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The value of information for the management of deficit irrigation systems

Niels Schuetze¹ and Oleksandr Mialyk²

¹TU Dresden, Institute of Hydrology and Meteorology, Dresden, Germany (niels.schuetze@tu-dresden.de)

²University of Twente, Water Engineering and Management Group, The Netherlands

Due to climate change, extreme weather conditions such as droughts may have an increasing impact on the water demand and the productivity of irrigated agriculture. For the adaptation to changing climate conditions, the value of information about irrigation control strategies, future climate development, and soil conditions for the operation of deficit irrigation systems is evaluated. To treat climate and soil variability within one simulation-optimization framework for irrigation scheduling, we formulated a probabilistic framework that is based on Monte Carlo simulations. The framework can support decisions when full, deficit, and supplemental irrigation strategies are applied. For the analysis, the Deficit Irrigation Toolbox (DIT) is applied for locations in arid and semi-arid climates. It allows the analysis of the impact of information on (i) different scheduling methods (ii) different crop models, (iii) climate variability using recent and future climate scenarios, and (iv) soil variability. The provided results can serve as an easy-to-use support tool for decisions about the value of climate and soil data and/or a cost-benefit analysis of farm irrigation modernization on a local scale.