

INNOVATIVE GREENHOUSE SUPPORT SYSTEM IN THE MEDITERRANEAN REGION: EFFICIENT FERTIGATION AND PEST MANAGEMENT THROUGH IOT BASED CLIMATE CONTROL — IGUESSMED

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Deliverable D5.5 Scientific papers for peer review journals

Version 1.0

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D5.5 - Scientific papers for peer review journals

Abstract

This deliverable will describe the scientific and technical publications as part of T.5.1 “Scientific publications and events”. The aim of this task was to give visibility to the outcomes of the research activities and to implement the visibility of the project between researchers, extensionists and technical advisors.

The objective of this deliverable is to collect the papers published in peer review journals, and the participation in national and international conferences and congresses. The Deliverable has been structured in four categories: 1) scientific papers for peer review, 2) contributions to international congresses and conferences, 3) contributions to national congresses and conferences, and 4) other contributions (networking, bilateral meeting, and end of degree/master studies).

At the time of writing this report, eleven peer review articles have been published, nine are already published and two articles are in press; other articles are in preparation. Regarding the participation in congresses and conferences, there have been 27 contributions in total and six activities linked to networking and bilateral meetings. The project has been also part of several end of degree/master studies.

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Introduction



The iGUESS-MED project aims to develop a Decision Support System (DSS) able to effectively manage fertigation and prevent plant diseases and pests in tomato crops grown in soil and soilless in commercial greenhouses of the Mediterranean region. This innovative greenhouse DSS will be developed to (i) help greenhouse farmers to improve the management of fertigation in areas with low (saline) quality waters (ii) to reduce the use of chemicals by a sustainable and integrated pest and disease control and (iii) to improve the climatic efficiency in the existent greenhouse by low-cost climate actions. The DSS will allow obtaining healthier and higher quality productions and higher yields, while will reduce the use of water and the losses of nutrients and chemicals to the environment. iGUESS-MED will be able to manage efficient fertigation, to forecast diseases and pests, and to improve the climatic efficiency in tomato greenhouses, using only climate data acquisition and basic information on cropping system. The DSS will provide feedback and alerts about crop needs and real time recommendations to the farmers through friendly portable real time data visualization tools as PC, tablets or smartphones. To achieve this objective, new models for calculating crop evapotranspiration will be performed by integrating sensor data from plant, soil and climate, and forecasting models for assessing disease and pest risks will be developed by using the Integrated Pest Management.

The project consortium (research centers, SMEs and end-users of EU and non-EU countries belonging to the Mediterranean basin) will collaborate from the beginning to make the DSS marketable involving, end-users and stakeholders to validate the system in own greenhouses, reducing gaps between research, application developers and farmers. The application of DSS will benefit the workers and the consumers, providing better working conditions, crop healthiness and reduction of environmental impact.

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1.1 Summary of the deliverable

This deliverable describes the scientific and technical publications as part of T.5.1 “Scientific and outreaching publications”. The aim of this task was to give visibility to the outcomes of the research activities and to implement the visibility of the project between researchers, extensionists and technical advisors.

The objective of this deliverable is to collect the papers published in peer review journals, and the contributions in national and international conferences and congresses.

The target for this deliverable was to publish at least eight scientific papers for peer-reviewed journals and to produce eight contributions for national and international congresses and conferences.

The Deliverable has been structured in four categories: 1) scientific papers for peer review, 2) contributions to international congresses and conferences, 3) contributions to national congresses and conferences, and 4) Other activities (networking, bilateral meeting, and end of degree/master studies).

The outcomes of this deliverable have been largely overcome. Results of iGUESS-MED project have been published in nine peer review articles, seven are already published and two articles are currently in press; other articles are in preparation. Furthermore, project partners have participated at several international and national congresses and conferences, presenting a total of 23 contributions.

2 Scientific papers for peer reviewed journals



2.1 Scientific papers for peer review

Nine peer review articles have been published and another two articles are in press. Other articles are in preparation.

