

Quantifying the supply of plant available nitrogen from dairy effluents using a laboratory assay approach

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Nitrogen (N) supply was quantified from a wide range of dairy effluents in two 6-month laboratory assays between 2014 and 2016. The aim of the studies was to identify measurable effluent characteristics which could be used to predict the amount and rate of N release from different effluent types once applied to soil. This information will enable farmers to optimise nutrient supply to crops and avoid over or under application of effluent and fertiliser. The assays were conducted in soils with low background inorganic N levels under controlled laboratory conditions. Assay 1 was an open incubation using a tephric derived silt loam with five slurries and six solids that were regularly leached to determine mineralised N through nitrate losses over time. Assay 2 was a closed incubation with six slurries and six solids whereby mineralised N was sampled directly from the soil at regular intervals after the initial application of effluent to two soils types, a tephric silt loam and an alluvial derived silt loam. A wide range of effluent characteristics and N release patterns were observed across the two assays, and statistical analyses revealed a number of common correlations between these patterns and initial effluent characteristics. Positive correlations were found between water-soluble N and C forms in the effluents and resulting N supply patterns, whereas negative correlations were found between high C:N ratios and recalcitrant C forms and N supply. Further assays are planned to test these relationships and develop practical methods to assist in effluent application decisions. Modelling work is also underway in APSIM using this data set in order to better predict nitrogen supply with outputs as tool for growers.