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Using a simple decision support system to evaluate water saving strategies in Alicante, Spain

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Advances in knowledge and technologies during the last decades have led to considerable water savings in many irrigated areas around the world. These have often been achieved through modern water supply methodologies involving, for example, advanced drip and sprinkler irrigation. These methods, however, are costly and socio-economically not always viable.

The southern Mediterranean region is particularly susceptible to water shortage problems because of the increasing (potable) water demands for human consumption and agricultural use on the one hand, and decreasing water availability on the other hand. Conventional water resources are inefficiently used through incomplete wetting of soils due to water repellency, excessive evaporation due to ponding, and water loss due to runoff and throughflow. There is a scope for developing new and advancing existing sustainable water saving strategies in the Mediterranean area, by focusing on largely unexploited opportunities for water saving and the use of waste water as a non-conventional water resource on irrigated land. The performance of water saving strategies depends on economic, ecological and socio-cultural valuations of the techniques by stakeholders.

This study was performed in the framework of the EU co-funded Water Reuse project, which aims at testing new and existing water saving strategies in the southern Mediterranean area and in NIS states.
The objective of this study was to use a simple decision support system to evaluate the performance of water saving strategies for vine-growing areas in Alicante, Spain from an economic, ecological and socio-cultural point of view. Water saving strategies were selected with the aims to 1) to optimize the irrigation dose to crop requirements, 2) to improve the wetting properties of soils by preventing formation of water repellency, 3) to prevent water loss due to evaporation, and 4) to investigate the use of waste water as a non-conventional water resource in irrigation, saving fresh surface and ground water. The water saving strategies included increasing the frequency and decreasing the dose of regular irrigation applications, the use of straw mulch and the use of waste water. The water saving strategies were tested in an experimental vineyard during two years. The adjustment of irrigation dose and frequency, and the use of straw mulch increased the water use efficiency and the soil structural stability. The use of waste water did not have significant effects on relevant soil properties for sustainable vine production, like heavy metal contents, soil organic matter, pH or soil water repellency. An increase of the electric conductivity of the soil was observed under the use of waste water which had undergone a secondary treatment. This resulted in a decay of aggregates at the soil surface and consequently lower infiltration rates.

Economic, ecological and socio-cultural criteria were selected to evaluate the performance of water saving strategies based on literature and consultation of an irrigation consultant. Representatives of stakeholder groups in irrigation in Alicante were asked to assign an importance to the criteria from the point of view of the stakeholder group. A simple, free decision support system (Facilitator) was used to identify preferred water saving strategies for the region consistent with the ranking of the decision criteria. The study shows how participation by stakeholders can be incorporated in research on water saving strategies, and how measured data, simulation model results and expert opinions can be accommodated in the decision making process.