Geophysical Research Abstracts
Vol. 18, EGU2016-17740, 2016
EGU General Assembly 2016

A comparative study of wireless and wired sensors networks for deficit irrigation management

Roque Torres Sánchez (1), Rafael Domingo Miguel (2), Fulgencio Soto Valles (3), Alejandro Perez-Pastor (4), Juan Antonio Lopez Riquelme (5), and Victor Blanco Montoya (6)

(1) ETSII, Universidad Politécnica de Cartagena, Cartagena, España. (roque.torres@upct.es), (2) ETSIA, Universidad Politécnica de Cartagena, Cartagena, España. (rafael.domingo@upct.es), (3) ETSII, Universidad Politécnica de Cartagena, Cartagena, España. (pencho.soto@upct.es), (4) ETSIA, Universidad Politécnica de Cartagena, Cartagena, España. (alex.perez-pastor@upct.es), (5) ETSII, Universidad Politécnica de Cartagena, Cartagena, España. (juanantonio.lopez@upct.es), (6) ETSIA, Universidad Politécnica de Cartagena, Cartagena, España. (victorblanco1990@hotmail.com)

In recent years, the including of sensors in the context of agricultural water management, has received an increasing interest for the establishment of irrigation strategies, such as regulated deficit irrigation (RDI). These strategies allow a significant improvement of crop water productivity (marketable yield / water applied), especially in woody orchards.
The application of these deficit irrigation strategies, requires the monitoring of variables related to the orchard, with the purpose of achieving an efficiently irrigation management, since it is necessary to know the soil and plant water status to achieve the level of water deficit desired in each phenological stage. These parameters involve the measurements of soil and plant parameters, by using appropriate instrumentation devices.
Traditional centralized instrumentation systems include soil matric potential, water content and LVDT sensors which information is stored by dataloggers with a wired connection to the sensors. Nowadays, these wired systems are being replaced by wireless ones due, mainly, to cost savings in wiring and labor. These technologies (WSNs) allow monitoring a wide variety of parameters in orchards with high density of sensors using discrete and autonomous nodes in the trees or soil places where it is necessary, without using wires.
In this paper we present a trial in a cherry crop orchard, with different irrigation strategies where both a wireless and a wired system have been deployed with the aim of obtaining the best criteria on how to select the most suitable technology in future agronomic monitoring systems.
The first stage of this study includes the deploying of nodes, wires, dataloggers and the installation of the sensors (same for both, wired and wireless systems). This stage was done during the first 15 weeks of the trial. Specifically, 40 MPS6 soil matric potential, 20 Enviroscan water content and 40 (LVDT and band) dendometers were installed in order to cover the experimental irrigation trials: Control, Severe deficit, Moderate Deficit, Low Deficit and Traditional irrigation, with 4 repetitions (2 wired and 2 wireless) each one.
The main goals were: (i) the ability of WSN for monitoring areas with high density of information, (ii) advantages and disadvantages compared to traditional wired instrumentation, (iii) energy sizing for autonomous operation of WSNs, (iv), strategies for deploying nodes to ensure the robustness of WSN.
The main conclusions were:
i) The WSNs need less time to be installed than the wired systems, ii) the WSNs is easier to install than the wired one because of the absence of wired links, iii) the advantage of WSNs is increased with high density of measure points, iv) the maintenance is higher in WSNs than the wired centralized systems, v) the acquisition costs is similar in both systems, vi) the installation costs is higher in Wired systems than WSNs, vii) the quality of data is similar in both systems although the data in WSNs are sooner available than wired, viii) the data robustness are higher in wired systems than WSN because of solar panel and battery lacks of WSN nodes.
This work has been funded by the Ministerio de Economia y Competitividad AGL2013-49047-C2-1R.