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The benefit of using an ensemble of global hydrological models in surface water availability for irrigation area planning

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Hydrological data and information on the availability of water are essential to support water allocation decisions in irrigated agriculture, especially under increasingly water scarce conditions. However, in many agricultural regions around the world hydrological information is scarce, leading to sub-optimal water allocation decisions and potential agricultural production loss. In this study we assess the influence of hydrological variability on water availability, and evaluate the benefit of using an ensemble of global hydrological models for designing the size of an irrigation area, where this is determined based on agreed operational targets of water supply reliability. Surface water availability estimates are established using an ensemble of global hydrological models. The risky outcomes in terms of annual agricultural production due to the actual frequency of occurrence of water scarcity were generated for a reference and alternative irrigation area sizes, resulting in a Relative Utility Value (RUV) that expresses the utility of the information used. Results show that using an ensemble of global hydrological models provides more robust estimates of the planned area compared to when using any of the single global models that constitutes the ensemble. A comparison of the information content in the ensemble shows that an ensemble with a period of record of fifteen years has an information content equivalent to a single model of thirty years. The results provide insight into how a hydro-economic framework can be applied in irrigation area planning, given uncertain surface water availability estimates.