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An Agent-Based Model of Farmer Decision Making in Jordan

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We describe an agent based hydro-economic model of groundwater irrigated agriculture in the Jordan Highlands. The model employs a Multi-Agent-Simulation (MAS) framework and is designed to evaluate direct and indirect outcomes of climate change scenarios and policy interventions on farmer decision making, including annual land use, groundwater use for irrigation, and water sales to a water tanker market. Land use and water use decisions are simulated for groups of farms grouped by location and their behavioural and economic similarities. Decreasing groundwater levels, and the associated increase in pumping costs, are important drivers for change within Jordan'S agricultural sector. We describe how this is considered by coupling of agricultural and groundwater models. The agricultural production model employs Positive Mathematical Programming (PMP), a method for calibrating agricultural production functions to observed planted areas. PMP has successfully been used with disaggregate models for policy analysis. We adapt the PMP approach to allow explicit evaluation of the impact of pumping costs, groundwater purchase fees and a water tanker market. The work demonstrates the applicability of agent-based agricultural decision making assessment in the Jordan Highlands and its integration with agricultural model calibration methods. The proposed approach is designed and implemented with software such that it could be used to evaluate a variety of physical and human influences on decision making in agricultural water management.