Master of Science Programme
in
SUSTAINABLE WATER AND LAND MANAGEMENT IN AGRICULTURE

Academic Year 2023 – 2024

DESCRIPTION

The Master of Science 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 in agriculture, 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 in agriculture.

Students follow theoretical and practical sessions that aim at framing improved management of water and land resources, at increasing food production using less water, and reversing land degradation. 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, students acquire the skills to apply integrated approaches of water and land management for sustainable agriculture and food systems, under significant challenges of climate change, resource scarcity, societal changes and food insecurity.

Specifically, they acquire the following competencies:

- management of water resources in agriculture 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 will accommodate the needs of students with diverse learning styles, abilities, backgrounds and experiences.

The programme is carried out in collaboration with national and international Institutions and Universities, and with the participation of academics and practitioners.

ORGANIZATION

First Year: 60 ECTS
Diploma: Master of CIHEAM Bari
Duration: from October 2023 to June 2024

Second Year: 60 ECTS
Diploma: Master of Science (MSc)
Duration: from November 2024 to October 2025

CANDIDATES' PROFILE

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

Requirements:

- Holding a University degree awarding at least 180 ECTS;
- Having completed four out of five years of University studies, upon agreement between the sending University and CIHEAM Bari (the year attended at CIHEAM Bari is recognized as final year in order to graduate at the University of origin);
- 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.

APPLICATIONS

through the CIHEAM Bari Platform (https://online-application.iamb.ciheam.org)
Deadline: 31 May 2023

COSTS

Registration fee: 200.00€/year.
Tuition fee: 500.00€/month (travel, accommodation and insurance expenses not included).

SCHOLARSHIPS

CIHEAM Bari grants **full** or **partial scholarships** to candidates according to a ranking list.

LANGUAGE OF INSCTRUCTION: **English**

Fur further information and application procedure: www.iamb.it

First-year programme

Unit I - Sustainability in agriculture and food systems (distance learning): It frames the concepts of sustainability applied to agriculture and food
sectors. It provides elements for understanding the main agricultural challenges to design solutions and actions towards sustainable and resilient agri-food systems. The multi-dimensional nature of sustainability challenges will be analysed, getting students to reflect on processes for sustainability transitions in agri-food systems.

Unit II - Sustainable land and water management: This unit describes land and water resource status in Mediterranean environments and the main challenges for their use in agriculture. Soil genesis and characteristics are discussed, introducing key concepts for resources classification and survey, 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 III - Sustainable on-farm irrigation management: 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, soil plant-atmosphere continuum, crop water requirements and Irrigation scheduling, resources use efficiency, crop growth modelling, and on-farm water management strategies and technologies.

Unit IV - Irrigation 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 advances and innovations in farm irrigation including renewable energy and IoT-based systems, and multi-objective planning, design and management of open channel and of pressurized large-scale irrigation systems.

Unit V - Use of smart tools 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, base maps and data for the irrigation project design (Unit IX) will be organized and refined.

Unit VI - Use of Alternative Water Resources in agriculture: 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 - Water Economics: 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. Students will acquire the basic concepts of economic and financial feasibility evaluation and learn how to undertake a Cost/Benefit Analysis of irrigation projects.

Unit VIII - Water Policy and Governance: Drivers, challenges and main outcomes and shortcomings of water policies in the Mediterranean agricultural context will be illustrated and analysed. 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.

Unit IX - Irrigation project – An integrated approach: Students will be engaged since the beginning of the course in an extensive team-work 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.

Second-year programme

Students who have successfully completed the first year are admitted to the second-year programme to conduct an applied research, under academic supervision. 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 and other modern tools to improve land, water and nutrient use in agriculture; Soil water balance and crop-growth modelling under different climatic and management scenarios; Resource use optimization and eco-efficiency in land and water management; Water-energy nexus (renewable and non) for efficient management of large scale pressurized irrigation systems; Technical and socio-economic impacts of modernization processes; Treatment and reuse of alternative water resources and impact on the environment and irrigation systems; Agro-hydrological modelling and modern techniques for field validation/calibration; Agro-ecological characterization, soil degradation and conservation, sustainable soil/land management; Agroeconomic and hydro-economic modelling to optimise land and water management strategies and policies; Characterization, modelling and participatory simulations of water use and development strategies; Policies and economic tools for an effective implementation of water demand management in agriculture