



Optimal management of water resources demand and supply in irrigated agriculture from plot to regional scale

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Growing water scarcity in agriculture is an increasing problem in future in many regions of the world. For assessing irrigation as a measure to increase agricultural water security a generalized stochastic optimization framework for a spatial distributed estimation of future irrigation water demand is proposed, which ensures safe yields and a high water productivity at the same time. Different open loop and closed loop control strategies are evaluated within this stochastic optimization framework in order to generate reliable stochastic crop water production functions (SCWPF). The resulting database of SCWPF can serve as a central decision support tool for both, (i) a cost benefit analysis of farm irrigation modernization on a local scale and (ii) a regional water demand management using a multi-scale approach for modeling and implementation. The new approach is applied using the example of a case study in Saxony, which is dealing with the sustainable management of future irrigation water demands and its implementation.