MASTER & MASTER OF SCIENCE PROGRAMMES IN "SUSTAINABLE WATER AND LAND MANAGEMENT IN AGRICULTURE"
ACADEMIC YEAR 2021 – 2022

DESCRITPION

The Master of Science Programme provides a two-year curriculum whose main objective is to prepare a new generation of motivated students towards professional and academic careers for the promotion of sustainable water and land management in agriculture and food sector in the framework of the Sustainable Development Goals (SDGs).

The programme frames water and soil as scarce resources, under pressure for population growth and climate change, and whose use and conservation are important for food production and ecosystem services provision. It focuses on irrigated agriculture, presenting the range of water resources available, and advanced topics and technological achievements for their sustainable exploitation at farm and large-scale level. Considering the worldwide importance of rainfed agriculture, the course also introduces the range of agricultural practices for soil conservation and management. Technologies and systems are analysed according to technical, social, economic and environmental issues, taking into considerations the application of innovative "green" management solutions. A key focus is dedicated to remote sensing and geographic information system applications finalized to sustainable water and land management.

At the programme completion students will be able to:
✓ promote integrated water and land management, at farm and large-scale level, taking into consideration the challenges of resource scarcity and fragility;
✓ manage water and land resources in a variety of agroecosystems adopting resource conservation measures and increasing water use efficiency and productivity;
✓ use a range of alternative water resources, including saline and treated wastewater, for irrigation purposes;
✓ research, plan and evaluate irrigation projects to optimize water/land/nutrient use, considering environmental/societal/institutional aspects and economic criteria, and using a variety of methodologies and tools.

Students will follow several practical activities and assignments, and will participate to technical visits on specialized farms, aimed at enhancing their skills and competencies.

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: 9 months (Oct - Nov 2021 distance learning; Dec 2021 – Jun 2022 at CIHEAM Bari)

Second Year: 60 ECTS
Diploma: Master of Science
Duration: 12 months

CANDIDATES' PROFILE

Courses are addressed to new graduate students and young professionals with a university background related to agronomic, irrigation, agricultural engineering and socio-economic issues.

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 sent online by candidates to support their application
2. Online interview

Submission of applications through the online procedure
Deadline: 30 June 2021

COSTS

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

BENEFICIARIES

Master and MSc Programmes are open to candidates of any nationality.

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, Balkan and Middle Eastern Countries.

LANGUAGE OF INSTRUCTION: **English**

For further information and application procedure: www.iamb.ciheam.org

Distance learning stage

The course will start with a 2-month distance learning phase with teaching units aimed at developing students' knowledge and mindset on issues related to sustainability and resilience of agro-ecosystems.

Unit I - Sustainability in agriculture and food systems: 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 - Climate "smart" agroecology: agroecology is the discipline that studies the ecological processes at the base of the functioning of agro-ecosystems. The course aims to provide a widely applicable knowledge base to increase the resilience and production of agro-ecosystems, in a changing climate scenario. Students will learn how to assess the complexities and challenges of agro-ecosystems, and ways for sustainable planning of actions to mitigate and adapt to climate change and other global drivers of change.

Face-to-face stage

Students will attend the courses and develop a project at CIHEAM Bari.

Unit III – Basic concepts of sustainable land and water management: the unit describes land and water resource status in Mediterranean environments, and the main challenges for their use in agriculture. Water and 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. Practical examples of sustainable land and water management to reverse and mitigate land degradation in various Mediterranean ecosystems will illustrate some of the most prominent best management practices.

Unit IV - Smart tools for the management of natural resources in agriculture: it provides students with basic knowledge on the use of smart tools important for driving decisions towards more sustainable ways of natural resources management in agriculture. Focuses will be on Remote Sensing, Geographic Information Systems, Global Position Systems as tools for the acquisition, management, processing, analysis and display of spatial data and information. During this unit, the base maps and data for the irrigation project design will be refined and organized.

Unit V - Sustainable on-farm water management: it focuses on water and land management problems and solutions at farm level and aims to enhance students' capacities to apply sustainable water practices and tools in different environments 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 Practical irrigation scheduling, Resources use efficiency, Crop growth modelling, and On-farm water management strategies and technologies.

Unit VI - Irrigation planning, design and management: this unit explores an integrated approach that fosters an optimal allocation, a resilient design and an efficient management of water in agriculture, at scheme and farm levels, tackling the different dimensions of water infrastructure development: storage, distribution, and access opening-up to Institutional capacity to provide the necessary water services. The concept of "Adaptive Planning" of infrastructure to uncertainties, including climate, will be also analyzed. Students will learn about advances in surface irrigation technologies, innovations in micro-irrigation, open channel irrigation design and management, multi-objective planning of large-scale pressurized systems, renewable energy in water systems.

Unit VII - Use of Alternative Water Resources in Agriculture: this unit offers a holistic approach towards AWR (Alternative Water Resources) management and practices in agriculture as a sustainable, innovative and cost-effective way of improving community access to water in water scarce areas, thereby contributing to climate adaptation. Major focuses will be on decentralized rainwater harvesting and storage systems, use of low-quality waters, salinity control and its impact on soils and crops, drainage systems design and management, desalination process.

Unit VIII - Water Economics and Governance: the unit introduces concepts of basic farm economic principles and tools for an optimal water allocation and planning of irrigation projects considering the main institutional issues of the Mediterranean irrigation sector. Cost Recovery and Water Pricing Policy will be important focuses. Students will understand how to undertake a Cost/Benefit Analysis of irrigation projects and learn about Participatory approaches for Irrigation Management (PIM) and Transfer (IMT).

Irrigation project: students will be engaged from the beginning of the course in a teamwork, aimed at developing multi-disciplinary skills for the design of irrigation schemes. The process will include a comprehensive analysis of climatic, soil and crop data; 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
November 2021 - October 2022

Students who have successfully completed the first year, and have met the prerequisites set by the Institute, will be admitted to participate in the 2nd year programme for the implementation of applied research, under academic supervision. Research will cover the latest scientific, technological, and/or socio-economic challenges related to water and land management issues, at farm or large-scale level, which need investigation and solutions.

Topics available for Master of Science 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;
- Agro-economic 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.