

Soil and Environmental Tools for Sustainable Dairy Farming

Keith Cameron, Hong Di and Jim Moir
Centre for Soil & Environmental Quality
Lincoln University



Environmental impacts of agriculture

1. Main issue is nutrient and microbial contamination of surface and groundwater

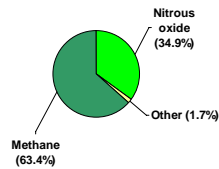


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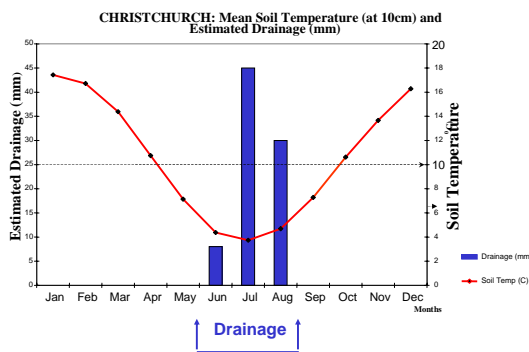
2. Greenhouse gas emissions



Factors that affect leaching from soil

- Rainfall & drainage
- Soil type and depth
- Farming system
- Fertiliser rate and timing
- Effluent rate and timing
- Plant uptake
- Irrigation
- Stocking rate

In Canterbury most leaching occurs in winter & early spring



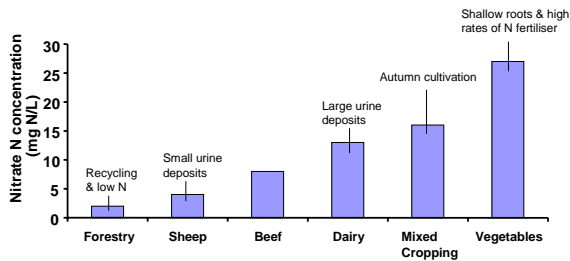
Soil type affects leaching loss



Fast draining shallow stony Lismore soil

Slow draining deep Wakanui silt loam

Farming system affects nitrate leaching

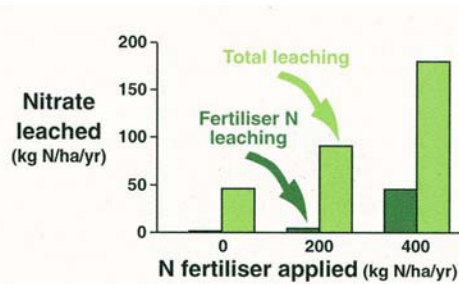


(Di et al. 2005. *Mgmt of Enviro. Quality* 16.)

In dairy farming **urine patches** are the main sources of nitrate leaching and nitrous oxide emissions

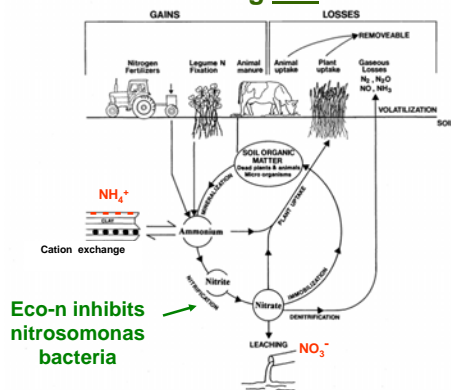


Most nitrate leaching comes from urine patches not from fertiliser



Ledgard et al, 2005

Nitrate leaching can be reduced



Nitrification inhibitor ('eco-n') is applied as a fine suspension spray



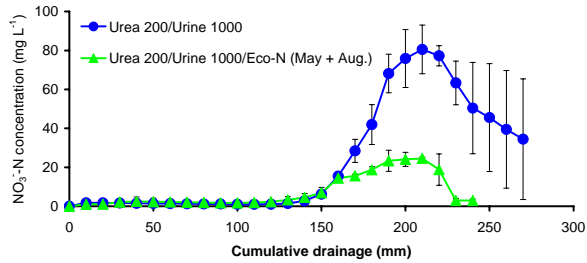
Eco-n developed from 8 years of research and published in internationally peer reviewed science journals:

Refereed papers:

1. Di HJ and Cameron KC (2002) *Soil Use and Management* 18: 395-403.
2. Di HJ and Cameron KC (2003) *Soil Use and Management* 19: 184-290.
3. Di HJ and Cameron KC (2004a) *Soil Use and Management* 20: 2-7.
4. Di HJ and Cameron KC (2004b) *NZ Journal of Agricultural Research* 47: 351-361.
5. Di HJ and Cameron KC (2004c) *Australian Journal of Soil Research* 42: 927-932.
6. Di HJ and Cameron KC (2005) *Agriculture, Ecosystems and Environment* 109: 202-212.
7. Di HJ and Cameron KC (2006) *Biology and Fertility of Soils* 42: 472-480.
8. Di HJ, Cameron KC and Sherlock (2006) *Soil Use and Management* (in press)



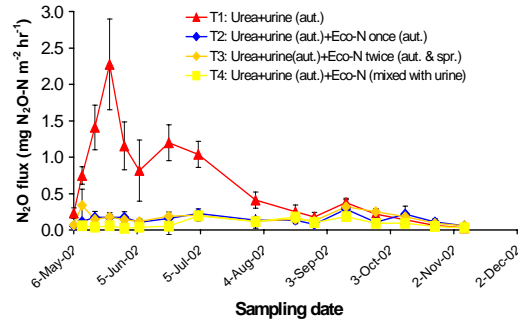
Eco-n applied twice (May plus August) reduced the nitrate concentration from urine applied in May
(Templeton soil) (Di and Cameron, 2004. NZ J Agr. Res. 47)



Greenhouse gas emissions:

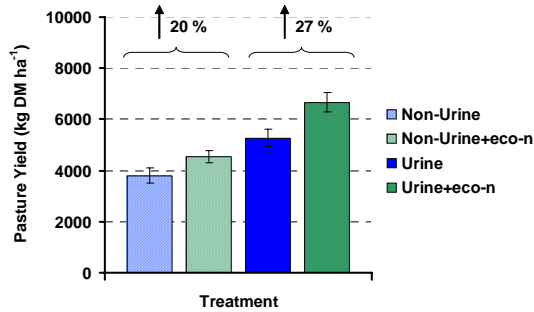
Nitrous oxide emissions reduced by 75%

(Di and Cameron 2003)



The extra nitrogen retained in the soil produces more pasture in spring.

Mean Spring Pasture Yield: LUDF Drainage Plots
Seasons: 2002/03, 2003/04, 2004/05



Best Management Practices to Minimise Losses

- **N fertiliser and effluent** - to meet plant demand
- **Nutrient budgets** - (e.g. OVERSEER®)
- **Irrigation**- best management practices
- **Standoff pads** - reduce nitrogen deposition on soil during winter
- **Nitrification inhibitor technology ('eco-n')** - improve the soil N cycle efficiency and reduce nitrogen losses

A Future Focus for Sustainable Dairy Farming

- **New soil and environmental tools**
 - to ensure that environmental protection and agricultural production are achieved.