

Evaluation of groundwater for irrigation water quality indices and their spatial distribution, Khyber District, North Western, Pakistan

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The present study evaluates groundwater suitability used for irrigation purposes in four tehsils (Mullagori, Jamrud, Bara, and Landikotal) of District Khyber, North Western Pakistan. The study aimed to investigate groundwater quality for agriculture purposes through various irrigation water quality indices (IWQI) and understand its hydro-geochemistry with the help of chemometric techniques as well as the assessment of spatial distribution of IWQI through GIS zonation in each of the four Tehsils. 61 samples taken from different groundwater resources were investigated and analyzed with different physicochemical parameters. The studied groundwater was evaluated for irrigation using permeability index (PI), Kelly's ratio (KR), percent sodium (%Na), magnesium hazard, sodium adsorption ratio (SAR), residual sodium carbonate (RSC), residual sodium bicarbonate (RSBC), and potential salinity. The ternary plot ascertained that 78.8% of samples are in the doubtful quality class while 3.2% are in good quality. Implementing GIS zonation-based indices, agriculturally suitable zones were assessed using IWQI and hydro-geochemical variables. IWQI results concluded that infiltration and permeability are prevalent issues found in the study area. Fertilizers are highly recommended when irrigating crops and conducting other agricultural activities.

Keywords: Kyber; groundwater; irrigation; hydro-geochemical; spatial distribution