

Effects of irrigation frequency on solute leaching through a stony soil

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Irrigation is rapidly expanding in the drought susceptible eastern regions of New Zealand, mostly to support intensification of pastoral agriculture, in particular dairy farming. In the Canterbury region stony soils (<45cm fine soil over gravels) are widespread, and are the dominant soil type in areas of irrigation expansion. Because of their low water holding capacity, particular concern has been raised about the susceptibility of stony soils to contaminant leaching under intensive irrigated landuse, and how they may behave under different land management practises.

This project tested the hypothesis that the leaching behaviour of a shallow stony soil would be significantly affected by the irrigation return interval. An experiment was performed at Lincoln using 24 steel-encased lysimeters containing an Eyre shallow silt loam soil under pasture. The lysimeters were split into six different irrigation treatments, with four reps per treatment. Treatments were based on triggering irrigation at differing degrees of soil water deficit, and for each deficit, applying either full replacement irrigation up to soil field capacity or irrigating to a target deficit below field capacity. The treatments were (mm deficit / mm irrigation applied): 15/10, 15/15, 30/20, 30/30, 60/40, 60/60. In early March 2016 all lysimeters received an surface application of Bromide tracer, and then each lysimeter was managed according to the irrigation treatment plan until May 2016. The application rate was 50 mm/hr applied as spray irrigation. At the end of the irrigation season the lysimeters were all subjected to consecutive constant rate irrigation applications of 250mm applied at 50 mm /hr to leach out bromide residing in the macropores, followed by 500 mm applied at 2 mm/hr to leach out bromide located within the soil matrix. The results of how the different irrigation treatments affected the solute leaching behaviour will be discussed, along with implications for irrigation management.