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Study of the return water coming from heating systems of geothermal greenhouses in El Hamma region, Gabès, Tunisia

Ibtissem Balaout (1), Fatma Wassar (1,2), Latifa Dhaouadi (3), and Wafa Tounsi (4)

(1) Higher Institute of Water Sciences and Techniques (ISSTEG), University of Gabès, Tunisia (fatmawassar@yahoo.fr) , (2) Institute of Biometeorology of the National Research Council (IBIMET-CNR), Italy (fatmawassar@yahoo.fr), (3) Regional Research Center of Oasis Agriculture, Degache-Tozeur, Tunisia (latifa_hydro@yahoo.fr), (4) Natural Water treatment Laboraory (LabTEN), Center of Water research and Technologies (CERTE), Borj Cedria, Tunisia (ouafa.tounsi@gmail.com)

Southern Tunisia is ranked among the suffering regions from water scarcity. Its groundwater is overexploited due to the absence of surface water and water demand increase. El Hamma region considered as our study area is so fare concerned. Some collective initiatives have been developed at the regional level for the re-use of return water coming from heating systems as a source of irrigation. But, information concerning return water, its reuse and its quality are still undocumented. From here emerges our project, which aims to study the return water coming from heating systems of geothermal greenhouses. Mainly, its valorization, its physico-chemical quality and its impact on the soil-plant system once reused as irrigation water. To fully understand the situation of return water in the study area, we collected data through a survey based on a well-detailed questionnaire and a representative sampling of drilling and return water. Greenhouses are mainly located in five areas of El Hamma region: Ben Ghilouf, El Khbeyet, El Hamma Chenchou, Bechima el Galb and Sokra. Physico-chemical analyses of water samples were made. The first results show that the majority of farmers reuse the return water to irrigate either close oases or their own greenhouses (only 10% of the total quantity). With the exception of Sokra region, where 90 % of return water is thrown in the close sabkhas mainly due to the absence of close irrigated areas and oases. The loss is estimated to be equal to 3732.48 m3 / day on a total of 12 cultivated hectares. It was also found that return water has practically the same quality as drilling water. This water is very saline (salinity > 3 g/l) and very rich in calcium (0.5-0.8 g/l), sulphate (1.7-2.2g/l) and magnesium (0.15g/l). Irrigation indices gives that return water has a poor quality that exceeds generally the Tunisian standards for irrigation water quality with a high risk of Salinization. This high salinity may affect soil physical properties and damage crop yields. Excessive calcium found in return water can be considered as the first factor contributing to water scaling and all related problems. A well detailed study on the effect of irrigation water quality on soil properties and crop production is strongly recommended.

Key words: El Hamma, return water, heating system, geothermal greenhouses, irrigation, salinity, scaling