

Conjunctive Use of Shallow Groundwater for Irrigation Purpose: The Case of Wonji Shoa Sugar Estate, Ethiopia

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Abstract : Irrigation suitability of shallow groundwater (SGW) was investigated by taking thirty groundwater samples from piezometers and hand-dug wells in Wonji Shoa Sugar Estate (WSSE) (Ethiopia). Many physicochemical parameters (Mg^{2+} , Na^+ , Ca^{2+} , K^+ , CO_3^{2-} , SO_4^{2-} , HCO_3^- , Cl^- , TH, EC, TDS and pH) were analyzed following standard procedures. Different irrigation indices (MAR, SSP, SAR, RSC, KR, and PI) were also used for SGW suitability assessment. If all SGW are blended and used for irrigation, the salinity problem would be slight to moderate, and 100% of potential sugarcane yield could be obtained. The infiltration and sodium ion toxicity problems of the blended water would be none to moderate, and slight to moderate, respectively. As sugarcane is semi-tolerant to sodium toxicity, no significant sodium toxicity problem would be expected from the use of blended water. Blending SGW would also reduce each chloride and boron ion toxicity to none. In general, the rating of SGW was good to excellent for irrigation in terms of average EC (salinity), and excellent in terms of average SAR (infiltration). The SGW of the WSSE was categorized under C3S1 (high salinity and low sodium hazard). In conclusion, the conjunctive use of groundwater for irrigation would help to reduce the potential effect of waterlogging and salinization and their associated problems on soil and sugarcane production and productivity. However, a high value of SSP and RSC indicate a high possibility of infiltration problem. Hence, it is advisable to use the SGW for irrigation after blending with surface water. In this case, the optimum blending ratio of the surface to SGW sources has to be determined for sustainable sugarcane productivity.

Keywords : blending, infiltration, salinity, sodicity, sugarcane, toxicity

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