

Irrigation scheduling research: South African experiences and future prospects

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Abstract

Many scheduling approaches have been developed with Water Research Commission funding over the past 4 decades and deployed with varying levels of success; 2 approaches have won prestigious international awards. Soil-based approaches which include measurement of matric potential (tensiometry), water content (neutron probes, capacitance sensors) and depth of wetting (wetting front detectors) have been relatively well accepted by farmers. Atmospheric-based approaches apply, through biophysical modelling of the soil-crop-atmosphere system, thermodynamic limits to the amount of water that can evaporate from a cropped surface under particular environmental conditions. Modelling approaches have been quite empirical or somewhat more mechanistic, generic or crop specific, with pre-programmed (e.g. irrigation calendars) or real-time output. Novel mechanisms have been developed to deliver recommendations to farmers, including resource-poor irrigators. Although general adoption of objective irrigation scheduling in South Africa is still low, the high cost of electricity and nitrogen, and scarcity of water is reviving the interest of consultants and irrigators in the application of these tools to use water more efficiently. Where adoption has been relatively high, intensive support and farmer-researcher-consultant interactions have been key contributing factors. We propose 4 avenues in the R&D domain to ensure responsible water utilisation. Firstly, there is a need to continue to advance existing soil-water measurement technology; and secondly, to further develop new and emerging technologies, like the use of remote sensing. Thirdly, the user-friendliness should be improved as should systems that support existing scheduling tools; and finally, we need to appreciate that farmers are intuitively adaptive managers, and we need to develop simple monitoring tools and conceptual frameworks that enable structured learning.

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