Fertiliser Association

Shaping profitable and sustainable farming

FERTILISER ASSOCIATION OF NEW ZEALAND

Code of Practice for Fertiliser Nutrient Management

Fertiliser Association

Shaping profitable and sustainable farming

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1. Purpose

All farm systems are dependent on an adequate supply of essential nutrients, whether it is for cropping and horticulture or pasture for livestock. The role of fertiliser along with other sources of nutrients such as crop residue, nitrogen fixation, soil reserves, compost and effluent is to help ensure adequate levels of essential nutrients are present for plant growth and animal health.

This Code of Practice for fertiliser nutrient management is intended to provide clear principle-based guidance on supplying the nutrients for growing healthy food, while at the same time avoiding or minimising the loss of those nutrients to the environment. The Code is designed to be relevant for the emerging regulatory framework and provide guidance for:

1. Farmers, growers and their advisers, when developing nutrient budgets, nutrient management plans, farm plans and freshwater farm plans;
2. Freshwater farm plan certifiers and auditors; and
3. Regional council planning and technical staff.

Why should I follow this code?

Following this code will help you manage fertiliser better so that:

* Less fertiliser is wasted (saving you or your client money)
* Any potential negative impacts on soil, air and water are avoided or minimised
* You can meet the requirements of customers, regulators, and your community by following well-documented good practice.

The guidance considers both the risks to the environment associated with fertiliser use and options for avoiding, remedying or mitigating impacts. It also provides examples of how farmers and growers can demonstrate their actions.

Our welfare and our nation's food and fibre production are intrinsically linked to our natural resources. To sustain the well-being of our soil and water for our own physical and spiritual health and welfare, and for the well-being of our

landscape, we need to nurture and manage our natural resources to the best of our ability. Natural resources must be safeguarded so that they provide not just for our current needs but also social, cultural, economic and environmental needs for generations to come.

We are custodians of the land for our children, their children and the generations that follow. We want farming systems that are sustainable for the long term – avoiding systems that leave the land depleted. When developing our land for primary production we have a responsibility to manage it well, so that we leave the land in as good, or better, condition than we inherited it. The impacts of past activities on soils and waterways must be acknowledged and addressed. When managing the nutrients in our productive land we must take a holistic approach to safeguard the health and well-being of the soils and water that sustain us.

> The characteristics of each farm are unique. Given this Code is designed to be used across all farms, care is needed when applying the Code to individual properties, with regular monitoring, review and evaluation.

This Code replaces the existing Code of Practice for Nutrient Management, first published in 1998 as the Code of Practice for Fertiliser Use. This review is the fifth review undertaken since that time, each one helping farmers and growers meet heightened expectations while achieving production targets. The Code is designed to support farmers, growers, rural professionals and council planners to face the future using new science and technology as they meet the challenge of operating under the new regulatory framework.

Development of the actions in this Code are founded on published research. This Code and supporting information including the research can be found at **www.fertiliser.org.nz**

It is intended that the Code will continue to be reviewed around every five years to incorporate new knowledge and address challenges resulting from any long-term and emerging issues.

2. Scope

The focus of this Code is on the use of nitrogen and phosphorus fertilisers, as these are the two key nutrients where good management can avoid or minimise environmental impacts (as well as reducing waste).

It also covers aspects of fertiliser spreading which may have social impacts on communities.

The Code operates within the requirements established by Acts, regulations, and regional and district rules. These place restrictions and limits on the use of fertiliser to achieve catchment outcomes and air quality.

This Code takes a risk-based approach, consistent with the approach planned for the preparation, certification, and auditing of Freshwater Farm Plans. It follows the internationally accepted principles of nutrient stewardship - the 4Rs (right product, right time, right rate, right place).

Importantly, the Code differs from Freshwater Farm Plans in that it does not identify where changes to the management of farm systems may be required to achieve environmental targets.

The Code provides links to more detailed information, for example the agronomic requirements for crop needs. **BOOKLETS**

> When considering nutrient use, it is critical that only nutrients needed by crops are applied, using the right product at the right rate, right time and right place – the 4Rs.

3. Knowing Your Situation

The Code of Practice provides a framework for managing fertilisers responsibly to support farm system goals, while at the same time reducing adverse environmental impacts.

