



Groundwater Quality Assessment for Chittoor District of Andhra Pradesh for Irrigation Purpose and Management Options

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Abstract

A survey was undertaken during the year 2019 to assess the quality of groundwater for irrigation in Chittoor district of Andhra Pradesh. A total of 358 samples were collected and GPS locations of sampling points were recorded. The water samples were analyzed for various chemical properties viz., pH, EC, Ca⁺², Mg⁺², Na⁺ and K⁺; CO₃⁻², HCO₃⁻, Cl⁻ and SO₄⁻². The pH, EC, SAR and RSC in groundwater ranged from 5.5-8.8, 0.2-13.5 (dS m⁻¹), 0.26-20.4 (mmol l⁻¹)^{1/2}, and 9.4-37.6 (me L⁻¹), respectively. The concentration of cations viz., Ca⁺², Mg⁺², Na⁺ and K⁺ varied from 0.8-26.4, 0-15.6, 0.25-91.31 and 0.001-2.64 me L⁻¹ with mean values of 5.13, 3.64, 6.58 and 0.11 me L⁻¹, respectively. Concentration of anions viz., CO₃⁻², HCO₃⁻, Cl⁻ and SO₄⁻² varied from 0-5.6, 0.2-14.6, 0.8-85.2 and 0-45 me L⁻¹ with average values of 0.84, 6.46, 5.84 and 2.03 me L⁻¹, respectively. The relative abundance of ions for most of the water samples were Na⁺ > Ca⁺² > Mg⁺² > K⁺ for cations and HCO₃⁻ > Cl⁻ > SO₄⁻² > CO₃⁻² for anions. In total the irrigation water samples were 65.64, 25.69, 0.27, 6.7, 1.11 and 0.55 per cent of good, marginally saline, high SAR saline, marginally alkaline, alkali and highly alkali, respectively. Spatial variability maps of EC, SAR, RSC of ground water used for irrigation in the district and groundwater quality map were also generated. Yields of major crops grown with poor- quality groundwater (saline/ alkali) were assessed. Yield losses (7.7 to 53.3%) under seven different crops due to poor-quality irrigation were estimated by comparing those yields with good-quality ground water areas. Soil and crop management practices were suggested to overcome the crop yield losses in poor-quality soil and water environment in the district.

Key words: Ground water quality, RSC, SAR, Spatial variability, Yield losses, Management options