

Evaluation of the impact of water harvesting techniques on the evolution of piezometric head of Ain El Bidha groundwater in Kairouan at the Central part of Tunisia

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This study aims to assess the impact of water harvesting constructed hydraulic structures (big and small dams, terraces, seuils for recharge. . .) on the evolution of piezometric head of Ain El Beidha groundwater table. The measurements of depth of water table, taken at the end of rain season and at the end of irrigation season, in many piezometers and monitoring wells, for a long period of observation before and after implementation of all the hydraulic structures, were used with the cumulative rain to the highest water table to diagnostic the effect of natural recharge and constructed hydraulic structures.

According to the analysis of curves illustrating the evolution of piezometric head and rainfall over time, it was shown that despite the fact that the same amount of rain fall on the total area in the limits of Ain El Beidha groundwater table, the piezometers respond differently. This is because there are many sources of recharge and many factors affecting the recharge. First of all, the aquifer is divided in four compartments (the calcareous formation of Djebel El Houyareb, the plio-quaternary formation, the Miocene formation: Baglia and Saouaf). All those respond differently to the recharge by their capacity of infiltration and their hydrodynamic characteristics. The recharge of the groundwater table was increased by the implementation of small soil and water conservation structures, artificial lakes, El Haouareb Dam, run off in the natural Oued bads and seuils for recharge installed in the bads of oueds. The different piezometric drown maps were used to determine the flow direction and hydraulic gradient in order to identify the recharge areas, while tracking maps for three equal piezometric heads 210 m 300 m and 370 m established over different years made it possible to assess the impact of hydraulic structures, namely the effect of SWC and Ben Zitoun Lake. To illustrate the impact of El Houareb dam on the groundwater, the piezometric maps and local values are deeply analyzed and the analysis showed the significant relationship between the level of water in the dam and the piezometric head. Moreover the effect of the dam on the flow rate down the lake showed a positive effect on Kairouan groundwater down in the plain. It was also shown that the fault existing in the center of El Houareb Dam is the lace where Ain El Bidha is draining down to Kairouan Groundwater. It creates a big cone in the piezometric map. A cross section explains very well this effect.

In addition, we were able to demonstrate that El Haouareb Dam has an effect on the recharge of Ain El Beidha groundwater without forgetting the main role of the alimentation of the Kairouan aquifer. A very significant relationship exists between the flow rate down El Houareb Dam sources and the total area in the limit of the aquifer higher or equal to 240 meter isopiez.