# MASTER & MASTER OF SCIENCE PROGRAMMES IN "SUSTAINABLE WATER AND LAND MANAGEMENT IN AGRICULTURE

## ACADEMIC YEAR 2020 – 2021

### 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 a sustainable use of land and water in agriculture, in view of important challenges that include water/land scarcity, population growth, climate change and correlated environmental and socio-economic burdens. A major focus will be on the application of modern technologies and tools that integrate agronomic, engineering, environmental and socio-economic aspects of land and water management in agriculture.

Candidates will follow theoretical and practical sessions that aim at framing the water and land resources management within a sustainable development perspective of agriculture and food sectors. The programme presents basic principles and advanced topics of the latest scientific and technological achievements, discussing challenges for the best exploitation of resources and options for a sustainable management at farm and large-scale level. Irrigation technologies and systems are analysed according to technical, social, economic, and environmental issues, taking into considerations the application of innovative "green" management solutions.

At the end of the programme, students will acquire the following skills and competencies:
- treat water management issues in the context of sustainability of agriculture and food systems, taking into consideration the challenges of climate change, resource scarcity, societal changes, food insecurity;
- manage water resource in a variety of agroecosystems for land conservation and increase the water use efficiency in the irrigation sector;
- use a range of alternative water resources, including saline and treated wastewater, for irrigation purposes;
- plan and evaluate irrigation projects, at farm and large-scale level to optimize water/land/nutrient use, considering societal/institutional aspects and economic criteria;
- use latest technologies and tools for a sustainable management of water resources at different scales and in different agroecosystems.

The Programme is carried out in collaboration with national and international Institutions and Universities.
International scientists and practitioners, with a consolidated knowledge on the covered topics, will give lectures.

Students will also undertake several practical activities and assignments, aimed at developing their skills and competencies in the Master sector.

### ORGANIZATION

**First Year: 60 ECTS**
**Diploma: Master of MAIB / Master Universitario di I Livello (First level Master)**
**Duration: 8 months (Dec 2020-Feb 2021 distance learning; Mar-Jul 2021 at CIHEAM Bari)**

**Second Year: 60 ECTS**
**Diploma: Master of Science**
**Duration: 12 months (mobility in the country of origin)**

### 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:**
- **Three years (180 ECTS) or Four years (240 ECTS) of university studies;**
- **Four years out of five of university studies (240 ECTS)**, upon agreement between the sending University and CIHEAM Bari;
- **Five years of university studies (300 ECTS)**;
- **Professionals** having a degree (3-4years) and at least **2 years** of experience in a field related to the Master Programme;
- 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. Skype interview

**Submission of applications through the online procedure**
**Deadline:** 30 September 2020

### 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

# FIRST-YEAR PROGRAMME
# MASTER/MASTER UNIVERSITARIO DI I LIVELLO
## DECEMBER 2020 – JULY 2021

The Master course will develop according to a series of teaching units and a final irrigation project design:

Unit I - Sustainability in agriculture and food systems: it frames the concepts of sustainability applied to agriculture and food sectors and provides for elements r understanding the main challenges to design solutions and actions towards sustainable agri-food systems. The multi-dimensions 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 agroecosystems. The course aims to provide a widely applicable knowledge base to increase the resilience and production of agroecosystems in a changing climate scenario. Students will learn how to analyse the complexities and challenges of agroecosystems, and ways for sustainable planning of actions to mitigate and adapt to climate change and other global drivers of change.
Unit III - 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 resource 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. Multi-model mechanistic approaches and examples of multi-criteria Decision Supporting Systems will be also presented.

Unit IV - Sustainable on-farm irrigation management: it focuses on water and land management problems and solutions at farm level and aims to enhance students' capacities to apply sustainable irrigation practices and tools in different environments and contexts. Students will enhance their knowledge on Pedology, Soil physics, Agro-meteorology, Soil-Plant-Atmosphere Continuum, Crop water requirements and Practical irrigation scheduling, Resources use optimization, Crop growth modelling, and On-farm irrigation methods and management.

Unit V - Irrigation systems design, planning and management: this unit explores an integrated approach that fosters a resilient design and an efficient management of water in agriculture, at scheme and farms levels. 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 VI - 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 rainwater harvesting, use of low-quality waters, salinity control and its impact on soils and crops, drainage systems design and management.

Unit VII - Water Economics and Governance: the unit introduces concepts of basic economic principles and tools for efficient irrigation 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 design: an integrated approach: students will be engaged in a team 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 the choice of the optimal cropping pattern determined using different simulation scenarios (limited availability of water, use of salt water, etc.) and economic criteria.

# SECOND-YEAR PROGRAMME - MASTER OF SCIENCE

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
- Nexus Energy - Hydraulic Performance, based on Management of Large-Scale Pressurized Irrigation Systems;
- Modernization techniques of pressurized irrigation system and related technical and socio-economic impacts;
- Impact of saline and treated wastewater use on the environment, cropping pattern, irrigation management and irrigation systems performance;
- Agro-hydrological modelling and modern techniques to estimate soil hydraulic parameters;
- Agroecological characterization, soil degradation and conservation, sustainable soil/land management;
- Characterization, modelling and participatory simulations of water use and development strategies at the level of rural households and rural territories;
- Economic policies and tools for an effective implementation of Water Demand Management in agriculture.