



Objective

The rapid advancement of Artificial Intelligence (AI) is radically transforming the agrifood sector, offering innovative solutions to improve efficiency, sustainability, and decision-making across the entire value chain. From precision agriculture and livestock management to food processing, distribution and governance, AI-driven technologies are reshaping how food is produced, processed and delivered.

However, the adoption of AI also presents challenges, including ethical considerations, biases, regulatory frameworks, and the need for digital infrastructure and expertise. This requires a rapid learning curve for staff and a change in company procedures and governance.

This course aims to provide professionals with a comprehensive understanding of how AI can be applied in the agrifood sector and equip them with the knowledge to evaluate its requirements, opportunities and risks.

Upon completion of the course, participants will have gained:

- an overview of the digital transformation of the agrifood system and the role of AI in shaping Agrifood 4.0 and beyond;
- a clear understanding of AI fundamentals and techniques and their applications in agriculture, livestock farming, food industry, retail, supply chain management and governance;
- knowledge of AI-driven decision support systems for optimising production, resource management, and logistics;
- insights into the challenges and barriers to AI implementation, including data availability, biases, legal frameworks, and environmental sustainability;
- exposure to case studies showcasing real-world AI applications in different agrifood sectors coming from key actors across the agrifood value chain;

- an understanding of emerging AI technologies and their potential role in shaping the future of the agrifood system.

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).

The course will be held at CIHEAM Zaragoza over a period of one week, from 29 September to 3 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, private companies and universities from different countries. The programme will be delivered in English.

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. Lectures will be complemented with practical work and case studies.

Guest lecturers

Anzaldi, Gabriel - Eurecat, Lleida (Spain)
Athanasiadis, Ioannis - WUR, Wageningen (the Netherlands)
Cots, Azahara - Dueñas Ruart Abogados, Córdoba (Spain)
del Cuvillo, Carlos - Digitanimal, Madrid (Spain)
Díaz de Otálora, Xabier - Univ. Politécnica de Valencia (Spain)
Echeverría, Lluís - Eurecat, Lleida (Spain)
Espejo-García, Borja - Agricultural University of Athens (Greece)
Flor-Montalvo, Francisco J. - Univ. Internacional La Rioja (Spain)
Govind, Ajit - ICARDA, Cairo (Egypt)
Lacueva, Francisco J. - Instituto Tecnológico de Aragón (Spain)
Lloret, Jaime - Univ. Politécnica de Valencia (Spain)
Mallo, Javier - Carrefour, Madrid (Spain)
Zarazaga-Soria, Francisco J. - UNIZAR, Zaragoza (Spain)

Programme

0. Opening session and programme presentation (1 hour)

1. Artificial Intelligence: overview in the agrifood system (5.5 hours)

- 1.1 Introduction to a digital Agrifood 4.0 system
 - 1.1.1 Digitalisation of the agrifood system
 - 1.1.2 Opportunities
 - 1.1.3 Barriers and challenges for application
 - 1.1.4 Sustainability, environmental impact and climate resilience across the agrifood sector
 - 1.1.5 Ethics & legislation
- 1.2 Fundamentals of Artificial Intelligence
- 1.3 Artificial Intelligence methods
 - 1.3.1 Supervised learning
 - 1.3.2 Unsupervised learning
 - 1.3.3 Reinforcement learning
- 1.4 Application of Artificial Intelligence
 - 1.4.1 Tabular data
 - 1.4.2 Time series prediction
 - 1.4.3 Machine vision
 - 1.4.4 Natural language processing
- 1.5 Practical work 1: A data-driven project: CRISP-DM

2. Artificial Intelligence in agriculture (7 hours)

- 2.1 Precision agriculture
 - 2.1.1 Robotics, drones, self-driven vehicles for crop management
 - 2.1.2 Crop and soil analysis
 - 2.1.3 Irrigation requirements
 - 2.1.4 Prediction of the impact of climate change on agrifood sectors
- 2.2 Plant breeding
 - 2.2.1 Phenotyping
 - 2.2.2 Genetic information
- 2.3 Crop disease and pest detection
 - 2.3.1 Early detection of disease and pests
 - 2.3.2 Harvest detection
 - 2.3.3 Post harvest detection
- 2.4 Optimisation of irrigation and fertilisation
 - 2.4.1 Irrigation schedule
 - 2.4.2 Identifying irrigation needs
 - 2.4.3 Nutrient management and precision fertilisation
 - 2.4.4 Water conservation strategies
- 2.5 Practical work 2: A decision support system for agriculture management