From these, nine of them have been published in some of the most prestigious journals belonging to the subject areas: Agricultural and Biological Sciences, Computer Science, Environmental Sciences, Environmental Studies and Mathematics:

- Agricultural water management (Q1, IF:6.7);
- Biosystems Engineering (Q1, IF: 5.1);
- Agronomy (Q1, IF: 3.7);
- Ecological informatics (Q1, IF: 5.1).
- Sustainability (Q2, IF: 3.9)

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The list of published and in press articles:

- Gallardo, M., Peña-Fleitas, M.T., Giménez, C., Padilla, F.M., Thompson, R.B. 2023. [Adaptation of VegSyst-DSS for macronutrient recommendations of fertigated, soil-grown, greenhouse vegetable crops](https://doi.org/10.1016/j.agwat.2022.107973). *Agricultural Water Management* 278: 107973. (<https://doi.org/10.1016/j.agwat.2022.107973>)
- Cedeño, J., Magán, J.J., Thompson, R.B., Fernández, M.D., Gallardo, M. 2023. [Reducing nutrient loss in drainage from tomato grown in free-draining substrate in greenhouses using dynamic nutrient management](https://doi.org/10.1016/j.agwat.2023.108418). *Agricultural Water Management* 287: 108418. (<https://doi.org/10.1016/j.agwat.2023.108418>)
- Bonachela, S., Fernández, M.D., Hernández, J., López, J.C. 2023. [Adaptation of standardised \(FAO and ASCE\) procedures of estimating net longwave and shortwave radiation to Mediterranean greenhouse crops](https://doi.org/10.1016/j.biosystemseng.2023.06.004). *Biosystems Engineering* 231: 104-116. (<https://doi.org/10.1016/j.biosystemseng.2023.06.004>)
- Puccinelli, M., Carmassi, G., Pardossi, A., Incrocci, L. 2023. [Wild edible plant species grown hydroponically with crop drainage water in a Mediterranean climate: crop yield, leaf quality, and use of water and nutrients](https://www.sciencedirect.com/science/article/pii/S0378377423001403). *Agricultural Water Management* 282: 108275. (<https://www.sciencedirect.com/science/article/pii/S0378377423001403>)
- Ciampi, L., Zeni, V., Incrocci, L., Canale, A., Benelli, G., Falchi, F., Amato, G., Chessa, S. 2023. [A deep learning-based pipeline for whitefly pest abundance estimation on chromotropic sticky traps](https://www.sciencedirect.com/science/article/pii/S1574954123004132?via%3Dihub). *Ecological Informatics* 78: 102384. (<https://www.sciencedirect.com/science/article/pii/S1574954123004132?via%3Dihub>)
- Karaca, C., Aslan, G.E., Buyuktas, D., Kurunc, A., Bastug, R., Navarro, A. 2023. [Effects of Salinity Stress on Drip-Irrigated Tomatoes Grown under Mediterranean-Type Greenhouse Conditions](https://doi.org/10.3390/agronomy13010036). *Agronomy* 13(1): 36. (<https://doi.org/10.3390/agronomy13010036>)
- Navarro, A., Scotto di Covella, F., Cacini, S., Sodini, M., Traversari, S., Venezia, A., Massa, D. 2023. [Testing sap-flow sensors to predict irrigation of soilless tomato fertigated with saline water](https://doi.org/10.17660/actahortic.2023.1377.78). *Acta Horticulturae* 1377: 639-645. (<https://doi.org/10.17660/actahortic.2023.1377.78>)
- Sodini, M., Cacini, S., Navarro, A., Traversari, S., Massa, D. 2024. [Estimation of pore-water electrical conductivity in soilless tomatoes cultivation using an interpretable machine learning model](http://dx.doi.org/10.2139/ssrn.4511077). *Computers and Electronics in Agriculture* 218: 108746. (<http://dx.doi.org/10.2139/ssrn.4511077>).
- Sturiale, S., Gava, O., Gallardo, M., Buendía Guerrero, D., Buyuktas, D., Aslan, G.E., Laarif, A., Bouslama, T., Navarro, A., Incrocci, L., Bartolini, F. 2024. [Environmental and economic performance of greenhouse cropping in the Mediterranean Basin: lessons learnt from a cross-country comparison](https://doi.org/10.3390/su16114491). *Sustainability* 16(11): 4491. (<https://doi.org/10.3390/su16114491>)
- Gallardo, M., López Martín, M., Thompson, R.B. 2024. The VegSyst-DSS v2 as a recommendation system for nutrient solution composition in greenhouse fertigated, soil-grown vegetable crops. *Acta Horticulturae*, in press.

