Assessing potential water savings achievable by implementing variable rate sprinkler irrigation

in a maize farm in northern Italy

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**Abstract.** The Po valley, in northern Italy, is characterized by a strong agricultural and zootechnical vocation; the Lombardy agricultural area is about 700,000 ha, of which the 70% is irrigated. The prevailing crops are cereals, with maize covering half of the total area, usually cultivated as fodder crop. Due to the abundance of water, irrigation in the area has been based on gravity-fed surface irrigation systems for centuries. However, as a consequence of the increasing in the occurrence of dry spells and of possible future water scarcity predicted by the IPCC scenarios, farmers are introducing more efficient irrigation methods to meet the crop water needs and at the same time to reduce the water use.

The SOS-AP project (Sustainable SOlutions for Precision Agriculture in Lombardy: variable rate irrigation and fertilization in maize and wine-growing - RDP Regione Lombardia Operation 1.2.01) aims at demonstrating the applicability of precision agriculture approaches in the Lombardy context. With regard to precision irrigation in the maize sector, the objectives of the project are: 1) the demonstration in a ‘pilot’ center-pivot of the possibility of implementing a variable rate irrigation (VRI) based on soil characteristics in the 2021 agricultural season: in the pilot pivot, the irrigation input was differentiated over circular sectors through a change in speed (“sector control”), with an economic investment to adapt the pre-existing pivot lower than the one needed to implement a true ‘zone control’ which would require the independent management of individual (or groups of) nozzles; 2) the simulation of the VRI in a 300 ha maize farm where irrigation is performed through center-pivot and linear irrigation systems which apply water in a uniform way on a fixed calendar. Both at the scale of the pilot pivot and for the entire farm, water and energy savings are compared with those found in the current management.

A soil monitoring survey through an electro-magnetic induction (EMI) sensor was used to produce a map of the homogeneous management zones for the whole farm. A semi-distributed agro-hydrological simulation approach based on the SWAP model (https://www.swap.alterra.nl) was developed and applied for: 1) the real-time VRI management during the 2021 season in the pilot pivot by using 7-day weather forecast data (https://www.abacofarmer.com) which led to a water saving of about 20%; 2) the simulation of the water saving that could have been achieved at the farm level if the VRI approach had been adopted in the period 2016-20.