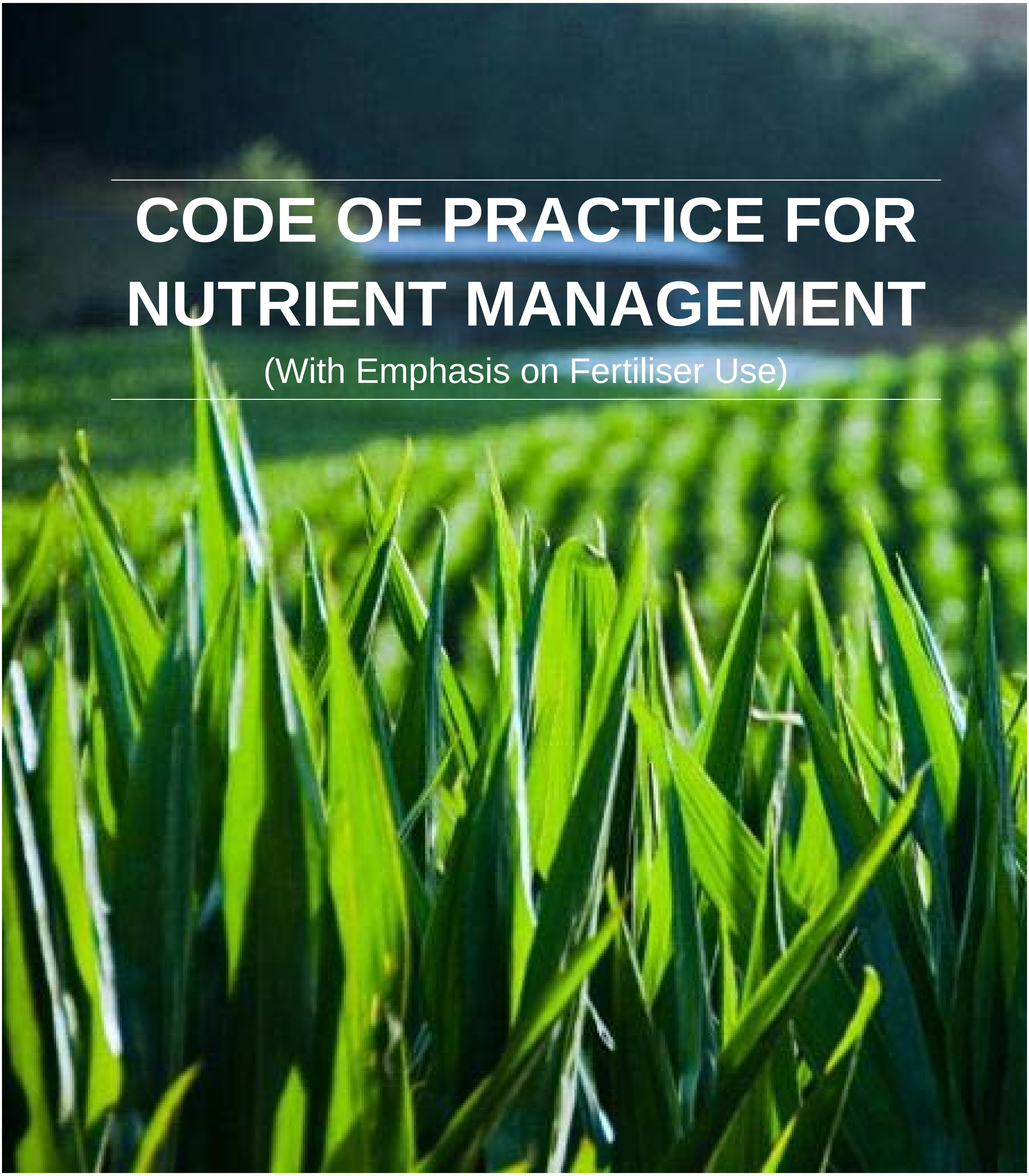

CODE OF PRACTICE FOR NUTRIENT MANAGEMENT

(With Emphasis on Fertiliser Use)

Fertiliser Association

Shaping profitable and sustainable farming

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Contents

Overview

The Fertiliser Association of New Zealand's *Code of Practice for Nutrient Management* (2013) considers fertiliser use within the broader context of nutrient management. With this approach, a nutrient budget is the basis for developing a nutrient management plan. This Code assists in achieving that, placing the planning within the context of a farm management system.

While it is mainly intended as a guide for nutrient advisers and consultants, this Code is also useful for land managers (farmers and growers) who want to know more about nutrient management planning and good nutrient management practices for their production system.

Wise nutrient management planning will enable land managers to demonstrate environmental care as they undertake production activities and aim to run a profitable business. Additionally, this Code will help land managers, consultants, Regional Councils and the public to have confidence in nutrient management practices throughout New Zealand's primary production sector.

It is not intended to be read from beginning to end. Users can select sections relevant to them, depending on their needs, farming systems and current level of nutrient management planning.

1 General

1.1 Objectives

This *Code of Practice for Nutrient Management* provides a framework for the overall management of nutrients on arable and pastoral farms, horticulture and viticulture blocks, market gardens and forest plantations, and places special emphasis on the use of manufactured fertilisers. In particular the Code aims to ensure that such fertilisers are used safely, responsibly and effectively, while avoiding or mitigating adverse environmental effects.

The Code objectives are:

- to provide a simple yet effective process for nutrient management,
- to promote practices that ensure sustainable and economically viable use of fertiliser, and
- to provide users with information on sustainable nutrient management.
- to help support business owners (farmers and growers) to achieve their production and environmental goals for nutrient management.

Use of the Code will give users, regulatory authorities and markets the assurance they require that the nutrients used in New Zealand primary production are well managed to avoid or minimise adverse environmental impacts.

1.2 Scope

The Code sets out an overall process for the management of all deliberately applied nutrients but places special emphasis on the use of manufactured fertiliser products in primary production systems including arable, pastoral, horticultural and forestry production. The Code has been designed to help users comply with the acts and regulations that affect nutrient management activities in primary production.

For the purposes of this Code, fertiliser is considered to be essentially any manufactured product that is specifically produced to be applied to land to increase plant or animal performance, whether by increasing plant growth or overcoming nutrient deficiencies or imbalances. This means the Code covers products used to provide major nutrients (such as nitrogen, phosphorus, sulphur and potassium) plus products used to supply trace elements of importance to plants or animals (such as copper, boron, cobalt and selenium).

It is important to recognise that the deliberate application of manufactured fertiliser is not the sole source of nutrients added to New Zealand soils. This Code encourages all land managers (including farmers, growers and foresters) to understand the role of fertiliser in balancing overall nutrient inputs and outputs in their production system to achieve their production and profit objectives while managing effects on the environment.

1.3 How to use this Code

This Code is arranged to:

- set the scene for adopting nutrient management planning, explaining the background to this process and the key concepts involved (Chapter 2, page 11 – Setting the Scene)
- explain how this Code's approach assists land managers to manage nutrients in farm production systems (Chapter 3, page 14 – Guiding Principles)
- give detailed instructions on preparing a nutrient management plan for arable, pastoral, horticultural, and forestry production (Chapter 4, page 16 – Nutrient Management Planning)
- provide Good Management Practices to manage environmental risks from nutrient management activities (Chapter 5, page 30 – Good Management Practices and Considerations – Fertiliser)
- provide more detailed explanations of technical or legal topics (Appendix 1, page 47)
- give detailed information about a wide range of topics, including how nutrients behave in the soil and the processes involved, different fertiliser types, and application methods, view Fact Sheets.
- provide information on the Certification of Nutrient Management Advisers and how such Certified Advisers can be accessed.

Refer to definitions on page 7 for any unknown terms.

If you want…

- ***a full understanding of the reasons for using nutrient management plans*** – read Chapters 2, page 11 and 3, page 14
- ***to prepare a nutrient management plan*** – go to Chapter 4, page 16 for the nutrient management planning process; use Chapter 5, page 30 to select Good Management Practices for your situation
- ***to check that present management is suitable*** – see Chapter 5, page 30
- ***more detail about nutrients and nutrient management topics*** – see the Fact Sheets

To get the most out of the nutrient management planning template:

- First write a management plan – follow the template
- Implement the plan and keep records
- Monitor the results
- Use the results to review progress and decide on any plan revisions

1.4 Checking Good Management Practices

This Code can be used to check Good Management Practices for nutrient budgeting and nutrient management planning are being followed. Requirements for each process may be set by a Regional Council. For example, where fertiliser application over a certain level requires a nutrient budget and/or nutrient management plan to be undertaken.

This Code assists land managers, alone or with the help of a Certified Nutrient Management Adviser, to follow the steps that may be required by a Regional Council in a specific situation.

Requirements may include:

- Nutrient Management Plan specific objectives (see page 18)
- evidence that environmental risks have been assessed (see page 20)
- a list of the legal and industry requirements which are relevant to the identified nutrient management activities undertaken on the property (see page 24)
- an appropriate nutrient budget to determine your specific nutrient situation and next steps (see page 25)

1.5 Definitions

Applicator	A user with specific responsibility for application of fertiliser.
Good management practice	A procedure that is accepted or prescribed as being a demonstrated, correct and effective control, technology, measure or operating method that is socially, economically, and technically feasible for mitigating or avoiding contamination from non-point sources.
Capital application	A fertiliser input additional to maintenance requirements which aims to raise soil nutrient status as measured by soil testing.
Carrier	A person/item that provides services for moving items from one place to another.
Certification	Authorisation that the item, practice or service is what it is stated to be.
Certified Nutrient Management Adviser	A qualified and experienced nutrient management adviser who has demonstrated their competence in preparing nutrient management plans by meeting the certification requirements of the Nutrient Management Adviser Certification Programme and whose name is recorded as a certified adviser on the website of the Nutrient Management Adviser Certification Programme: http://www.nmacertification.org.nz/site/nutrient_management/
Coefficient of variation (CV)	The deviation of the item from a reference value. A statistical measurement which is expressed as a percentage of the reference value.
Consequence	The result of an action. In nutrient management planning, the environmental consequences of nutrient management activities are particularly relevant.
Consultant	A person who operates in the field of providing advice generally on a fee paid basis.
Contaminant	Includes any substance (including gases, liquids, solids and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat – (a) When discharged into water, changes or is likely to change

	the physical, chemical or biological condition of water; or (b) When discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged (s2 RMA).
District Plan	An operative plan approved by a territorial authority under the first schedule (to the RMA) and includes all operative changes to such a plan (whether arising from a review or otherwise).
Fact Sheet	A paper which summarises key information relevant to a specific topic and which indicates where further information may be found.
Fertiliser	Any substance (whether solid or fluid in form) which is described as or held out to be for, or suitable for, sustaining or increasing the growth, productivity, or quality of plants or animals through the application of essential nutrients to plants or soils.
Fertiliser blend	A product obtained by dry mixing of relatively homogenous fertiliser materials.
Fertiliser user	A person who takes delivery of fertiliser materials for the purposes of applying them to the land.
Fine particle application	A term commonly used to describe application of a suspension fertiliser.
Foliar analysis	A direct measurement of the level of nutrients contained within the plant tissue at the time of sampling.
GIS (Geographical Information System)	Computer system for mapping and displaying geographical information.
GPS (Global Positioning System)	Satellite and associated ground station system that allows a user to accurately determine their location (longitude, latitude and altitude) in any weather, day or night, anywhere on earth.
Groundwater	Any subsurface body of natural water.
Indicator	A parameter or value derived from data, which points to, provides information about, or describes the state of a phenomenon/environment/area, with a significance extending beyond that directly associated with a parameter value.
Inherent risk	Background risk due to a particular combination of natural characteristics. Inherent risk does not consider Good Management Practices applied to reduce any potential adverse impacts of the activity.
Iterative	A repeated process of re-evaluation to achieve best results.
Land manager	Farmer, grower, viticulturalist, forester – anyone managing a growing system which requires nutrient management.
Land management unit	An area of land that can be farmed or managed in a similar way, due to