The first step in implementing this Code is to identify the farm-specific goals, regulatory requirements and environmental issues, and the outcomes sought. Once the farm specific situation is understood, the necessary management actions can be considered and decided.

All farms are different. “Inherent” and “management” risks vary across individual farms.

Inherent risk is based on the biophysical characteristics of the landscape. It also includes the identification of any significant sites, or areas of disproportionate nutrient loss. It is important to note that the inherent risks may be altered through human-made “land modifications”, such as irrigation and drainage. Inherent risks are defined on a spatial basis.

Management risks are risks to freshwater and freshwater ecosystems from farming/growing activities. Management risks are assessed by considering farming/growing activity together with the inherent risk of the land units where the activity is undertaken.

For managing nitrogen and phosphorus fertiliser, some of the key factors affecting nutrient requirements, productivity and risk of loss to the environment are:

Site Characteristics

Seasonal climatic conditions, temperature/rainfall, topography, artificial and modified drainage, aspect, altitude and soil properties will impact on nutrient requirements, use and loss.

Areas with limited production potential and/or environmentally or culturally sensitive zones on, or impacted, by the property should be identified.

Site characteristics also include social, cultural or regulatory requirements or limits which apply to the farm or catchment.

Soil Properties

Soil parent material, texture, depth, structure and organic matter impact on nutrient retention, soil moisture and drainage and therefore impact on crop or pasture yield potential, nutrient demand and risk of nutrient loss.

Soil Nutrient Status

Soil chemical and physical properties are key determinants in nutrient and water management.

It is necessary to undertake the correct soil tests at the appropriate time and frequency for your production system to inform decisions on fertiliser applications to manage soil fertility to meet the farm objectives, while avoiding, mitigating, or if this is not possible, minimising environmental risks.
BOOKLETS

Forage or Crop

The requirements of pasture, livestock or crops and the projected target yield or production goals, will inexorably influence the decisions required for site-specific nutrient management. BOOKLETS

4. Nutrient Budgets and Plans

Nutrient Budget and Fertiliser Nutrient Management Plans

Central to good fertiliser nutrient management is understanding the nutrient demands and nutrient cycle for your farm system.

Nutrient inputs and outputs should be documented in a nutrient budget. The actions and nutrient management requirements to achieve production goals and manage environmental risks should be clearly documented in a nutrient management plan which can be monitored and reviewed at the end of each production cycle.

A Nutrient Budget is: A statement of the total nutrient inputs and outputs for a specific land area or management unit.

This nutrient budget could be based on modelled information using tools such as OverseerFM or estimates of stock requirements or crop removals, and soil test data etc. The nutrient budget should be reassessed when there is a significant change to the farm system or production goals, or where there is new soil testing information. The nutrient budget should address regional council and national regulations.

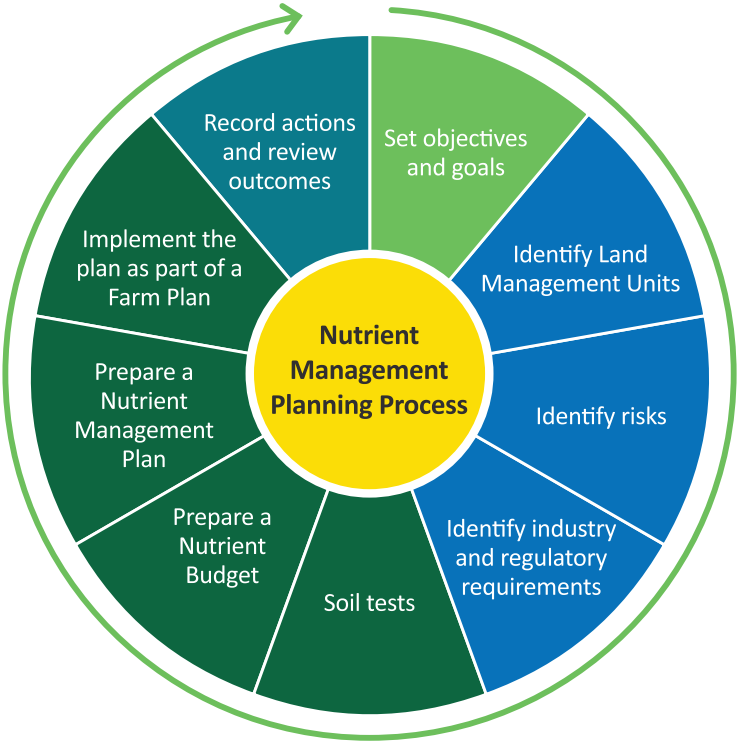
The information in a nutrient budget helps to inform decisions for fertiliser recommendations and for development of a nutrient management plan.

