



Roberta Martelli

Associate Professor of Agricultural Engineering

Academic Discipline Group: 07/AGRI-04– Agricultural, Forest and Biosystems Engineering

Academic Discipline (SSD): AGRI-04/B – Agricultural Engineering

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● Research Areas

Precision Agriculture

Sustainable Agricultural Engineering and Mechanization

Geographic Information Systems (GIS) and Geostatistics

Digital Agriculture

Precision Viticulture

Advanced Mechanical Systems for Organic Farming

● Research Profiles

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Scopus Author ID: 8702982300

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● Research Activity

The research activity is conducted in the field of Agricultural Engineering and focuses on the development of innovative technologies that support the sustainability and digital transformation of agricultural systems.

The research integrates expertise in agricultural engineering and mechanization with advanced methodologies in precision agriculture, geographic information systems (GIS), geostatistics, remote sensing and data analysis, with the aim of developing management models and technological solutions that improve the productivity, environmental sustainability and resilience of agricultural production systems.

Research has gradually evolved from conventional agricultural mechanization to the integration of digital technologies, contributing to the development of innovative methodologies for site-specific crop management and optimization of agricultural inputs.

A distinctive feature is the interdisciplinary approach, combining methodological research, field experiments and technology transfer. Research activities are carried out in collaboration with universities, research institutions, public authorities and private companies active in the agri-food sector, promoting the transfer of scientific knowledge into

practical applications and fostering innovation in agricultural systems.

Precision Agriculture and Digital Farming

Activities are devoted to the development of methodologies for site-specific crop management through the integration of Geographic Information Systems (GIS), geostatistics, satellite imagery, proximal sensing, remote sensing, and digital decision-support tools.

The research has contributed to the development of innovative approaches for analysing the spatial and temporal variability of agricultural systems, identifying management zones, and implementing variable-rate application strategies for agricultural inputs. The ultimate goal is to improve productivity, resource-use efficiency, and reduce the environmental impact of agricultural production.

Sustainable Agricultural Engineering and Mechanization

This research area focuses on the development and evaluation of innovative mechanized systems designed to improve the technical, economic, and environmental performance of agricultural operations.

Research activities include the analysis of mechanized production systems, technical and economic assessment of field operations, and evaluation of the efficiency of agricultural machinery applied to arable, perennial, and forestry crops.

Particular attention has been devoted to vineyard mechanization, biomass harvesting systems, machinery for organic farming, and safety of agricultural machinery, with the objective of improving work quality, reducing energy consumption, and enhancing the sustainability of farming operations.

Technologies for Sustainable Agricultural Systems

This research area combines agricultural engineering, spatial analysis, sensor technologies and digital tools to develop innovative management models for sustainable agricultural production.

Research activities support the transition to more efficient, resilient, and environmentally sustainable agricultural systems by integrating engineering approaches, precision agriculture technologies, and data-driven decision making.

Applications include precision viticulture, biomass valorization, the bioeconomy, and the development of decision support systems, with particular emphasis on the transfer of innovative technologies to the agricultural sector.

● Teaching

The teaching activity is aimed at providing students with advanced knowledge in Agricultural Engineering, Agricultural Mechanisation, and Precision Agriculture.

The teaching approach combines theoretical foundations with practical applications, field experimentation, and case studies.

In the Department of Life Sciences of the University of Modena and Reggio Emilia, she is currently responsible for the following courses:

- Agricultural Engineering and Mechanisation
- Technological Systems for Precision Agriculture
- Introduction to Geographic Information Systems (GIS) and QGIS

Her teaching activities also include the organization of specialized seminars and training activities for students, technicians and professionals working in the agricultural sector.

● Academic and Institutional Responsibilities

- Deputy Coordinator of the Master's Degree Programme in Integrated Sustainability of Agricultural Systems (SISTA).
- Member of the Board of the BIOGEST-SITEIA Interdepartmental Research Centre, dedicated to the improvement and valorisation of agri-food biological resources.
- Member of the Quality Assurance Committee of the Bachelor's Degree Programme in Agricultural and Food Sciences and Technologies.
- Member of the Student Career Monitoring Committee of the Bachelor's Degree Programme in Agricultural and Food Sciences and Technologies.

Full Member of the National Academy of Agriculture (Accademia Nazionale di Agricoltura).

● Research Projects

The research has been characterized by participation in competitive research projects funded at regional, national and European levels, dealing with technological innovation in agricultural systems.

In recent years, the research activity has focused on precision agriculture, digitalization of agricultural production systems and sustainable agricultural mechanization.

Principal Research Projects (last five years)

SMART_Tomato (2025)

Innovative technological solutions for the sustainable transformation of processing tomato production in Po Valley.

