental issues. Students will enhance their knowledge on soil physics, agro-meteorology and soil plant-atmosphere continuum.

Unit III - Advanced Irrigation Water Management. Principles, Practices and Tools: Crop water requirements, Irrigation scheduling, resources use efficiency, crop growth modelling, and on-farm water management strategies and technologies are core to this unit. Through theoretical and practical sessions this TU will deliver the basic and advanced knowledge to simulate crop growth, development and yield, and to manage on-farm irrigation with practical tools including digital apps.

Unit IV - Modern Irrigation Infrastructure: Planning, Design, and Management. This unit explores an integrated approach that fosters optimal water allocation and resilient design of irrigation systems in a performance-oriented perspective. For an outlook in efficient resource management in agriculture, students will learn about renewable energy for sustainable irrigation, and multi-objective planning, design and management of open channel and of pressurized large-scale irrigation systems.

Unit V - Harnessing Geomatics for Natural Resource Management in Agriculture. This unit provides students with basic knowledge on the use of smart tools for driving decisions towards a more sustainable irrigation management in agriculture. Remote sensing, geographic information and global position systems are deployed as tools for the acquisition, management, processing, analysis and display of spatial data and information. Moreover, advances and innovations in digital ag and farm irrigation including IoT-based systems are explored.

Unit VI - Reimagining Irrigation: Sustainable Use of Alternative Water Resources. This unit offers a holistic approach towards Alternative Water Resources (AWR) management and practices in agriculture as a sustainable, innovative, and cost-effective way for improving community access to water in scarce areas, thereby contributing to climate adaptation. Major focuses will be on the use of low-quality waters, salinity control and its impact on soils and crops, drainage systems design and management, and desalination processes.

Unit VII - Economic Principles of Irrigated Agriculture and Water Management. The unit introduces the basic concepts of economic principles of farm management for an optimal use of irrigation water and the planning of irrigation projects taking into account the main institutional problems of the Mediterranean irrigation sector. Cost recovery and irrigation water pricing issues will be important focuses.

Unit VIII - Eco-Environmental Evaluation in Irrigation: Governance and Sustainability. Drivers, challenges and main outcomes and shortcomings of water policies in the Mediterranean agricultural context will be illustrated and analyzed. Participatory approaches for Irrigation Management (PIM) and Transfer (IMT) will be important focuses. Students will be introduced to the most used approaches and metrics to evaluate the social and environmental impacts of the main programs and measures. Students will also acquire the basic concepts of economic and financial feasibility evaluation and learn how to undertake a Cost/Benefit Analysis of irrigation projects.

Unit IX - Holistic Design and Management of Irrigation Projects and Case study application. Students will be engaged since the beginning of the course in an extensive teamwork to design a large-scale irrigation system, integrating concepts, techniques and approaches, developed throughout the different teaching units. Team-working provides great learning opportunities and promotes workplace synergy. The process will include a comprehensive analysis of climate, soil, and crop data and the hydraulic design of a large-scale distribution network based on optimal cropping pattern determined using different simulation scenarios and economic criteria.

Master of Science Programme (60 ECTS)

The best classified students at the Second-Level University Master are admitted to the Master of Science Programme of CIHEAM Bari and conduct an applied research under academic supervision. Topics of the MSc theses will be chosen considering CIHEAM Bari research priorities, the current funded research/cooperation programs, and bilateral agreements with public/private institutions and enterprises. Research will address the challenges related to water and land management in agroecosystems, and with a problem-solving approach, investigate and apply the latest scientific, technological, and/or socio-economic solutions.

Main research lines include: Application of remote sensing technologies, machine learning and IoT to improve land, water and nutrient use in agriculture; Soil water balance and crop-growth modelling; Resource use optimization and eco-efficiency in land and water management; Water-energy nexus (renewable and non) for efficient management of irrigation systems; Treatment and reuse of alternative water resources in agricultural ecosystems; Agro-economic modelling to optimise land and water management strategies and policies; Policies and economic tools for an effective implementation of water demand management in agriculture.