	the soil type, capabilities and function, and strategic importance to the farming system.
Likelihood	The probability of an event occurring. In nutrient management planning, the likelihood of adverse environmental effects arising from nutrient management activities is particularly relevant.
Maintenance application	A fertiliser input that maintains the balance between input and output of nutrients as measured by soil nutrient status from a soil test.
Nitrification-inhibitor	A product which slows the first stage of nitrification in the soil and reduces the rate at which ammonium is converted into nitrate, thus reducing the potential for N leaching losses and nitrous oxide gas emissions.
Nutrients	Essential elements required for normal growth and development of plants and/or animals.
Nutrient audit	The process of examining and assessing a nutrient budget.
Nutrient management activities	Activities associated with the design and implementation of a nutrient management plan.
Nutrient budget	Statement of the total nutrient balance for a specific area or production system, taking into account all the nutrient inputs and all the outputs.
Nutrient management plan	A nutrient management plan (NMP) is a written plan that describes how the major plant nutrients (nitrogen, phosphorus, sulphur and potassium, and any others of importance to specialist crops) will be managed annually on a particular area or property. This plan will be implemented to optimise productivity, to reduce nutrient losses and to avoid, remedy or mitigate adverse effects on the environment. See page 16 for the Nutrient Management Planning Process.
Organic fertiliser	Carbonaceous materials mainly of vegetable and/or animal origin added to the soil specifically for the nutrition of plants and which contain nutrients as per the definition of a fertiliser.
Point of sale	The place where the ownership of an item moves from one person to another.
Regional plan	A Regional Council document produced under the RMA on behalf of the local community, which sets out objectives, policies, and methods, (including rules), for the sustainable management of natural and physical resources.
Regional policy statement	A policy framework prepared by a Regional Council under the first schedule to the RMA.
Soil sample	For pasture, typically a set of 15 or more soil cores of 7.5cm depth which are bulked for analysis as a sample. For crops/horticulture, depth of sample taken varies as can minimum number of cores.
Soil test	A procedure to estimate the nutrient status of the soil at the time of

	sampling.
Segregation	The separation of physical materials. The tendency of a uniform mixture containing a range of different particle sizes or densities to separate into classes.
Soil quality	A qualitative term referring to the physical, chemical and biological attributes of a soil.
Standards	Standards in the context of this Code of Practice for Nutrient Management means; technical specifications representing a reliable and consistent practical guideline. For clarity's sake, standards in this context are a practical definition, and do not have legal status, effect or operation.
Surface water	Any above-ground body of water including streams, rivers, wetlands, ponds, drains, dams and harbours.
Sustainable management	Managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while: a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment (s5 (2) RMA)
Urease inhibitor	Products which slow the conversion of urea to ammonium while the nitrogen fertiliser is on the soil surface, thus reducing the potential for nitrogen loss as ammonia gas.

2 Setting the Scene

This chapter explains the key ideas behind the nutrient management concept required under this Code. If you prefer to go straight to nutrient management planning, see chapter 4, page 16.

2.1 Sustainability

The term 'sustainability' implies the ability to keep doing a particular activity indefinitely, without unacceptable impact on people, land or other natural resources. This Code recognises three key principles of sustainability that can be summarised as:

- ***environmental issues***
  Environmentally sustainable land use practices must manage any potential adverse effects to avoid unacceptable degradation of land, air and water resources. Ideal management practices will enhance resources and boost productive potential.
- ***financial issues***
  Sustainable farming keeps management activities economically viable and holds any variation in profit (and the risk of poor returns) to an acceptable level.
- ***social issues***
  Production practices must be acceptable to local communities and to final product markets.

Assessing sustainability is a balancing act that compares impacts across these three areas. Sustainable nutrient management helps avoid serious adverse effects on the environment while achieving economically viable levels of production, profit and risk, both nationally and on individual farms.

2.2 The Resource Management Act

The Resource Management Act 1991 (RMA) was introduced "to promote the sustainable management of natural and physical resources." It requires every person to recognise their duty to avoid, remedy, or mitigate any adverse effect on the environment that could arise from their activity.

The RMA is given effect through regional and district plans – e.g. regional air quality plans, water quality plans and land (soil) management plans. In particular, Regional Councils have responsibility for controlling discharges to land, water, and air. This has implications for fertiliser handling and use, as well as overall loss of nutrients from land use activities.

Nutrient management activities often include fertiliser use and the disposal of animal waste products. It is important to realise that nutrient management activities that are classed as 'permitted activities' (i.e. that can be practiced without resource consent so long as management complies with certain conditions) in one region may have different conditions imposed or even require resource consent in another. It is up to each landowner or manager to make sure they know their regional plan requirements and meet these.

Some Regional Council rules may list fertiliser use applied in accordance with this Code as a permitted activity, but they may also list other permitted activity conditions that the land owner or manager will need to be aware of.

2.3 Market requirements

Given that most of New Zealand's produce is exported, it is essential that land managers understand the requirements of their customers, locally and internationally. Environmental protection is important to many international markets and may also be used as a non-tariff trade barrier to restrict the import of New Zealand goods.

Internationally, the regulatory environment includes standards and restrictions that could pose threats to New Zealand's primary producers. Using this Code should give international markets the assurance they require that there is an effective process in place for the management of soil nutrients.

Some specific QA schemes and programmes that land managers should be aware of are:

New Zealand GAP: http://www.newzealandgap.co.nz

GLOBAL G.A.P: http://www.globalgap.org/uk_en

Global Food Safety Initiative: http://www.mygfsi.com

2.4 Nutrient management

'Nutrient management' is a very important concept in ensuring efficient nutrient use and avoiding or mitigating adverse environmental impacts. It combines production and environmental aspects of nutrient input and output management, rather than considering manufactured fertiliser use in isolation. Complete nutrient management looks more widely at all sources of nutrient input and output and considers manufactured fertiliser use as part of the mix.

Nutrient input sources could include those:

- supplied through breakdown of organic matter (including applied compost or naturally occurring organic matter) and continued weathering of soil materials
- applied in fertiliser use
- deposited in urine and dung
- returned through the irrigation of dairy effluent
- added through the importing of supplementary feed
- nitrogen fixed from the atmosphere by clovers and other legumes
- deposited aerially

Nutrient outputs could include:

- nutrients taken off in products (e.g. fruit, vegetables, grain, logs, meat, wool, milk)
- crop residues removed from the paddock or burnt on site
- losses through erosion, leaching, surface flow and return to the atmosphere
- hay and silage sold off farm
- transfers to unproductive areas (e.g. raceways, stock camps)

Nutrients are essential for healthy plant and animal production, and deliberate nutrient inputs are often required to enhance productivity and address animal health issues. However, poor nutrient management can lead to consequences that are highly undesirable, environmentally, socially and economically. Implementing nutrient management planning will help land managers to maximise the efficiency of their use of nutrients, which will in turn avoid or minimise adverse environmental impacts and increase overall production efficiency.

This Code provides a procedure for the management of all nutrients used in primary production systems, with special emphasis on the management of manufactured fertiliser inputs.

2.5 Adverse environmental impacts

‘Adverse environmental impacts’ refer to any harmful effects on the environment – for example, degradation of soil, water or air, changes that reduce flora or fauna habitat or make the local environment socially unacceptable.

Adverse environmental effects associated with nutrient management can occur through one or more of the following mechanisms[1]:

Leaching = occurs when water carrying dissolved nutrients moves beyond the plant root zone. Potential consequences include harmful contamination of ground water or waterways, and poor performance of target crops if necessary nutrients are lost in leaching.

Runoff = storm water and surface water run-off carrying nutrients away from the target area. Potential consequences include algal blooms in waterways, water contamination making the water source unsuitable for farm or domestic supply, and reduced nutrients available to the crop or pasture on the target area.

Airborne = air quality effects associated with dust arising from fertiliser handling and application. Potential consequences include poor air quality (dust, odour), complaints from neighbours and contamination of water bodies and water supplies.

Mine = declining soil fertility due to net export of nutrients in product without replacement. Potential consequences include declining soil fertility, falling production, reduced feed value of pasture or crops and lower profit.

Load = the accumulation of nutrients and undesired substances, particularly on non-target areas. Potential consequences include imbalances of nutrients in soil and produce, and toxic levels of nutrient.

Atmospheric = greenhouse gas emissions that occur when nitrous oxide (N_2O) and nitric oxide (NO) are released from urine patches and as nitrogen fertiliser products are converted to nitrate.
Potential consequences are increased emission of greenhouse gases.

This Code provides a procedure for managing or avoiding the potential adverse environmental impacts associated with nutrient use on a range of farming systems.

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[1] *Fertiliser Industry Federation of Australia (2001):* Cracking the Nutrient Code, Guidelines for developing a Nutrient Management Code of Practice for your industry, region or farm.

3 Guiding Principles

These guiding principles are built into the nutrient management approach in this Code. They are the underlying philosophies used in this Code that enable land managers to use this Code to manage nutrients practically, profitably and responsibly in their production systems.

This Code's five guiding principles are:

3.1 Effective process

Nutrient management planning can improve results for land managers and the environment simultaneously.

Change for its own sake never makes sense – there must be a reason for it. The nutrient management process as outlined in this Code is a simple, effective process that enables land managers to maximise the benefits of nutrient use while avoiding or mitigating adverse effects on the environment. Widespread adoption of the process can be expected to aid production and profit while addressing community and market environmental concerns.

Although not all land managers face a requirement for external audit of their practices, this Code is set out so use of this Code can be audited. Keeping good records is an essential part of this process.

Involvement of a Certified Nutrient Management Adviser will assist land managers in the implementation of this Code.

3.2 Ease of use

Nutrient management must be 'user friendly' – i.e. it allows the user to accept responsibility for their actions, is simple yet effective and allows the user some flexibility to choose and adapt practices to suit their situation.

Simplicity and flexibility do not mean 'dumbing down' to a system that does not achieve environmental objectives. Rather, the approach advocated through this Code encourages land managers to use their knowledge and skills to understand, choose and apply the most suitable practices for their individual situations. In practice, this can produce greater environmental benefit than can be achieved by prescribing practices for all land managers to follow regardless of situation.

3.3 Legal and industry compliance

As a minimum, this Code requires compliance with legal and industry requirements relating to nutrient management. In reality, many land managers will aim higher than this as they seek effective nutrient use and value for money from their investment in nutrients.

