Interreg Greece-Italy IR2MA
European Regional Development Fund

EUROPEAN UNION

Large Scale Irrigation Management Tools for Sustainable Water Management in Rural Areas and Protection of Receiving Aquatic Ecosystems

https://www.interregir2ma.eu/

Application experiences of technological approaches for efficient irrigation of greenhouse vegetable crops

F. F. Montesano,
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SUSTAINABLE IRRIGATION MANAGEMENT IN SOUTHERN MEDITERRANEAN AGRICULTURE: OPPORTUNITIES AND CHALLENGES

24/06/2021-WEB event | IAMB

Sustainability of greenhouse production process

https://venets.wordpress.com/2015/05/29/almeria-dove-ce-la-piu-alta-concentrazione-di-serre-al-mondo/

http://www.communianet.org/il-network/azione-con-il-soc-sat-almeria-tappa3

Greenhouse versus Open-Field Tomato Production in the Mediterranean Region: an LCA approach

Overall result for greenhouse and open-field systems to produce 1 kg of tomatoes.

Categorie di impatto	Unit	Greenhouse	Open field	Of/G
Depletion of non renewable resources	Kg Sb eq	3,65E-04	**4,79E-04**	1,31
Global warming	Kg CO^2 eq.	**7,44E-02**	5,01E-02	0,67
Ozone depletion	Kg CFC-11 eq.	8,97E-09	**8,95E-09**	1,00
Acidification	Kg SO^2 eq.	4,84E-04	**6,38E-04**	1,32
Eutrophication	Kg PO^{4-2} eq.	1,23E-04	**1,52E-04**	1,24
Energy consumption	MJ eq.	0,94	**1,19**	1,27
Water consumption	L	24,24	**42,84**	1,77

Muñoz et al., 2008

Type of efficiency	Species	Crop water requirement (L kg^{-1})		
		Soilless cultivation system		Soil cultivation system*
WUE	Lettuce	1.6	Barbosa et al., 2015	76
	Hot pepper	58	Ahmed et al., 2014	110
	Sweet pepper	17	El-Sayed et al., 2015	121
	Zucchini Squash	39	Rouphael et al., 2005	97
	Muskmelon	42	Hamdy et al., 2002	170
	Spinach	8.3	Van Ginkel et al., 2017	106
	Strawberries	136	Van Ginkel et al., 2017	544
	Brassica	5.0	Van Ginkel et al., 2017	129
	Tomatoes	35	Massa et al., 2010	78

*Values were estimated using FAO references (http://www.fao.org/3/u3160e/u3160e04.htm) adopting a sub-humid cultivation area and an average ETo of 5 mm day^{-1}. The following formula was used to calculate the crop evapotranspiration: ETc = [(kc × ETo) × average length of total growing season (days)] where ETo is the reference crop evapotranspiration and kc is the crop factor. kc values were used according to Dukes et al. (2012).

