OPTILIGHT: Accelerating the arrival of real-time, automated light type monitoring and optimal control in commercial horticulture production

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Abstract (300 word limit)

Solar irradiation is the most important input triggering photosynthesis in plants, i.e. the process that primary drives their growth and quality. It has been widelydemonstrated that diffuse irradiation, in particular, plays a substantial role for crop photosynthesis enhancement as well as for production improvement, for it creates a more homogeneous light profile in canopies, avoids photo-damage, and overall leads to a more efficient use of light by crops [1-5].

Despite the scientifically proven relevance of diffuse sunlight for crop photosynthesis enhancement, commercial light sensing technologies do not allow for the implementation of an effective and affordable automated control of shadings systems in precision horticultural practices.

For this reason, the shading process and, therefore, the production are not optimized.

To fill this gap, Alitec has developed a system gathering information about the type of sunlight available in greenhouses under continuously changing irradiation conditions, and of providing real-time input for controlling shading nets.

The system represents an innovation to the extent that it makes available, affordable, and easy to implement the monitoring of the type of sunlight available to crops. Such step-forward in the precision agriculture domain is enabled by the CIS sensor, key component of the system: it is a dramatically innovative device capable of performing a full irradiation assessment broken into all components (direct and diffuse) of sunlight.

By making solar irradiation monitoring affordable & easy to implement, the CIS sensor allows for the uptake of real-time light type control systems in precision agriculture applications.

The proposed system features the CIS sensor mounted on two low cost, self-powered modules providing power, networking and wireless communication capacity to the sensors, along with the potential to complement the sunlight observation with a variety of other environmental parameters (temperature, wind, humidity, soil moisture, leaf wetness,..).

Image



Figure 1: The Complete Irradiance Sensor (CIS).

Recent Publications (minimum 5)

1. Gu L., Baldocchi D., Verma S.B., Black T. A., Vesala T., Falge E. M. et al. (2002) Advantages of diffuse radiation for terrestrial ecosystem productivity. Journal of Geophysical Research, Vol. 107, No. D6, 4050,ACL 2-1-ACL 2-23
2. Li T., Yang Q. (2015) Advantages of diffuse light for horticultural production and perspectives for further research. Frontiers in Plant Science 6:704. doi: 10.3389/fpls.2015.00704
3. Li, T., Heuvelink, E., Dueck, T. A., Janse, J., Gort, G., and Marcelis, L. F. M. (2014). Enhancement of crop photosynthesis by diffuse light: quantifying the contributing factors. Ann. Bot. 114, 145–156.
4. Reindl, D. T., Beckman W. A., and Duffie J. A. (1990) Diffuse fraction correlations, Sol. Energy, 45,1–7.
5. Alados, I., and L. Alados-Arboledas, Direct and diffuse photosynthetically active radiation: Measurements and modeling,Agric. For. Meteorol., 93,27–38, 1999.



Biography (150 word limit)

Alessandro Rossi is a physicists with more than 17 years' experience in R&D in the smart sensing technologies applied to the environmental monitoring. He holds a Master degree in Physics and PhD in Experimental Physics and has worked as researcher in world-class Italian and international universities and research centers among which the Universities of Pisa, Siena and Trento (Italy), Tampere University of Technology (Finland), and the German Aerospace Center (DLR) in Stuttgart (Germany). Alessandro authored several international scientific peer-reviewed papers and one international patent. Currently he is the CTO and CEO of Alitec.

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