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SustainValencia 2022

October 6 to 8, 2022

Valencia

Book of abstracts

J. Jaime Gómez-Hernández
James J. Butler Jr.
Editors

Editors:

J. Jaime Gómez-Hernández

James J. Butler Jr.

Editorial:

Grupo de Hidrogeología

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SustainValencia2022 builds on the success of the 2019 Chapman conference “Quest for Sustainability of Heavily Stressed Aquifers at Regional to Global Scales” held in Valencia and the well-attended 2021 AGU annual meeting hybrid session “Prospects for Sustainability of Heavily Stressed Aquifers: Impediments and Opportunities.” The conference has attracted close to 100 participants from all over the world with an important presence of USA, Germany, Spain and Italy. It has been organized around eleven topical sessions, touching groundwater sustainability from many different angles.

J. Jaime Gómez-Hernández
James J. Butler Jr.
Editors

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Cooperative Behavior in a Groundwater Irrigated Social-Agricultural Context

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Keywords: groundwater management, agent based model, policy testing

Abstract. Farmers all over the world rely on irrigation to increase their profitability in agricultural production. Particularly in semi-arid and arid regions where surface water is scarce or inaccessible, groundwater resources are of vital importance for the continuity of agriculture. However, being a common pool resource (CPR), groundwater is likely to be overexploited, even depleted, unless effective measures are taken. Relevant literature highlights the significance of collective action in sustaining CPRs like groundwater. There exist many forms of cooperative institutions in various social-economic contexts, aiming to foster collaboration among farmers and define use rights for groundwater. In this study, we build an agent-based model for a predefined, hypothetical, semi-arid region where groundwater is utilized for agricultural irrigation and farmers have the option to join a groundwater co-op scheme that operates in the region. Inspired by our experience from another relevant case study, we explore the economic and environmental impacts of two co-op policies: a mandatory crop rotation schedule which aims to manage the groundwater demand, and a maximum allowed irrigation rate policy regardless of individual crop selection which restricts the supply of groundwater. The policies are tested separately and together against a no-policy base scenario. The results reveal that the suggested policies delay the depletion of groundwater with varying rates of participation in different policy scenarios. As expected, stricter policies, though potentially more effective, result in lower participation in co-op and weaker impact. To comprehend the full potential impact of the policies, we replicate all policy scenarios with the assumption that all farmers are co-op members. The results show that proposed policies are significantly effective in preserving groundwater resources in case of a high cooperation rate. Therefore, the issue of groundwater management as a CPR does not only pertain to the effectiveness of collective action, but also to whether maintaining it is possible to start with.

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