



## Daniele Torreggiani

### Curriculum Vitae

Daniele Torreggiani, Environmental engineer and PhD in Agricultural Engineering, is full professor at the Department of Agricultural and Food Sciences (DISTAL) of the University of Bologna in the Agricultural and Biosystems Engineering sector, where he carries out research with particular reference to the structures and environment field, focusing on the following topics: smart farming and precision farming; use of LED lights in protected cultivations and vertical farming; environmental and energy monitoring, analysis and simulations and sustainability assessment of structures for agricultural production and protected cultivation environments; green infrastructure.

He is member of the Spoke #3 of Agritech – National Research Center for Technology in agriculture (PNRR) “Enabling technologies and sustainable strategies for the smart management of agricultural systems and their environmental impact”, where he conducts activities in the fields of environmental and energy modelling applied to greenhouses and vertical farming and environmental monitoring and LED biostimulation in greenhouse cultivations and vertical farming.

He participates as a member of the research team or scientific responsible for the University of Bologna in many national and international research projects and in various applied research activities carried out in collaboration with organizations and companies, including:

- PRIN 2022 - DiAGreen - Digital twin of Agricultural Greenhouses: a multi-domain tool for energy efficiency, decarbonization, enhanced production and cost reduction of intensive greenhouse cropping systems.
- Bioengineered systems for the cultivation of ornamental plants and plants of pharmaceutical and medicinal interest' (2022-2024), research carried out in collaboration with C-LED - company of the multinational CEFLA group, as part of a PON Doctoral project funded by the Italian Ministry for university and research.
- Bioengineered systems for the production of plants with anti-tumor properties in a controlled environment (2023).
- Anti-tumor active ingredients from plants grown in a protected environment: testing of cultivation systems and technologies (2021).
- Ultra precision greenhouse farming and sustainability: Highly efficient LED lighting systems applied in ornamental crops to improve the sustainability and quality of production (2019).
- Evaluation of the performance of LED lighting systems and analysis and optimization of the environmental parameters applied in the context of protected crops with particular reference to ornamental species, carried out within the agreement between the Department of Agricultural Sciences of the University of Bologna and C-LED - company of the multinational CEFLA group (technical responsible of the Agricultural and Biosystems Engineering research group) (2017- 2018).
- monitoring and study of environmental parameters in greenhouses, project in collaboration with the Sant'Orsola agricultural cooperative company (2017)

- Energy efficiency in the greenhouse sector: feasibility study in the Imola area, 2012- 2013, Scientific responsible.
- Horizon Europe Project MARIE SKŁODOWSKA-CURIE ACTIONS Doctoral Networks “GreeNexUS” Green-health-safety Nexus for new Urban Spaces (Member of the Leading team of the University of Bologna).
- PRIN 2022 PNRR Project "Urban green systems: integrated modelling of environmental, energy and microclimatic benefits and GHG offsetting for strengthening resilience and adaptation to climate change – GRACE (Green foR climAte resilienCE)" - Principal investigator.
- Big data and healthy cities: regeneration of urban contexts, green systems and safe and healthy lifestyles –2021-2024. PhD project POR FSE Project. PhD program in “Health, safety and Green systems” – University of Bologna – Funded within the Research training projects “Big Data per una regione europea più ecologica, digitale e resiliente” (Fondo POR FSE).
- PRIMA Project (Partnership for Research and Innovation in the Mediterranean Area - Euro-Mediterranean cooperation joint programme) “Self-sufficient Integrated Multi-Trophic AquaPonic systems for improving food production sustainability and brackish water use and recycling (SIMTAP)” (Scientific responsible for the University of Bologna).
- Climate KIC pathfinder Project (Knowledge and Innovation Community - Europe’s leading climate innovation initiative) “AELCLIC: Adaptation of European Landscapes to Climate Change” (Scientific responsible for the University of Bologna).
- PRIN 2020 Project “Eye-Land”: A crowd-sensing geospatial database for the monitoring of rural areas (Scientific responsible for the University of Bologna).
- Horizon 2020-EU Project “LEAP-RE - Long-Term Joint EU-AU Research and Innovation Partnership on Renewable Energy” (2020- 2025).
- ERA-HDHL Project - Knowledge Hub on Food and Nutrition Security “An integrated approach to the challenge of sustainable food systems: adaptive and mitigatory strategies to address climate change and malnutrition (SYSTEMIC)” (2020- 2023).

