Land amendment for irrigation with coal seam gas water and subsequent rainfall

Aram Ali, John McL. Bennett

Centre for Sustainable Agricultural Systems (P13 Blk), University of Southern Queensland, West St, Toowoomba, Qld, 4350. Australia.

Email: aram.ali@usq.edu.au,

The demand for Coal Seam Gas (CSG) water as an irrigation resource is increasing in arid and semi-arid regions of Australia. This study investigated the magnitude of impact of rainfall on soil infiltration, dispersion and surface aggregate breakdown following irrigation with untreated CSG water. Additionally, it identifies management strategies for irrigation by untreated CSG water and subsequent rainwater via amending black Vertosol and red Ferrosol with gypsum, elemental sulphur, and Hydroguard-i™ polymer for the Darling Downs region, Australia. Two soils were repacked in soil columns passing 10 or 20 ML/ha of rainwater or untreated CSG water with 340, 220 Kg/ML gypsum and sulphur respectively, and 20 Kg/ha of Hydroguard-iTM to protect the soil surface aggregate stability, or without soil amendments (control). Saturated hydraulic conductivity (Ksat), dispersion, and surface aggregate breakdown observation post rainfall simulation were measured. Soils were severely dispersed with low Ksat for both soils where the untreated CSG water solution was applied to non-amended soils, as would be expected. Although, where soil was amended with gypsum and elemental sulphur, maintained Ksat and aggregate stability indicated that amendments had been successful. Hydroguard-i™ presented a visible protection of soil surface aggregates from mechanical force of raindrop impact, but was considered to be inappropriate for irrigated agriculture lands due to the rapid Ksat decrease in coarser textured soil (Ferrosol); there was no observable influence in fine textured soil (Vertosol). Subsequent leaching with rainwater caused a significant reduction in Ksat with increased leachate pore volumes, causing the soil solid phase to disperse as a result of rapid dilution of the soil solution. In this case the land amendment was exhausted, indicating amendment buffering needs to be considered on rainfall magnitude. Keywords: Soil amendment, rainwater, CSG water, hydraulic conductivity, clay dispersion.