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Increased water use efficiency through Variable Rate Irrigation

Channa Rajanayaka (1), Seth Laurenson (2), James Griffiths (1), and Christian Zammit (1)

(1) The National Institute of Water and Atmospheric Research, Hydrological Modelling, Christchurch, New Zealand , (2) AgResearch Limited, Lincoln Research Centre, Lincoln, Christchurch, New Zealand

Irrigation is a major and growing consumptive use and improving irrigation efficiency is a key aspect in realising overall water-use efficiency. We examined the effective use of Variable Rate Irrigation (VRI) for improving irrigation efficiency. The effectiveness of VRI depends on the understanding of small-scale soil and landscape variability as this guides the optimum number and location of irrigation management units (IMUs). In landscapes that are highly variable (topography, soil depth, subsoil type), a greater number of IMUs may be required to achieve the best water-use efficiency (WUE). Some areas may not provide sufficient economic return (via crop production) to warrant any irrigation at all. In this research, the LImburg Soil Erosion Model (LISEM) (Jetten, 2014)* hydrological model was used to identify different IMUs (based on soil and topographic conditions) at the plot scale. The performance of the model was first tested for a synthetic case-study of different soil, topography and grid scale. Once the performance of the model had been assessed, it was used with data from a real irrigation pasture site in Canterbury, New Zealand. The resulting spatial variation in infiltration allowed identification of the areas that produced most runoff (due to low infiltration), and areas that experienced highest infiltration (due to convergence of surface runoff). Evaluation of the modelling outputs using GIS spatial analysis provided a suitable approach for determination of different IMUs.

* Jetten, V.G. 2014. A brief guide to openLISEM, University of Twente, Faculty of Geo-Information Science and Earth Observation.