

ABSTRACT

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The aim of this study is to evaluate the effects of the intensive agricultural activities and the associated overexploitation of the groundwater on soils and the shallow aquifer. The study area is located at the northern-east of Jordan and comprises about 1300 km². The annual rainfall in the area ranges between 200 mm/yr in the west northern parts to less than 100 mm/yr in the east southern parts. It is located at the transition zone between semiarid to arid climate

During this study 110 water samples from the shallow aquifer were analysed for major cations and anions, the results were subjected to different statistical and hydrochemical evaluations. The results revealed the fact that the salinity of the water has been increased from 286 μ S/cm to more than 4890 μ S/cm.

The environmental isotopic composition of the groundwater clusters between the World Meteoric Line (WML), and Eastern Mediterranean Meteoric Line (EMML). It is formed by mixing process of the two types of water with d-parameter of 17.23. Some of water samples indicates different sources with d-parameter (-10), which shows that another sources of pollution must affected the groundwater.

The soil of the study area was classified as a weak aridic regime (Xeric-Aridic), three types of agricultural landuse have recognized in the study area, nomadic grazing, dry farming with winter cereals (wheat and barley) and irrigated farming based on groundwater irrigation.

Representative 58 profile pits with 223 soil samples of soil were analyzed for mineralogical, physical, chemical properties and soil salinity at fourth depths between (0-25 cm), (25-50 cm), (50-75 cm) and (75-100 cm). The soil samples were collected from the virgin soil and cultivated soil lands to compared the affects of cultivated process during the

irrigation on the soil properties, specially the soil salinity depending on climate conditions such as rainfall, high temperature, evaporation.

According to the soil salinity classification the study soil samples are classified into two types, strongly saline soil which have an average of $EC_e = 8.73$ mS/cm at depth of (0-25 cm) and moderately saline soil which have an average of $EC_e = 5.25$ mS/cm, at depth (25-50 cm), $EC_e = 4.73$ mS/cm at depth (50-75 cm) and $EC_e = 3.37$ mS/cm at depth of (75-100 cm).

Salt accumulation takes place in the tope of the soil profile in cultivated lands were the evaporation is higher than precipitation as soon as the salinity of virgin land increased with increasing depth.

Geochemical models were used to simulate the quality of the infiltrated soil water by the irrigation process into the groundwater by using different mixing ratios. The geochemical mixing models show the infiltrated soil water will effect the groundwater and there are environmental impacts on the water quality.