

Assessment of Groundwater Resources in Jhunjhunun District, Rajasthan

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Abstract: An assessment of groundwater resources in Jhunjhunun district during 2005-2008 revealed that about 46% area of the district had water table at >60 m below ground level (bgl). Younger alluvium had a shallower water table (mean depth 40.63 m bgl). Ground water quality in the district is generally good (mean EC 1.88 dS m⁻¹), and is best in the younger alluvium (mean EC 0.78 dS m⁻¹). For irrigation purpose the district's groundwater could be categorized as having low salinity, medium sodicity and high alkalinity (C1S2R2). The discharge from the wells varied from 40 to 120 m³ day⁻¹. Groundwater level in the district has found to be falling at an average rate of 1.46 m y⁻¹ (2001-2008). The net groundwater availability, total draft, groundwater balance and stage of groundwater development were calculated as 274.61 mcm, 525.84 mcm, (-) 251.18 mcm, and 191.5%, respectively. There is, therefore no scope for future groundwater development in the district.

Key words: Jhunjhunun, groundwater potential, quality, salinity, sodicity, irrigation class.

Groundwater is an important source of water for meeting the major water demands especially in the arid and semi-arid regions with no reliable source of surface water. Of the total groundwater extraction, more than 80% is generally used for irrigation. Groundwater quality is an important parameter for both irrigation and domestic use. Keeping in view the importance of groundwater, an assessment of the quality and quantity of groundwater in Jhunjhunun district was carried out during 2005-2008. The district is located in the northern part of Rajasthan (N 27°38' to N 28°31'; E 75°02' to E 76°06' area 5915 km²; Fig.1). The district has an arid climate with a hot summer. The average annual rainfall at district headquarter is 444.5 mm with 27 rainy days in a year. The minimum and maximum temperatures recorded are 1.0°C and 45.0°C, respectively.

Materials and Methods

A total of 309 groundwater wells samples from different locations (Fig. 2) were inventorized for depth to groundwater, well discharge and trend of groundwater table. Groundwater samples were analyzed for cations (Ca⁺⁺, Mg⁺⁺, Na⁺, and K⁺), anions (CO₃⁻², HCO₃⁻¹, and Cl⁻¹), electrical conductivity (EC), pH, sodium absorption ratio (SAR) and residual sodium carbonate (RSC), using standard laboratory methods.

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On the basis of EC values groundwater was classified into salinity classes viz. low (<3 dS m⁻¹), medium (3-5 dS m⁻¹) and high (>5 dS m⁻¹). Three classes of SAR were identified as: low (<10), medium (10-18) and high (>18). The RSC in water was classified as low (<2.5 me L⁻¹) and high (>2.5 me L⁻¹) as per the groundwater quality standards used for arid and semi-arid regions (Aggarwal and Ramamoorthy, 1974; Gupta, 1979). The standard classification was taken for evaluating distribution of SAR and RSC (Richards, 1954; Dhir, 1977).

Result and Discussion

Distribution of aquifers

Major hydrogeological formations in the district are Older Alluvium (63.78%), Metamorphic rock formations of quartzite, phyllite and schist (19.96%) and Younger Alluvium (10.88%). Hilly terrain covers 5.38% area (Table 1; Fig. 3).

Younger alluvium: This formation comprises of mainly unconsolidated to semi-consolidated fine-grained sand and stream-laid deposits of clay, silt, gravel, pebbles, boulders, etc. The formation is restricted to flood plains of rivers Kantli, Udaipurwadi Nadi and their tributaries. Groundwater occurs mainly under unconfined conditions. Depth to water ranges from 9.14 to 91.4 m bgl. The is shallower along the river courses and increases away from the rivers.