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- Aslan G.E., Bastug, R., Karaca, C., Kurunç, A., Buyuktas, D., Navarro A. 2024. Effects of Saline Irrigation Water Applications on Evapotranspiration Partitioning and Crop Coefficient of Tomato Grown in Mediterranean Type Greenhouses. *Agronomy*, in press.

2.2 Contributions to international congresses and conferences

The project was presented in the following international scientific congresses and conferences:

- [31st International Horticultural Congress 2022](#), held in Angers (France), organized by the International Society of Horticultural Science (ISHS). From 14 to 20/08/2022. Participation of CREA with the oral presentation “Testing sap-flow sensors to predict irrigation of soilless tomato fertigated with saline water” within the “International symposium on Innovative technologies and production strategies for sustainable controlled environment horticulture”.

Navarro, A., Scotto di Covella, F., Cacini, S., Sodini, M., Traversari, S., Venezia, A., Massa, D. 2022. Testing sap-flow sensors to predict irrigation of soilless tomato fertigated with saline water. 31st International Horticultural Congress 2022, Angers (France), 14-20 August 2022.

- [Horchimodel Congress](#). International Symposium on Models for Plant Growth, Environments, Farm Management in Orchards and Protected Cultivation, held in Almería (Spain), from 26 to 28/06/2023. Organized by ISHS (International society for Horticultural Science). Participation of UAL with the presentation “Adaptation of VegSyst-DSS as a recommendation system for nutrient solution composition in greenhouse fertigated, soil-grown vegetable crops”.

Gallardo, M., López-Martín, M., Thompson, R.B. 2023. Adaptation of VegSyst-DSS as a recommendation system for nutrient solution composition in greenhouse fertigated, soil-grown vegetable crops. International Symposium on Models for Plant Growth, Environments, Farm Management in Orchards and Protected Cultivation, Almería (Spain), 26 to 28/06/2023.

- [Horchimodel Congress](#). International Symposium on Models for Plant Growth, Environments, Farm Management in Orchards and Protected Cultivation, held in Almería (Spain), from 26 to 28/06/2023. Organized by ISHS (International society for Horticultural Science). Participation of UNIPI with the presentation “Comparison among four different simplified models for the estimation of tomato crop evapotranspiration in Mediterranean soilless greenhouses”.

Carmassi, G., Cela, F., Stravato, G., Incrocci, L. 2023. Comparison among four different simplified models for the estimation of tomato crop evapotranspiration in Mediterranean soilless greenhouses. International Symposium on Models for Plant Growth, Environments, Farm Management in Orchards and Protected Cultivation, Almería (Spain), 26 to 28/06/2023.

- [Horchimodel Congress](#). International Symposium on Models for Plant Growth, Environments, Farm Management in Orchards and Protected Cultivation, held in Almería (Spain), from 26 to 28/06/2023. Organized by ISHS (International society for Horticultural Science). Participation of CREA with the poster “Modelling leaf area index and water requirements as a function of water salinity in a cherry tomato crop grown soilless”.

Sodini, M., Cacini, S., Navarro Garcia, A., Traversari, S., Massa, D. (2023) Modelling leaf area index and water requirements as a function of water salinity in a cherry tomato crop grown soilless. International Symposium on

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Models for Plant Growth, Environments, Farm Management in Orchards and Protected Cultivation - Horchimodel 2023. Almeria, Spain, 26-28 June 2023.

- V INTERNATIONAL AGRICULTURAL, BIOLOGICAL, LIFE SCIENCE CONFERENCE AGBIOL 2023 (<https://agbiol.org/>). 18/09/2023. Edirne (Türkiye). Organized by Akdeniz University. Presentation of communication by Akdeniz University “Assessing the impact of irrigation water salinity on mineral composition in different parts of tomato”.