While helping users meet legal requirements, this Code provides flexibility in how land managers select practices that apply to their situation and production systems. It provides a framework of practices that should be followed to assist in meeting regulatory requirements and defines practices that are recommended on a site specific basis. Involvement of a Certified Nutrient Management Adviser will assist land managers in meeting legal requirements.

3.4 Risk based

The basis of effective nutrient management is being aware of and understanding the actual and potential environmental risks associated with these activities. Once understood, these risks and impacts can be strategically managed.

The concept of ‘environmental risk’ is an important part of sustainable nutrient management. While there is potential to cause environmental harm when using nutrients, this need not happen in practice. Depending on conditions and practices, the risks can usually be managed.

Nutrient management risks refer to the chance of an unfavourable consequence resulting from nutrient inputs or outputs. This can be determined by undertaking a nutrient budget, which will indicate an excess or deficit of nutrients. This Code sets out a process for assessing environmental risks associated with nutrient management activities (see Chapter 4, page 20)

3.5 Continuous improvement

Continuous improvement implies that practices are considered more than once, in light of new information and the results of previous management. This leads to future practices reflecting things learned along the way. A cycle of planning, doing, monitoring and improving (‘PDMI’) ensures practices are continuously getting better.

The ‘PDMI’ process emphasises the use of past results when planning management and choosing good practices for the future. Many managers already use continuous improvement approaches to problem solving and day to day management. Using the same process for nutrient management means the nutrient management plan is not just a static document but a vehicle for learning and improvement.

4 Nutrient Management Planning

This chapter explains how to create an individual nutrient management plan for a particular production system and location. A documented nutrient management plan may be required by Regional Councils, or a land manager's own interest. This Code sets out how this can be achieved.

In practice most land managers will use the services of a Certified Nutrient Management Adviser to help with this but it is also important for the land manager to understand what is involved and how the steps fit together.

4.1 What is a nutrient management plan?

A nutrient management plan (NMP) is a written plan that describes how the major plant nutrients (nitrogen, phosphorus, sulphur and potassium, and any others of importance to specialist crops) will be managed. See fact sheets 7 & 8. The NMP applies only to that area of the property which is under the direct management oversight of the property manager. The nutrient management plan aims to optimise production and maximise profit value from nutrient inputs while avoiding or mitigating adverse effects on the environment.

A good NMP:

- ensures that nutrient management meets legal and industry requirements,
- includes a nutrient budget which compares nutrient inputs from all sources with all nutrient outputs,
- achieves desired changes in nutrient levels and production (e.g. increasing soil fertility from a poor base to support a higher stock carrying capacity; altering soil nutrient status to suit future crops),
- minimises the cost of supplying nutrients and avoids wasted spending on unnecessary or unused nutrients,
- minimises the risk of damage to the environment, and
- considers the land manager's personal objectives.

The sample NMP template is provided in Appendix 4, page 59 of this document. This template which adheres to the objectives as outlined in the Code illustrates one type of plan that land managers can use or adapt to suit their circumstances.

Use of this particular template is not essential under the Code but users of alternative NMP templates must be able to demonstrate that their plan includes the following:

- the Code specific objectives (See page 18)
- evidence that environmental risks have been assessed and addressed (See page 20)
- a list of regulatory and industry requirements which are relevant to the identified nutrient management activities undertaken on the property (see page 24)
- an appropriate nutrient budget

and must outline:

- the management practices adopted to avoid or reduce the environmental risks associated with the nutrient management activities undertaken on the property.

4.2 Preparing a nutrient management plan

Figure 1 below sets out the steps involved in preparing and using the nutrient management plan template as provided in Appendix 4, page 59 of this document.

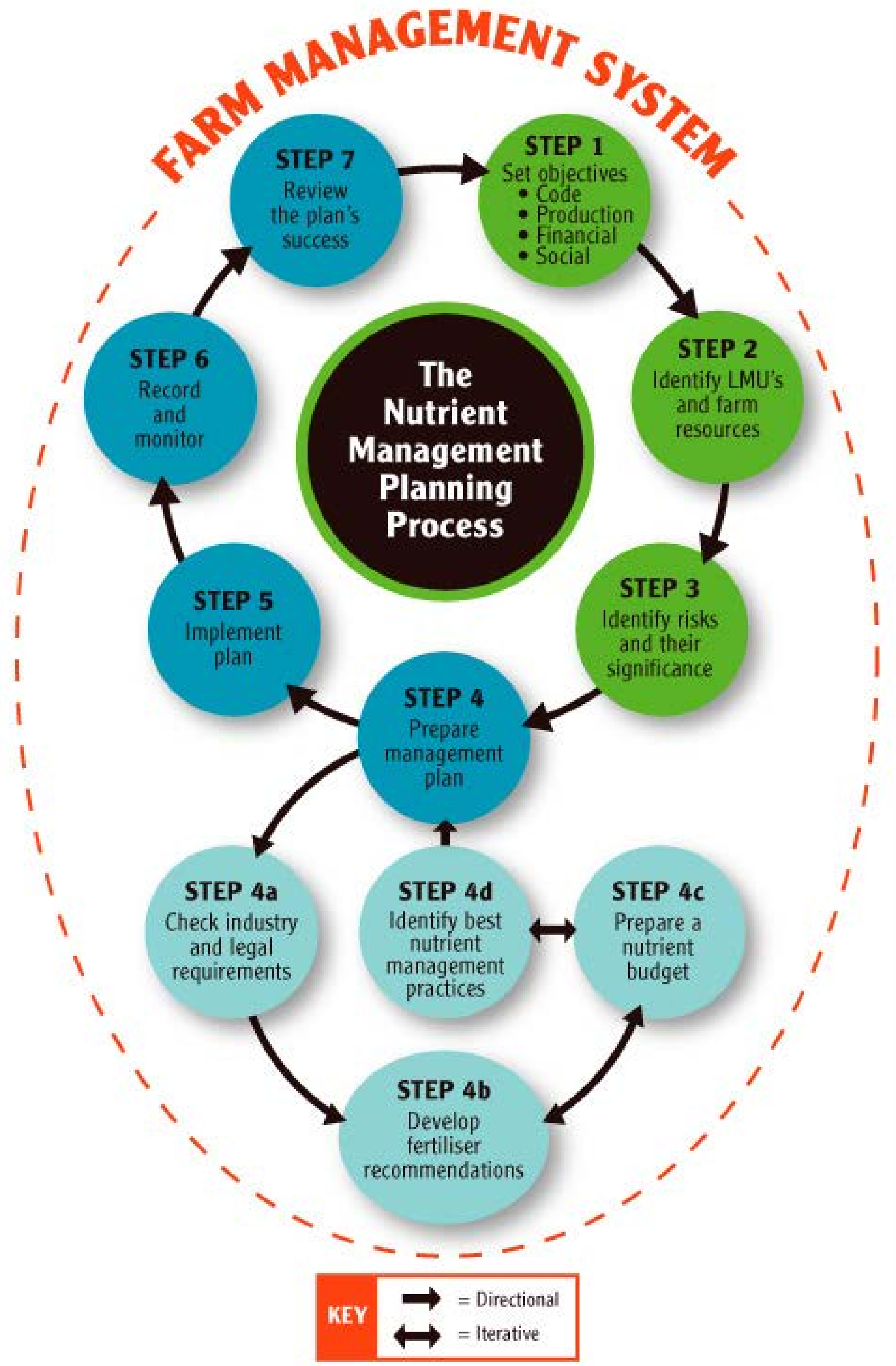

Figure 1: Steps to preparing a Nutrient Management Plan

Step 1: Set objectives for nutrient management

The NMP must include all of the Code specific objectives as listed below. It may also include additional property objectives. The objectives are the things the land manager wants to achieve, against which they will compare the final results of their nutrient management.

Code specific objectives

'Code specific' objectives apply to all users of this Code and primarily cover environmental management. Other aspects of this Code link these to production goals. These objectives should be used when following this Code. Not all of the objectives will apply to every property but all should be considered and adopted where they do apply. For example, all properties will have to meet objectives 1 and 2 but some will find that objective 5 is not relevant because the land does not have any significant (extensive, native) vegetation areas or wildlife habitat. Where a Code specific objective is not applied in the NMP, an explanation should be provided for that decision.

The Code - specific objectives

1. ***To comply with legal requirements related to nutrient management activities.***
   These include national and regional legal requirements as well as industry standards and requirements.

2. ***To take all practicable steps to maintain or enhance the quality of the property's water resources.***
   This will be achieved by adopting management practices that minimise the risks of ground water and/or surface water contamination.

3. ***To take all practicable steps to ensure that there is an adequate supply of soil nutrients to meet plant needs.***
   Most land managers expect to optimise soil nutrient levels (this would be determined in consultation with the fertiliser company representative or farm consultant). This may require an increase or decrease in nutrient inputs.

4. ***To take all practicable steps to contain nutrients within the property boundaries.***
   Best management practices must be adopted where there is any risk of nutrients applied on the property causing damage or nuisance beyond the boundary.

5. ***To take all practicable steps to minimise the risk of nutrient contamination of any areas of significant vegetation and/or wildlife habitat.***
   Nutrient management activities must not degrade any areas identified in district or regional plans as 'outstanding' or 'significant' vegetation or wildlife habitat. Good Management Practices must be planned to minimise the risk of nutrient contamination to these areas.

Property management objectives

'Property management objectives' are part of a nutrient management plan. These typically have a production focus (e.g. "To grow an average of 15,000 kg DM/ha/year on irrigated pasture areas" or "To achieve Olsen P of minimum 25 in all tested paddocks") but may also include environmental perspectives (e.g. "To enhance Pukeko habitat along Wandery creek"), and social perspectives (e.g. "To take at least one month's holiday each year").

Appropriate fertiliser applications will depend on what the land manager is trying to achieve on the property. It is important to know what levels of performance are required before making fertiliser decisions. Is the manager attempting to hold or increase production? Will pasture or crops change in future? If so, do nutrient levels need to be altered over time to suit? The answers to these questions will help set the property management objectives.

Step 2: Identify land management units (LMUs) and farm resources

Under the Code the identification of land management units (LMU's) is optional. However, the concept is strongly recommended for pastoral and arable properties. Failure to identify LMU's and manage them differently could lead to some significant production losses and adverse environmental impacts. Understanding differences in the way parts of the property respond to nutrient management and different land management practices is an important step in achieving production goals as well as recognising and understanding the environmental risks associated with nutrient management activities. The risks associated with nutrient management activities may vary on different parts of the property, so we need to consider each of these areas separately.

The method described below is one means of assessing land management units. In some areas alternative methods such as land use capability mapping may be used. General background is provided in Fact Sheet 1.

A land management unit (LMU) is defined as:

> ***"A homogeneous block of land that responds in a similar way under similar management."***

Areas that need different management or that will show different responses need to be separated for good planning. For example, is all of the area managed in the same way? Will all parts of the property or block respond to nutrients in the same way? Do they share the same environmental risks?

LMUs are best assessed using a combination of physical factors (e.g. soil type, slope, aspect), major management factors (e.g. dryland versus irrigated areas, different arable or horticultural crops, dairy effluent disposal areas, etc.) and history of previous use and management. Some producers will find that their property has several land management units while others can treat their entire property as a single LMU.

