

“Mechanisation and Technologies for New Farmers Needs”

34th Members’ Meeting of the Club of Bologna

AGRILEVANTE 2025 - Bari (Italy), 11-12 Oct 2025

Key Note Reports Extended Abstracts

<i>SESSION 1 - HOW TECHNOLOGY AND FARMERS' NEEDS SHAPE NEXT-GEN TRACTORS</i>
1.1 – Evolving Farmers' Needs as Drivers of Next-Generation Tractor Design in Africa, Asia, and Latin America <i>Karim Houmy, Josef Kienzle (FAO)</i>
1.2 – Designing Dreams for a Bright Future <i>David Melvin Wilkie (CNH)</i>
1.3 – New Technologie for Tractors: Less Iron and More Intelligence (manufacturers' panel discussion) <i>AGCO, Kubota, John Deere, CNH - Moderator: Karl Renius (Univ. Munich)</i>

1.1 – Evolving Farmers' Needs as Drivers of Next-Generation Tractor Design in Africa, Asia, and Latin America

by Karim Houmy, Josef Kienzle (FAO)

As agriculture undergoes significant changes across Africa, Asia, and Latin America, the technologies supporting it must also evolve, especially tractors. Farmers today face an increasingly complex set of challenges: shrinking and fragmented landholdings, diverse cropping systems, rising labor costs, climate change, and a growing need for environmentally sustainable practices. In response, the next generation of tractors must evolve beyond conventional models to reflect the real, on-the-ground needs of smallholder and medium-scale farmers.

This presentation explores how these evolving needs are shaping the future of tractor design. It highlights the demand for compact, multifunctional machines capable of operating in narrow, irregular fields, handling various cropping systems, and performing a variety of tasks using easily interchangeable implements. It also emphasizes the importance of simplicity: tractors must be easy to use, maintain, and repair locally. As rural populations decline and labor becomes scarce, digital integration and even semi-autonomous features are becoming increasingly important.

It is essential that the design of future tractors also reflects inclusivity. For equitable mechanization, it is essential to design with women, ergonomics, control interfaces, and affordability in mind. Similarly, digital tools must be accessible, intuitive, and adapted to local connectivity realities.

Ultimately, the future of tractors lies not in more technology for its own sake, but in co-designing with farmers and aligning innovation with their changing realities. Needs-driven design, anchored in context, simplicity, and inclusivity, will ensure tractors remain powerful enablers of sustainable agricultural transformation.

1.2 Designing Dreams for a Bright Future

by David Melvin Wilkie (CNH)

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SESSION 2 – SPECIALIZED MECHANIZATION: MACHINERY FOR OLIVE GROWING AND OIL EXTRACTION
2.1 – Global Olive Cultivation: Between Tradition and Innovation to Preserve Oil Quantity and Quality in a Changing World <i>Eddo Rugini (Accademia Nazionale dell'Olio e dell'Olivo - Italy)</i>
2.2 – Advanced Field and Mechanical Milling Technologies to Enhance the Olive Oil Supply Chain and Sustainability: towards AI <i>Alessandro Leone (University Bari - Italy)</i>
2.3 – Technologies and Mechanization to Enhance Value Chain in Developing Countries <i>Biagio Di Terlizzi (CIHEAM - Italy)</i>
2.4 – The Challenges of EVOO Production in New Regions: the Australian and Californian Experience <i>Pablo Canamasas (Cobram Estate Olives Consultant)</i>

2.1 – Global Olive Cultivation: Between Tradition and Innovation to Preserve Oil Quantity and Quality in a Changing World

by Eddo Rugini (Accademia Nazionale dell'Olio e dell'Olivo - Italy)

Olive cultivation faces major challenges in today’s changing world. Climate variability, water scarcity, pests, diseases, and shifting markets are putting increasing pressure on the sector. About 90% of production still occurs in the Mediterranean, while new regions that have adopted super-intensive systems are already facing water shortages. At the same time, traditional growing areas, where labor demands are high, are being affected by extreme weather and rural depopulation.

To secure yields, oil quality, and the many environmental and cultural roles of the olive tree, management must be tailored to local conditions—there is no single solution that works everywhere. Older orchards require renewal and adaptation to mechanization, supported by modern tools such as drones, sensors, and remote monitoring to improve irrigation, crop protection, pruning, and harvesting. Sustainable practices—such as propagation, pruning, cover cropping, soil conservation, and the use of new-generation chemical products—can help both old and new plantations reduce the impacts of climate change while lowering carbon emissions.

For new orchards, it is essential to select varieties best suited to local conditions, drawing from the more than 1,500 preserved in field collections. Looking ahead, both traditional and modern breeding will play a key role in developing resilient cultivars capable of meeting tomorrow’s challenges.

The long-term sustainability of olive cultivation will depend on research, knowledge sharing, and supportive policies. Training and certification can empower small producers to innovate while maintaining authenticity. By combining tradition with innovation, and heritage with science, the olive sector can secure its future—delivering high-quality oils while preserving its cultural and economic significance.

2.2 – Advanced Field and Mechanical Milling Technologies to Enhance the Olive Oil Supply Chain and Sustainability: towards AI

by Alessandro Leone (University of Bari Aldo Moro, Italy)

The modernization of the olive oil supply chain represents a strategic challenge to improve efficiency, ensure high product quality, and enhance environmental sustainability. This work illustrates the main technological advances in both the field and the milling process, showing how innovation and automation can support process optimization and sustainability.

Mechanization has always aimed to reduce production costs and operation times. Today, olive-growing mechanization adapts to different cultivation models, providing solutions for all agronomic operations. Since harvesting represents the major cost in olive production, current machines allow rapid and efficient fruit collection, especially in orchards with continuous canopy systems.

