

WHO WE ARE

CICYTEX (Center for Scientific and Technological Research of Extremadura) is a public research institution of the Regional Government of Extremadura, Spain, specialised in applied research and innovation for sustainable agricultural systems under real farming conditions. Within this framework, CICYTEX has developed strong expertise in improving the resilience of Mediterranean irrigated agriculture under water and nutrient constraints, combining agronomic knowledge, field monitoring and digital tools for decision support.

With more than 20 years of experience in irrigation and fertilisation research, the group works on horticultural crops (processing tomato, broccoli and cauliflower) under both experimental and commercial conditions, in close collaboration with farmers, cooperatives, irrigation communities and private farms. This provides a strong basis for multi-actor research, co-development and validation of practical solutions adapted to end-user needs.

CICYTEX integrates soil, plant, water and environmental data to support efficient input management and climate adaptation. Its activities include soil physical and chemical characterisation, crop nutritional assessment, spatial variability analysis, in situ monitoring, proximal sensing, plant-based diagnostics and satellite imagery. The group also uses DUALEM-1S for apparent soil electrical conductivity mapping, together with soil and plant sensors, to improve the assessment of water and nutrient dynamics under heterogeneous field conditions.

A distinctive asset of CICYTEX is its capacity to transform field data into actionable digital solutions. The group has experience with decision-support tools such as VegSyst-DSS for irrigation and nitrogen management and IrriDesK, a digital twin for automatic precision irrigation, which supports real-time, data-driven management under water-limited conditions. This positions CICYTEX as a relevant partner for projects aiming to develop and validate digital innovations, AI-ready datasets and user-oriented decision-support systems for resilient and resource-efficient agriculture.

CICYTEX is particularly well positioned to contribute to projects addressing the interactions between plant, soil, water, air and nutrients across contrasting pedoclimatic conditions, and to test digital tools in representative Mediterranean systems where water scarcity, nutrient-use efficiency and pollution reduction are critical challenges. Its experience in nitrate vulnerable zones such as the Vegas Bajas del Guadiana further strengthens its capacity to validate solutions with direct relevance for sustainable farming, biodiversity protection and reduced dependency on mineral fertilisers

OUR TOPIC OF INTERESTS IN Horizon Europe:

- HORIZON-CL6-2027-02-FARM2FORK-01: Increasing the resilience of agriculture in water and nutrient-scarce environments through digital innovations

OUR priority interest in research collaboration in the selected topic

For HORIZON-CL6-2027-02-FARM2FORK-01, CICYTEX is interested in contributing to the development and field validation of digital solutions that improve agricultural resilience under water and nutrient scarcity, particularly in Mediterranean irrigated systems, by combining expertise in irrigation and fertilisation management, soil–plant–water monitoring, multi-source data integration, and user-oriented tools such as IrriDesK, a digital twin for precision irrigation, to support more efficient input use, climate adaptation and reduced environmental impacts.

WHAT WE OFFER (expertise, publications, infrastructures and skills)

CICYTEX offers advanced expertise in sustainable irrigation and fertilisation under water- and nutrient-scarce conditions, with more than 20 years of experience in Mediterranean cropping systems. We provide field experimentation and demonstration sites in real farming conditions, including horticultural crops, with strong links to farmers, cooperatives and irrigation communities. Our infrastructures and capabilities include soil physical and chemical laboratories, in situ and proximal sensing (soil and plant sensors), geophysical soil mapping (e.g. DUALEM), plant-based diagnostics, and integration of satellite imagery for spatial variability analysis. We offer robust datasets and capacity for multi-source data integration to support digital innovation. Our skills include the development, calibration and validation of decision-support tools, including VegSys-DSS and IrriDesK, a digital twin for precision irrigation, enabling real-time, data-driven optimisation of water and nutrient management. We also contribute to multi-actor approaches, co-creation processes, and the transfer of operational solutions to end-users, supporting the uptake of digital tools and improving resource-use efficiency and environmental sustainability.

– **HORIZON-CL6-2027-02-FARM2FORK-01: Increasing the resilience of agriculture in water and nutrient-scarce environments through digital innovations**

Research and Innovation Actions

Expected outcomes	How CICYTEX could contribute to each expected outcome?
<p>farmers have increased access to digital tools and advice to improve their resilience to water and nutrient scarcity</p>	<p>CICYTEX can contribute to ensuring that “farmers have increased access to digital tools and advice to improve their resilience to water and nutrient scarcity” by developing, testing and validating user-oriented digital solutions that integrate soil–plant–water–nutrient data into actionable recommendations. Through tools such as VegSys-DSS, a decision-support system for fertilisation management, and IrriDesK, a digital twin enabling automatic precision irrigation, CICYTEX can support real-time, data-driven decision-making adapted to farmers’ needs. Its experience in multi-source data integration (sensors, satellite imagery, field measurements) and its strong collaboration with farmers, cooperatives and irrigation communities enable effective co-creation, demonstration and uptake of affordable and accessible digital tools and advisory services under real farming conditions.</p>

Farmers are better prepared for the Green Transition and EU's new plan for sustainable prosperity and competitiveness

CICYTEX contributes to ensuring that *"farmers are better prepared for the Green Transition and EU's new plan for sustainable prosperity and competitiveness"* by providing scientifically validated strategies to optimise water and nutrient use efficiency, reduce input dependency and improve system resilience under climate variability. Through field experimentation, digital modelling and decision-support tools, CICYTEX supports the transition towards more sustainable and competitive farming systems. Its work in Mediterranean environments under water scarcity conditions provides transferable knowledge for adapting cropping systems to climate change, aligning with EU objectives on resource efficiency, sustainability and competitiveness.

Biodiversity benefits from decreasing water, air and soil pollution while European dependency on mineral fertilisers is reduced

CICYTEX contributes to ensuring that *"biodiversity benefits from decreasing water, air and soil pollution while European dependency on mineral fertilisers is reduced"* by developing and validating management strategies that reduce nutrient losses and environmental impacts, particularly in nitrate-vulnerable areas. Its expertise in monitoring soil and water quality, nutrient dynamics and spatial variability allows the optimisation of fertilisation and irrigation practices, reducing leaching, runoff and emissions. By improving nutrient-use efficiency and promoting data-driven fertilisation strategies, CICYTEX supports the reduction of mineral fertiliser inputs and associated

environmental pressures, contributing to the protection of ecosystems and biodiversity.

This work builds on previous and ongoing projects such as “Validation and applicability of the assimilation of remote sensing ET and biophysical parameters of the vegetation for managing irrigation at field scale” and “Evaluation of the digital twin paradigm applied to precision fertigation”.



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