Surface Irrigation Using Cloud-Based Automation, Sensors, & Data Analytics

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Numerous modern techniques and technologies exist to improve crop yield per unit of applied water. However, despite technical advances having been available for many years, adoption of agricultural water management solutions to enable holistic decision making has been hampered by fragmented solutions and financial and logistical barriers, both in developing and in developed countries.

This paper discusses the benefits that can be achieved by better use of information and communication technology, through the adoption of consolidated platforms to enable more informed irrigation decision making. Prior studies have identified the opportunity for major water savings via prudent irrigation scheduling. However, until now, the technologies to achieve these outcomes have not been available to many of the world's farmers and this has constrained large-scale uptake to the detriment of global food production and environmental outcomes.

This paper deals with the potential of Information Technology and Telecommunications to better manage the scheduling of irrigation water supplies. The nexus of cloud-based hosting, Software as a Service (SaaS), Internet of Things (IoT), and advances in evapotranspiration data enables global access to best-practice irrigation scheduling tools, with consequential benefits for regional water supplies.

A range of opportunities for using this integrated cloud-hosted information is considered, ranging in sophistication from basic calculators estimating crop water use requirements, through to automated precision application management solutions that remotely and automatically control networked on-farm irrigation systems.

By adding additional input data (such as fertilizer application), together with output data (harvest data, for example), farmers can use the platform to benchmark their irrigation and make better-informed decisions. These insights can be shared between farmers to develop a platform for district-wide performance benchmarking, and Artificial Intelligence (AI) can assist with predictive water application and forward analysis.

The on-farm irrigation benchmarking data can be aggregated and used to accurately pre-empt both demand and supply conditions at the catchment level. The ability to precisely forecast ordered flows will assist irrigation districts in achieving operational objectives including delivering water when required by the crop and eliminating spills due to oversupply.

Pilot trials of the platform, in collaboration with University of Melbourne in Australia, have been scheduled with various irrigation districts within Australia's Murray-Darling Basin for the 2020 calendar year. The aim of the trials is to obtain dataset inputs from micro-climatic weather stations (rainfall, temperature, humidity, wind speed/direction, solar radiation and atmospheric pressure), satellite imagery and remote-sensing information to develop quality irrigation benchmarking. The improved data will be integrated into the water ordering interface used by approximately 16,000 Australian farmers.

Rubicon Water, in collaboration with the University of California Division of Agriculture and Natural Resources (UC ANR), has commenced a number of projects with the principal objective to demonstrate the gains in application efficiencies possible through the use of optimally-managed, automated, high-flow bay irrigation using cloud based computing in California for alfalfa and furrow irrigation in Holtville, California for sugar beet production.

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