Mark the different LMUs on a farm map, and the paddock number, with a note about what each unit represents – e.g. different soil types, aspect, flat and steep areas, different horticultural crops, etc.

Note also any significant environmental features within each LMU – e.g. waterways, wildlife habitat, wetlands, native bush or areas subject to frequent flooding.

An example of a LMU map is shown on the next page.

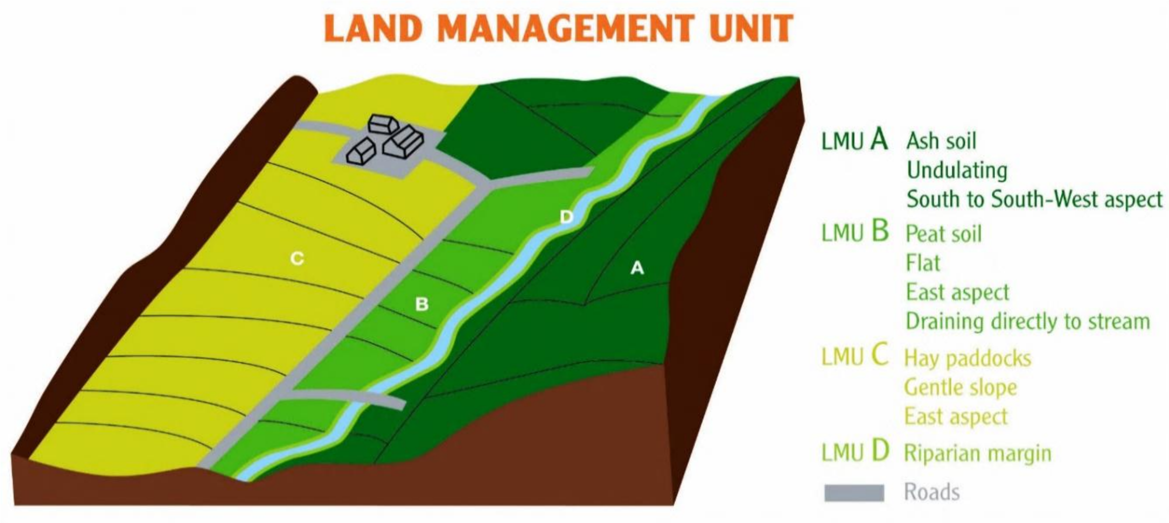

Figure 2: Example of Land Management Unit map

Collect information about the LMUs that will influence nutrient management decisions. Some things to think about:

- Do you have soil or herbage test results for these areas? What is the current soil nutrient status? If there are no recent test results then you should consider testing to establish background soil nutrient levels.
- Are nutrients other than fertiliser applied? For example, is dairy effluent spread on the land? Is conserved feed brought in from other land?
- Do you have information about factors that may alter the environmental risk in any of these areas? For example, are there any irrigated areas where the water table is naturally high?

Mark on your LMU map all potential nutrient 'hot spot' sites. (e.g. silage pits, offal pits, stock handling facilities, feedpads, effluent ponds, effluent spray areas, fertiliser storage areas etc)

Farm resources are interlinked and will influence the nutrient management plan.

Step 3: Identify environmental risks and assess their significance

You need to identify the risks of environmental harm that might arise from nutrient management activities **(e.g. fertiliser use, dairy effluent irrigation and cropping)** and to decide which of these are important enough to need management to avoid, reduce, or mitigate them. There are several different approaches to assessing environmental risks. Most land managers can use a simple system of assessing risks themselves but some may need more formal risk assessment if their industry organisation or Regional Council requires this.

The approach provided here will help you recognise and understand the inherent environmental risks associated with the main nutrient management activities. In some situations you may need a higher standard of proof that you have assessed risks more scientifically – e.g. regulatory authorities may require a more detailed assessment if nutrient management activities do not fit within the 'permitted activity' category and require resource consent.

Identifying 'inherent risks'

For each land management unit you must assess the inherent environmental risks associated with the main nutrient management activities. Inherent risk means any risk that arises because of the activity and the location. If you have not divided the property into its respective LMUs then assess the inherent environmental risk for the property as a whole. *Do not* ignore an environmental risk because the land manager already uses good management to reduce it. This *does not* remove the inherent risk, it only shows that they have recognised it and responded to it.

Typical risks arising from nutrient management activities include:

- contamination of ground and surface waters
- undesired changes in soil nutrient status (i.e. increasing or decreasing beyond target levels)
- fertiliser application to non-target land (i.e. spread beyond the target area, blown off target, etc.)
- accumulation of non-nutrient impurities in the soil profile. See fact sheet 12.

Some land managers may need to consider environmental risk in special detail – e.g. when applying for resource consent to apply fertiliser in a way that is not a 'permitted activity' in their region. Such detailed risk assessments should usually be prepared by a Certified Nutrient Management Adviser with specialist knowledge of nutrient management and environmental risks.

Inherent risks are largely governed by site factors and the amount of nutrient applied (i.e. risks increase as the level of nutrient inputs increases). A list of site factors to consider in evaluating inherent risk is provided in Table 1 below:

Table 1: Site features that affect inherent environmental risks from nutrient use/application:

Site features	Factors to consider in evaluating risks
Groundwater	• depth to ground water and direction of flow • the type and thickness of underlying sediments • potential for nutrients to reach and affect ground water
Surface water bodies (e.g. streams, rivers, wetlands, lakes and dams)	• distance from areas intended for fertiliser storage, handling and application • density of stream and drainage network • any places where stock can directly enter • susceptibility to frequent flooding • susceptibility to run off or leaching of nutrients • erosion
Soils	• current nutrient status • soil structure, including susceptibility to compaction • current compaction status • presence or absence of soil pans • drainage characteristics, including artificial sub soil drainage • current heavy metal status • water holding capacity • organic matter content

Altitude	• altitude range
Aspect	• direction of slope e.g. north versus south facing
Climate	• susceptibility to heavy rainfall or drought or other unfavourable weather event
Slope	• steep, rolling or flat (increasing slope generally increases the potential for nutrient run-off) • natural drainage courses
Nutrient sources	• single or multiple nutrient sources • current nutrient load status in waterways (streams, rivers, lakes and ground water) • form of nutrient used
Neighbouring crops and land owners	• proximity of sensitive crops on neighbouring properties • proximity of adjoining landholders • prevailing wind direction, strength and frequency
Biodiversity – native fauna and flora	• proximity of target areas for fertiliser to any areas of native vegetation • sensitivity of those areas to the fertiliser being considered

Assessing significance

Having identified the environmental risks on the land, you need to decide on the significance of these risks.

In many cases the significance will be fairly obvious. For example, land managers applying nitrogen fertiliser regularly on highly permeable soils with a high water table are likely to be well aware that there is a significant risk of ground water contamination. Land managers applying similar rates of nitrogen to impermeable soils with little ground water do not need to be so concerned with ground water contamination but may need to be aware of the risk of surface water contamination if heavy rain falls soon after fertiliser application.

For each risk identified on the property, think about the potential adverse effects and the likelihood that they will occur in the short (up to 1 year) to medium (3-5 years) term given the conditions on each of the LMUs. Are the adverse effects highly likely or quite unlikely? You could think about it like this:

Likelihood

- If there is little chance of the effect happening (i.e. it is possible but not aware of it happening on this property) then the likelihood is **low**.
- If there is some chance of the effect happening (i.e. it has happened in the past, but not often), then the likelihood is **medium**.
- If there is a strong chance that the effect will happen (i.e. it happens regularly), then the likelihood is **high**.

Think also about the environmental consequences in the context of Regional Council and/or local community expectations. If the adverse effect happens, will the effects be major or minor? Will they be very localised or widespread? Will neighbours be affected? Will the effects be easy to fix or irreversible? You could think about it like this:

Consequences

- If the effect is unlikely to cause real environmental damage, has minimal potential to affect other properties and/or would be easy to reverse, then you can call the consequence **low**.
- If the effect has some potential to cause damage or harm, is reversible but could cause adverse effects in the surrounding environment (i.e. could affect neighbouring or downstream properties), then the consequence is **medium**.
- If the effect has the potential to cause significant environmental damage or harm, both in the immediate area and surrounding environment, is difficult to reverse and likely to concern the community, then you must consider the consequence **high**.

At this stage, think only of the overall practice of the activities proposed – e.g. nitrogen or phosphate fertiliser use. *Do not* downplay the likelihood or consequence because the land manager will practice good management. You will allow for good management and risk mitigating measures, such as applying split dressings of nitrogen, at a later stage in the planning process.

Now you can decide whether the overall risks of nutrient management activities are highly significant or less important. Figure 3 below combines likelihood and consequence to decide the overall significance of any environmental risk.

		Environmental Consequence		
		Low	***Medium***	***High***
Likelihood	***Low***	Low significance	Low significance	Medium significance
	Medium	Low significance	Medium significance	High significance
	High	Medium significance	High significance	High significance

Figure 3: Assessing environmental risk

In other words, if the likelihood, consequences or both are low, then the risk is generally low. As the likelihood of adverse effects and/or the seriousness of these effects increases, the risk becomes more significant.

Any environmental risk with a combination of high or medium likelihood and high or medium consequences *must* be addressed in the NMP with the Good Management Practices chosen to minimise the risk.

Getting advice on activities and their risks

In many cases, you will already be aware of the environmental risks associated with production activities. If you are making major changes to production operations and you are not sure about the inherent risks, seek further advice from a Certified Nutrient Management Adviser. Sources of information and advice include:

- Regional Council staff (or equivalent)
- industry organisations – these may have their own standards, separate to any set or recommended by Regional Council
- fertiliser company staff
- other agribusiness consultants (e.g. agricultural, horticultural or forestry professionals)
- other land managers – look for experience with similar production systems to the management under consideration

Step 4: Prepare the management plan

Step 4a: Check industry and regulatory requirements

Compliance with regulatory requirements is essential to meet the terms of this Code. You must comply with the regulatory requirements which apply to the particular nutrient management activities undertaken on the property. These include those contained in the applicable Regional Council's plans, enacted through resource consent conditions or through the conditions applying to permitted activities. Some industries have additional requirements.

Ask the relevant industry organisations and/or Regional Council to supply a list of their requirements to ensure that you are fully aware of what applies to local operations. These requirements may not have changed since last year's NMP was drawn up but it is good practice to check.

Knowledgeable staff will be available for all of these bodies. It is much easier to discuss the options before completing or implementing the plan than to fix a mistake later.

A locally-based Certified Nutrient Management Adviser will be familiar with the requirements of your Regional Council regarding for nutrient management.

Step 4b: Develop fertiliser recommendations

Fertiliser type, application rates and timing are key management factors that can be greatly varied to meet NMP objectives, balancing information about the environmental risks, present nutrient levels, capital or maintenance dressings, and the objectives for the property. Fertiliser recommendations must take into account the environmental risks and Good Management Practices presented in this Code and the results of nutrient budgets. Many land managers use their fertiliser company representative or consultant to assist in fertiliser planning.

