



Advanced course:

## **INTEGRATING THE WATER-ENERGY-FOOD-ECOSYSTEM (WEFE) NEXUS APPROACH IN MEDITERRANEAN IRRIGATED AGRICULTURE**

Zaragoza (Spain), 6-11 November 2023

### **PROGRAMME**

#### **0. Opening (1 hour)**

#### **1. Framing the WEFE nexus in Mediterranean irrigated agriculture (5 hours)**

- 1.1. The challenging interdependency between Water, Energy, Food and the Ecosystem (WEFE) in the light of the Sustainable Development Goals (1 h) (G. Bidoglio)
- 1.2. WEFE nexus implementation under climate change: from silo thinking to cross-sectoral risk & benefit sharing (1 h) (G. Bidoglio)
- 1.3. Discussion of the situation of the WEFE nexus in participant's countries (1 h) (A. Rhouma, F. Nardi)
- 1.4. Case study – Irrigated agriculture under severe stress: the views of an environmental NGO. Tablas de Daimiel, Doñana; and/or Campo de Cartagena (1 h) (A. Fernández)
- 1.5. Case study – Irrigated agriculture under severe stress: Irrigated agriculture under severe stress: view of a scientist's and a practitioners country (1 h) (A. Rhouma, F. Nardi)

#### **2. Deploying innovative technological solutions (10 hours)**

- 2.1. Regulated deficit and low-pressure irrigation to reduce the water and energy dependence of Mediterranean irrigated agriculture (1 h) (N. Zapata)
- 2.2. Alternative water resources for Mediterranean agriculture: quality and energy requirements (1 h) (A. Battilani)
- 2.3. Software, modelling and decision-making tools for building and managing nexus-ready irrigation systems (1 h) (M.A. Moreno)
- 2.4. Making the most of renewable and grid energy for irrigation pumping requirements (1 h) (To be decided)
- 2.5. Optimizing nitrogen input and using monitoring networks to reduce nitrate water pollution in irrigated areas (1 h) (D. Isidoro)
- 2.6. Exploratory solutions and trade-offs for the complex relationship between wetlands and irrigated agriculture (1 h) (C. Castañeda)
- 2.7. Case study – Implementing transdisciplinary WEFE nexus and stakeholder engagement for sustainable resource allocation in the Val di Cornia, Italy (1 h) (F. Nardi)
- 2.8. Case study – “Piano Laghetti”: interconnected small nature based solutions providing ecosystem services, water storage and energy generation (1 h) (A. Battilani)
- 2.9. Practical session: Implementing the nexus in a solid-set irrigated farm using electricity for pumping in a vulnerable area for nitrate pollution (2 h) (N. Zapata, E. Playán)

#### **3. Developing policy and governance approaches (9 hours)**

- 3.1. The nexus policy framework: EU and non-EU policies and strategies, institutional coordination challenges and barriers, and a nexus approach to coordinated WEFE policy development (2 h) (I. la Jeunesse)
- 3.2. Innovative nexus governance approaches: institutional aspects illustrated by case studies in the Mediterranean (3 h) (I. la Jeunesse)
- 3.3. Case study – The North-Western Sahara Aquifer System: options for nexus policies in a transboundary situation (1 h) (Y. Almulla)

- 3.4. Case study – River contracts in Italy: a policy instrument implemented by water users associations to control nitrate pollution (1 h) (A. Battilani)
- 3.5. Practical session – Nexus game: exploring the nexus solutions tool for optimizing multi-scale energy-water-land system transformations (2 h) (Y. Almulla)
- 4. Performing sustainability assessments and nexus trade-off analyses (8 hours)**
  - 4.1. Assessing WEFE trade-offs across different scales; translating findings into decision support (1 h) (A. Karnib)
  - 4.2. Sustainability assessment: ecological footprinting and life cycle analysis (LCA) (1 h) (E. López Günn)
  - 4.3. Ecosystem services accounting (1 h) (M. Lago)
  - 4.4. Practical session – Application of the Q-Nexus Web Tool for resilient Mediterranean irrigated agriculture (2 h) (To be decided)
  - 4.5. Case study – Application of the Q-Nexus Web Tool for resilient Mediterranean irrigated agriculture (1 h) (A. Karnib)
  - 4.6. Practical session – Life Cycle Analysis for resilient Mediterranean irrigated agriculture (2 h) (E. López Günn)
- 5. Round table (2 hours)**

“Implementing the WEFE nexus in Mediterranean Water Users Associations: constraints, challenges and expected benefits” (A. Battilani, A. Karnib, A. Rhouma).
- 6. Technical visit to the Monegros area (N. Zapata and E. Playán)**

The field trip, programmed for November 11, will visit this irrigated area of 125,000 ha using water resources from reservoirs in the Pyrenees mountains. The main WEFE traits of this irrigated area will be presented: water scarcity, production of renewable energies, energy consumption for pumping, production of agricultural commodities and food, water pollution control and irrigation modernization. Successes and complex challenges in Nexus implementation.