

The role of sensors in Agriculture 4.0

Dr. Lorena Parra, Universitat Politècnica de València and Instituto Madrileño de Investigación y Desarrollo Rural, Agrario y Alimentario, Spain.

The technological revolution of the agriculture sector is boosting the development of different applications, prototypes and systems to increase the efficiency of the sector. In the last decade, thousands of proposals have been published. Nonetheless, the adoption of those proposals is not yet achieved at commercial scale. In this tutorial, we are going to summarise some of those proposals and analyse the main barriers that are stopping the adoption of these systems. Starting with the role of Wireless Sensor Networks (WSN) in agriculture and their multiple benefits, we will evaluate the different proposals for saving water. The similarities and differences of existing proposals for irrigation monitoring based on WSN will be shown. Later, we will focus on the requirements of sensors that compose those WSN revolving around on the developed prototypes for soil and water monitoring. Among those requirements, we can highlight the robustness and the absence of maintenance. Those requirements led us to the use of physical sensors based on optic or electromagnetic phenomenon. We will show some of the prototypes used in irrigation channels to monitor water quality and in the soil to monitor the soil moisture, among others. Following, the use of sensors for monitoring the crop status or crop vigour will be evaluated. Different remote sensing tools are compared to highlight the benefits of different available options. From handheld remote sensing tools to satellite images, the advantages and possible limitations of each method will be underlined. We will present some examples that evaluate the plant vigour using handheld tools, the estimation of harvest with image processing and remote sensing, the recognition of weed plants with drone imagery, and the use of satellite imagery to estimate the existence of grass cover in the crops among others. Finally, the synergies of both technologies, their possible combined use or the estimation of some remote sensing parameters from sensors will be presented. To close this tutorial, the main barriers and challenges of the sensor for Agriculture 4.0 are emphasised.