

La ricerca in 3 minuti | Giornata verde del dottorato @DISTAL multicampus



Skills for sustainable, resilient, and socially fair communities



3-11 June 2023

**#EUGreenWeek
PARTNER EVENT**



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI
SCIENZE E TECNOLOGIE AGRO-ALIMENTARI

Making Crop Production Process Greener Using Computer Simulations

Supervisor: Dr. Marco Bovo

Goals:

- To understand the complex interaction between crops and their microclimate within a greenhouse.
- To utilize computer simulations and wind tunnel measurements to optimize crop growth and resource usage.
- To develop sustainable and eco-friendly methods for enhancing crop production while minimizing the ecological footprint.

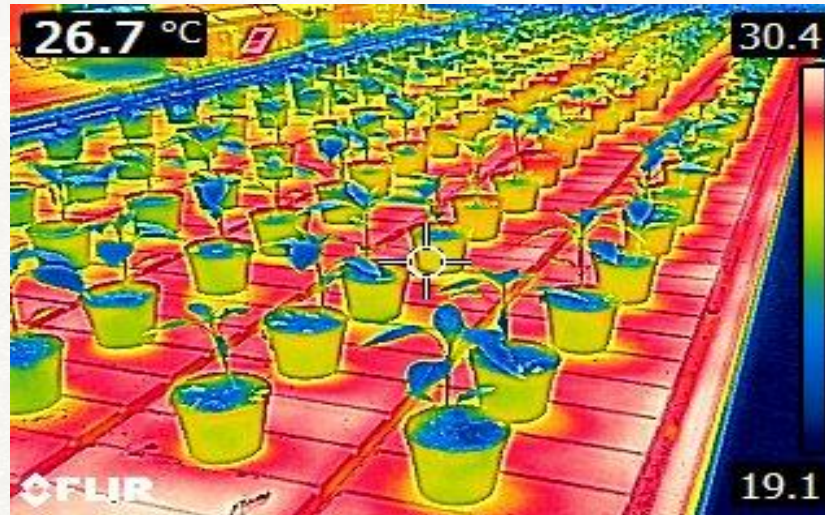


Main Outcomes:

- Accurate modeling and simulation of the microclimate within a greenhouse.
- Optimization of greenhouse configurations, ventilation strategies, and irrigation systems for maximum crop productivity.
- Reduction in resource waste and increased efficiency in crop production.

Novel Aspects of the Research:

- Study of Plant Behavior.
- Consideration of Thermal Comfort.



Wind Tunnel Measurements and Aerodynamic Characteristics of Crops

- Conducting wind tunnel measurements to understand the aerodynamic properties of crops.
- Determination of drag coefficient and leaf area density (LAD) to assess crop-airflow interaction.
- Wind tunnel data used as inputs for accurate computer simulations of crop behavior.



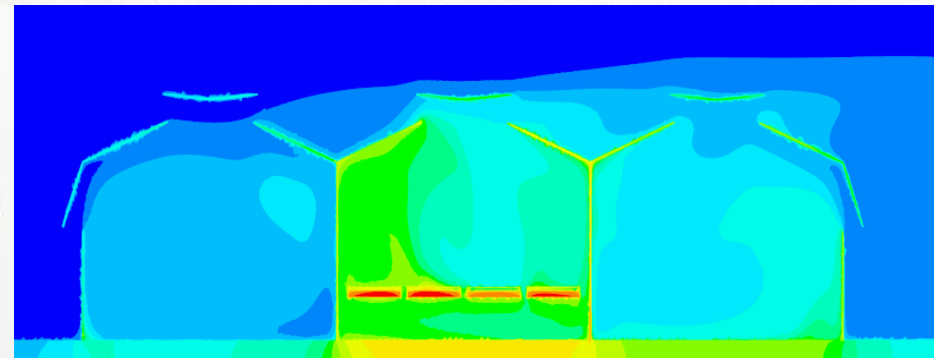
Computer Simulations

Experimental Measurements in the Greenhouse in Imola

- Sensors and instruments placed to measure temperature, humidity, air velocity, and other relevant parameters.
- Weather station at the top of the greenhouse provided data of solar radiation, wind speed, and wind direction.

Utilizing Computational Fluid Dynamics (CFD)

- (CFD) is a powerful tool for simulating microclimate parameters within a greenhouse.
- Simulating various scenarios based on experimental data, we can identify the most effective greenhouse configurations.



Temperature (C)
19.545 20.541 21.537 22.534 23.530 24.526 25.522 26.518 27.514 28.510

z
y_x



Impact on production world and society

- Identify the ideal conditions for crop growth.
- Resource Optimization.
- Improved Decision-Making.
- Reduced Environmental Impact
- Crop Quality and Consistency.
- Designing Sustainable Greenhouses.