Aslan, G.E., Karaca, C., Kurunç, A., Büyüктаş, D., Baştuğ, R., Navarro, A., 2023. Assessing the impact of irrigation water salinity on mineral composition in different part of tomato. In: Kaya, Y., Beser, N. (Eds.) Proceedings of the V International Agricultural, Biological & Life Science Conference (AGBIOL 2023), Edirne, Turkey, 18-20 September 2023. pp. 132 -138. ISBN: 978-605-73041-6-2.

- 5th Euro-Mediterranean Conference for Environmental Integration ([EMCEI-23](#)), organized by University of Calabria and held in Rende (Italy), from 2 to 5/10/2023. Participation of UNIPI and BIOPLANET with the oral communication “Life cycle environmental impacts of greenhouses cropping in the Mediterranean region”.

Sturiale, S., Gava, O., Incrocci, L., Bartolini, F. 2023. Life cycle environmental impacts of greenhouses cropping in the Mediterranean region. 5th Euro-Mediterranean Conference for Environmental Integration (EMCEI-23), Rende (Italy), 2 – 5 October 2023.

- 6th Euro-Mediterranean Conference for Environmental Integration ([EMCEI-24](#)) organized by Cadi Ayyad University and held Marrakech (Morocco) from 15 to 18/05/2024. Participation of CRRHAB with twos oral communications “Innovative Greenhouse Support System in the Mediterranean Region: efficient fertigation and pest management through IoT based climate control (iGUESSmed) - Case study in Tunisia” and “Development and validation of a mathematical model to predict the occurrence of the different stages of the tomato leaf miner *Tuta absoluta* (Meyrick, 1917) in a context of a proactive Integrated Pest Management Strategy”.

Laarif, A., Ben Aissa, I., Mansour, M., Jeder, H., Bouslama, T., Navarro Garcia, A. 2024. Innovative Greenhouse Support System in the Mediterranean Region: efficient fertigation and pest management through IoT based climate control (iGUESS-MED) - Case study in Tunisia. (EMCEI-24), Marrakech (Morocco), 15-18 May 2024.

Bouslama, T., Mohsen Mansour, M., Laarif, A. 2024. Development and validation of a mathematical model to predict the occurrence of the different stages of the tomato leaf miner *Tuta absoluta* (Meyrick, 1917) in a context of a proactive Integrated Pest Management Strategy. (EMCEI-24), Marrakech (Morocco), 15-18 May 2024.

- [1 International Symposium on Protected Cultivation, Nettings and Screens for Mild Climates](#) held in Athens (Greece), organized by the International Society of Horticultural Science (ISHS) and the Agricultural University of Athens from 23 to 26/09/2024. Participation of UNIPI with “Using sap flow sensors for estimating tomato transpiration in greenhouse soilless culture under different salinity conditions”.

Cela, F., Carmassi, G., Navarro, A., Pardossi, A., Incrocci L. 2024. Using sap flow sensors for estimating tomato transpiration in greenhouse soilless culture under different salinity conditions. 1st International Symposium on Protected Cultivation, Nettings and Screens for Mild Climates, Angers (France), 14-20 August 2022.

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2.3 Contributions to national congresses and conferences

The project was presented in the following national scientific congresses and conferences:

- XIII edition of the [Scientific Congress SOI](#) organized by SOI (Italian Society for Horticultural Science) “I traguardi di Agenda 2030 per l’ortoflorofruitticoltura italiana”, held in Catania (Italy), from 22 to 23/06/2021. Participation of CREA with the poster “Testing sap-flow sensors for the estimation of crop transpiration in soilless tomato irrigated with saline water”.

Massa, D., Traversani, S., Cacini, S., Venezia, A., Navarro, A. 2021. Testing sap-flow sensors for the estimation of crop transpiration in soilless tomato irrigated with saline water. XIII Giornate Scientifiche SOI “I traguardi di Agenda 2030 per l’ortoflorofruitticoltura italiana”. Catania, Italy, 22-23 June 2021. In: Acta Italus Hortus n. 26, p. 271. ISBN 978-88-32054-07-1.

- Annual meeting of the Spanish Society of Horticultural Sciences (SECH). From 17 to 22/10/2021, held in Córdoba (Spain). Organized by Spanish SECH. Participation of CAJAMAR and UAL with two posters: “Evaluacion de dos estrategias de manejo del riego con agua moderadamente salina en un cultivo de tomate en invernadero”, and “Manejo optimizado del potasio y fósforo en fertirriego en tomate en invernadero”.

