

Influence of irrigation on the level, salinity and flow of groundwater at Vaalharts Irrigation Scheme

PMJ Verwey^{1*} and PD Vermeulen²

¹Department of Agriculture Forestry and Fisheries, Agricultural Engineering Services, Private Bag X 515, Silverton 0127, South Africa

²Institute of Groundwater Studies, University of the Free State, PO Box 339, Bloemfontein 9300, South Africa

Abstract

In 1934, Act No. 38 of 1938 was approved, providing permission to construct the Vaal Dam and develop the Vaalharts Irrigation Scheme. There are currently 1 200 plots varying in size from 25 to 75 ha and covering a total area of 35 302 ha. Water logging and salinisation are being experienced, leading to research being initiated in the area. The area researched stretches from Jan Kempdorp in the south to Taung (the Dry Harts River) in the north. A sampling network of 246 piezometers was installed to monitor the water levels and electrical conductivity (EC) over a period of 1 year. It was found that the leaching requirement to ensure sustainable irrigation is 611.5 mm/a. According to the water balance this requirement is 562 mm/a. Salt deposited through irrigation water amounts to 4.65 t/ha per annum. The total dissolved salts (TDS) averaged 1 005 mg/l in 1976 and 1 350 mg/l in 2004, an average increase per annum of 13 mg/l. At the time of this research TDS was 1 476 mg/l, representing an increase of 96 mg/l in 5 years, an average increase per annum of 19.25 mg/l. Irrigated salt deposits not drained build up in the soil at a rate of 0.8 t/ha per annum. Results of this study suggest that upgrading of all infrastructure is essential. Suitable internal subsurface drainage should be cleaned, unsuitable drainage replaced and spacing decreased to drain the area more effectively. Effective drainage would minimise the salt build-up in the soil, have a positive influence on the sustainability of irrigation farming and improve crop yields and quality in the area. The drained water can be reticulated into an evaporation pond to confine the salt mass, thus preventing it from influencing the environment and other activities downstream.

Keywords: Drainage, irrigation and scheduling, soil water quality, water and salt balance