Managing cadmium in grazing farm systems in New Zealand

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This practical fact sheet has been developed by the Cadmium Management Group to provide farmers with advice about managing cadmium in their grazing systems.

What is cadmium?

Cadmium is a naturally occurring metal element, present in small amounts in soils, rocks, plants and animals. Cadmium is absorbed by plant roots and transported to different parts of the plant. In grazing farm systems, uptake by pasture, forage crops or plants used for supplementary feeds provides a pathway for animal intake.

Why can it be an issue?

Cadmium can accumulate in humans and livestock, mainly through food consumption. Excessive long-term daily intake of cadmium can lead to health problems in humans and animals. New Zealand, via Food Standards Australia New Zealand, has set maximum levels (MLs) for cadmium in food products. Where an ML for cadmium is exceeded, those food products may not legally be sold and the Ministry for Primary Industries will take action to alert the supplier. Non-compliance with MLs in exported food products could result in rejected shipments and may negatively affect the international reputation of New Zealand food products.

Managing soil cadmium is also important to protect versatility of future farming land-use options

What are the sources of cadmium?

The main source of cadmium in agricultural soils is from phosphate fertilisers, which contain cadmium as an impurity from phosphate rock. New Zealand soils contain little cadmium naturally, from less than 0.1 to 0.6 mg/kg. Composts and manures may also contain cadmium. While they generally contribute less cadmium to soils than phosphate fertiliser, management of cadmium should still be considered if these products are used.

How is cadmium managed in New Zealand?

A National Cadmium Management Strategy sets out the approach to managing cadmium in the primary sector. This includes managing the accumulation of soil cadmium in agricultural production land through the Tiered Fertiliser Management System, which sets out increasingly stringent restrictions on the choice and rate of phosphate fertiliser as soil cadmium increases

(www.fertiliser.org.nz/site/resources/tools). Cadmium in food, soil and fertiliser is regularly monitored by government and industry agencies.

Achieving low cadmium in grazing systems

For grazed livestock it is principally the offal (kidney) food standard which is being managed and monitored as cadmium does not tend to accumulate in meat and milk.

The risk of non-compliance with the ML for kidneys is currently managed by the exclusion of kidneys from ruminant livestock (excluding deer) greater than 2 years old, from the human food chain. However, levels higher than the ML can also be found in animals less than 2 years old, and so awareness and management of cadmium in soil and forage species is needed.

Soil properties such as pH, organic matter and clay content can significantly affect how much cadmium is taken up by plants. Soil tests for cadmium, pH, organic matter and Olsen P provide valuable information for monitoring and managing cadmium accumulation in plants.

Reducing cadmium inputs – don't over-fertilise!

Phosphate fertilisers are the primary source of cadmium in agricultural soils, so reducing their application rate and/or switching to lower-cadmium containing fertilisers will reduce the input of cadmium to soils. Olsen P is a key indicator of phosphate fertiliser requirements and phosphorus fertiliser can be reduced where the Olsen P is at or above recommended levels for your crop and soil type. Advice on the appropriate rate can be obtained by soil testing, from your soils and fertility advisor, and by using nutrient management models or www.fertiliser.org.nz/site/resources/tools

Phosphoric-acid-derived fertilisers (e.g. triple superphosphate, DAP) typically have less cadmium than sulphuric-acid-derived products (e.g. superphosphate) and rock phosphate. Nitric-acid-derived fertilisers (e.g. complex products, with NPK in each prill) generally have the least cadmium. Composts and lime may also be sources of cadmium in agricultural soils, so ensure products containing low cadmium are used.

Reducing ingestion of fertiliser and contaminated soil

Do not graze pastures top-dressed with phosphorus fertiliser for 21 days or until 25mm of rain has fallen; this is important to avoid fluoride toxicity to stock, but also reduces exposure to cadmium.

Grazing livestock may consume more than 50 kg of soil a year. The greatest risk period for high levels of soil ingestion occurs during the winter grazing months and during drought. Where possible, minimise the risk of animals ingesting soil by:

- avoiding overgrazing
- paying special attention to controlling grazing pressure and management during winter months and drought periods.
- not feeding grain or other supplements on the bare soil surface.

Pasture composition and forage crop selection

Selection of crop species can have more significant influence on the plant uptake of soil cadmium than any other factor. For example, the forage crops chicory and plantain have been identified as higher-cadmium-accumulating species than ryegrass and white clover. There is an increasing trend for these alternative forage crops to be used to finish young stock, but this may lead to a greater risk of raised cadmium in the offal of these animals.

Different crop varieties or cultivars can accumulate cadmium at different rates. Testing of a range of chicory cultivars showed some typically higher-accumulating ones: http://www.fertiliser.org.nz/Site/research/projects/effect-of-breeding-for-lowered-cadmium-concentrations-in-chicory.aspx

Improving soil conditions

In general, plant uptake of cadmium can be reduced by:

- increasing soil pH to the high end of the optimal range for your pasture or forage crop, and ideally above 6
- increasing soil organic matter in fields with low organic matter
- addressing any zinc deficiency – this is best-determined through foliar analysis.

Cadmium is generally more available to plants in soils with a low clay content. Therefore, the risk of high cadmium in produce is generally greater for sandy soils than clay soils. Plant uptake of cadmium is also generally lower in Granular and Allophanic (volcanic) soils than in non-volcanic soils.

Next steps

The Cadmium Management Group encourages you to assess how to include the management of cadmium in your farm management plan. As first steps, talk with your soils and fertility advisor about including cadmium in your next soil test, and talk to your forage specialist about cadmium in your grazing system.

Additional resources

www.mpi.govt.nz (search cadmium)
www.fertiliser.org.nz (search cadmium)

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