



Objective

Non-conventional water resource development and use for agriculture in arid and semiarid regions is of utmost importance in responding to the increasing food demand of the rapidly and ever-growing population. These regions suffer from growing water scarcity, water quality deterioration, and the uncertainties associated with climate change. To overcome this situation, the safe use of treated wastewater should be largely adopted where the available water for agriculture is decreasing.

The challenge lies in equipping professionals involved in the management and use of non-conventional water resources with the most efficient and cost-effective treatment technologies, together with protocols, guidelines and case studies to support optimal use of these valuable resources. This advanced course will provide an overview into regulatory frameworks as well as legal, environmental, and socioeconomic constraints to ensure the safe use of non-conventional water resources. It will also present actionable recommendations and illustrative examples to promote social acceptance and inform effective re-use policies.

The aim of this advanced course is to integrate the key elements and technologies involved in the reuse of wastewater for agriculture to enhance the capacity of professionals working in this field. The course focuses on the adoption of evidence-based solutions of reuse of treated wastewater at different scales, its environmental and safety impacts, according to the principle of integrated water resources management and the circular economy approach.

At the end of the course, participants will have:

- better understanding of the role of wastewater reuse in water resource management and planning;
- enhanced capacity to assess wastewater suitability for irrigation;
- been acquainted with current regulatory framework on wastewater reuse at national and international level;
- learn about the necessary treatments for a safe wastewater fit-for purpose reuse, technically and economically viable;
- greater capacity to perform risk analysis for wastewater reuse;

- insights on irrigation practices and techniques for the use of reclaimed water sources that preserve soil quality and crop production;
- knowledge about strategies to improve the acceptance of wastewater reuse for food production;
- awareness about the institutional and socioeconomic implications of wastewater reuse projects;
- enhanced experience on the development and implementation of wastewater reuse projects through real success cases.

Organisation

The course is jointly organised by the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), through the Mediterranean Agronomic Institute of Zaragoza (CIHEAM Zaragoza), and the International Center for Agricultural Research in the Dry Areas (ICARDA), with the collaboration of the Regional Office for Near East and North Africa of the Food and Agriculture Organization of the United Nations (FAO), the Spanish Agency for International Development Cooperation (AECID) and the International Water Management Institute (IWMI).

The course will be held at CIHEAM Zaragoza over a period of one week, from 20-25 October 2025, in morning and afternoon sessions. It will also be held online through live sessions transmitted from CIHEAM Zaragoza. The course will be given by well qualified lecturers from international organisations, and research centres, firms and associations in different countries.

The course requires personal work and interaction among participants and with lecturers. The international characteristics of the course favour the exchange of experiences and points of view. Formal lectures are illustrated by applied examples, real case studies in various contexts and debates. Practical sessions will be devoted to risk management assessment for wastewater reuse; good agricultural practices in different socioeconomic contexts; and to skills improvement in participatory processes for wastewater reuse projects.

Participants will be invited to provide a brief document about experiences in wastewater reuse in their specific regions/countries. These will be distributed to all participants and lecturers and will be the basis for a debate at the beginning of the course.

