
Accurate and Efficient Use of Nutrients on Farms

This document contains the abstracts of all papers that were presented at the 26th Annual FLRC Workshop held at Massey University on the 12th, 13th and 14th February 2013. They are printed here in the order of presentation at the workshop and may assist people who wish to search for keywords prior to accessing the individual manuscripts.

Individual manuscripts are available from the website at:

<http://flrc.massey.ac.nz/publications.html>

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Simon Woodward, R Stenger and V Bidwell

Lincoln Agritech Ltd, Hamilton

**USING STREAM FLOW AND CHEMISTRY DATA TO ESTIMATE CATCHMENT SCALE
GROUNDWATER AND NITRATE FLUXES**

Chris Tanner

NIWA, Hamilton

**BOTTOMS OR TOPS? – OPTIMISING LOCATION OF WETLANDS IN CATCHMENTS TO
MAXIMISE EFFICIENCY**

Andrew Hughes, L McKergow, J Sukias and C Tanner

NIWA, Hamilton

**INFLUENCE OF LIVESTOCK GRAZING ON WETLAND ATTENUATION OF DIFFUSE
POLLUTANTS IN AGRICULTURAL CATCHMENTS**

**Dylan Clarke, J Paterson, D Hamilton, J Abell, R Moore, M Scarsbrook, K Thompson
and A Bruere**

Environmental Research Institute, University of Waikato, Hamilton

**OVERVIEW OF DETAINMENT BUNDS FOR MITIGATING DIFFUSE-SOURCE
PHOSPHORUS AND SOIL LOSSES FROM PASTORAL FARMLAND**

Greg Barkle, R Stenger, T Wöhling, B Moorhead, A Wall and J Clague

Aqualinc Research Limited, Hamilton

FATE OF A DAIRY COW URINE PULSE IN A LAYERED VOLCANIC VADOSE ZONE

Ton Snelder and C Fraser and J Bright

Aqualinc Research Ltd, Christchurch

**THE 'WATER WHEEL' - A TOOL FOR FINDING BALANCE BETWEEN ECONOMIC AND
ENVIRONMENTAL OUTCOMES**

Session 7 : Tools and Practices

Andrew Manderson and C Hunt

AgResearch, Palmerston North

**INTRODUCING THE AGRI-ROVER: AN AUTONOMOUS ON-THE-GO SENSING ROVER
FOR SCIENCE AND FARMING**

Stefanie von Bueren and I J Yule

NZ Centre for Precision Agriculture, Massey University

**MULTISPECTRAL AERIAL IMAGING OF PASTURE QUALITY AND BIOMASS USING
UNMANNED AERIAL VEHICLES (UAVS)**

FATE OF A DAIRY COW URINE PULSE IN A LAYERED VOLCANIC VADOSE ZONE

G.F. Barkle*, R. Stenger[†], Th. Wöhling[†], B. Moorhead[†], A. Wall[†] and J. Clague[†]

*Aqualinc Research Ltd, Ruakura Research Centre, Private Bag 14-041, Hamilton

[†]Lincoln Agritech, Private Bag 3062, Hamilton

Email: G.Barkle@Aqualinc.co.nz

Nitrate-N leaching from dairy cow urine patches has been identified as one of the major contributors to diffuse groundwater contamination in dairying catchments. To investigate the transport and transformations of nitrogen (N) originating from a urination event between the ground surface and the water table, fresh urine was amended with a conservative tracer (Cl) and applied onto a pumice soil in the Lake Taupo Catchment in early August. The resulting fluxes of the different N components and the conservative tracer leached from the urine patch were monitored at different depths through the vadose (unsaturated) zone using automated equilibrium tension lysimeters (AETLs). These were installed in triplicates at each of five depths between 0.4 and 5.1m.

Textural variability, hydrophobicity, and the coarse gravelly pumicious materials in the vadose zone resulted in heterogeneous flow patterns with high variability in the N and Cl masses captured. The measured N uptake by herbage, 123 kg N/ha in the 67 days following the application of the urine, represented 27% of the applied urine N. The breakthrough of concentrations of organic-N, ammonium-N and nitrate-N, measured at the bottom of the root zone (at the 0.4m depth), exhibited distinctively different dynamics reflecting urea hydrolysis and subsequent nitrification. By the 1.0m depth, effectively all the N present was in the mobile nitrate-N form. In the lower part of the vadose zone at 4.2m, an average of 32.7% of the applied urine-N was recovered; all of it was nitrate-N. This recovered N fraction was not significantly different (95% CI.) from the fraction measured at the bottom of the root zone, indicating that no assimilation of the nitrate-N being leached from the root zone was occurring in the vadose zone. This is despite significant denitrification capacity being found in laboratory incubation experiments where anaerobic conditions are artificially created. However, significant evidence of nitrate removal by denitrification has been observed in the shallow groundwater system at this site. No substantial urine-N or conservative tracer was measured below the top of a Palaeosol layer at approximately 4.2m depth. This result is consistent with results from a previous conservative tracer experiment and suggests that unsaturated lateral flow was occurring at the interface between the Taupo Ignimbrite and the Palaeosol.