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Presenter Information
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Nitrogen leaching from cattle, sheep and deer grazed pastures in New Zealand

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Introduction The impacts of intensified grazing in New Zealand are being reflected in declining quality of groundwater, streams and lake water. Manipulation of ratios of grazing animal species may be one way farmers can reduce nitrogen (N) emissions to ground water. The present research quantifies nitrate and ammonium leaching losses from rotationally grazed sheep, cattle and deer pastures in a common environment.

Materials and methods On a highly porous pumice soil, triplicate 0.4 to 0.6 ha plots were fenced to contain 5 to 17 month-old female cattle, sheep or deer. Grazing started in October 2003 and pasture mass was measured before and after 2-day grazing events to determine pasture utilisation. The pre-grazed pasture was analysed for N content to allow determination of N intake by grazing animals. Animal grazing-days were recorded and expressed as sheep stock unit equivalents (SU). Within plots, 40 randomly located ceramic cup samplers, set 60 cm below the soil surface, were used to sample drainage water, between March and October 2004. Nitrate and ammonium concentrations in drainage water were assayed for each of 7 sampling times. Drainage volume was estimated by water balance estimations.

Results During the 8 months from March 2004, pasture and N utilisation and SU grazing days were similar across treatments (Table 1). During this period, 700 mm of the 950 mm rainfall drained to groundwater. At similar levels of pasture dry matter and N utilisation, nitrate leaching losses over 8 months from young, non-lactating cattle grazed swards was more than twice that from swards grazed by either sheep or deer (Table 1). Of the N apparently consumed, 22% was leached as nitrate N, compared with 10 to 11 % for deer and sheep. Only 0.4 kg/ha of ammonium N was leached from each pasture. Nitrate losses from these sheep and dairy pastures on pumice soils, without fertiliser N, are high compared with losses from sheep or dairy grazed pastures without fertiliser N, on sedimentary or less-free draining volcanic ash soils, where drainage volumes were substantially less (Ruz-Jerez *et al*., 1995; Ledgard *et al*., 1996; Eckard *et al*., 2004).

Table 1 Eight month mean pasture and herbage N utilisation, sheep stock unit equivalent SU grazing days and leached nitrate N

Treatment	Utilised DM (kg/ha)	Utilised N (kg/ha)	SU grazing Days	Nitrate-N (kg/ha)	Nitrate-N/ utilised N (%)
Cattle	4320	159	4106	35.0 a	21.6 a
Sheep	3960	160	4150	17.8 b	11.1 b
Deer	4930	167	3924	15.8 b	9.5 b
$LSD_{0.05}$	2133	89	1078	15.7	8.9

Conclusions Increasing the proportion of feed utilised by sheep and deer, and decreasing the proportion utilised by cattle will reduce nitrate leached to ground water.

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