Image analysis technologies enable objective monitoring of canopy conditions, yield estimation, and maturity index assessment, supporting precise harvest planning.

In the milling process, innovative optical sorters improve olive cleaning, while new crushing systems enhance paste preparation and the release of bioactive compounds. Meanwhile, mechanical, and thermal solutions such as heat

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exchangers, ultrasound, and vacuum technologies overcome the limitations of traditional malaxers with limited heat exchange. These innovations increase phenolic content, extraction efficiency, and energy performance.

Further advancements include NIR systems for real-time quantification of residual oil in pomace and in-line turbidimeters for monitoring oil clarity and separator performance.

Future developments will integrate artificial intelligence into process control, enabling predictive machinery management and adaptive optimization of operating parameters. This approach aims to create intelligent, circular, and sustainable olive mills achieving the highest extraction efficiency while maintaining superior olive oil quality.

2.3 – Technologies and Mechanization to Enhance Value Chain in Developing Countries

by Biagio Di Terlizzi (CIHEAM - Italy)

L'alta formazione (precision agriculture) e, in primis, la cooperazione allo sviluppo sono leve cruciali per diffondere buone pratiche e tecnologie di meccanizzazione nei Paesi partner. Il CIHEAM Bari si pone come catalizzatore di questo trasferimento, agendo in sinergia con la Cooperazione Italiana per stimolare e coinvolgere attivamente tutto il "Sistema Italia" impegnato nelle più avanzate tecnologie e macchinari agricoli.

L'efficacia di questo approccio deriva dal profondo radicamento nei territori, che consente di capitalizzare l'esperienza e le soluzioni locali nell'olivicoltura per affrontare sfide internazionali. La relazione ripercorre le tappe di questo modus operandi e il suo impatto sulle catene del valore agricole. Saranno illustrate le azioni concrete svolte dal CIHEAM Bari, con una focalizzazione sui risultati ottenuti nel settore olivicolo in aree strategiche:

- Egitto, Kurdistan iracheno, Libano, Libia, e Pakistan: Interventi volti al rafforzamento della capacità tecnica e all'adozione di soluzioni agro-meccaniche efficienti.
- Tunisia (Progetto TANIT): Un'iniziativa di grande portata che funge da modello e pioniere concettuale nell'ambito del Piano Mattei, dimostrando come la meccanizzazione mirata possa migliorare significativamente l'efficienza e la sostenibilità delle filiere produttive locali.

In conclusione, la presentazione dimostrerà come la combinazione strategica di conoscenza, meccanizzazione specializzata e cooperazione internazionale sia indispensabile per costruire sistemi agricoli più resilienti e valorizzare il potenziale economico dei Paesi in via di sviluppo.

2.4 – The Challenges of EVOO Production in New Regions: the Australian and Californian Experience

by Pablo Canamasas (Independent Consultant for Cobram Estate Olives (Australia/California))

The expansion of olive cultivation into new regions such as Australia and California has introduced both opportunities and challenges for producing high-quality extra virgin olive oil (EVOO). The trend towards early harvesting aims to improve oil quality, reduce alternate bearing, and minimize frost and disease risks. However, early-harvest fruit often shows low maturity, high moisture, and reduced oil concentration, increasing processing difficulty.

Modern olive farms in these regions are fully irrigated, requiring precise water management. Advanced irrigation technologies—such as moisture probes, pressure chambers, and remote sensing via drones—allow real-time assessment of plant water status and optimization of irrigation to enhance efficiency and sustainability.

Mechanization plays a key role, with high- and super-high-density orchards enabling efficient mechanical harvesting. Canopy management, supported by NDVI, infrared, and thermal imaging, ensures optimal light interception and productivity while reducing labor costs.

At the processing stage, fruit characterization (oil and moisture content, maturity index, and weight) is crucial to predict industrial behavior and adjust parameters. Optical sorters improve fruit selection, while crushing speed adjustments, heat exchangers, and processing aids such as talc and enzymes enhance extraction efficiency and oil quality. Moreover, paste viscosity measurement provides essential information on rheological behavior affecting malaxation, heat transfer, and oil release.

Recent innovations include NIR sensors for real-time monitoring of free fatty acids and oil losses in pomace, enabling a dynamic process control and improved product classification. These technologies are transforming olive oil production in new regions into a highly efficient, data-driven process capable of consistently achieving premium EVOO quality.

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<i>SESSION 3 – APPLICATION OF AI IN AGRICULTURAL MACHINERY AND COMPONENTS</i>
3.1 – The EU Vision of AI and Its Role in Agricultural Automation <i>Georg Happich (Univ. Applied Sc. Kempten - Germany), Alessio Bolognesi (Federunacoma - Italy)</i>
3.2 – Embedded AI for Application in Real-time <i>Marko Bertogna (University Modena-Reggio Emilia - Italy)</i>
3.3 – The Use of AI for Productivity and Safety in Agricultural Machinery <i>Daniele Parazza (KIWITRON - Italy)</i>

3.1 – The EU Vision of AI and Its Role in Agricultural Automation

by Georg Happich (Univ. Applied Sc. Kempten - Germany), Alessio Bolognesi (Federunacoma - Italy)

(not sent)

3.2 – Embedded AI for Application in Real-time

by Marko Bertogna (University Modena-Reggio Emilia - Italy)

(not sent)

3.3 – The Use of AI for Productivity and Safety in Agricultural Machinery

by Name Surname (University/Organization/Agency - Country)

by Daniele Parazza (KIWITRON - Italy)

(not sent)