Fernández, M.D., Magán, J.J., García, M.F., Bonachela, S., Gallardo, M. 2021. Evaluación de dos estrategias de manejo del riego con agua moderadamente salina en un cultivo de tomate en invernadero. Annual meeting of the Spanish Society of Horticultural Sciences, Córdoba (Spain), 17-22 October 2021.

Gallardo, M., Cedeño, J., García M.F., Fernández, M.D., Magán, J.J. 2021. Manejo optimizado del potasio y fósforo en fertirriego en tomate en invernadero. Annual meeting of the Spanish Society of Horticultural Sciences, Córdoba (Spain), 17-22 October 2021.

- [Jornadas de Ciencias Hortícolas](#), organized by Spanish Society of Horticultural Sciences (SECH) and held in Lugo (Galicia), from 18 to 20/05/2022. Participation of UAL with the oral presentation “Comparación de métodos para determinar la extracción de nutrientes en un cultivo de tomate en invernadero en perlita”.

Cedeño, J., García, M.F., Fernández, M.D., Magán, J.J., Gallardo, M. 2022. Comparación de métodos para determinar la extracción de nutrientes en un cultivo de tomate en invernadero en perlita. Jornadas de Ciencias Hortícolas, Lugo (Galicia), 18-20 May 2022.

- [First Italian National Congress of Horticulture and Floriculture](#), held in Pisa (Italy) from 14 to 16/06/2022. Organized by SOI (Italian Society for Horticultural Science). Participation of CREA with two oral presentations: “Controllo dell’alternariosi e muffa grigia su pomodoro in coltura protetta con trattamenti a base di chitosano e Trichoderma harzianum” and “Modelling evapotranspiration of soilless tomato grown with saline water using a simplified Penman–Monteith equation and a machine learning approach”.

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Nicastro N., Navarro A., Scotto di Covella F., Pane C. 2022. Controllo dell'alternariosi e muffa grigia su pomodoro in coltura protetta con trattamenti a base di laminarina, chitosano e Trichoderma. I Convegno Nazionale Orticoltura e Floricoltura, Pisa, 14-16 June 2022 p.50. ISBN: 978-88-95613-57-4.

Sodini M., Cacini S., Traversari S., Venezia A., Navarro Garcia A., Massa D. 2022. Modelling evapotranspiration of soilless tomato grown with saline water using a simplified Penman–Monteith equation and a machine learning approach. I Convegno Nazionale Orticoltura e Floricoltura, Pisa, 14-16 June p. 29. ISBN: 978-88-95613-57-4.

- XXVII [Congress of the Italian Phytopathological Society](#) (SIPaV). From 21 to 23/09/2022. Organized by Agricultural, Food and Forestry Sciences Department (SAAF), University of Palermo. Held in Palermo (Italy). Participation of CREA and EVJA with the poster “Bio-based treatments with laminarin, chitosan and Trichoderma harzianum to prevent alternariosis and grey mold on tomato in Mediterranean greenhouse system”.

Nicastro N., Navarro A., Affinito A., Loret N., Scotto di Covella F., Pane C. 2022. Bio-based treatments with laminarin, chitosan and *Trichoderma harzianum* to prevent alternariosis and grey mold on tomato in Mediterranean greenhouse system XXVII Congress of the Italian Phytopathological Society (SIPaV). Palermo, 21-23 Settembre 2022, p. 1259. In: Abstracts of presentations at the XXVII Congress of the Italian Phytopathological Society (SIPaV) September 21-23, 2022. Palermo, Italy. Journal of Plant Pathology (2022) 104, 1207–1280. p. 1259. <https://doi.org/10.1007/s42161-022-01234-8>.

- Congress: CONTRIBUTO DI RICERCA DEL CREA PER UNA AGRICOLTURA SOSTENIBILE, INNOVATIVA E RESILIENTE AL CLIMA CHE CAMBIA, organized within the [PROGRAMMA DI EARTH TECHNOLOGY EXPO 2022](#) by CREA Politiche e Bioeconomia. From 5 to 8/10/2022, held in Fireze (Italy). Participation of CREA with a presentation “iGUESS-MED, un sistema pionieristico di supporto alle decisioni (DSS) per una gestione sostenibile e competitiva del pomodoro nelle serre del bacino Mediterraneo”.

