

Effect of dairy farm management practices on hydraulic properties of Dermosols

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Soil bulk density (BD), macroporosity (MP) and saturated hydraulic conductivity (Ks) are most important soil hydraulic properties affecting soil-water-plant interactions, as well as water and solute retention and movement through the soil profile. Animal treading and effluent application associated with dairy farm management practices can have detrimental impacts on these properties, with the effect likely varying with intensity of traffic. The objective of this study was to determine the effect of paddock management and intensity of within-paddock use on BD, MP and Ks of Dermosols, a prominent dairying soil in Gippsland, Victoria. Intact cores samples were used to determine BD and MP while Ks was measured in the field, using a disc permeameter, for four paddock management practices (regular, holding, night and effluent paddocks) and three intensities of within-paddock use (under the fenceline, near the gateway and in the middle of the paddock) at two different soil layers (surface and subsurface) in Gippsland, Victoria. We used two infiltration models (cumulative and instantaneous) to determine Ks in this study. The cumulative form of the Philip equation predicted Ks better than the instantaneous form of the equation. The differences in BD, MP and Ks between different intensities of within paddock use were found to be significant and no significant differences were found between paddock management practices ($P > 0.05$). The difference between two soil layers also found to be significant ($P < 0.001$) for BD and Ks but not for MP ($P > 0.05$). The interactions between intensity of within-paddock use and soil layer were significant ($P < 0.001$). Mean BD for top soil and subsoil varied from 1.08 (fence) to 1.27 (gate) and 1.45 (fence) to 1.49 (gate) Mg m⁻³ respectively. Mean MP for topsoil and subsoil varied from 6.6 (gate) to 13.6 (fence) and 8.9 (gate) to 10.3 (fence) % vol. respectively. Mean Ks for topsoil varied from 3.88 (gate) to 5.77 (fence) log₁₀(mm h⁻¹).