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## Wastewater residues and hydrogel application: Pathways to increase water and food security in Morocco?

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### Abstract

Drought conditions in large parts of the Maghreb negatively affect crop development and yield potential also in 2022/2023. In Morocco, drought conditions have delayed planting, reduced the area sown and resulted in below-average biomass. While hydrogels could be a way to increase water efficiency, (treated) wastewater is often used directly or indirectly for irrigation. In addition, waste water treatment by-products (treated waste water and sludge) can be used to improve soil fertility. In the framework of the Moroccan-German research project I-WALAMAR, the potential for the safe use of treated wastewater and residues from municipal wastewater treatment plants and olive mills in agriculture were investigated. The interdisciplinary project also focused on the development and application of hydrogels in field and plot experiments. In this presentation we will present the evaluation of the impact of hydrogel application on different crops in field and plot trials and discuss the potential for safe use of waste water treatment by-products (treated waste water and sludge in agriculture. Field trials in Meknes, Morocco, showed how different hydrogel applications and the use of olive oil production residues can be used to support water efficiency in food production and nutrient supply in the soil. Results varied with crop type, application rate, hydrogel type and irrigation pattern. Field studies on wastewater and effluent residues from the municipal wastewater treatment plant in Ain Taoujdate showed that the liquid and solid residues can be used safely, but only under certain conditions, such as extended storage of the sludge or post-treatment of the wastewater. Findings also showed that surface waters used for irrigation might be higher polluted with pathogens than wastewater effluents. There is thus potential to improve water and food security in Morocco with wastewater residues and hydrogel application. The developed biodegradable hydrogels also showed good water absorbing properties. They could help increasing crop yield and to safe water resources. Furthermore, the biodegradable material could increase the sustainability of the application of hydrogels. However, there are still challenges and open questions in the

concrete, safe application of these substances and work to scale up needs to be carried out.

**Keywords:** Climate adaptation, hydrogel, Morocco, water efficiency, water reuse