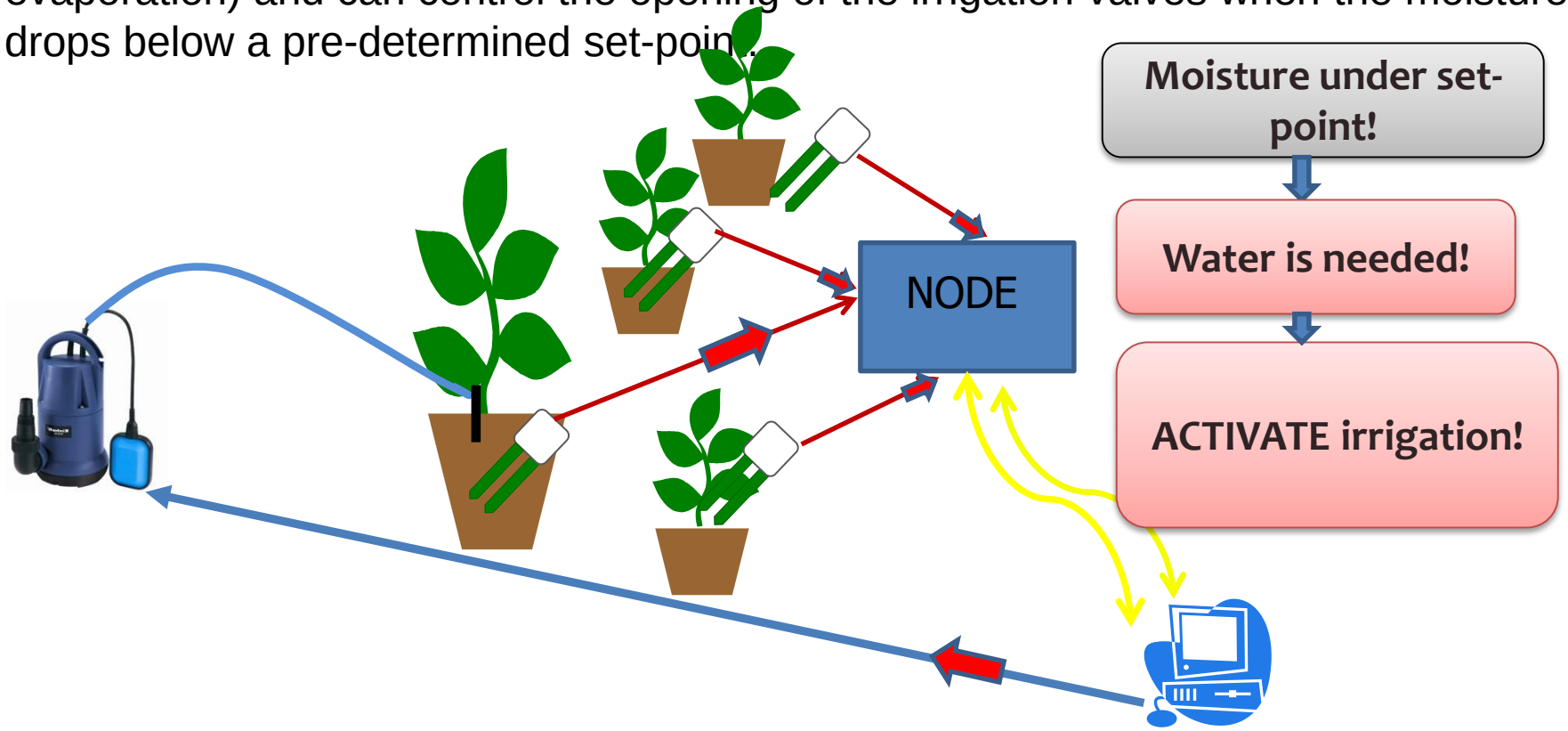
Sambo et al., 2019, Front. Plant Sci., 24
https://doi.org/10.3389/fpls.2019.00923

Sensor – based irrigation management

Real time sensing of growing media parameters: A promising and feasible approach to increase the sustainability and profitability of greenhouse cultivation

Let the plant decide!

The basic principle for the use of soil moisture sensors for irrigation control is simple: when plants use water they subtract it from the substrate, then the substrate moisture decreases.
The sensors measure these variations (due to the water used by the plants and to evaporation) and can control the opening of the irrigation valves when the moisture drops below a pre-determined set-point.



Benefits:

- Control of optimal substrate **water availability conditions**
- Prevention of plant water stress and waterlogging: **improved crop performance**
- Water supply based on plant needs: **rational use of water resource**
- Optimal control of leaching and runoff: **minimizing environmental pollution**
- **Higher plant quality** (controlled stress conditions)
- **Water and fertilizers savings**

Higher profits!!