OverseerFM

A Fertiliser Nutrient Management Plan is: A documented plan that describes how the major plant nutrients (nitrogen, phosphorus, sulphur and potassium, and any others of importance) will be managed. A Fertiliser Nutrient Management Plan will cover an appropriate time frame for the activity, typically annually.

The purpose of the Fertiliser Nutrient Management Plan is to ensure that farmers and growers get the best return from their fertiliser and to reduce direct fertiliser nutrient losses so that adverse effects on the environment are avoided, remedied or mitigated.

It is anticipated that the nutrient management plan will be incorporated as part of the Freshwater Farm Plan.



5. Fertiliser Use Practices

Purpose

Fertiliser use is supported by decades of scientific research on agronomic requirements. Increasingly, research is focusing on practices to minimise risks to the environment.

The following Tables are designed to assist with preparation of the fertiliser nutrient component of a farm environment plan or freshwater farm plan. Plans take a risk-based approach tailored to management of both inherent and management risks to ensure that actions are practical and effective.

Each of the Risk Tables below identify a potential risk resulting from the use of fertiliser. Addressing these risks helps ensure better economic returns and reduce losses to the environment.

The first column sets out a list of possible actions and practices that avoid, remedy or mitigate these potential risks. These practices enable you to develop tailored actions and practices relevant on your farm.

The second column describes the kinds of records that demonstrate actions or practices have been carried out, for assurance purposes.

Regional councils and industry groups may recommend or require actions or practices or require records to be kept in addition to those listed below.

Risk: Fertiliser application rates exceeding plant or pasture requirements	
Practices to Address Risk	**Records of action**
Use the industry crop-specific fertiliser application guidelines. BOOKLETS Identify the targeted amount of fertiliser for expected yield or annual production. Adjust application to consider soil type. Ensure fertiliser nitrogen for pasture production is focused on meeting anticipated feed demand using feed budgets. Calculate other sources of on-farm nitrogen and phosphorus inputs including legumes, collected dairy effluent, imported feeds and composts; and include these in calculations to determine the inputs required to meet pasture and crop demand. Adjust the rates of fertiliser based on soil or plant test results as appropriate. BOOKLETS Investigate the use of Fertmark quality assured products. If using a combination of fertiliser products, ensure they are compatible.	Nutrient budget. Feed budget. Fertiliser nutrient management plan. Soil or plant test results. Records of products applied (including the percentages of each nutrient) and the land area to which it is applied. Year-end purchase records from fertiliser companies can be useful to document farm purchases. Fertmark and Spreadmark records.

Nutrient Management Adviser Certification Programme Ltd

Using a Certified Nutrient Management Adviser will give you assurance you are accessing the best possible advice.

Risk: Nitrogen exceeding plant or pasture requirements	
Practices to Address Risk	**Records of action**
Maximise nitrogen uptake and use efficiency by applying split applications of nitrogen fertiliser in areas with frequent high rainfall events resulting in surface runoff or drainage; and irrigated sites that have free-draining soils. Ensure fertiliser nitrogen applications are within the relevant N-Cap for pastoral farms, as well as council-imposed limits. Reduce nitrogen fertiliser rates to match growth potential when conditions such as soil moisture, temperature, pests or diseases are limiting plant growth. Investigate the use of legumes to reduce nitrogen fertiliser requirement. Adjust nitrogen fertiliser to account for readily available and mineralisable soil nitrogen from previous crops grown as well as any nitrogen applied from other sources such as dairy effluent.	Identification of areas on farm with free-draining soils and soils with artificial drainage; and record of actions taken. Nutrient budget (including estimates of other sources of nitrogen and calculations showing adjustments made). N-Cap recording tool.

