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Re-Assessing Leaching Requirements for the Salinity Control under New Irrigation Regimes

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Irrigation is essential to sustain agricultural production, but it adds dissolved salts (or salinity) to croplands. Leaching is thus necessary to keep the average rootzone salinity below the plant threshold EC levels in order to sustain crop production. Current leaching requirement (LR) calculation is based on steady-state, one-dimensional (1D), and water balance approaches, which often overestimates the LRs under transient field conditions. While in recent years, surface and sprinkler irrigated fields have been largely converted to drip or micro-spray systems and deficit irrigation has become more popular, currently accepted LRs may not be appropriate for these irrigation systems. Under point or line irrigation sources (e.g., drips or drip-lines), water and salts move both downwards and laterally, which may lead to highly saline areas on the edges of the wetted area. Under such circumstances, processes such as precipitation/dissolution of mineral phases and/or cation exchange may significantly affect the leaching requirement. The overall objective of this research was to use computer simulation models (i.e. Hydrus-2D and UnsatChem) to evaluate LRs under transient conditions and new irrigation regimes. Simulations were carried out using parameters for soils, climate zones, and major crops and their corresponding fertilization practices typical for California to: (1) Assess the effects of salt precipitation/dissolution on the leaching requirement (LR); (2) Evaluate localized water movement on average rootzone salinity and the leaching requirement (LR); (3) Evaluate leaching requirements for soils under deficit irrigation; and (4) Assess the effects of rainfall on the leaching requirement. Information from this research could significantly impact water management practices in irrigated croplands.