Massa, D., Navarro Garcia, A. 2022. iGUESS-MED, un sistema pionieristico di supporto alle decisioni (DSS) per una gestione sostenibile e competitiva del pomodoro nelle serre del bacino Mediterraneo.

- 51 [Seminario de Técnicos y Especialistas en Horticultura](#). From 14 to 18/11/2022. Almeria (Spain). Organized by CAJAMAR. Participation of CAJAMAR with an oral presentation entitled “PROGRAMACIÓN DEL RIEGO EN INVERNADERO MEDIANTE LA HERRAMIENTA DE PLATAFORMA TIERRA”.

Fernández M.D., Céspedes A.J., Magán J.J. 2022. Programación del riego en invernadero mediante la herramienta de Plataforma Tierra. 51 Seminario de Técnicos y Especialistas en Horticultura. Almería (Spain), 14-18 November 2022.

- Academic General Assembly Meeting of Agriculture Faculty of Akdeniz University, on 22/03/2023, in Antalya (Türkiye). Participation of Akdeniz University.

Büyüктаş, D. 2023. iGUESMED projesi kapsamında yürütülen IOT Tabanlı İklim Kontrolü Yoluyla Verimli Gübreleme Projesi-Türkiye (Efficient Fertilization through IoT-Based Climate Control project carried out within the scope of iGUESMED project-Türkiye). Antalya, Türkiye, 22 March 2023.

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- Symposium: Pesticides and Integrated Pest Management in Greenhouse Systems: case of greenhouse cultivation in the Center East of Tunisia. 25/04/2023. Hammamet (Tunisia). [Organized by FAO Regional Office for Near East and North Africa](#). Presentation of an oral communication by CRRAHB about “Pesticides used by farms and results of alternatives methods used in iguessmed trials (reduction of pesticides use)”.

Laarif, A. and Bouslama, T. 2023. Management of insects and pesticides in vegetable crops: case of greenhouse farming in Central Eastern of Tunisia (in French). National conference on “Pesticides for agricultural use and alternative control methods”. Hammamet (Tunisia), 25-26 April 2023.

- XIV edition of the [Scientific Congress SOI](#), organized by SOIHS (Italian Society for Horticultural Science) and Torino University, held in Torino (Italy) from 21 to 23/06/2023. Participation of CREA with an oral presentation “Sensori Sap flow: uno strumento promettente per la stima della traspirazione nelle specie ortofloricole”.

Navarro, A., Scotto di Covella, F., Nicastro, N., Di Cesare, C., Venezia, A., Massa, D. 2023. Sensori Sap flow: uno strumento promettente per la stima della traspirazione nelle specie ortofloricole. XIV Giornate Scientifiche SOI. L'ortoflorofruitticoltura per la transizione ecologica. Torino (Italy), 21-23 June 2023. Acta Italus Hortus n. 28, p. 148. ISBN: 978-88-32054-05-7.

- XIV edition of the [Scientific Congress SOI](#), organized by SOIHS (Italian Society for Horticultural Science) and Torino University, held in Torino (Italy) from 21 to 23/06/2023. Participation of UNIFI with two oral presentations: “Comparazione di vari modelli per la stima dell’evapotraspirazione di una coltura fuori suolo di pomodoro” and “Sviluppo di un modello per la previsione della biomassa e dell’assorbimento di nutrienti per il pomodoro cv. Pisanello coltivato in coltura fuori suolo”.

Incrocci L., Carmassi, G., Orsini, R., Stravato G., Cela, F. 2023. Comparazione di vari modelli per la stima dell’evapotraspirazione di una coltura fuori suolo di pomodoro cv. Pisanello. XIV Giornate Scientifiche SOI. L'ortoflorofruitticoltura per la transizione ecologica. Torino, 21-23 giugno 2023. Acta Italus Hortus n. 28, p. 326. ISBN: 978-88-32054-05-7.