Risk: Volatilisation losses from urea	
Practices to Address Risk	**Records of action**
Use urease inhibitor coated urea fertilisers to reduce volatilisation losses. Limit the application of uncoated urea or incorporate into soil when there is high risk of volatilisation. Volatilisation losses from the application of uncoated urea is greater where there is less than 10 mm of rain (or irrigation) within eight hours of application.	Record of product used, application method and timing in relation to rainfall or irrigation.

Risk: Phosphorus exceeding plant or pasture requirements	
Practices to Address Risk	**Records of action**
Manage soil phosphorus levels within the target range for the soil type and farm enterprise. BOOKLETS Manage the frequency of soil testing in line with recommendations. BOOKLETS	Soil test results recorded.

Risk: Unacceptable environmental impacts from direct application (Exclusion Areas)	
Practices to Address Risk	**Records of action**
Identify areas that should be excluded from application of fertiliser. These include areas such as: • Where fertiliser is legally prohibited. This includes any areas where stock are excluded under the Resource Management (Stock Exclusion) Regulations 2020, and the Drinking Water Supply Protection Zone Regulations; • Areas that accumulate excessive nutrients such as stock camps and around drinking troughs; • Significantly compacted areas; • Riparian margins and wetlands; • Areas of cultural significance that could be impacted by the direct application of fertiliser; • Critical Source Areas identified in an annual intensive winter grazing plan as outlined in the Intensive Winter Grazing Module MfE/MPI November 2022. Do not apply fertiliser on identified Exclusion Areas.	Record and map Exclusion Areas and Critical Source Areas in the nutrient budget and fertiliser nutrient management plan. Intensive winter grazing plan.

Risk: Fertiliser nutrient loss from susceptible production areas	
Practices to Address Risk	**Records of action**
Identify Risk Areas e.g. * steep slopes, easily eroded soil types. * soil that have high amounts of macropores or have artificial drainage (which can provide a rapid conduit between nutrients applied at the surface and streams). * soils that have low phosphorus retention (ASC, less than 15%). In these Risk Areas: * Manage soil P levels to the low end of the target range, and if applying higher than maintenance rates to raise Olsen P, consider split applications. * Carefully manage the amount of phosphorus applied per application. * Consider using slow-release phosphorus options e.g., Phosphate Rock (Note: Phosphate Rock is better suited to soils where pH is <6 and rainfall is >800 mm.) * Investigate the options for nitrogen and phosphorus fertiliser products to enable more precise application. (Note: droplet size for liquids, and particle size of dry fertiliser formulations will influence placement accuracy). * Consider crops or pasture with lower phosphorus and/or nitrogen requirements.	Record and map Risk Areas in the nutrient budget and nutrient management plan. Soil test results. Crop choice. Choice of fertiliser product.

Risk: Fertiliser nutrient loss by not matching timing with crop growth stage, weather conditions and soil temperature.	
Practices to Address Risk	**Records of action**
Apply nitrogen and phosphorus at the optimal time to match stage of crop and pasture demand. Avoid applying nitrogen fertiliser when the temperature is too low, or soil is too dry for plant growth. For example, nitrogen should not be applied to pasture when the 10 cm soil temperature at 9 am is less than 6^{o}C and falling, (at these low soil temperatures, rye grass growth and nitrogen uptake is very slow and there is greater risk of leaching loss). In normal circumstances do not apply fertiliser when pasture height is less than 25 mm.	Records of land use activity/ crop to which the fertiliser is applied including crop growth stage and other details relevant to product choice and rate. Records of dates, soil and weather conditions. Irrigation scheduling records. Record of weather forecast at time of application.

Risk: Runoff or leaching of fertiliser nutrients	
Practices to Address Risk	**Records of action**
Avoid applying fertiliser on soils where there is overland flow, ponding, or soils are saturated and still draining below the root zone. Avoid applying fertiliser when rain is likely to cause overland flow or drainage below the root zone is forecast. (Typically, it will be up to eight days following application before the concentrations of phosphorus in overland flow will return to background levels.) Correctly time fertiliser applications with irrigation management and crop uptake to minimise runoff or drainage losses. (Irrigation management is most critical in the shoulder periods of the irrigation season to minimise drainage losses.) Split applications of phosphate fertiliser in areas where high rainfall events are frequent (such as the South Island's West Coast).	Record of weather forecast and soil moisture status at the time of application. Irrigation scheduling records.

