

Tiered fertiliser management system

Cadmium is a naturally occurring element, a metal that is present at trace levels in the earth's crust, in water, in the air and in soils.

In order to secure the long-term use of agricultural soils, cadmium accumulation should be kept to a minimum, through a common-sense approach to fertiliser use and farm management.

Cadmium can enter agricultural soils by a number of different processes, through air, water and direct deposition. In New Zealand, the most significant sources of cadmium today are fossil fuels and phosphate fertilisers, as cadmium is a natural component of the raw materials used to make these products.

Research conducted in the late 1980s and early 1990s raised awareness of the need for long-term management of cadmium levels in agricultural soils, and the fertiliser industry responded by reducing the cadmium content of phosphate fertilisers.

Since January 1997 the maximum permissible level of cadmium in fertiliser has been 280 mg Cd/kg P. The fertiliser industry has been consistently below this target and now averages about 180 mg Cd/kg P.

National Cadmium Management Strategy

In 2006, the Cadmium Working Group (CWG) was formed. Tasked with developing a strategy to manage cadmium in the agricultural environment, the group comprised representatives from central and regional government, agriculture sectors and the fertiliser industry.

This strategy - the National Cadmium Management Strategy - was launched in 2011. Its stated objective is 'To ensure that cadmium in rural production poses minimal risks to health, trade, land use flexibility and the environment over the next 100 years.'

As a result of this, cadmium accumulation in agricultural land was excluded from the *National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health*, published by the Government.

Tiered Fertiliser Management System

The Tiered Fertiliser Management System (TFMS) is central to the National Cadmium Management Strategy. It is a voluntary system, but it's recommended for all farmers, in particular those who apply more than 30 kg P/ha/year.

Under the TFMS, a predefined soil testing programme is used to determine representative soil cadmium levels on participating farms. The outcome of the soil testing determines subsequent action, both in terms of additional testing and in terms of fertiliser use (see Table 1).

Tier	Soil Cd concentration (mg/kg)	Management action
0	<0.6	Retest in 5 years and no restrictions on P fertiliser use
1	≥0.6- <1.0	Retest in 5 years and restrict fertiliser product choice based on application rate
2	≥1.0- <1.4	Restrict fertiliser product choice based on application rate. Limit rates of application
3	≥1.4- <1.8	Restrict fertiliser product choice based on application rate. Further limit rates of application
4	≥1.8	No further cadmium accumulation permitted. Site-specific investigation required

Table 1: A summary of the TFMS. The majority of farms in New Zealand will fall into Tier 0 or Tier 1

One of the keys to managing soil accumulation of cadmium is the use of appropriate fertiliser products, in light of both the soil cadmium levels and the rate of application of phosphorus that is needed.