He is author of more than 100 publications in indexed international journals and contributions to conferences and is referee for several international scientific journals.

He is a member of the PhD Board of the PhD in Agricultural, Environmental and Food Sciences and Technologies at the University of Bologna, where he is the coordinator of the Agricultural Engineering topic, and is the supervisor of numerous doctoral students. He is associated chair of the Working Group “Rural Landscape structures and infrastructure” of the CIGR. He is Guest editor of the Special issue "Landscape Analysis, Planning and Regional Development" of Sustainability. He is a member of the scientific committee of the "G. Goidanich" Library of the University of Bologna. Since 2015 he has been coordinator of the degree course in ‘Sciences and technologies for green and landscape’ and has been member of various departmental commissions.

He registered an industrial patent entitled "Modular Building" presented on 07/09/2019 and granted on 06/14/2021 (Application number: 102019000011301), together with colleagues from the Rural Constructions and Agroforestry Territory research group of Department of Agri-food Sciences and Technologies of the University of Bologna, on behalf of Alma Mater Studiorum – University of Bologna.

He has been invited speaker, chairman and member of the organizing committee in various national and international conferences, including:

- chairman at the XX CIGR World congress 2022 in Kyoto “Sustainable Agricultural Production - Water, Land, Energy and Food” organized by the International Commission of Agricultural and Biosystems Engineering;
- invited speaker at the international conference organized by the University of Bologna and selected by CRUI for EXPO 2015 “Measuring agriculture and rural planning with advanced methods - New challenges and cross-cutting issues in agricultural and rural planning”;
- organizer of the Special session “Smart systems for land monitoring, analysis, management and planning” in the international conference “MetroAgriFor Metrology for Agriculture and Forestry”, 2021;
- chairman at the International Conference of agricultural engineering CIGR-Eurageng 2012, Valencia, Spain "Agriculture and engineering for a healthier life";
- chairman at the international Conference of Agricultural Engineering - AgEng 2014 Zurich - Engineering for Improving Resource Efficiency.

Since 2005 he has held numerous courses in undergraduate and master's degrees in the Department of Agro-food Sciences of the University of Bologna.

Main publications of the last 10 years:

- Reyhani M., Santolini E., Tassinari P., Torreggiani D., Environmental assessment of design choices of green walls based for materials combination and plants, 2023, International Journal of Life Cycle Assessment, 10.1007/s11367-023-02181-x
- Rao P., Tassinari P., Torreggiani D., Exploring the land-use urban heat island nexus under climate change conditions using machine learning approach: A spatio-temporal analysis of remotely sensed data, 2023, Heliyon, 10.1016/j.heliyon.2023.e18423
- Chiocchio I., Barbaresi A., Barbanti L., Mandrone M., Poli F., Torreggiani D., Trenta M., Tassinari P., Effects of LED supplemental lighting on the growth and metabolomic profile of *Taxus baccata* cultivated in a smart greenhouse, 2022, PLoS ONE, 10.1371/journal.pone.0266777
- Reyhani M., Santolini E., Torreggiani D., Tassinari P., Assessing the environmental performance of plastic-based and felt-based green wall systems in a life-cycle perspective, 2022, Science of the Total Environment, 10.1016/j.scitotenv.2022.153648
- Giorgioni M.E., Torreggiani D., Tassinari P., Morphology and carbohydrate accumulation in *Pelargonium* cuttings as affected by blue ratio of the supplemental lighting on stock plants, 2022, Acta Horticulturae, 10.17660/ActaHortic.2022.1337.32
- Santolini E., Pulvirenti B., Guidorzi P., Bovo M., Torreggiani D., Tassinari P., Analysis of the effects of shading screens on the microclimate of greenhouses and glass facade buildings, 2022, Building and Environment, 10.1016/j.buildenv.2021.108691
- Barbaresi A., Ceccarelli M., Menichetti G., Torreggiani D., Tassinari P., Bovo M., Application of Machine Learning Models for Fast and Accurate Predictions of Building Energy Need, 2022, Energies, 10.3390/en15041266
- Reyhani M., Santolini E., Bovo M., Barbaresi A., Torreggiani D., Tassinari P., A comparative life cycle analysis of living walls, 2022, VDI Berichte, 10.51202/9783181024065-235
- Al-Rikabi S.H.F., Santolini E., Bovo M., Barbaresi A., Torreggiani D., Tassinari P., Pulvirenti B., Definition of a Porous Media Model Simulating the Presence of a Small Canopy Crops in a