Good records of results achieved from previous fertiliser applications will help. Where problems have been encountered (e.g. dry matter production targets have not been met, nitrate leaching to ground water) then planned management practices need to prevent or remedy these when future fertiliser is applied.

This phase of planning may identify several different fertiliser types that could be used to supply the required nutrients in suitable forms and proportions while managing environmental risks. Decisions on the best types and application rates to meet the plan's objectives will then be based on financial and physical compatibility factors. Many consultants use computer software to select the least cost fertiliser combination (types and application rates) to meet nutrient application objectives.

Step 4c: Prepare a nutrient budget

Nutrient management activities associated with this Code require preparation of a nutrient budget. The nutrient budget is done to assess the cumulative effects of nutrient use. This will allow adjustment of inputs, such as fertiliser, if necessary.

There are several ways to prepare a nutrient budget. One popular approach is to use the nutrient budgeting software, 'OVERSEER®' http://www.agresearch.co.nz/overseerweb/

Typically the nutrient budget will use historical fertiliser applications (e.g. in a 'maintenance' fertiliser programme) and the latest soil test results. For other situations – e.g. where increased fertiliser and increased production are expected – then the nutrient budget should be prepared to evaluate these objectives. This situation may require several nutrient budgets to compare alternative scenarios. This is easily achieved with OVERSEER™ once base farm information has been entered.

A nutrient budget compares inputs and outputs to establish changes in soil nutrient levels. Inputs include nutrient:

- in mineral fertilisers
- in organic fertiliser, soil amendments, feedlot waste, other imported manures or by-products
- in dairy and pig effluent
- in purchased feed (such as grain, hay, silage, brewer's grain, palm kernel extract, other feeds)
- contained in stock returns from stock grazing regularly on the land
- released from soil fixation sites or mineralised from organic matter
- in irrigation water and rainfall
- in clover/lucerne nitrogen fixation

Nutrient outputs and losses occur in:

- produce leaving the block (such as fruit, vegetables, grain, hay, silage, milk, meat, wool, timber)
- nutrient leaching below the root zone
- losses in run-off, including nutrients associated with eroded soil particles
- loss through soil fixation (P, K) or immobilisation (N, S)
- loss to the atmosphere from volatilisation and denitrification
- transfer in dung or urine to stock camps, yards or laneways.

It is important to realise that a 'balanced budget' is not always desirable. Keeping the nutrient budget in balance will, in the long term, maintain soil fertility at its current level but this is not always the best result. For example, if present soil nutrient status for, say, phosphorus (P) is low, then the land manager may want greater P inputs than outputs so that soil P rises – i.e. they will apply capital P dressings. Conversely, if the soil has very high P levels then greater outputs than inputs (or even no P fertiliser inputs at all) could be appropriate.

A nutrient budget is not a fertiliser recommendation.

A nutrient budget can be used as a modelling tool to test different nutrient scenarios providing a feedback loop to fertiliser recommendations.

Some land managers trained in the user of Overseer may wish to prepare their own nutrient budget or alternatively seek the services of a fertiliser company representative or consultant who should be a certified nutrient management adviser. Regardless of who prepares it, accurate input information is required if the nutrient budget is to have credibility and be of use as a management guide. Nutrient budgets can be difficult to interpret and guidance on what the output data means may be necessary in situations where a land manager has prepared their own budget.

More information on soil testing and nutrient budgeting is provided in Fact Sheets 2 and 7.

Step 4d: Identify good nutrient management practices

Chapter 5, page 30 sets out considerations and Good Management Practices for fertiliser handling, use and application to overcome any significant environmental risks identified in Step 3. The NMP must list the Good Management Practices selected to reduce the risks on the property. The Good Management Practices listed in Chapter 5, page 30 are written in such a way that they can be directly transferred into the NMP to provide a definite statement of management intent. Actual practice can then be compared with the planned practices and improvements can be made if they are needed.

The environmental risks identified as important for the situation will prompt selection of practices or products to avoid or minimise these risks. However, there may be further practices that are important to overcoming the risk of adverse environmental effects, which are specific to the area and operation. It is important to include these as part of the listed Good Management Practices.

Some land managers might also set additional preferred management practices to meet personal objectives – e.g. annual soil testing or a limit on total nitrogen applied, independent of any Regional Council or industry specification.

This Code addresses in detail Good Management Practices for fertiliser handling, use and application. Other Good Management Practices to be considered include riparian management, wetlands, winter grazing and herd homes.

When including nutrient management activities such as dairy effluent disposal, in the NMP it may be useful to contact the local Regional Council or industry adviser for the Good Management Practices appropriate to the activities and area.

Note: If you have assessed the environmental risks from a nutrient management activity (e.g. fertiliser use, dairy effluent irrigation and cropping) as being of medium to high significance a separate management guide should be prepared for those that are medium to high. The management guide(s) should address all identified LMU's.

The management guide needs to include reference to all legal and industry requirements and the identified Good Management Practices relating to the particular activity. If the management guide relates to a specific fertiliser nutrient (e.g. nitrogen) then it should also include the fertiliser type and amount recommended for that nutrient plus any supporting information such as nutrient budget results.

Step 5: Implement plan

Having planned for success, the plan must be communicated and implemented. Putting it into action includes making sure that all people involved (e.g. staff and/or contractors) understand the plan and can do their part. For example, if there are areas to avoid when spreading fertiliser, then these need to be understood by staff or contractors doing the work. Good communication, staff training, and contractor certification all have roles in successful plan implementation.

Changes may have to be made for practical reasons – e.g. if a chosen fertiliser is not available or conditions are not suitable for application (e.g. weather and soil conditions) at the desired time. Keep a note of these changes alongside the NMP, with comments about the reasons and any further implications (e.g. changes to other fertiliser applications to achieve the correct overall nutrient applications, changes to the next fertiliser application timing, etc.).

Step 6: Record and monitor

Recording and monitoring are essential for assessing whether the land manager has achieved their nutrient management plan goals and how well the planned activities went. It also helps identify areas where management could be improved. Remember the old saying, "you cannot manage what you do not measure."

Good records for different areas and LMU's are valuable for assessing success, and should give details of all aspects of the nutrient management plan put into practice, covering:

- fertiliser types
- application rates
- timing of application
- application methods
- nutrients added by methods other than fertiliser – e.g. conserved feed from another area brought onto the block, dairy effluent applied to land
- stocking rates and animal type
- notes on special considerations – e.g. buffer zones not treated
- new soil or herbage test results
- any environmental measurements – e.g. ground water nitrate levels
- records of risk factors that may affect environmental effects from nutrients – e.g. rainfall records, irrigation records, effluent applications, etc.
- extent to which production goals were met
- Resource Consent and conditions

A property map with LMU's marked can be a good way to record fertiliser applications (manually or by GPS), with details noted in the appropriate paddocks or blocks. In this way a series of maps covers the year's fertiliser treatments.

Record keeping serves many purposes but key uses include:

- a systematic approach to identifying and solving ongoing problems
- a reminder of the influences of seasonal variations
- as a means of measuring progress or lack of it, over time
- to serve as a tool that might unlock additional information when required at some point in the future
- as a tool to undertake a regular critique of management practices
- as a tool to demonstrate that the land manager has taken steps to overcome various problems by implementing their stated Good Management Practices
- a means of determining returns on fertiliser and other nutrient investments

Good paddock records help in calculating nutrient budgets, calculating nutrient and water use efficiency, identifying areas of a paddock with varying productivity, refining production targets and predicting future nutrient requirements. They can also be used to demonstrate that nutrients have been managed for the best production and environmental outcomes.

Accuracy and attention to detail pay off. For example, accurate records of the position of soil sample sites will aid in interpreting the results against yields, soil types, incidence of frosts, water logging, etc. These records also allow future sampling in the same positions. GPS technology is increasingly used for accurate positioning but good records using paddock landmarks and measurement from the landmarks allow relocation of the sites within a few metres. Permanent markers and an established soil sampling routine also help.

Soil testing will commonly be used to check changes in soil nutrient levels and some land managers will also use herbage tests. As long as nutrient applications go as planned, most land managers will *not* monitor actual environmental indicators (e.g. water quality measures) on their property. Those who apply special nutrients – e.g. those requiring resource consent for particularly high nutrient applications or because of sensitive areas or catchments– may be required to do specific monitoring as a condition of their resource consent.

On dairy farms with high rates of supplements going into the system, effluent sampling for nutrient content is highly recommended.

Most land managers keep fertiliser use records for their own information - to know how their fertiliser programme is going, to assess pasture and crop responses and to relate these results to future fertiliser planning. In addition, by following this Code and keeping accurate records of compliance, regional authorities can have confidence that this Code is being followed. Given that authorities have limited contact with most land managers, proof of good management depends on good records.

Sample templates for recording are provided in Appendix 5, page 74.

Step 7: Review the plan's success

Check performance with a 'self-assessment'

Making the NMP work means that it must be followed, not just filed – and this requires checking.

'Self-assessment' simply means the land manager checking that they or their staff did the things they said they planned to do and also checking that this management had the desired effects. It either confirms that the plans were successful or identifies areas for future improvement.

The self-assessment checklist in the NMP template provides spaces to show:

1. whether the plan was carried out as set out,
2. to explain any changes made along the way (and the reasons for these),
3. whether the land manager achieved the objectives set, and
4. management improvements planned for the future to meet any objectives that were not achieved this year.

Monitoring actual performance is an essential part of achieving continuous improvement. It is not enough to plan carefully and follow the plan – land managers and their advisers need to check that the actions really achieved the plan's objectives and did not cause unexpected harm to the environment, and determine if production goals have been met.

Failing to meet objectives does not necessarily mean that the plan itself failed. It is important, however, to learn any lessons from the results and identify improvements for the future.

Nutrient budgets can be re-done (using the season's actual nutrient inputs and production) to check the sustainability of fertiliser use, particularly in intensive land use systems. Success in meeting production and environmental objectives should support future nutrient management planning – the property now has some history of suitable management.

If any adverse event was measured or noticed, good records should help identify the actions and risk factors that led to the event and allow better management practices to be adopted for the future. Having completed the monitoring and assessed the plan's success, the process begins again with planning for the following year.

External audit can verify nutrient management performance

Regional Councils and some industry organisations, or market bodies may ask to see land management records to prove environmentally responsible nutrient management. Completing the NMP and self-assessment provides the evidence to demonstrate sound nutrient management to third parties.

5 Good Management Practices and Considerations - Fertiliser

This chapter describes ‘Good Management Practices’ (GMPs) for land managers applying nutrients – i.e. practices recommended for practical use to reduce the risks of adverse environmental effects and gain maximum benefits from nutrients applied.

These practices:

- combine the practical experience of land users with scientific development,
- provide generic recommendations that can be adapted to suit local conditions,
- may require changes to the way some nutrient management activities are carried out, and
- provide the means for continuous improvement in nutrient management on the property.

Be very careful when adapting GMPs to suit a particular situation. Changes must be based on good scientific evidence for the alterations, not just a return to ‘what we’ve always done’. It is essential that you can justify why you have made the alterations to the listed Good Management Practices.
A Certified Nutrient Management Adviser will be able to assist land managers in identifying GMPs.