Risk: Off target drift	
Practices to Address Risk	**Records of action**
Identify areas that could be impacted by spreading drift. Investigate and implement appropriate measures to manage risk of off-target drift. This may include measures such as buffers, wind breaks, traffic management etc. Investigate the use of well granulated fertilisers to minimise drift. Ensure the wind is blowing away from areas at risk of off-target drift and delay spreading until conditions are more suitable. Reassess the spreading of fertiliser if the wind picks up or changes direction. Choose spreading equipment that restricts off-target drift.	Document measures implemented to manage risk of off-target drift. Proof of placement/application information. Fertmark records. Record of weather forecast and conditions at the time of application. Good maps to communicate to spreader operator. Records of Spreadmark Certification if contractors used to spread fertiliser.

Risk: Social disturbance	
Practices to Address Risk	**Records of action**
Identify risks of social disturbance and modify or change the method and timing to reduce the effects such as noise or odour on affected parties. Keep affected parties informed of timing and nature of products being applied. Check weather prior to application (wind direction, speed etc).	Record of complaints/ concerns and actions taken. Record of when affected parties notified of upcoming spreading. Record actions taken to minimise nuisance. Record of application dates, times, weather conditions and rate applied.

Risk: Uneven application rates (creating production or environmental risk)	
Practices to Address Risk	**Records of action**
Choose the most appropriate placement mechanisms for the product type and to achieve evenness of spread. Ensure application equipment is calibrated in accordance with equipment manufacturers recommendation for the products used. Use precision placement technology such as variable rate application where appropriate. Place fertiliser where it is most available for plant uptake, for example banded application or side-dressing for arable systems. When applying liquid fertilisers follow equipment manuals to ensure the appropriate pressure at the spray nozzles to minimise fine droplets (small nozzle orifice and high pressures promote fine droplets). Investigate application of liquid fertiliser via technologies such as directed solution placement with drop-legs or hoods and droplet enhancers such as atomisers and electrostatics that will enhance placement accuracy. Investigate the use of Spreadmark certified contractors, where available, with the correct level of application overlap and uniformity.	Proof of placement/ application mapping. Records of which paddocks or land units received fertiliser. Record of application method and equipment calibration process.

6. Managing Contaminants

Phosphate fertilisers are manufactured from naturally ocurring rock phophate. Rock phosphate typically contains a range of minerals and elements which occur in the Earth's crust. Some of these natural trace elements are unwanted contaminants. The non-essential minerals cadmium and fluoride require management.

Cadmium

Repeat applications of phosphate fertilisers over a prolonged period can lead to a gradual accumulation of cadmium in agricultural soils. At elevated levels in soil, there is increased opportunity for plant uptake which presents a potential pathway for entering the food chain.

The National Cadmium Management Strategy has the objective:

To ensure that cadmium in rural production poses minimal risks to health, trade, land-use flexibility and the environment over the next 100 years.

Under the Cadmium Management Strategy, soil accumulation of cadmium is guided by the Tiered Fertiliser Management System which has the principal purpose of controlling the accumulation of cadmium in agricultural soils.

The Tiered Fertiliser Management System reduces cadmium accumulation rates as soil cadmium increases by restricting the choice and rate of phosphate fertilisers to ensure that soil cadmium remains within acceptable limits over the very long term. TOOLS

Good management of cadmium accumulation in soil will help to address soil accumulation of other contaminants.

Fluoride - Fertiliser and Stock Management

Repeat applications of phosphate fertilisers over a prolonged period can lead to a gradual accumulation of fluoride in agricultural soils. Typically, plant uptake of soil fluoride is negligible, however through incidental soil ingestion by grazing livestock, or through direct phosphate fertiliser ingestion by livestock, excessive fluoride intake can lead to a condition called "fluorosis".

In rare situations, fluorosis can lead to animal mortality. This usually occurs where hungry animals in vulnerable metabolic state i.e., near-term pregnancy, are allowed to graze paddocks with low cover immediately after phosphate fertiliser has been applied or where accidently they have had access to stores of phosphate fertiliser. This condition is sometimes called “phosphate poisoning”.