Programme

0. Opening session and programme presentation (1 hour)
1. Water reuse in perspective (4 hours)
 - 1.1. Role of wastewater resources in water-scarce conditions
 - 1.1.1. Historical review of the treated wastewater reuse in the agricultural sector
 - 1.1.2. Opportunities and challenges associated with the use of reclaimed water
 - 1.2. The water reuse concept
 - 1.2.1. Wastewater sources
 - 1.2.2. Wastewater fate: direct and indirect use of wastewater and wastewater lost
 - 1.2.3. Integration of wastewater resources in an IWRM scheme
 - 1.2.4. Treated, partially treated and untreated wastewater
 - 1.3. Wastewater and circular economy (sludge, biogas, phosphorus, etc.)
 - 1.4. Debate: experiences in participants' countries
2. Quality requirements for water reuse and water reclamation treatments (3 hours)
 - 2.1. Quality parameters and potential hazards for water reuse
 - 2.2. Water reclamation treatments
 - 2.2.1. Wastewater collection, treatment, storage and distribution
 - 2.2.2. Low-cost treatments. Decentralised and extensive reuse technologies
 - 2.2.3. Primary, secondary and tertiary wastewater treatments
 - 2.2.4. Advanced treatments
3. Risk assessment (3 hours)
 - 3.1. One health risk assessment (human, animal and environment)
 - 3.2. Quantitative and Qualitative Risk Assessment Methods
 - 3.2.1. WHO's Sanitation Safety Planning approach
 - 3.2.2. EC guidelines
 - 3.2.3. HACCP (Hazard Analysis and Critical Control Points) adapted for wastewater reuse
 - 3.3. Application of Risk-Based Approaches in Wastewater Management
 - 3.3.1. Identifying critical control points in wastewater treatment and irrigation
 - 3.3.2. Case studies of risk-based decision-making in agriculture
 - 3.4. Practical exercise on Water Reuse Risk Management for Agricultural Irrigation Schemes
4. Implementation of treatment technologies (2 hours)
 - 4.1. Operation and maintenance of water reclamation systems
 - 4.2. Continuous production vs seasonal uses
 - 4.3. Costs and technological efficiency
5. Field implementations to manage crop production system sustainability in arid and semi-arid zones (4 hours)
 - 5.1. Quality of the effluent and choice of the irrigation system and devices
 - 5.2. Effects in the short and long term on crops, soil and land sustainability
 - 5.2.1. Salinity effects
 - 5.2.2. Nutrient management
 - 5.2.3. Crop yield and quality
 - 5.2.4. Emergent contaminants
 - 5.3. Innovative approaches and advanced tools to manage wastewater at Irrigation district level
6. Institutional framework and socioeconomic aspects (7 hours)
 - 6.1. Social and economic analysis
 - 6.1.1. Cost-benefit analysis to assess the economic feasibility
 - 6.1.2. Stakeholder and consumer acceptance (markets)
 - 6.1.3. Strategies to promote irrigation with treated wastewater in Europe and throughout the Mediterranean region
 - 6.2. Institutional framework
 - 6.2.1. Inter-sectoral coordination requirements and policy coherence
 - 6.2.2. Development of scenarios for institutional set up/establishment of wastewater reuse management
 - 6.3. Policy Instruments
 - 6.3.1. Public/private partnership
 - 6.3.2. Economic incentives (tariffs, subsidies etc.)
 - 6.3.3. Innovative financing and cost recovery
 - 6.4. Regulations and standards at national and international level: differences between the Arab and Mediterranean countries
 - 6.5. Practical exercise on good agricultural practices reusing wastewater in different socioeconomic contexts
7. Experiences in reclaimed water use (7.5 hours)
 - 7.1. Real case studies
 - 7.2. Practical exercise: participatory processes for wastewater reuse projects
8. Conclusions and messages to take home (0.5 hours)
9. Technical visit to wastewater treatment plants and to an irrigation area using wastewater.

Guest lecturers

Alarcón, Juan José - CEBAS-CSIC, Murcia (Spain)
Al-Hamdi, Mohamed - FAO-RNE, Cairo (Egypt)
Alhariry, Heba - FAO-RNE, Cairo (Egypt)
Allende, Ana - CEBAS-CSIC, Murcia (Spain)
Battilani, Adriano - ANBI, Roma (Italy)
Isidoro, Daniel - Univ. Zaragoza, Teruel (Spain)
Lombard-Latune, Rémi - INRAE, Villeurbanne (France)
Mateo-Sagasta, Javier - IWMI, Colombo (Sri Lanka)
Noury, Benjamin - Independent consultant, Tunis (Tunisia)
Pedrero, Francisco - CEBAS-CSIC, Murcia (Spain)
Simón, Pedro - ESAMUR, Murcia (Spain)

Admission

The course is designed for professionals with a university degree and is aimed at public and private professionals involved in water decision making, management, treatment, reuse, technical consultancy and research in the agricultural sector.

- 25 places will be available for face-to-face participation (lectures, practical exercises, case studies, & technical visit).
- 25 places will be available for online participation (lectures and case studies).

Knowledge of English or Spanish will be valued in the selection of candidates. Simultaneous interpretation in these two languages will be provided.

Registration

- Candidates may apply online at the following address: <https://admission.iamz.ciheam.org/en/>
- Applications must include the curriculum vitae and a copy of the supporting documents most related to the subject of the course
- The deadline for the submission of applications is 27th July 2025. The deadline may be extended for candidates not requiring a visa and not applying for a grant if there are free places available.
- Applications from candidates requiring authorisation to attend the course may be accepted provisionally.
- Registration fees for the course amount to 500 euro for face-to-face participation and 350 euro for online participation. This sum covers tuition fees only.

Support to candidates

Candidates from Mediterranean CIHEAM member countries (Albania, Algeria, Egypt, France, Greece, Italy, Lebanon, Malta, Morocco, Portugal, Spain, Tunisia and Türkiye), other neighbouring countries (Jordan, Libya and Palestinian Territories), and ICARDA Middle East and North Africa partners, may apply for financial support covering registration fees, and for financial support covering the cost of travel and full board accommodation in Zaragoza. Preference will be given to candidates from low- and middle-income countries.

Candidates that wish to request financial support should complete the relevant section when making their online application to participate in the course.

Candidates from other countries who require financial support should apply directly to other national or international institutions.

Insurance

It is compulsory for participants to have medical insurance valid for Spain. Proof of insurance cover must be given at the beginning of the course. Those who so wish may participate in a collective insurance policy taken out by the Organisation, upon payment of the stipulated sum.

With the collaboration of



Food and Agriculture
Organization of the
United Nations



Contact:

Maite Aguinaco
Academic coordinator
iamz@iamz.ciheam.org
www.iamz.ciheam.org



Av. Montañana 1005 - 50059 Zaragoza (Spain) • www.iamz.ciheam.org • (+34) 976 71 60 00