This chapter is divided into three sections, dealing with:

1. fertiliser handling
2. fertiliser use – including choice of fertiliser type, application rate, timing
3. fertiliser application – the mechanics of applying nutrient

5.1 Fertiliser handling

Fertiliser handling, transport, or storage should aim for containment of the product until it is applied. This means that no fertiliser should be lost to the environment during transport, storage and any other handling operations, thus avoiding any possible adverse environmental effects. Contamination arising from handling, transport, or storage problems is a point source (i.e. highly localised) contamination, which can be effectively managed and contained if appropriate actions are taken immediately.

Transporting fertiliser

Users will comply with the requirements of the Transport Act 1987 and Transport Law Reform Act 1991 and Traffic Regulations or the appropriate legislation of the time, when transporting fertiliser by road. Under this Act, it is the driver’s responsibility to ensure that:

- all freight is correctly restrained,
- any hazardous substances are segregated correctly,
- the driver’s licence has the appropriate endorsements, and
- any safety equipment required, which is provided by the carrier, is used.

The carrier (freight operator) is responsible for ensuring that their drivers meet these requirements.

Fertiliser products need to be kept free of any foreign material throughout all transport, storage, and handling. Loading and unloading procedures should be designed to minimise segregation of fertiliser components (i.e. fertiliser mixes and blends separating out into their various component products) and to prevent changes to the particle size and size range of the fertiliser.

General requirements for the transport of fertilisers are:

- vehicle decks shall be such that fertiliser cannot spill during transport,
- vehicle decks shall be cleaned so that no contamination or chemical reaction of fertilisers carried can occur. The wash down shall occur on areas where there is no runoff into a waterway or a storm water system.
- all loads of fertiliser products shall be securely covered to prevent dust blowing from the truck and to prevent moisture uptake by the product, and
- when unloading fertiliser the driver should ensure that all fertiliser is removed from the vehicle decks.

All carriers shall be aware of the requirements of the Operators Handbook for the Transport of Hazardous Substances by Road (Land Transport Safety Authority: http://www.landtransport.govt.nz/

Fertiliser storage

Location

Storage conditions shall ensure that fertiliser is never contaminated with other chemicals or chemical products, and that fertiliser does not escape from the storage facility. Some stores may also need to provide appropriate signage.

Fertiliser storage buildings shall be sited to minimise any risk of environmental contamination. In particular, storage sites must not present a risk of direct water contact with stored fertiliser. This includes the entry of storm water or runoff from surrounding areas. See the Good Management Practices at the end of this chapter.

Construction

Fertiliser buildings shall be constructed so that stored fertiliser remains in a useable condition. In particular, fertiliser should stay dry and free from contamination by other fertiliser types or any foreign material. Bulk fertiliser shall be stored in a manner that preserves the physical properties of the fertiliser and allows the fertiliser to be retrieved from storage and used without contamination. The fertiliser shall be stored on an impermeable surface to prevent leaching to ground water and to prevent the localised accumulation of contaminants in the soil.

Note: Appendix 1, page 47 - Legislation and Fertiliser Use

a) Fertiliser storage buildings may be subject to approval and issue of the necessary consents from the local authority concerned.

b) Temporary storage sites should comply with local council requirements.

c) Bagged fertiliser should be protected from direct sunlight, rainfall and contamination by chemical products.

Compatibility of fertilisers

Fertiliser blends or physical mixtures shall only be used if there is no risk of chemical or physical (e.g. moisture absorption) reaction between fertilisers in the blend or mixture that may reduce application accuracy. The blend or mixture should be such that there is little or no physical segregation (separating out or settling) of the blended or mixed components in transport and handling operations. Expert advice should be sought before creating a blend as some fertilisers are not compatible. See Fact sheet 6.

Fertiliser disposal

Under no circumstances shall any fertiliser be disposed of in a way that risks adverse environmental effects. The best practical option for the disposal of any surplus or unwanted fertiliser is application onto suitable land or crops in accordance with this Code or finding a neighbouring farmer who may have a use for it.

While most fertiliser materials are handled in bulk, some products are provided in bags of varying sizes and some as liquids. Re-usable or recyclable containers should be used if available. For all other situations, containers should be disposed of in a manner that minimises any risk to human health and the environment.

Disposal options may include:

- Alternative use - the container must be completely empty. Liquid fertiliser containers should be triple rinsed and the washings applied to land
- Recycling
- Sanitary landfills - check with the local Regional Council or unitary authority to confirm that packaging material for fertilisers are accepted at landfills in your region.
- Burning - regional air quality plans for *some* areas permit controlled incineration of packaging material.

Fertiliser spills

Fertiliser spilled during transport, storage and handling can have significant adverse environmental effects. The Resource Management Act states that every person has a duty to avoid, remedy or mitigate such adverse effects on the environment.

In the event of any spillage of fertiliser products, the driver must take immediate steps to prevent any further loss, risk to other people and/or any contamination of land or waterways. The driver must:

- Notify the appropriate authority (call 111) if there is a large spill
- Minimise any hazard to other road users
- Ensure that no residual product remains that could pose any immediate or future threat to the environment.

Note: At the earliest opportunity, the regional authority must be advised of any spillage risks to waterways, ponds, lakes or ground water.

Best management practices for fertiliser handling and storage

Activity	Good Management Practices	Fact sheet
Fertiliser transport	• All freight is correctly constrained • Hazardous substances are segregated and correctly labelled • All fertiliser products are covered during transport to prevent dust blow • All transport equipment is cleaned after use. Wastewater is prevented from entering any surface water or stormwater system	6
Fertiliser storage	• Nitrogen, phosphorus and soluble fertilisers are contained within the storage area on an impervious floor and protected from rain • Storage facilities are at least 50 metres from open waterways, avoiding areas subject to slope failure or significant flood risk • All storm water discharges are collected and diverted away from the storage area • The storage facility is designed to effectively contain stored fertiliser	6
Fertiliser loading	• Fertiliser loading sites are at least 50 metres from any open waterway on areas that are not susceptible to flooding • Wind shelters are used around the loading site to contain fertiliser • Fertiliser spillage is minimised when loading into or out of storage or into application equipment • Fertiliser spills on the loading area are collected and returned to the storage facility	4, 6
Fertiliser disposal	• Excess or unwanted fertiliser is spread onto suitable land or crops • Surplus containers are reused, recycled or delivered to a resource recovery site or suitable landfill • Contact supplier for possible return	- -

5.2 Fertiliser Use

It is the fertiliser user's responsibility to ensure they have adequate information about any fertiliser product they intend to use and the potential risks its use may pose to the environment.
Fertiliser companies have safety data sheets available.

Information required for good understanding of potential environmental risks arising from the use of any fertiliser product includes:

- name of the fertiliser material
- nutrient content (including N, P, K, S, Mg proportions)
- physical characteristics (e.g. liquid, solid, particle size range, blended/compound)
- particular hazards associated with the product – e.g. chemical compatibility (also with reference to storage requirements), hygroscopic characteristics, solubility and dust.

C.R.A.F.T.

'C.R.A.F.T.' is an easily remembered acronym that highlights the fertiliser use factors that land managers can readily control. It stands for:

Choice of fertiliser product
Rate of application
Application technique
Frequency of application
Timing of application

Carefully considering each of the C.R.A.F.T. elements allows fertiliser application practices to be planned to meet production and environmental objectives. Managing the product, rate, application technique, frequency and timing of application should ensure that nutrients are available in the right amounts at the right location and at the right time to meet plant needs. This will improve the efficiency of nutrient use and minimise the potential for nutrient loss.

Choice of fertiliser product

There are a vast range of fertiliser products in the marketplace. Fertilisers chosen should be Fertmark registered, appropriate for use in New Zealand and meet production needs without unacceptable environmental effects. Fertmark registered products: http://www.fertqual.co.nz/content.php?content.2

Aim to select fertilisers that best meet identified nutrient needs while avoiding or mitigating environmental risks.

The suitability of a product is determined by:

- product specification (which nutrients are present, their concentration and mobility)
- the form or chemical species of the nutrients in the product (i.e. liquid, fluid suspension, solid, physical or chemical mixture)
- particle size (including droplet size for liquid fertilisers) and other physical properties
- solubility or release rate of the product and nutrient availability to plants
- any effects on other products (e.g. can it be blended or tank mixed?) or equipment (e.g. is it corrosive?)
- impurities which may be present in the product

- application and handling equipment required
- spreading characteristics
- required application rate to meet nutrient requirement
- cost
- *Fertmark* registration.

More information in fact sheet 6.

Rate of application

The rate of fertiliser application for a particular situation should be based on the rate of nutrient required by the plants.

fertiliser rate (kg/ha) = required nutrient rate (kg/ha) ÷ (% of the nutrient in the fertiliser ÷ 100)

For example, suppose we have a product containing 46% nitrogen and the desired nitrogen application is 50 kg N/ha.

fertiliser rate (kg/ha) = 50 kg N/ha ÷ (46% N ÷ 100) = 50 kg N/ha ÷ 0.46 N = 109 kg product/ha

In determining nutrient rates to apply, consider:

- soil and plant tissue analysis results
- nutrient budget reports
- crop type, yield/quality/stocking rate targets
- the need for maintenance or capital applications (i.e. goals for soil fertility and production results from fertiliser. Is the land manager trying to maintain present soil fertility and productive performance or increase nutrient levels to support higher production or different pastures/crops?)
- water availability and expected future weather patterns
- local fertiliser trials and local land manager experience
- previous crop and fertiliser history on the site
- different LMU requirements

Any application of fertiliser should be made on the basis of required present and/or future production level. If calculated fertiliser application rates exceed crop uptake as suggested by nutrient budget results this should be recognised and managed accordingly through a nutrient management plan, to reduce losses and ensure production is not limited.

Application method

Application method will affect the accessibility of applied nutrients. Different placement methods can ensure that the nutrient is immediately available to rapidly growing plants (e.g. banded below the seed at planting) or is applied very gradually over a lengthy growing period (e.g. fertigation in horticulture). Placement will also affect the degree of interaction between the fertiliser and the soil, which is particularly important where nutrients can become unavailable due to reactions with soil minerals (e.g. phosphorus fixation) or organic matter (e.g. nitrogen immobilisation).

Placement of fertiliser should conform to the Spreadmark Code of Practice for both Aerial and Ground Fertiliser Spreading: http://www.fertqual.co.nz/content.php?content.3

Common options for fertiliser placement include:

- surface broadcast application (by ground or aerial spreading)
- surface broadcast and incorporated
- banded into the soil at various band widths and depths
- surface banded
- fertigation
- foliar application
- fine particle suspension or slurry application (ground or aerial).

The best placement method will depend on the nutrient(s) concerned, topography and individual production situations. For example, applications to crops, especially in horticulture, generally require more accuracy and precision than applications to intensive pastures where nutrients are continually redistributed by the grazing animals.

In deciding on the right application method, key questions to consider include:

- does the method apply the nutrient sufficiently accurately for its purpose?
- is the equipment suitable for the terrain and soil conditions?
- is the equipment appropriate for the size of the application area?
- is the use of the equipment likely to result in noise or dust nuisance to third parties?
- is the equipment certified to meet accuracy requirements?