Managing Cadmium and Fluoride

Risk: Phosphorus fertiliser contributes to gradual increase in soil cadmium concentrations.	
Practices to Address Risk	**Records of Actions**
Use the Tiered Fertiliser Management System for Soil Cadmium to monitor and control cadmium accumulation in soils from the application of phosphorus fertiliser. Use sources and rates of phosphorus fertiliser in accordance with the Tiered Fertiliser Management System as appropriate to the soil cadmium status. Consider crop variety, cultivar and agronomic practices to control cadmium uptake from soil and meet food standards. **EXTERNAL RESOURCES**	Fertiliser product and rate used. Actions taken to reduce cadmium uptake, such as choice of crop variety, cultivar and agronomic management. Soil analysis at appropriate intervals e.g. five-yearly.

RISK: Livestock toxicity from ingestion of fluoride	
Practices to Address Risk	**Records of Actions**
Apply phosphorus fertiliser to pasture at times when the fertiliser will not be ingested by grazing animals Be aware of heavy dews when finer particles can stick to plant leaves and be ingested by the animal. Allow adequate rainfall/irrigation or time after application of phosphorus fertilisers (at least 21 days, or until 25mm of rain/irrigation) to allow fertiliser to be washed off pasture leaves and dissolve to avoid ingestion by grazing animals (particularly pregnant animals, lactating animals, and animals under stress).	Actions taken to reduce fluoride uptake by grazing animals.

7. Fertiliser Compatibility

Expert advice should be sought before creating a blend of fertiliser products because some fertilisers are not physically or chemically compatible.

Fertiliser blends or physical mixtures should only be used if there is no risk of chemical or physical reaction (for example moisture absorption). Reaction between fertilisers in blends or mixes may reduce product safety, effectiveness or application accuracy.

Care should be taken to ensure there is no segregation of the blended or mixed components in transport and handling operations.

For example:

- Ensure particle size of blended fertilisers are similar (differences in particle size, e.g., greater than 10 %, can lead to separation during transport and spreading);
- Wherever possible, mix components immediately prior to use to reduce time for interactions (e.g., increased moisture absorption, chemical reactivity);
- Do not mix herbicides or other agrichemicals with fertilisers because this can result in unpredictable responses, e.g., reduced effectiveness, or hazardous chemical reaction.

Appendix

Fertiliser

The role of fertiliser (along with other sources of nutrients such as crop residue, nitrogen fixation, soil reserves, compost and effluent) is to help ensure adequate levels of essential nutrients are present for plant growth and animal welfare. The development of this Code relied on the two definitions available from national legislation and standards:

Ministry for the Environment, November 2019. National Planning Standards

The standard defines fertiliser as: *a substance or biological compound or mix of substances or biological compounds in solid or liquid form, that is described as, or held out to be suitable for, sustaining or increasing the growth, productivity or quality of soils, plants or, indirectly, animals through the application to plants or soil of any of the following:*

(a) nitrogen, phosphorus, potassium, sulphur, magnesium, calcium, chlorine, and sodium as major nutrients; or

(b) manganese, iron, zinc, copper, boron, cobalt, molybdenum, iodine, and selenium as minor nutrients; or

(c) fertiliser additives to facilitate the uptake and use of nutrients; or

(d) non-nutrient attributes of the materials used in fertiliser.

It does not include livestock effluent, human effluent, substances containing pathogens, or substances that are plant growth regulators that modify the physiological functions of plants.

Agricultural Compounds and Veterinary Medicines (Exemptions and Prohibited Substances) Regulations 2011

Within the definitions of this regulation, fertiliser -

(a) means a substance or biological compound or plant material, or a mix of substances or biological compounds or plant material, that is described as, or held out to be suitable for, sustaining or increasing the growth, productivity, or quality of plants through the delivery to plants or soil of plant nutrients; and

(b) includes any—

(i) non-nutrient attributes of the materials used in fertiliser; and

(ii) animal nutrients used in fertiliser; but

(c) does not include a substance or biological compound or plant material, or a mix of substances or biological compounds or plant material, that is intended for use as a plant growth regulator that modifies the physiological functions of plants.

Always work to the Four Rs

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