

Effect of irrigation on soil salinity profiles along the Lower Vaal River, South Africa

PAL le Roux*, CC du Preez, MG Strydom, LD van Rensburg and ATP Bennie

Department of Soil, Crop and Climate Sciences, University of the Free State, PO Box 339, Bloemfontein 9300, South Africa

Abstract

The impact of long-term irrigation on semi-arid soils along the Lower Vaal River in central South Africa was assessed. Irrigated sandy and clayey soils representative of relatively homogeneous agro-ecosystems were sampled at 200 mm intervals to a depth of 2 m wherever possible. To serve as a reference, adjacent virgin soils were sampled wherever possible. All the samples were analysed for common salinity indicators. Soils irrigated for more than 20 years with water varying in electrical conductivity (EC) from 52 to 74 $\text{mS}\cdot\text{m}^{-1}$ and sodium adsorption ratio (SAR) of < 5 reacted differently. Salts were generally less and more evenly distributed in the virgin profiles than in their irrigated equivalents. In the irrigated clayey soil at Spitskop the salt content increased with depth. In the irrigated sandy soil at Vaalharts maximum salt accumulation occurred above the water table, whereas in the centre pivot irrigated sandy soil at Wildeklaar it occurred at 400 to 800 mm depth. In the latter case the salt accumulation is linked to water uptake by crops probably due to limited water application. In the irrigated sandy soil at Zandbult salt accumulation at 1 100 mm depth was linked to a period of irrigation with low quality water. In spite of a general increase in salinity the soils were not physically severely degraded. Where water tables occurred in sands the salinity reached levels where it will affect sensitive crops. In the Spitskopdam clay soil it reached levels affecting tolerant crops. However, the accumulated salt load varied between sand and clay soils and improved irrigation scheduling practices that do not allow additional water for salt leaching; this may lead to increased salinity and degradation of the irrigated soils.

Keywords: primary salinity, secondary salinity, water logged