Cialli, S., Carmassi, G., Orsini, R., Cela, F., Mensuali, A., Incrocci, L. 2023. Sviluppo di un modello per la previsione della biomassa e dell’assorbimento di nutrienti del pomodoro cv. Pisanello in coltura fuori suolo. XIV Giornate Scientifiche SOI. L'ortoflorofruitticoltura per la transizione ecologica. Torino, 21-23 giugno 2023. Acta Italus Hortus n. 28, p. 324-325. ISBN: 978-88-32054-05-7.

- Technical congress SOI “[Sensoristica digitale e agromotica in ortoflorofruitticoltura](#)”, organized by SOIHS (Italian Society for Horticultural Science) and CREA at the CREA-OF, Pontecagnano Faiano (Italy), from 4 to 5/10/2023. Participation of CREA with an oral presentation “Gestione irrigua delle colture orticole in serra tramite monitoraggio del flusso linfatico nello stelo con sensori sap flow”.

Navarro A., Massa D., 2023. Gestione irrigua delle colture orticole in serra tramite monitoraggio del flusso linfatico nello stelo con sensori “sap flow”. In: Galieni, A., Pane, C., Savona, M. (Eds.), Giornate Tecniche SOI - Sensoristica digitale e agromotica in ortoflorofruitticoltura. Società di Ortoflorofruitticoltura Italiana (SOI), Pontecagnano-Faiano (SA), 4-5 ottobre 2023. Acta Italus Hortus 29: 36. ISBN: 978-88-32054-06-4.

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- Technical congress SOI “[Sensoristica digitale e agromotica in ortoflorofruitticoltura](#)”, organized by SOIHS (Italian Society for Horticultural Science) and CREA at the CREA-OF, Pontecagnano Faiano (Italy), from 4 to 5/10/2023. Participation of UNIPI with an oral presentation “Calibrazione, validazione e implementazione di un modello di stima della biomassa e dell’assorbimento di nutrienti in pomodoro (cv. Pisanello)”.

Cela, F., Carmassi, G. Cialli, S., Incrocci L. 2023. Calibrazione, validazione e implementazione di un modello di stima della biomassa e dell’assorbimento di nutrienti in pomodoro (cv. Pisanello) In: Galieni, A., Pane, C., Savona, M. (Eds.), Giornate Tecniche SOI - Sensoristica digitale e agromotica in ortoflorofruitticoltura. Società di Ortoflorofruitticoltura Italiana (SOI), Pontecagnano-Faiano (SA), 4-5 ottobre 2023. Acta Italus Hotus 29: 11. ISBN: 978-88-32054-06-4.

- XXXIX Congreso Nacional de Riegos. [Organized by Asociación Española de Riegos y Drenajes \(AERYD\)](#), in Ubeda (Spain). From 18 to 20/10/2023. Oral presentation given by CAJAMAR entitled “Plataforma Tierra: Herramienta digital para la elaboración de planes de riego en invernadero”.

Fernández, M.D., Magán, J.J., Céspedes, A., Blaas, A. 2023. Plataforma Tierra: herramienta digital para la elaboración de planes de riego en invernadero. XXXIX Congreso Nacional de Riegos, Úbeda (Spain), 18-20 October 2023.

2.4 Other activities (networking, bilateral meeting, and end of degree/master studies)

The project was presented in the following networking and bilateral meetings:

- Virtual exchange of experiences between operational groups and innovative projects on fertilization organized by the Ministry of Agriculture, Fisheries and Food of Spain, held online on 08/07/2021. Participation of CAJAMAR with the presentation “iGUESS-MED. Sistema innovador de apoyo a los invernaderos en la región mediterránea: fertirrigación eficiente y gestión de plagas a través de un control climático basado en la IoT”. [Video](#).
- 4th meeting of the EUVRIN Working Group on Fertilization & Irrigation, organized by EUVRIN (European Vegetable Research Institutes Network) and held online on 17/06/2021. Participation of CREA with a presentation “Testing new techniques and technologies for improving the fertigation of Mediterranean greenhouse vegetables”.
- Meeting of Red RUENA (Red de Uso Ediciente del Nitrógeno en la Agricultura), held in Murcia (Spain) from 18 to 19/04/2023. Participation of UAL with a presentation “Manejo optimizado del riego y el N en cultivos hortícolas y sistemas de fertirriego”.
- 5th meeting of the EUVRIN Working Group on Fertilization & Irrigation, organized by EUVRIN (European Vegetable Research Institutes Network) and held in Kmetijski inštitut Slovenije, Ljubljana (SLOVENIA). from 12 to 14/09/2023. Participation of CREA with a presentation

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“Successful project example 2 – iGUESS-MED”. Session 3. Topic: EU funds and successful EU projects.

