

Topic for cooperation under the Horizon Europe programme:

HORIZON-CL6-2024-CLIMATE-01-1

Topic for cooperation:

Improving irrigation practices and technologies in agriculture

SCOPE OF CONDUCTED RESEARCH

1. Irrigation and fertilization of horticultural crops. Evaluation of different irrigation and fertigation techniques for the production of field and protected-grown crops. Optimization of irrigation of crops considering weather condition and soil water resources.
2. Sensor technologies. Developing sensor systems for automation of plant production. Novel tools for smart crop management using IoT and AI-based solutions (Agriculture 4.0 and 5.0).
3. Plant physiology. Examination of the influence of environmental factors on plant performance (plant tolerance to biotic and abiotic stresses). Much effort is focused on evaluation of plant response to water stress (tolerance of different cultivars to drought, effects of waterlogging).
4. Protected cultivation of horticultural plants. Development and adaptation of soilless production systems (including hydroponics and aeroponics). Artificial lighting systems. Closed nutrient solution systems. Testing new cultivars, growing media and fertilizers. Developing plant propagation systems (soilless nursery).
5. Agrometeorology. The Laboratory has access to a weather station network which is used for monitoring weather conditions and soil water status (water balance) in major fruit production regions. The study and application of weather and climate information to increase crop production and to reduce weather-related hazards that producers may face.

EXPERIENCE

Key person:

Prof. dr. hab. ing. Waldemar Treder (M) Head of the Laboratory of Plant Irrigation (InHort), 38 years of experience in the area of agronomy. Main research activities include (among others): developing irrigation and fertilization technologies (water management), sensor systems for automation of plant production, evaluation of plant responses to environmental factors. The author/coauthor of over 145 papers, 9 patents/utility models; leader, coordinator or the contractor of over 21 projects including EU funded.

Relevant publications

1. Treder W., Klamkowski K., Wójcik K., Tryngiel-Gać A. 2023. Machine learning for supporting irrigation decisions based on climatic water balance. *Journal of Water and Land Development* 58: 25-30. DOI: 10.24425/jwld.2023.145358
2. Treder W., Klamkowski K., Tryngiel-Gać A., Wójcik K. 2022. Evaluating the suitability of a new telemetric capacitance – based measurement system for real-time application in irrigation and fertilization management. *Journal of Water and Land Development* 56: 1-7. DOI: 10.24425/jwld.2023.143746
3. Treder W., Klamkowski K., Tryngiel-Gać A., Wójcik K. 2022. Assessment of rainfall efficiency in an apple orchard. *Journal of Water and Land Development* 53: 51-57. DOI: 10.24425/jwld.2022.140779
4. Treder W., Klamkowski K., Wójcik K., Tryngiel-Gać A., Sas-Paszt L., Mika A., Kowalczyk W. 2022. Apple leaf macro- and micronutrient content as affected by soil treatments with fertilizers and microorganisms. *Scientia Horticulturae* 297: 1-10. DOI: 10.1016/j.scienta.2022.110975

Relevant previous projects

1. 'Improving plant quality and economy for a more sustainable and efficient berry production'. POLNOR 2019 Call, NOR/POLNOR/QualityBerry/0014/2019, QualityBerry.
2. 'Transfer of innovative techniques for sustainable water use in fertigated crops.' H2020-WATER-2014-2015, 689687, Fertinnowa.
3. 'Development of an innovative system for distributed measurement of climate and soil parameters as a tool for optimization of irrigation, crop protection and agrotechnical work'. Regional Operational Programme for the Mazowieckie Voivodeship RPMA.01.02.00-14-5663/16.
4. 'Sustainable irrigation of ornamental nurseries'. Applied Research Programme. DZP/PBS3/2385/2014.

Significant infrastructure

The Institute's facilities consist of several laboratories, greenhouses, including the Central Experimental Greenhouse facility with 50 chambers with individually-climate setting, fully computerised and remotely controlled as well as 200 ha of experimental fields and orchards. The laboratories are well equipped with modern instrumentation for agricultural trials, including equipment for plant physiological and morphological assessment, study of soil-plant-water relations, as well as equipment for microbiology and molecular biology studies.

Research interests & Achievements in implementation of R&D results and innovative activities

Studies in the area of agronomy, developing irrigation and fertilization strategies especially in the light of climate changes, increasing pollution of air, soil and water resources and declining water supplies for the agriculture. Development of novel tools for growers: DSS (e.g. platform supporting irrigation and fertigation decisions), sensor systems (Agriculture 4.0 and 5.0), new cultivation techniques (environmental-friendly growing media, biofertilizers, new stress tolerant cultivars, etc.)

CONTACT

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