

Agricultural Intelligence Takes Root: Turning Plant Science into a Digital Frontier

On 30 April 2026, the International Symposium on Agricultural Intelligence and Ecological Intelligence (AIEI 2026) convened at the Alliot Amphitheater of French Agricultural Research Centre for International Development (CIRAD) in Montpellier, France, drawing researchers, engineers, and industrial practitioners from China, France, the Netherlands, The Republic of Côte d'Ivoire, and beyond (Fig. 1). Gathered to celebrate the scientific legacy of Professor Philippe de Reffye (Academy of Sciences and Letters of Montpellier (ASLM) and retired senior researcher from CIRAD), whose groundbreaking plant modeling research has guided the field over the past fifty years, the event showcased a fundamental transformation across agricultural science: while field plots and greenhouses remain the main venues for research and practical application, emerging technologies such as artificial intelligence (AI), digital twins, and autonomous systems are reshaping its development paradigm.

From Field Notes to Digital Twins: A New Benchmark for Agricultural Research

The conference was chaired by Prof-

essor Fei-Yue Wang (Institute of Automation, Chinese Academy of Sciences, CASIA), Professor Marc Jaeger (CIRAD), Professor Mengzhen Kang (CASIA), and Professor Véronique Letort (CentraleSupélec). The central question AIEI 2026 posed was not limited to whether AI can be applied to agriculture, but how to bridge the gap between laboratory models and deployable, climate-resilient farming systems. The conference showcased this transition through six keynote presentations, eleven peer-reviewed special issue papers, and live demonstrations, including Mediterranean plant identification via Pl@ntNet and agroforestry visualization through augmented reality.

The contrast with traditional agricultural conferences was stark. Rather than isolated disciplinary presentations, AIEI 2026 deliberately wove together digital twins, unmanned aerial vehicle (UAV) phenotyping, functional-structural plant models (FSPMs), blockchain-enabled agriculture, and climate-resilient farming. This integration reflected a maturing field: agricultural intelligence is becoming a system-level endeavor, not a collection of point solutions.

The Power of Cross-Border, Cross-Disciplinary Collaboration

AIEI 2026 was orchestrated through a partnership among the Association of Global Intelligent Science and Technology (AGIST), CASIA, and China Agricultural University (CAU), with substantive contributions from CIRAD, ASLM, and the Digital Agriculture Convergence Lab. The hybrid format, combining in-person sessions with virtual conferencing, accommodated a geographically dispersed audience and signaled the conference's global ambition.

The event also launched a dedicated special issue in *The International Journal of Intelligent Control and Systems (IJICS)*, providing a peer-reviewed pathway for ongoing research at the intersection of AI, agriculture, and ecology, as shown in Fig. 2.

Invited speakers presented their perspectives on the evolution of the discipline:

- Professor Fei-Yue Wang outlined how decentralized autonomous organization (DAO) and decentralized science (DeSci) architectures can embed new AI into agricultural and ecological intelligence.



Fig. 1 AIEI 2026 delegates at CIRAD, Montpellier, France.

- Professor Pierre Bonnet (CIRAD) demonstrated how citizen science platforms like Pl@ntNet are scaling plant knowledge globally, turning millions of smartphone snapshots into training data for AI-driven species identification.

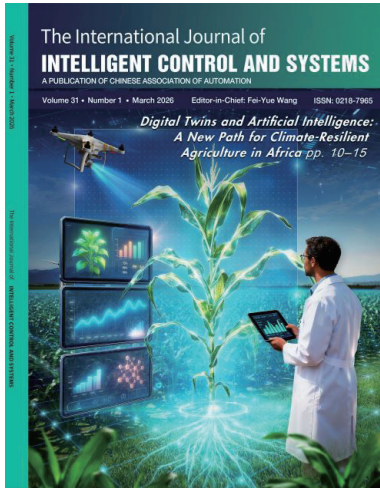


Fig. 2 *IJICS* special issue.

- Professor Ep Heuvelink (Wageningen University) placed crop growth models in the spotlight, bridging classical agronomic theory with the computational demands of real-time digital twin systems.

- Professor Caicong Wu (CAU) revealed how global navigation satellite system (GNSS) trajectory big data from

thousands of wheat harvesters across China can be harnessed to estimate national machinery deployment in real time—a striking example of how passive machine-generated data becomes active agricultural intelligence.

- Assistant Professor Fangle Chang (Zhejiang University) contributed to the special issue session, presenting a deployable digital twin system for precision irrigation management via deep reinforcement learning, translating model predictions into autonomous water-management decisions at the field scale.

- Professor Philippe de Reffye, celebrating his 80th birthday, delivered a capstone reflection on fifty years of plant modeling, from his 1970s coffee-architecture simulations in The Republic of Côte d'Ivoire to today's Green-Lab digital twin frameworks.

The Road from Symposium to System

A single conference, no matter how well organized, does not transform global agriculture. The challenges are still significant: scaling digital twin systems across diverse agro-ecological zones, ensuring smallholder farmers can access AI-driven decision tools, building trustworthy data governance for blockchain-enabled agricultural contracts, and closing the loop between phenotypic data and real-time robotic intervention.

Yet AIEI 2026's significance lies precisely in exposing these barriers under the pressure of interdisciplinary scrutiny and in translating them into concrete research agendas. At the closing session, remarks by Thierry Fourcaud, CIRAD Scientific Deputy Director, framed the event less as a culmination than as a starting point.

The broader message is clear: agricultural intelligence is moving from pilot demonstrations to system-level integration. The seeds planted in Montpellier, spanning digital twins, autonomous phenotyping, and climate-resilient modeling, are beginning to take root. AIEI 2026 established not an endpoint, but a foundation: a global community now equipped with shared terminology, shared platforms, and shared ambitions.

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