3. Artificial Intelligence in livestock farming (7 hours)

- 3.1 Smart livestock monitoring
 - 3.1.1 Animal identification
 - 3.1.2 Behaviour tracking
- 3.2 Disease management and traceability
 - 3.2.1 Animal health monitoring
 - 3.2.2 Prediction and early detection
 - 3.2.3 Disease traceability
- 3.3 Feed and production optimisation
 - 3.3.1 Feed formulation for optimal nutrition
 - 3.3.2 Prediction of animal growth
 - 3.3.3 Prediction of by-products: quantity, quality
- 3.4 AI in aquaculture
 - 3.4.1 Feed optimisation. Animal welfare
 - 3.4.2 Early detection of diseases
 - 3.4.3 Fish prediction for a more sustainable fishery
- 3.5 Practical work 3: Animal welfare assessment with sensors

4. Artificial Intelligence in the agrifood industry (5 hours)

- 4.1 Food processing: Quality and safety
 - 4.1.1 Quality inspection
 - 4.1.2 Food fraud detection
- 4.2 Food processing: Automation in production lines
 - 4.2.1 Optimisation in energy and water
 - 4.2.2 Machine maintenance
 - 4.2.3 Production control and OEE
 - 4.2.4 Production scheduling
- 4.3 Demand forecasting and logistics management
 - 4.3.1 Demand prediction
 - 4.3.2 Inventory and storage management
 - 4.3.3 Supply chain optimisation
 - 4.3.4 Optimal food distribution
- 4.4 Practical work 4: Computer vision for assessing ripeness and maturity levels from UAV data in horticultural crops

5. Artificial Intelligence in retail (2 hours)

- 5.1 Consumer behaviour analysis. Customer segmentation
- 5.2 Efficiency in inventory management
- 5.3 Reduction of food waste

6. Artificial Intelligence in agrifood system governance (2 hours)
 - 6.1 Policy-making and decision support
 - 6.2 AI in risk management and crisis response
 - 6.3 Sustainability and environmental governance
7. Case studies (5 hours)
 - 7.1 Case study 1 – GeoAgro: An AI-powered digital extension system for smallholder farmers in the Global South
 - 7.2 Case study 2 – Using AI to predict fungal problems in corn and barley: FUSPREDICT project
 - 7.3 Case study 3 – AI in livestock monitoring
 - 7.4 Case study 4 – Applications of AI in the agrifood industry: ALIMENTE21 project
 - 7.5 Case study 5 – AI in product price prediction
8. Next wave of Artificial intelligence in the agrifood system (1 hour)
 - 8.1 Agrifood 5.0
 - 8.2 Ethics & legislation
 - 8.3 Synthetic data and modelling reality
 - 8.4 Digital Twins in agriculture
 - 8.5 GenAI: LLMs for developing advisory systems
 - 8.6 Autonomous agriculture beyond autonomous equipment

Admission

The course is designed for professionals with a university degree interested in learning more about the current applications of AI and its future developments in the agrifood system, as well as its implementation within firms and organisations. The programme targets researchers and members of the academic community; project managers, innovation agents, decision-makers, and technical advisors from the administration, private companies and NGOs; as well as actors across the agrifood system - from the primary sector such as agriculture and livestock, to industry, logistics and distribution.

- 25 places will be available for face-to-face participation.
- 25 places will be available for online participation.

Knowledge of English will be valued in the selection of candidates.

Registration

- Candidates may apply online at the following address: <https://admission.iamz.ciheam.org/en/>
- Applications must include the curriculum vitae and copy of the supporting documents most related to the subject of the course.
- The deadline for the submission of applications is 1 June 2025. The deadline may be extended for candidates not applying for a scholarship if there are 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.

Scholarships

Candidates from CIHEAM member countries (Albania, Algeria, Egypt, France, Greece, Italy, Lebanon, Malta, Morocco, Portugal, Spain, Tunisia and Türkiye) and from ICARDA Middle East and North Africa partners, may apply during the registration process for scholarships covering registration fees, and for scholarships covering the cost of travel and full board accommodation in Zaragoza.

Preference will be given to candidates from low- and medium-income countries. If you wish to request a scholarship, please complete the relevant section when you make your online application to participate in the course.

Candidates from other countries who require financial support should apply directly to other national or international institutions. All applications are subject to a selection process based on profiles submitted.

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.

Contact:

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<https://www.iamz.ciheam.org/education/advanced-courses/>

