Soil fertility and acidification in irrigated pastures in the Upper Hunter

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Introduction

A survey of Upper Hunter dairy farmers was conducted to determine the effects of past pasture management practices and the implications of current management on soil pH and nutrient levels.

The background to this was the increasingly large nitrogen input into the soil (via lucerne and heavily fertilised ryegrass pastures) combined with economic pressures to remain viable, resulting in higher stocking rates, increased productivity per hectare and the greater removal of nutrients in milk, animals, dung and urine.

Methods

In October 1999, dairy farmers in the Upper Hunter were surveyed to determine their practices, attitudes and knowledge base of soil acidity and pasture nutrition. Replies were received from a cross section of Upper Hunter dairy farmers.

Paired soil samples were taken from adjacent sites to compare un-farmed with intensively farmed soils and determine nutrient changes under previous soil management and fertiliser practices, with some soils having a farming history of over 100 years.

Results and Discussion

- The use of nitrogen fertiliser for topdressing is increasing on Hunter Valley dairy farms. This increase may be attributed to the need to maximise feed production per hectare (or per megalitre of irrigation water). Forty-six percent of producers surveyed topdressed pastures/winter forage crops with nitrogen after every cut or grazing, while a further 37% topdressed at least three times per season. Typically, application rates ranged from 30 to 85 kg/ha of nitrogen with the most common being 60 kg/ha.
- Over half the producers were concerned about the long-term effect of nitrogenous fertiliser use but few cited soil acidification as a problem or understood the benefits of liming. The concern of the majority of farmers was directed towards the general health of soils.
- Soil testing indicated that the majority of alluvial soils in the Upper Hunter had a pH trend down the soil profile from neutral to alkaline and that even where soil had been intensively farmed for many years (some more than 100), changes were negligible.
- The decline of soil nutrients was, however, more marked. Decreases in the levels of most nutrients were recorded with phosphorus and potassium levels being of greatest concern. Farmers need to take a balanced approach to fertiliser management and consider nutrient budgeting as a management tool.
- Further, the heavy reliance on irrigated lucerne (pure lucerne occupies 30% of the land area on the properties surveyed and oversown lucerne/pasture a further 21% of the land area) means that managing pH and soil fertility is crucial.

Table 1. Comparison of farmed and un-farmed soils on Upper Hunter dairy farms

Result	Site 1. Denman		Site 2. Singleton	
	Farmed	Unfarmed	Farmed	Unfarmed
pH ($CaCl_2$)	6.6	6.6	6.4	6.4
Organic Carbon (%)	2	1.9	1.6	2.4
Sulfate sulfur (mg/kg)	3	2	2	4
Phosphorus –Bray (mg/kg)	21	30	NA	NA
Phosphorus – Colwell	50	76	19	68

(mg/kg)				
Potassium (meq/100g)	0.27	0.82	0.25	0.50
Potassium % of CEC	1.4	3.2	1.2	2.3

Conclusion

With emphasis on dairy farmers to increase production to remain viable in a deregulated market, greater pressure will be placed on the sustainability of the whole farming system.

Several factors identified in the survey, including increased nitrogen fertiliser use and the reliance on pure lucerne, indicate a need for better management of soil acidity and fertility. The greatest current threat to production and persistence of irrigated pastures and forage crops is the decline in soil fertility that has occurred under past management systems.

Dairy farmers should be encouraged to monitor their soil fertility through regular soil testing, and adopt nutrient budgeting techniques to remain sustainable in the future.

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