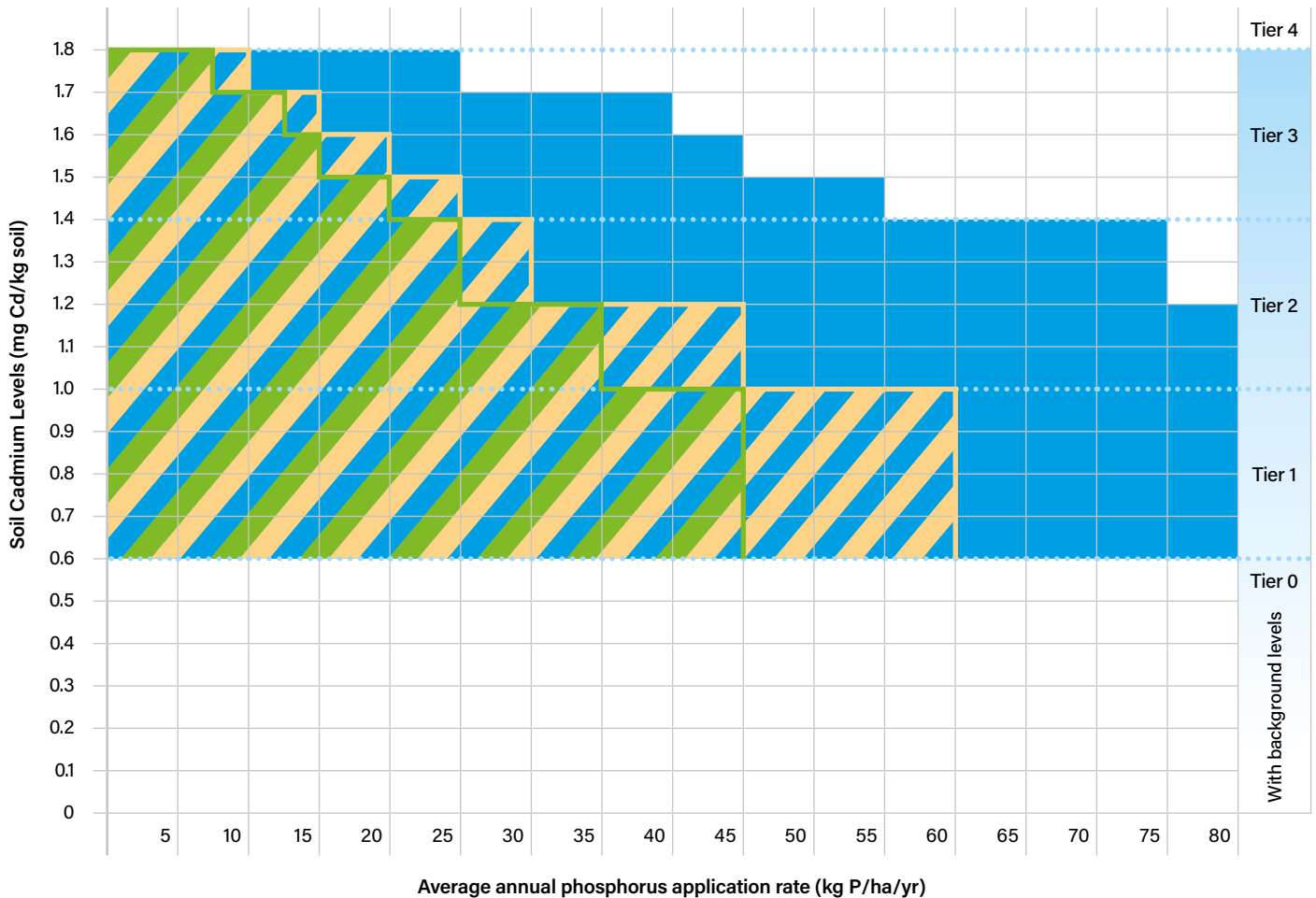
The TFMS groups phosphorus fertilisers into three categories, based on their manufacturing process and relative concentration of cadmium (Table 2).

The use of the various groups of fertiliser products within the TFMS is shown in Figure 1. For example, if a farm has an average soil cadmium level of 0.3 mg Cd/kg soil (Tier 0), there are no restrictions on the type or rate of phosphate fertiliser that can be used. On the other hand, if a farm falls into Tier 1 and the annual application of phosphorus is 50 kg P/ha/year, reactive phosphate rocks (RPR) and sulphuric- acid derived products may not be used alone, although it may be possible to use them in combination with other phosphorus fertilisers with lower cadmium levels, e.g. DAP, triple superphosphate or YaraMila products. The restriction on product selection activates at lower application rates as the soil cadmium level increases. Restrictions are most stringent as soils approach the maximum permissible level of 1.8 mg Cd/kg soil.

While the TFMS is designed to help manage cadmium inputs from fertiliser, it should be complemented by other farming practices to reduce soil cadmium accumulation and plant cadmium uptake.

Product group	Ballance fertiliser products
RPR and sulphuric acid-derived products	RPR Superten Sulphurgain SurePhos Serpentine super
Phosphoric acid-derived products	Triple superphosphate DAP
Nitric acid-derived products	YaraMila Complex YaraMila 12-10-10 YaraMila 8-11-20

Table 2: Examples of Ballance products in the phosphate fertiliser groups of the TFMS



Note: This approach is conservative in that it assumes all cadmium remains in the surface soil within a depth of 15 cm, with no soil system losses. It also assumes the cadmium levels in the phosphate fertiliser are always at the maximum allowable limit, when in fact they are kept below this level, to ensure it is not exceeded.

Key

- Sulphuric acid derived products plus DAPR / RPR
- Phosphoric acid derived products
- Nitric acid derived products

Figure 1: Product selection and maximum rate of average annual P application for soils at Tiers 1-4

This fact sheet should be read in conjunction with the fact sheets Cadmium, Cadmium soil sampling and Cadmium in fertilisers.