IR2MA activity

1) Applicative research

- To assess the potential water saving for Mediterranean greenhouse vegetable crops

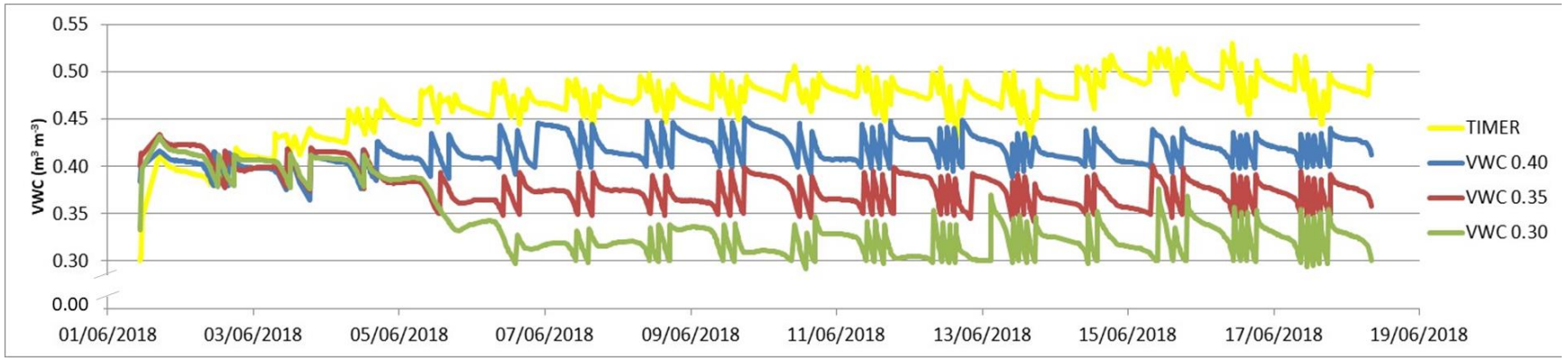
- To define optimal irrigation set-points and strategies for using sensors in terms of **crop performance, quality and WUE**

Sensor-based vs empiric irrigation management

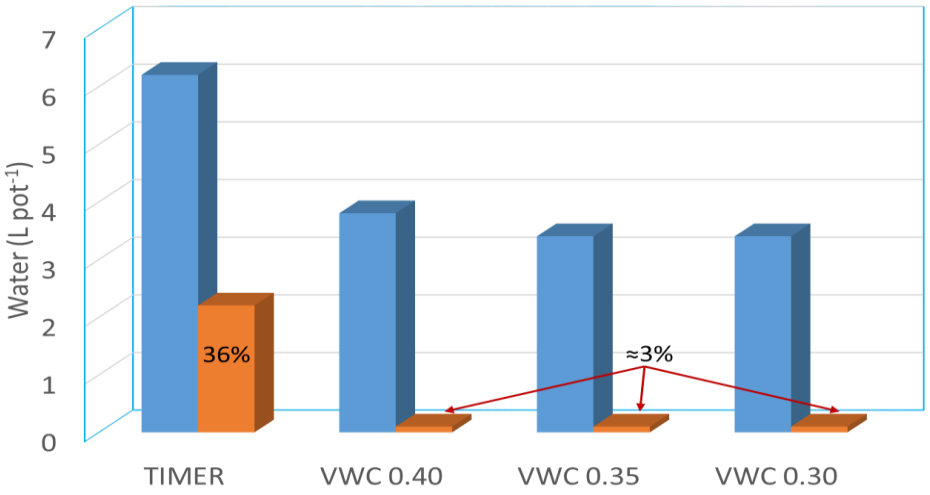
	Water saving	WUE
Basil 	38%	+128%
Green bean 	36%	+70%
Cherry tomato 	58%	+73%

