Rainwater Harvesting and Sustainability (RWHS) of Recharging the Aquifer and its Effect on Groundwater Chemistry of Wadi Al-Shoar Basin/ E. of Mosul City \ N. of Iraq

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Abstract

The Wadi Al-Shoar basin, northeast of Mosul, is a medium-sized basin and part of the Nineveh Plain. There are approximately 15 villages geographically distributed throughout the basin, in addition to the Hamdaniya district. Most of the villagers in the basin are interested in raising livestock and growing wheat, barley, and some vegetables, which they depend on. They depend on groundwater wells and rainfall during the period (October - April) of the year, which flows in the valleys that form the basin and drains into the Tigris River. The sources of the basin begin at Mount Ain al-Safra and Mount Bashiqa in the northeast of the basin. The Wadi al-Shoar basin is characterized by a gradual slope from the northeast to the southwest, where the Wadi al-Shoar basin flows into the Tigris River. This prompts us to consider implementing the idea of rainwater harvesting in the wadi Al-Shoar basin, in order to benefit from it for many purposes and not waste a single drop of rainwater falling on the basin.

Rainwater harvesting (RWH) is the collection and storage of rain, rather than allowing it to run off. It is a process used for collecting and storing rainwater for later use**.** It is an ancient technique that has gained popularity in recent years due to its environmental and economic benefits.

Rainwater harvesting can be implemented on both small and large scales, by using different types of storage structures such as weirs or small dams primarily for humans, irrigation and livestock. More over the stored rainwater behind the weirs or small dams recharge the aquifer in the study area.

Rainwater harvesting is a double agents process, firstly store water behind the weirs for different uses and secondly is recharging groundwater which in turn works to reduce the concentration of negative anions such as sulfates (SO_4) and bicarbonates (HCO_3) due to the Fatha geological formation, and positive ions such as calcium (Ca), sodium (Na) and magnesium (Mg), since rainwater is considered soft and clean water.

Groundwater samples obtained from (12) wells distributed inside the basin. These samples were analyzed for physical properties such as TDS, pH and Ec and their cations such as Ca, Na, Mg and K and anions such as HCO_3, SO_4, Cl, NO_3 and F. The results analysis for the first

period showed that the amount of Ca present in the groundwater samples ranges from (87 – 123) mg/l, Na values were in the range of (114 - 146) mg/l, Mg concentration vary from (98 – 152) mg/l and K ranges from (1.2 - 3.4) mg/l. While values for anions concentration such as HCO_3 range (187- 267) mg/l , SO_4 values range (220-550) mg/l, Cl values range (58-94) mg/l, NO_3 values range (32-43) mg/l and F values range (0.3-1.2) mg/l. While the results analysis of second period differ slightly from the first period, which showed that the amount of Ca present in the groundwater samples ranges from (74 – 89) mg/l, Na values were in the range of (95 - 122)mg/l, Mg concentration vary from (102 – 142)mg/l and K ranges from (1.3 - 2.8)mg/l. While values for anions concentration such as HCO_3 range (166- 236)mg/l , SO_4 values range (220-440) mg/l, Cl values range (46-86) mg/l, NO_3 values range (24-32) mg/l and F values range (0.28-1.14) mg/l Conservation and preservation of water resources is urgently required to be done. Water management has always been practiced in our communities since ancient times, but today this has to be done on priority basis.

Rainwater harvesting can also lessen the environmental impact of urbanization on storm water drainage systems and receiving water bodies.

Keywords: Drainage basin, harvesting and conservation of rainwater, Weirs, Small **dams**, Groundwater recharge.