Identification of Salinity in Luohui Irrigation Scheme, China
-Research on Water Management to Prevent Salinization in Semiarid Land-

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1. Introduction

The study area has semi arid climate with annual average rainfall of 550mm. Irrigation is a requirement to fulfill the water demand of crops in the area. The scheme (50,000 ha) gets water from Luohe River diversion and shallow wells. The major problem of the scheme is severe land salinization. In order to address this problem it needs to understand the process and source of salinization through repeated and integrated studies.

The objective of this specific study was to identify and understand salinity in the irrigation scheme in well depth and spatially in the study area with in the main frame of research on water management to prevent salinization in the study area.

2. Methodology

To study the salt accumulation in the area, 80 observation wells were set up. Electric conductivity (EC), water depth, elevation, and geographical coordinate data as well as water samples were collected in 2002 and 2003. The term salinity is used to express the quality of irrigation water, which is considered as the total dissolved concentrations of major inorganic ions (Na^+, Ca^{2+}, Mg^{2+}, K^+, CO_3^-, $HCO3^-$, $SO4^{2-}$ and Cl^-). EC is used to measure the salinity of water (FAO, 1992). Laboratory analyses were conducted to measure the ions. Sodium adsorption ratio (SAR) values were then computed using $SAR= Na/((Ca+Mg)/2)^{0.5}$(FAO, 1985). Overlaying all results was done using Arc view (GIS soft ware).

3. Results and Discussion

3.1 Topography of the scheme

The drainage pattern of the scheme is as shown in Fig. 1 that the surface flow coming from the elevated areas drains along the dotted lines. It is indicated that the drainage concentrates and flows through the central area of the scheme, where water stagnation was observed in October 2003 field visit (Fig. 2) due to poor drainage condition.

Fig. 2 Stagnation of water in the scheme

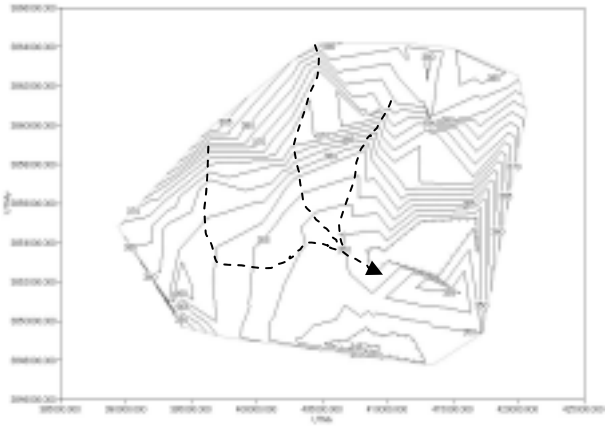

Fig. 1 The topography of the scheme

3.2 Spatial variation of EC and SAR

Based on the spatial distribution of the wells, higher EC values were concentrated at the central and Northern part of the scheme (Fig. 3). Similar results were obtained for the case of SAR in the same area. In addition, the Northeastern part of the scheme had higher SAR value particularly in 2003.

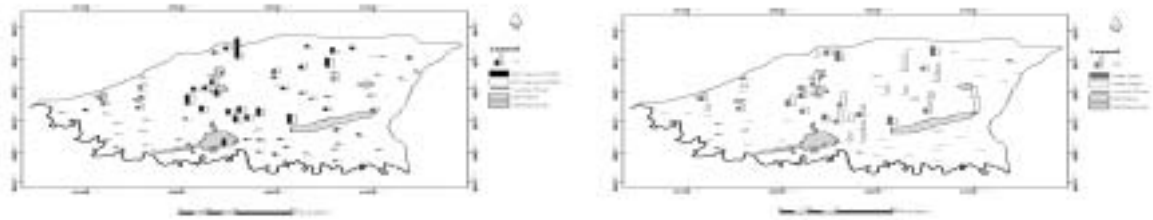

Fig. 3 Spatial distribution of EC and SAR

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3.3 EC versus water depth

The water depth in the wells ranged from minimum of 2.05 to a maximum of 37 m in 2002 while 0 to 19.83 m in 2003. The values of EC ranged from a minimum of 0.53 to a maximum of 21ds/m in 2002 and 1.21 to 9.7 ds/m in 2003. As shown in Fig. 1, higher EC values were concentrated with in less than10 meters water depth with a general trend of decreasing EC as depth increased in both years (2002 and 2003).

