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"Agricultural development within the rural-urban continuum"

Supporting Sustainable Water Resource Management along the Tarim River (China) until 2030

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Abstract

Overexploitation of scarce water resources for irrigation agriculture is a key problem impeding a sustainable development in the extremely arid Tarim Basin in China's Xinjiang province. Therefore the SuMaRiO (Sustainable Management of River Oases along the Tarim River) project develops a Decision Support System (DSS) for integrated land and water resource management. To ensure credibility, relevance and acceptance of the DSS an inter- and transdisciplinary research approach is applied that includes local stakeholders' knowledge, perception, and preferences from the beginning of the project. The DSS-sub-models which are linked within the DSS include hydrological models (WASA, SWIM, and MIKE BASIN), quantifying discharge and irrigation water availability, bio-geophysical models (EPIC, APSIM), determining crop yields and actual crop water use, and farm optimisation models (Linear programming), deciding farmers' current and future cropping pattern. Furthermore the response of riparian forests along the river, on changes in groundwater level and flooding events is determined by self-developed empirical models. The actual land and water management measures that can be simulated through the DSS comprise improvement of water transmission and storage infrastructure, restriction of agricultural land expansion, improvement of agricultural extension service, subsidisation of advanced irrigation technology and others. Specific ecosystem service (ESS) indicators enable the DSS-user to judge the impact of potential water and land resource management measures under a range of future climate and consecutive river discharge scenarios. Socio-economic scenarios define future developments of agricultural input and output prices, which directly enter the farm optimisation model. The ESS indicators are then determined for every sub-region annually until 2030 and include among others the status of natural riparian ecosystems, farmers' income, production amount of food, feed and fiber, employment in agriculture, as well as ground and surface water status.

Keywords: China, decision support system, trans-disciplinary research

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