- **Bilateral meeting:** International meeting CREA (Research Centre for Vegetable and Ornamental Crops - Council for Agricultural Research and Economics) - BAAS (Institute of Plant Nutrition, Environment and Resources - Beijing Academy of Agricultural and Forestry Sciences), held in Pescia (Italy), on 24/10/2023. CREA presented the main projects of both research centers regarding fertirrigation in Horticulture, including iGUESS-MED.
- **Summit of Digital Technologies:** Tarimda Dijital Teknolojiler Zirvesi, held at Konya Food and Agriculture University, on 08/12/2023 in Konya (Turkiye). Akdeniz University set up stands to share information about the project and an introduction presentation of the project was made. At Konya Food and Agriculture University Conference Hall, the latest developments in the sector on issues such as artificial intelligence, sensor technologies, data analytics, agricultural robots and the integration of these technologies into agriculture were discussed.

The project was part of the following end of degree/master studies:

- Sánchez Martín, F.G. 2022. Medida y simulación de la evapotranspiración de un cultivo de tomate (ETc) en invernadero en el litoral de Almería. End of Degree Project (Agricultural Engineer) in Universidad de Almería (Spain). Date of Defense: 21 July 2022. Directed by Santiago Bonachela and María Dolores Fernández-Fernández. Qualification: 10 of 10. First Award of the “Cátedra del Agua en Agricultura, Regadío y Agroalimentación 2022” of the Universidad de Almería.
- Makhloufi, W. 2021. Irrigation control of a tomato crop under a multi-span greenhouse. Date of Defense: 01 July 2021. Director: Mohsen Mansour. Higher Agronomic Institute of Chott-Mariem (Tunisia). Engineer degree.
- Dabbabi, R. 2023. Contribution to the validation of a prediction model for the occurrence of the tomato leafminer *Tuta absoluta* (Meyrick, 1917) on a tomato crop grown in a greenhouse. Date of Defense: 4 July 2023. Directors: Asma Laarif and Thameur Bouslama. Higher Agronomic Institute of Chott-Mariem (Tunisia). Engineer degree.
- Mhadhbi, T. 2023. Comparative study of two methods of water requirements calculating for a greenhouse tomato crop. Date of Defense: 05 July 2023. Director: Mohsen Mansour. Higher Agronomic Institute of Chott-Mariem (Tunisia). Engineer degree.
- Cialli, S. 2022. Sviluppo di un modello di biomassa e di assorbimento di nutrienti per il pomodoro cv. Pisanello a differenti concentrazioni di salinità (in English: Development of a biomass and nutrient uptake model for tomato cv. Pisanello grown at different salinity concentrations). Date of Defense: 12/09/2022. Director: Prof. Luca Incrocci. University of Pisa. Master degree. Graduation grade: (110/110 cum Laude).
- Stravato, G. 2022. Comparazione di vari modelli per la stima dell’evapotraspirazione di una coltura fuori suolo di pomodoro. (in English: Comparison of various models for estimating the

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evapotranspiration of a soilless tomato crop). Date of Defense: 12/12/2022. Director: Prof. Luca Incrocci. University of Pisa. Master degree student. Graduation grade: (110/110 cum Laude).

3 Conclusions



Results of the iGUESS-MED project have been published in at least eleven peer reviewed papers (nine published articles and two articles in press) and contributions have been presented at several congresses and conferences in major international and national events (27 contributions). The target for this deliverable was to publish at least eight scientific papers for peer-reviewed journals and to produce eight contributions for national and international congresses and conferences, therefore, all the KPI proposed in the project have been met and succeeded, implementing the visibility of the project among researchers, technical advisors and extensionists.

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