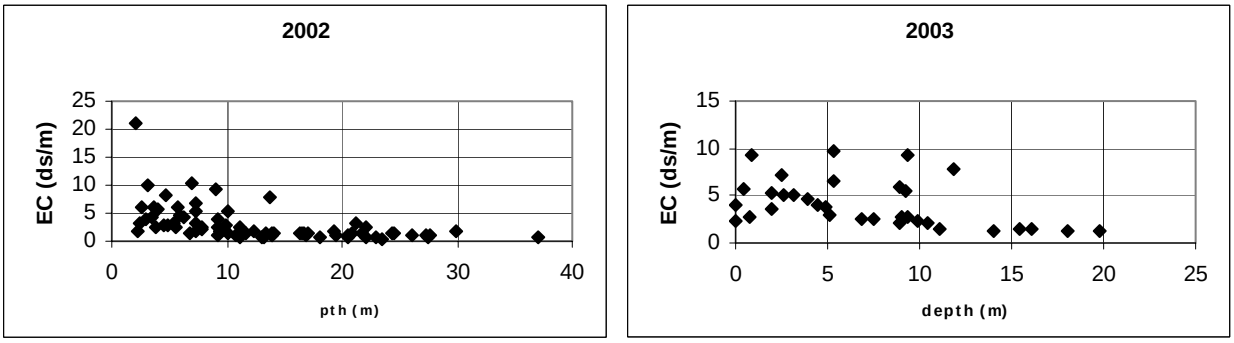

Fig. 4 Distribution of EC in water depth

3.4 SAR versus water depth

The values of SAR ranged from minimum of 0.66 to maximum of 8.85 in 2002 and 2.53 to 16.55 in 2003. Like as EC, higher SAR values were obtained in the same depth range (less than 10 m) as shown in Fig.2.

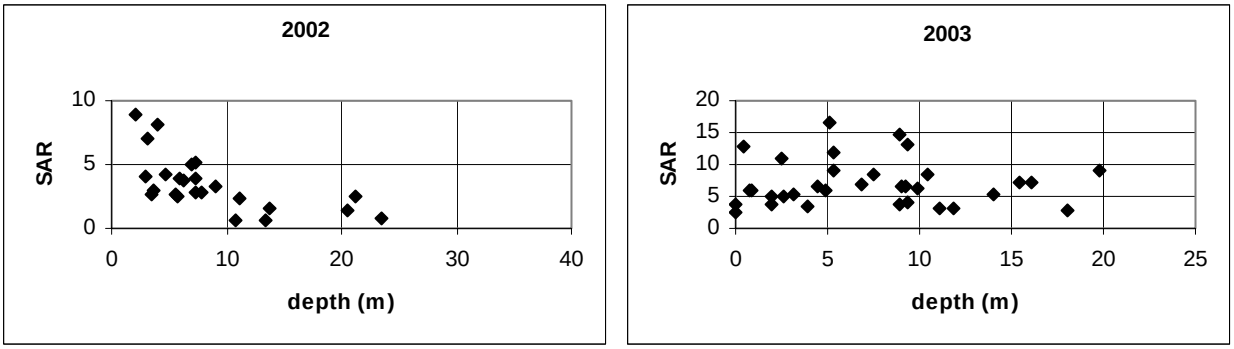

Fig. 5 Distribution of SAR in water depth

4. Conclusions

(1) Higher magnitudes of EC and SAR were concentrated with in the depth range of less than 10 meters in Northern, central and North eastern area of the scheme. In the Northern and central area of the scheme, both higher EC and higher SAR were obtained being spatially overlapped, which indicated that the water in this location has saline nature. However, the Northeastern part of the scheme (with higher SAR and smaller EC in 2003) indicated that the water has sodic nature (higher Sodium).

(2) As to the possible sources of salinity in the area, it could be due to the ground water rise followed by high evaporation or deposition of salts from other catchments conveyed by the overland flow in rainy season and gradual percolation in to underground favored by stagnation of water as well as the dominant sandy loam soil texture. This part needs to be further clarified through detail and integrated research that is going on in the area.

(3) Monitoring and controlling ground water level and establishment of effective drainage network may contribute to the control of salinization in this area.

Reference

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