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LCIS: a DSS irrigation system for water use efficiency improvement in precision agriculture: a maize case study

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The United Nations and FAO, through the Sustainable Development Goal 2 (Zero Hunger) and the Sustainable Crop Production Intensification (SCPI) Strategic Objective A underline the need for an increase of crop productivity, based on science-based sustainable practices, able to improve resource use efficiency (water and nutrient) in a context of Climate Change.
The efficient use of water in agriculture is one of the most important agricultural challenges that modern technologies are helping to achieve through Irrigation Advisory Services (IAS) and Decision Support Systems (DSS).
These last are considered powerful management instruments able to help the farmer to achieve the best efficiency in irrigation water use and to increase its incomes through the achievement of the highest obtainable crop yield.
In this context, within the project “An advanced low cost system for farm irrigation support – LCIS” (a joint Italian-Israeli R&D project), a fully transferable DSS for irrigation support, based on three different methodologies representative of the state of the art in irrigation management tools (W-Tens, proximal sensing; IRRISAT®, remote sensing; W-Mod, simulation modelling of SPA system), has been developed.
However, the implementing of appropriate management procedures is not always straightforward in practices and each possible approach to irrigation support application presents pros and cons in the application, due to different spatial scale applicability, costs and complexity of use.
For this reason, the LCIS-DSS tools have been evaluated, in terms of their ability to support the farmer in irrigation management, in a real applicative case study on maize in a private farm of southern Italy in the season 2018 on Andosols. The obtained results, have shown that the compared approaches are able to realize the maximum obtainable maize production, however, the method based on proximal sensing (W-Tens) supply 40% more water compared to the other two methods. IRRISAT® and W-Mod approaches represent the best solution in terms of IWUE, moreover the former has the advantage to work without soil spatial information, however both methods need a high level of user expertise and consequently a support of external service providers. Integration between different tools represents the future opportunity to improve water use efficiency in agriculture (e.g. field sensors and remote sensing).

Keywords: precision agriculture, DSS for irrigation, water use efficiency, maize, SDG