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Results from a 3-year deficit irrigation experiment with drip-irrigated maize to improve water productivity

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Water for irrigation farming is severely limited in arid and semi-arid regions, hence reliable and robust strategies are needed that allow to use the available resources efficiently. Controlled deficit irrigation (DI) is one strategy that can help to use water in an effective way while still ensuring considerable yields from harvest. It needs precise irrigation control however where sensors are used to determine when to irrigate. Therefore, thresholds that trigger irrigation need to be chosen carefully.
An irrigation experiment with drip-irrigated maize was conducted in three consecutive years (2010-2012) where different controlled DI strategies were tested. The experiments took place in a greenhouse at TU München in Freising, Germany, and comprised treatments with constant and varying irrigation thresholds throughout the growing season, which were compared to fully irrigated reference treatments. Thresholds were determined in soil tension as it is closely related to the working principle behind plant transpiration and treatments evaluated with regard to their water productivity (WP - yield over applied irrigation water).
The irrigation thresholds were determined prior to the experiment by a stochastic simulation-based framework that consisted of a weather generator, the crop growth model Daisy, and an optimization algorithm for finding optimal thresholds under limiting water supply.
Achieved results show similar or better WP compared to the reference and generally high WP compared to values from literature which suggests this methodology is a promising approach to improve WP.