There is more detail about application methods and Good Management Practices for fertiliser spreading in Chapter 5.3

Frequency of application

The best way to ensure that added nutrients are used efficiently by plants and to reduce the risk of nutrient loss to the environment is to match nutrient availability to plant demand over time. Annual crops, perennial crops and pastures all have different patterns of nutrient demand over time, and respond differently according to soil moisture status and temperature. These factors should be considered in planning fertiliser applications.

Mobile nutrients such as nitrogen or potassium are most effectively used when split applications of fertiliser are applied frequently during the periods of crop or pasture growth. This is usually preferable to one large application. However, crops and pastures may have short periods of very high nutrient demand and so a larger application will be required at that time.

Fertigation systems (adding nutrients in irrigation water) provide flexibility in applying nutrients to meet plant demand but regular top-dressing or side dressing of fertiliser can have similar effects, provided that there is sufficient moisture to move nutrients into the soil.

Timing of application

Fertiliser application should be timed to achieve maximum plant uptake, thereby reducing losses of nutrient to the environment. Ideal timing will be affected by the solubility (mobility) of the nutrient or fertiliser used, crop stage and rate of growth (and therefore its nutrient demand) and the nutrient fixing capability of the soil. Consider also the amount of rainfall and/or irrigation experienced or expected.

Applying fertiliser long before the plant will take up the nutrient exposes the nutrient to potential loss. This is particularly so with nitrogen fertilisers. Maximum responses and minimal nutrient losses will usually occur if fertiliser is applied when plants are growing rapidly. It is especially important to apply highly mobile nutrients at times when plants are actively growing to avoid losses to the environment between application and plant uptake, and thus to maximise the return on the investment. This is particularly important when highly soluble nutrients are applied in high rainfall or irrigation situations.

Application of fertiliser in relation to soil and air temperatures is also important because these conditions affect plant growth and hence nutrient use. For example, applying nitrogen fertiliser to ryegrass when soil temperatures are less than 6°C and falling is likely to be ineffective in stimulating pasture growth because ryegrass stops growing at soil temperatures below 4°C. If it will be some time before temperatures rise and the ryegrass starts to grow again (and take up the nitrogen), the nitrate may be lost through leaching. Nitrogen fertiliser application should be delayed until the pasture is actively growing, especially if considerable rainfall is expected in the meantime.

Fertiliser often requires water to move it to a site where it can be taken up by plants and, in the case of nitrogen, where it is protected from gaseous losses. Timing of fertiliser application in relation to irrigation or rainfall can be critical to determining the risk of gaseous loss.

Good management practices for fertiliser use

The Good Management Practices provided below cover the four main fertiliser user groups – pastoral, arable, horticultural and forestry. While most practices are generic across all user groups, some will be specific to a particular user group.

For information related to dairy farm nutrient management see:

Nutrient Management on Your Dairy Farm:
http://www.dairynz.co.nz/page/pageid/2145866833/Nutrient_Management#802

A Farmers Guide to Managing Farm Dairy Effluent:
http://www.dairynz.co.nz/page/pageid/2145866686?resourceId=765

Best management practices for nitrogen (N) fertiliser use

Activity	Best management practices	Fact Sheet
Choice of fertiliser	• Use Fertmark registered products	4
Rate of fertiliser application	• Nutrient application rates are determined using some or all of the following factors: - *soil and plant tissue analysis* - *nutrient budgets (including any effluent and/or feed imported to the block)* - *crop type, yield/quality/stockingrate targets* - *the need for capital or maintenance applications* - *previous crop and fertiliser history on the site* - *soil moisture conditions and expected future weather patterns* - *local knowledge* - *feed budgeting/monitoring*	2, 5, 7,8

	- *soil temperature* • The amount of nitrogen applied per application is limited: - *on soils where ground water lies under permeable sediments (e.g. gravels)* - *in areas where there is a high water table* - *on areas where there is subsurface mole and tile drainage* • Apply nitrogen fertiliser in split dressings of 50kg N/ha when 200kg N/ha or more is required • Nitrogen is applied in proportion to other nutrients, according to plant requirements. (Adding excessive N when other elements limit crop or pasture growth leads to greater N losses.)	8,9 6,8,9 5
Application technique	• Application equipment is suitable for the conditions and fertiliser type. • Only *Spreadmark* accredited spreading companies (experienced operators and calibrated equipment) should be used • GPS and GIS technology is used for precise application and for a digital record of fertiliser application locations. • Non-target application of fertiliser is avoided by: - *using fertiliser with larger particle sizes (mean size greater than 1mm) and few or no fine particles* - *application techniques that direct or specifically place the fertiliser appropriately* - *application in bands when sowing crops or pasture seed* - *choice of fertiliser types that can be applied more precisely (e.g. slurry/liquid)* - *applying fertiliser only when any significant wind is blowing away from sensitive areas* - *fertiliser is not applied by air when wind speed exceeds 15 km/hr*	3,4 4 3 3,4
Frequency of application	• Nutrient availability is matched to plant demand. • Lower rates of N fertiliser are applied more often, at times to match the growth cycle of the crop or pasture and soil moisture conditions, rather than in single large applications.	6,8 6,7, 8
Timing of application	• Nitrogen application is matched to times of high plant growth. • Pasture is at least 25mm high (approx. 1000 kg DM/ha) before nitrogen is applied. • In the case of border-dyke irrigation fertiliser is applied afterwards, provided the soil is not saturated. If the soil is saturated fertiliser application is delayed until ground conditions are suitable. • Nitrogen is not applied when the 10cm soil temperature at 9am is	7,8 9 9 6,9

	less than 6ºC and falling (at these low soil temperatures plant nitrogen uptake is slow and there is greater risk of leaching loss). • Nitrogen is not applied after a dry (drought) period until sufficient regrowth has occurred after rain. • Where possible, fertiliser N application is adjusted to complement the release of soil mineralisable N. • For information about the effects on stock of high nitrate in grass contact the Fertiliser Association for a Wise N use fact sheets • N fertiliser is not applied in mid to late autumn to fallow land unless there is a cover crop. • N fertiliser is not applied when the ground is saturated and/or when tile drains are running. • N fertiliser is applied 4-6 weeks before the feed is required.	9 6,9 9 9
Fertiliser use and management measures	• N fertiliser is not applied to severely compacted soils. Soil aeration techniques are used on such soils before fertiliser application. • Pasture is at least 25mm high (approx. 1000kg DM/ha) before N fertiliser is applied. • Vegetated riparian buffer strips of sufficient width (10m – adjust for slope) to filter any run-off are maintained adjacent to all waterways. • Urease inhibitors – can be used to reduce urea losses to the atmosphere when conditions are conducive to volatilisation. • Nitrification inhibitors: As an interim position nitrification inhibitors should not be applied to pasture until further notice	- 9 -

Best management practices for phosphorus (P) fertiliser use

Activity	Best management practices	Fact Sheet
Choice of fertiliser	• Soluble phosphate fertiliser is used where: - *rapid plant response is required* - *soil P levels are required to be increased rapidly* - *plants are actively growing* - *there is a low risk of runoff* • Slow release phosphate fertiliser is used when: - *there is a high risk of runoff and/or*	6,9, 13 6,9, 13

	- *a rapid plant response is not required and/or* - *soil P levels are adequate and/or* - *soil pH is less than 6.0 and annual rainfall is greater than 800mm*	
Rate of fertiliser application	• Nutrient application rates are determined using some or all of the following factors: - *soil and plant tissue analysis* - *nutrient budgets (including any effluent and/or feed imported to the block)* - *crop type, yield/quality/stocking rate targets* - *the need for capital or maintenance applications* - *previous crop and fertiliser history* - *soil moisture conditions and expected future weather patterns* - *local knowledge*	5, 6, 7
	• The amount of phosphate applied per application is limited: - *when high rainfall is anticipated or irrigation is planned* - *on very sandy soils, particularly for soluble phosphate fertilisers* - *when slope is greater than 25º, and/or pasture is less than 25mm high (approx. 1000 kg DM/ha)* - *during winter*	6,8, 13
	• Soluble phosphate fertiliser must be applied in split dressings if the single application rate would exceed 100 kg P/ha.	6, 13
	• Phosphate is applied in proportion to other nutrients, according to plant requirements. (Adding excessive P when other elements limit crop or pasture growth is inefficient and could lead to P losses.)	5,6
Application technique	• Application equipment used is suitable for the conditions and fertiliser type.	3,4
	• Only *Spreadmark* accredited spreading companies (experienced operators and calibrated equipment) should be used	4

	• GPS and GIS technology is used for precise application and for a digital record of fertiliser application locations. • Non-target application of fertiliser is avoided by: - *using fertiliser with larger particle sizes and few or no fine particles (aerial application)* - *application techniques that direct or specifically place the fertiliser appropriately* - *application in bands when sowing crops or pasture seed* - *applying fertiliser only when any wind is blowing away from sensitive areas* - *apply fertiliser only under agreed conditions (e.g. wind speed of less than 15 km/h)*	3 4
Frequency of application	• Nutrient availability is matched to plant demand, particularly for soluble P products and liquids. • Split applications are used where the single application rate would exceed 100 kg P/ha for soluble P or liquid fertiliser.	5, 6 6
Timing of application	• Pasture is at least 25mm high (approx. 1000 kg DM/ha) before P is applied. • Phosphate fertiliser is not applied after a dry (drought) period until sufficient regrowth has occurred after rain. • P fertiliser is not applied when the soil is saturated	- 5 5, 6
Fertiliser use and management measures	• P fertiliser is not applied to severely compacted soils. Soil aeration techniques are used on such soils before fertiliser application. • To avoid fluoride toxicity to stock, pastures top-dressed with P fertiliser are not grazed for 21 days or until 25mm of rain has fallen. • Only phosphate fertilisers which comply with the industry limit of 280mg of cadmium per kg of P are used. • Vegetated riparian buffer strips of sufficient width (10m – adjust for slope) to filter any run-off are maintained adjacent to all waterways.	- 12 12

5.3 Fertiliser Application

The fertiliser spreading industries (ground and aerial spreaders) have their own Codes of Practice. Fact sheets 3 & 4 include information of importance to the land manager employing these operators and those who apply some or all of their own fertiliser.

The process of spreading fertiliser on a property is a critical part of managing fertiliser use. The objective should be to achieve evenness of spread at the required rate in order to maximise economic return from the investment while ensuring minimal environmental impact. Spreading should be even within an LMU, but differential rates are expected between LMU's.

The key factors that will influence this objective are:

- the environmental understanding of the person doing the spreading
- the skill and competency of the spreader
- the suitability of the machinery being used (i.e. to spread fertiliser accurately)

Spreading fertiliser to maximise returns and avoid adverse impacts is a technically demanding task. While some land managers spread some or all of their fertiliser themselves, spreading by *Spreadmark* accredited spreading companies is recommended.

The person spreading fertiliser has four main objectives:

- to spread the fertiliser at the desired rate and as evenly as possible over the target area
- to avoid any fertiliser directly entering surface water
- to control wind drift to avoid any fertiliser indirectly entering or landing on surface water, or going outside the boundaries of the target zone
- to ensure that the work is undertaken safely

Application accuracy

Fertiliser application must be confined to the desired application site. Fertiliser spread more widely is inefficient and potentially environmentally harmful. The person applying fertiliser shall ensure that it is applied as accurately as is reasonably possible. A clearly marked map showing buffer zones should help contractors ensure that non-target areas are not treated.