Departmental Research Fund (FAR), Department of Life Sciences, University of Modena and Reggio Emilia, Italy.

IN.MO.ME.VI.

Innovative Models for Sustainable Mechanized Vineyard Management.

Rural Development Programme (PSR) 2014–2020, Emilia-Romagna Region, Italy.

IN.SO.WINE

Innovative Solutions for Sustainable Mechanized Vineyard and Winery Management.

Funded by the Centro Ricerche Produzioni Vegetali (CRPV).

She has participated in numerous competitive research programmes funded through PRIN, INTERREG, ENAMA, PRRITT, and the Rural Development Programme (PSR), collaborating with universities, research institutions, public authorities, and private companies at both national and international levels.

● Research Output

The scientific activity is documented by more than 100 scientific publications, including articles in international peer-reviewed journals, book chapters, and papers presented at national and international conferences in the fields of Agricultural Engineering, Agricultural Mechanization, Precision Agriculture and Sustainable Agricultural Systems.

The research output reflects the progressive evolution of the scientific interests towards the integration of agricultural mechanization, digital

technologies, spatial analysis, and sustainable agricultural management, with particular emphasis on technology transfer and innovation.

A complete list of publications is available through the major international bibliographic databases and the institutional repository of the University of Modena and Reggio Emilia.

List of publications from the last 3 years:

Martelli, R., Ali, A., Rondelli, V., & Barbanti, L. (2025). Are We Up to the Best Practices in Forage and Grassland Precision Harvest? A Review. *Grass and Forage Science*, 80(1), e12701.

Sangiorgio, D., Allegro, G., Valentini, G., Pastore, C., Colucci, E., Martelli, R., Pezzi F. & Filippetti, I. (2024). Potatura meccanica, effetti su resa e qualità delle uve. *VITE & VINO*, 2024(1), 12-18.

Ali, A., Martelli, R., Scudiero, E., Lupia, F., Falsone, G., Rondelli, V., Barbanti, L. Soil and climate factors drive spatio-temporal variability of arable crop yields under uniform management in Northern Italy (2023) *Archives of Agronomy and Soil Science*, 69 (1), pp. 75-89. eid=2-s2.0-85111778803 doi:10.1080/03650340.2021.1958320

Allegro, G., Martelli, R., Valentini, G., Pastore, C., Mazzoleni, R., Pezzi, F., Filippetti, I. Effects of Mechanical Winter Pruning on Vine Performances and Management Costs in a Trebbiano Romagnolo Vineyard: A Five-Year Study (2023) *Horticulturae*, 9 (1), art. no. 21. eid=2-s2.0-85146738365 doi:10.3390%2fhorticulturae9010021

Assirelli A., Esposito F., Martelli R., Rondelli V., Sannino M., Piscopo R., Topa V., Faugno S., Amaducci S. Harvesting with Traditional Mechanical Systems of Hemp Grown Under Water Stress Conditions: A Technical-Economical Evaluation. In: 31th European Biomass Conference and Exhibition (EUBCE). 2023

Capacci, E., Franceschetti, B., Piovaccari, G., Martelli, R., & Rondelli, V. (2023, September). An Evaluation of Operator Perception in Manual Handling of Front Foldable Rollover Protective Structures Mounted in Narrow-Track Tractors. In *International Conference on Safety, Health and Welfare in Agriculture and Agro-food Systems* (pp. 141-152). Cham: Springer Nature Switzerland.

Martelli, R.; Civitarese, V.; Barbanti, L.; Ali, A.; Sperandio, G.; Acampora, A.; Misturini, D.; Assirelli (2023). Soil prospection and aerial imagery in management zone delineation in a hazelnut grove in Italy. In *Precision agriculture'23* (pp. 55-56). Wageningen Academic Publishers.

Martelli, R.; Civitarese, V.; Barbanti, L.; Ali, A.; Sperandio, G.; Acampora, A.; Misturini, D.; Assirelli, A. Multi-Parametric Approach to Management Zone Delineation in a Hazelnut Grove in Italy. *Sustainability* 2023, 15, 10106. <https://doi.org/10.3390/su151310106>.

● Scientific Collaborations

The research activities are carried out in collaboration with universities, public research organizations, governmental institutions and private companies within national and international research projects focused on technological innovation in agriculture.

During her academic career, she has established scientific collaborations with the University of Bologna, CREA, the Centro Ricerche Produzioni Vegetali (CRPV), ENAMA, the Emilia-Romagna Regional Authority, international universities and companies operating in the agri-food sector, contributing to interdisciplinary research networks and promoting technology transfer to agricultural production systems.