Sensor-based vs empiric irrigation management

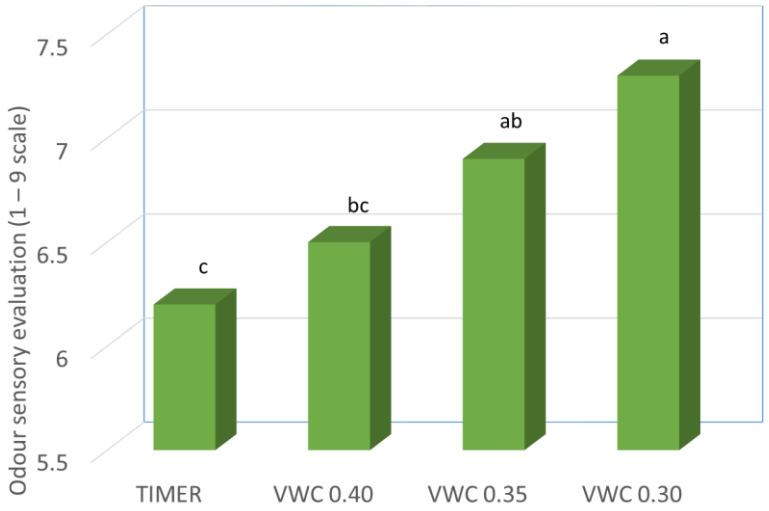
Effects on quality



Water saving, similar plant growth



Quality increase

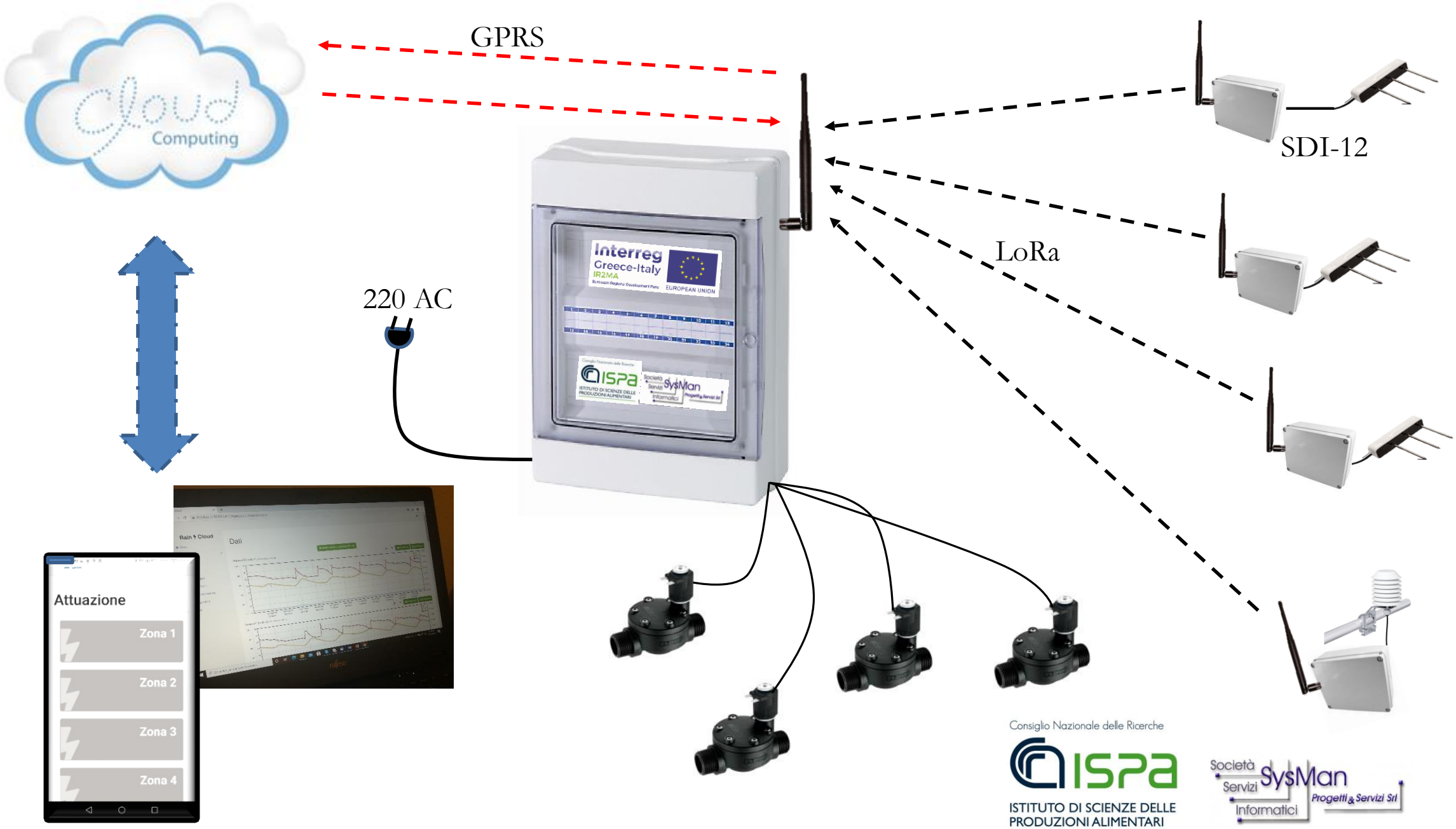


Effects on quality

Sensor-controlled salt stress (5 dS/m)

Trattamento	%<25 mm	%25-35 mm	%>35 mm	% dry matter	°Brix
TIMER	1,7	60,5	37,9	7,5	6,8
SMART (5 dS/m)	4,7	93,2	2,5	9,0	7,8
Significance	**	**	**	**	***

2) Prototype fro automatic sensor-based irrigation



http://80.241.136.71/legacy/pages/login.html

LoRa

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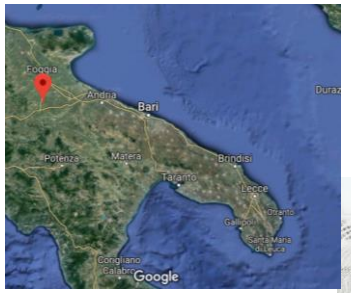
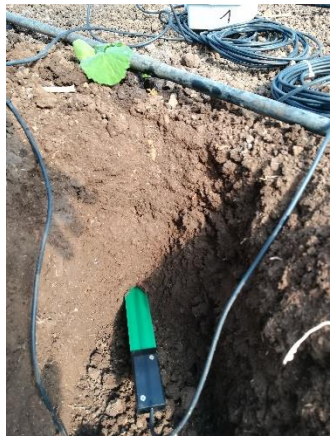
3) Demonstrative activity: test in commercial greenhouse

38% water saving compared with farmer's practice





http://80.241.136.71/legacy/pages/login.html

https://web.bluleaf.it
/

- Communicate the opportunities related to the use of sensors for the irrigation management of greenhouse crops

- Ameliorate technologies and application strategies

- Create competences and specific services to support growers interested in using a sensor-based approach

Colture Protette | n. 11 - dicembre 2020

RICERCA

LA GESTIONE IRRIGUA AUTOMATIZZATA, BASATA SULL'UTILIZZO DI SENSORI PER LA MISURA DELL'UMIDITÀ DEL SUBSTRATO, CONSENTE SIGNIFICATIVI RISPARMI IDRICI E INCREMENTA L'EFFICIENZA D'USO DELL'ACQUA

NUOVE TECNOLOGIE PER RAZIONALIZZARE L'IRRIGAZIONE

Contributo realizzato a cura della sezione Ortoflorovivaismo della Soi

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Prova di coltivazione di basilico con gestione automatica dell'irrigazione basata su sensori

Fra i diversi approcci proposti per migliorare la gestione automatica dell'irrigazione in serra e in particolare nelle colture su substrato, si è rivelato molto promettente quello basato sull'impiego di moderni sensori dielettrici per la misurazione in tempo

grammazione automatica sulla base dei reali fabbisogni idrici della pianta. Con questo approccio, è possibile ridurre il consumo di acqua e aumentarne considerevolmente l'efficienza d'uso rispetto a forme di gestione empirica dell'irrigazione, come quella

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Esperienze applicative di approcci tecnologici per l'irrigazione razionale delle colture orticole di serra

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