Greenhouse CFD simulations and comparison with experimental tests, 2022, VDI Berichte, 10.51202/9783181024065-639

- Barbaresi A., Ceccarelli M., Bovo M., Agrusti M., Santolini E., Torreggiani D., Tassinari P., Menichetti G., Machine Learning Models for Predictions of Thermal Energy Need in Farm Buildings, 2022, VDI Berichte, 10.51202/9783181024065-477
- Ceccarelli M., Barbaresi A., Menichetti G., Santolini E., Bovo M., Tassinari P., Barreca F., Torreggiani D., Simulations in agricultural buildings: a machine learning approach to forecast seasonal energy need, 2022, 2022 IEEE Workshop on Metrology for Agriculture and Forestry, MetroAgriFor 2022 - Proceedings, 10.1109/MetroAgriFor55389.2022.9965083
- Santolini E., Barbaresi A., Pulvirenti B., Torreggiani D., Tassinari P., Shading screens and ventilation efficiency in a naturally ventilated greenhouse by means of CFD modeling, 2021, Acta Horticulturae, 10.17660/ActaHortic.2021.1311.41
- Barbaresi A., Ceccarelli M., Agrusti M., Bovo M., Santolini E., Tassinari P., Torreggiani D., Methodology for sensor calibration in agro-industrial facilities, 2021, 2021 IEEE International Workshop on Metrology for Agriculture and Forestry, MetroAgriFor 2021 - Proceedings, 10.1109/MetroAgriFor52389.2021.9628666
- Barbaresi A., Maioli V., Bovo M., Tinti F., Torreggiani D., Tassinari P., Application of basket geothermal heat exchangers for sustainable greenhouse cultivation, 2020, Renewable and Sustainable Energy Reviews, 10.1016/j.rser.2020.109928
- Gholami M., Barbaresi A., Tassinari P., Bovo M., Torreggiani D., A comparison of energy and thermal performance of rooftop greenhouses and green roofs in Mediterranean climate: A hygrothermal assessment in WuFi, 2020, Energies, 10.3390/en13082030
- Santolini E., Torreggiani D., Tassinari P., Shading Screens Characterization by Means of Wind Tunnel Experiments and CFD Modeling, 2020, Lecture Notes in Civil Engineering, 10.1007/978-3-030-39299-4\_36
- Santolini E., Pulvirenti B., Torreggiani D., Tassinari P., Novel methodologies for the characterization of airflow properties of shading screens by means of wind-tunnel experiments and CFD numerical modeling, 2019, Computers and Electronics in Agriculture, 10.1016/j.compag.2019.05.009
- Santolini E., Pulvirenti B., Benni S., Barbaresi L., Torreggiani D., Tassinari P., Numerical study of wind-driven natural ventilation in a greenhouse with screens, 2018, Computers and Electronics in Agriculture, 10.1016/j.compag.2017.09.027
- Benni S., Santolini E., Barbaresi A., Torreggiani D., Tassinari P., Calibration and comparison of different CFD approaches for airflow analysis in a glass greenhouse, 2017, Journal of Agricultural Engineering, 10.4081/jae.2017.568
- Benni S., Tassinari P., Bonora F., Barbaresi A., Torreggiani D., Efficacy of greenhouse natural ventilation: Environmental monitoring and CFD simulations of a study case, 2016, Energy and Buildings, 10.1016/j.enbuild.2016.05.014
- Torreggiani D., Dall'Ara E., Tassinari P., The urban nature of agriculture: Bidirectional trends between city and countryside, 2012, Cities, 10.1016/j.cities.2011.12.006

More information and complete publication list available at <https://www.unibo.it/sitoweb/daniele.torreggiani/en>

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