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Decision Support Software (DSS) in irrigation management: application to small farms

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The importance of irrigation water management has increased in recent years with the declining summer availability due to climate change, especially for surface waters. Along with an increase of efficiency, the diffusion of pressure irrigation systems (sprinklers, drip irrigation, pivot, etc.) allows for a demand-based irrigation, overcoming the limitations of turn-based management typical of flood irrigation. The challenge of correctly addressing this approach shift is addressed within the GUARDIANS project (<https://guardians-project.eu/>), funded by the Horizon Europe program. GUARDIANS involves 22 partners from 9 countries in the development and demonstration of IT technologies, specifically designed for small farms, in several study areas. One of these case studies is the irrigation reservoir of Rivoira (Boves, Piedmont, NW Italy), built in 2017 along with a pipeline network that complements the existing irrigation canals. This reservoir, with a capacity of 42000 m³, is supplied by one of these canals and is connected to a pressure irrigation network that can serve about 300 ha; initially conceived as a "last resort basin", it has become the primary water supply source for several farms.

One of the approaches adopted for on-demand irrigation is the use of Decision Support Software (DSS) based on remote sensing satellite images with indicators such as NDWI (Normalized Difference Water Index) and NDVI (Normalized Difference Vegetation Index). A major limitation of this approach was found in the limit of 1 ha surface due to the spatial resolution of satellite images (10 m for Sentinel 2), which is hardly met in small farms contexts, and in the scarce correlation between indicators such as NDWI and the ground-based measures of volumetric water content (VWC). The performance of DSS could be improved with ground-based VWC sensors, but their cost is unsustainable for small farms. Low-cost sensors with remote transmission, which have been recently released in the mass-market, have therefore been tested. This solution, which can partially bridge the gap between small and large farms, could be implemented through specific training courses.

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