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Abstract: We build a hydro-economic behavioural model of groundwater irrigated agriculture to help understand and analyse the impact of institutional and biophysical changes on land and water use in the Jordan Highlands. The model sits within a Multi-Agent-Simulation (MAS) framework representing the physical and institutional components of the wider national water resources system, which are being modelled by an interdisciplinary team, including a tanker water market and a groundwater model which interact with the farmer model. The MAS is designed to evaluate climate change scenarios and policy interventions to test whether reform of institutional rules that govern water usage in Jordan can improve water system performance. To structure the sub-model interactions and to manage the sequence of yearly and monthly decision making by agents and institutions within the water resource system, we use Pynsim, an open-source modelling framework (also presented at this conference). Farmer decision making is approximated as an optimisation problem where land and water are allocated to maximise profits from cropping and sale of groundwater to tankers. Farms are aggregated at sub-district level and by farm size. We use PMP (Positive Mathematical Programming) methods to calibrate the model and integrate rules, norms and behaviours as constraints. The dynamic linking of the farmer model with the other MAS components allows studying different aspects such as the economic impact of decreasing groundwater levels, the economic effects of tanker supply and demand, etc. The work demonstrates that modelling agent-based decisions provides an applicable and flexible approach to modelling the agricultural sector within the context of water resources planning.

***Keywords**:* Hydroeconomic, Agent-Based, MAS, pynsim, Agriculture, Open-source, Jordan, Irrigation