As well as keeping fertiliser to the target area, application needs to be even across this area at the desired fertiliser application rate. The potential evenness of application for any given fertiliser is affected by:

- the physical form of the fertiliser
- size guide number (SGN), uniformity index (UI) and bulk density (BD) of fertiliser mixes
- the type of application equipment
- application techniques
- operational factors at the application site, including the weather (wind speed and direction)

The evenness of distribution is described using the coefficient of variation (CV%). This can be measured by catching fertiliser in collectors across the distribution area and weighing the fertiliser in each container.

CV is defined as:

standard deviation (of weight of fertiliser retained in each collector) ÷ mean weight across all containers and is expressed as a percentage.

A high CV indicates poor (uneven) spreading while a CV of zero indicates perfectly even spreading.

The target application rate should be chosen to meet the true plant nutrient requirements. Inappropriate application may increase the risk of adverse environmental effects and reduce production potential.

In New Zealand, the standards set under the *Spreadmark* Code of Practice for the Placement of Fertiliser allows for a single pass transverse spreading CV of no greater than 15% for nitrogen fertilisers and 25% for all other fertilisers. When making recommendations for the amount of fertiliser to be applied, fertiliser providers and consultants assume a CV of zero percent.

Modern technology, such as GPS and GIS systems, has enabled commercial fertiliser spreaders (ground and aerial) to achieve a high degree of fertiliser spreading accuracy. This technology enables spreaders to cover precise areas with minimal overlap or gaps between spreading runs and to achieve accurate buffers between target and non-target areas. See Fact Sheet 3 & 4 for more information about precision application technology.

Application methods

Interactions between the form of fertiliser and the type of application equipment can have serious effects on the evenness and accuracy of application. Terrain and the task to be done often dictate the type of application system used – e.g. aerial spreading on steep hill country.

Weather conditions can significantly affect both the containment of fertiliser on the application site and the evenness of application within this site. The importance of weather conditions depends on the form of fertiliser, the application method and equipment used.

Recommendations and nutrient management plans from fertiliser and agricultural consultants assume the fertiliser material will be spread evenly and accurately over the target area at the target application rate. Poor spreading can negate the good management plans and result in significant production losses and pollution of waterways.

Ground based application

Ground based application includes a wide range of application methods to apply a vast array of fertiliser products, requiring careful matching of equipment and technique to the fertiliser and production system.

Spreading operators must understand the spreading characteristics of all products they spread, and how their equipment and equipment settings affect spreading performance. For example, products may be solid (free flowing particles or mass material) or fluid (solutions, suspensions, slurries). Particle sizes in free flowing solid fertilisers typically range from less than 1mm to over 5mm in diameter. When ejected laterally from spreading equipment, particles of different sizes have different ballistic trajectories and therefore variable spreading patterns. Particle shape also varies but is usually near spherical in manufactured products. Particle shape, density and surface roughness all affect the flowability of the product.

There are two broad types of ground based spreading equipment:

- ground based equipment that spreads fertiliser beyond the width of the machine – e.g. bulk spinners
- ground based equipment where the swath width is equal to or less than the width of the machine – e.g. boom sprayers, combine drills, pneumatic top dressers

Factors that may affect ground based fertiliser spreading performance:

- Calibration – application equipment must be calibrated for the fertiliser product to be applied. Different products have different bulk densities and even different lines or batches of the same product can vary in bulk density.
- Slope – the performance of all ground based application equipment is likely to be affected by sloping ground. It is generally preferable to operate up and down rather than across slopes. Unless the spreader is computer controlled, variations in surface roughness may lead to uneven spread as vehicle speed varies.
- Weather, atmospheric conditions – some fertiliser materials are hygroscopic, i.e. they absorb water from the atmosphere. Changing temperatures and humidity during the day can affect their flow rate through machinery.
- Soil conditions – slippery ground conditions can interfere with accurate fertiliser placement. Avoid operating machinery on soft soils where there is a risk of compaction. On slopes, slippery conditions can create a safety issue for the operator.
- Speed of spreader.
- Broadcast (spinners, reciprocating spouts, muck spreaders) – because the material is thrown beyond the width of the machine there is a risk that driver error and wind will make it difficult to keep the fertiliser within the target area and achieve a low CV%.
- Other equipment (e.g. drills, pneumatic booms, boom sprayers) – these are capable of achieving lower CV% results, especially where tramlining and bout markers are used, but only if they are accurately calibrated.
- Irrigators and sprinklers – the volumes applied must be controlled so that nutrients are not washed off the surface or subject to deep percolation through the soil. Application evenness and distribution pattern should be calibrated as for other application equipment.

The application of fertiliser from ground based machinery should comply with the Code of Practice for the Placement of Fertiliser in New Zealand (*Spreadmark*). See Fact Sheet 4.

Aerial application

In many situations, aerial application is the only practical means of applying fertiliser. Where fertiliser is applied by air, the minimum acceptable standards for evenness of spreading should be the same as for other application methods used on similar classes of land. Where the risk of environmental contamination is low, higher CV values for evenness of distribution may be acceptable.

Keys to quality aerial topdressing include:

- good communication and direction from land manager
- the calibration efficiency of the equipment being used
- the accuracy of spread
- the skill level of the pilot
- high environmental standards
- use of GPS to achieve higher accuracy of fertiliser placement

The aerial application of fertiliser should comply with the Code of Practice for the Placement of Fertiliser in New Zealand (*Spreadmark*), Part B: The Aerial *Spreadmark* Code. See Fact Sheet 4.

Best management practices for fertiliser application

Most agricultural fertiliser is spread by contract ground spreaders and aerial applicators following the applicable parts of the Code of Practice for the Placement of Fertiliser. Good communication between the contractor and farmer or land manager is essential to optimise value from nutrients and to mitigate environmental risks. The ideas listed below are also useful considerations for land managers who apply their own fertiliser.

Clearly state the name of product and application rate. Use correct product names as stated on sales documents – common names and abbreviations can cause confusion.

- Express all application rates in kilograms per hectare (kg/ha); lime application may be stated in tonnes/ha. Be sure your spreading operator is absolutely clear about the desired fertiliser application rate.

- Give details of the application area. A map showing the location, boundaries and size of the area(s) to be treated is best. Pointing out easily identifiable ground features can help the contractor find the right paddock.

- Describe any hazards present, such as power lines, trees, silage pits or hidden steep slopes that may be dangerous to the operator. It is also important to highlight any 'unusual' activities that may be taking place on the farm – e.g. tree felling.

- Note any areas and features to be avoided, such as streams, lakes, ponds, wetlands and riparian strips. It is helpful to mark these on the map, rather than rely on verbal explanation. Areas of high nutrient status may not respond to the fertiliser being applied and should usually be avoided – e.g. stock camps.

- Note any conditions to be avoided. Avoid applying fertilisers, particularly those containing nitrogen, when soil moisture levels are high (at or near field capacity) to avoid the risk of nutrient moving laterally rather than being absorbed into the soil. There is a risk that fertiliser applied on slopes will be washed downhill if the soil surface is hard and dry and/or the vegetative cover is very short. Delay spreading fertiliser materials if the wind is strong enough to cause drift away from the target area or if the wind direction is towards nearby sensitive crops or dwellings.

- Consult the fertiliser supplier for information about hazards to livestock from direct intake of fertiliser. Avoid application on blocks where livestock are grazing.

Specify the accuracy and evenness required. The usual measure for evenness of spread is the coefficient of variation (CV%), in which the lowest figure represents the most even spread. Spreader operators should be given a clear indication of the evenness (CV%) required for the job in hand.

APPENDICES

Appendix 1: Legislation and Fertiliser Use

Fertiliser products covered by the Code

The Code is intended to cover the full range of products that are used, known as or seen as fertilisers, and are recognised as such under the Agricultural Compounds and Veterinary Medicines Act 1997, and the Agricultural Compounds and Veterinary Medicines Regulations 2001. If there is any uncertainty about whether a given product is considered a ‘fertiliser’, this Code specifically covers:

“Any substance (whether solid or fluid in form) which is described as or held out to be for, or suitable for, sustaining or increasing the growth, productivity, or quality of plants or animals through the application of the following essential nutrients to plants or soils:

> *nitrogen, phosphorus, potassium, sulphur, magnesium, calcium, chlorine, sodium, as major nutrients or manganese, iron, zinc, copper, boron, cobalt, molybdenum, iodine, selenium, as minor nutrients or additives”*

and,

> *“Any other product which is considered to meet identified soil or plant nutrient deficiencies and is applied with this as the principle objective. Products discharged or applied as part of a waste treatment process require resource consents. Products that have received resource consent and will be used as a nutrient source should comply with the principles of the Code.”*

Notes:

To be considered a fertiliser under this Code, any product shall be free from pathogens or any other agents which could affect disease and pest transmission.

Substances not specifically manufactured as a fertiliser (e.g dairy shed effluent, chicken litter and manures) may be subject to specific legislative requirements not covered in this Code.

Legislation

Various regulatory and other industry or quality assurance requirements affect the use and application of fertiliser. The main legislative requirements are the Resource Management Act (1991), the Agricultural Compounds and Veterinary Medicines Act (1997) (ACVM), Agricultural Compounds and Veterinary Medicines Regulations (2001), the Hazardous Substances and New Organisms Act 1996 (HSNO), the Transport Act 1985 and the Transport Law Reform Act 1990. The Health and Safety in Employment Act 1992 (HSE) is also relevant in relation to safe workplace requirements.

The RMA

The principal item of legislation that affects the application of fertiliser is the Resource Management Act 1991 (RMA).

Part 1 of the Act - Interpretation and Application

Section 2. Interpretation

The RMA does not define what a fertiliser is but does define contaminant.

“Contaminant” includes any substance (including gases, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat –

(a) When discharged into water, changes or likely to change the physical, chemical, or biological condition of the water; or
(b) When discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged.

Fertiliser, along with numerous other substances, is regarded as a “contaminant”.

Part 2 of the Act states that:

Section 5. Purpose

(1) The purpose of this Act is to promote the sustainable management of natural and physical resources

(2) In this Act, “sustainable management” means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while

(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment.

Part 3 Duties and Restrictions under this Act

Section 15. Discharges of contaminants into the environment

(1) No person may discharge any

(a) Contaminant or water into water; or

(b) Contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or

(c) Contaminant from any industrial or trade premises into air; or

(d) Contaminant from any industrial or trade premises onto or into land unless the discharge is expressly allowed by a rule [in a regional plan and in any relevant proposed regional plan], a resource consent or regulations.

(2) No person may discharge any contaminant into the air, or into or onto land, from

(a) Any place; or

(b) Any other source, whether moveable or not, in a manner that contravenes a rule in a regional plan or proposed regional plan unless the discharge is expressly allowed by a resource consent or regulations, or allowed by section 20A (certain existing lawful activities allowed).

Regional and District Councils prepare resource management policies and plans under the RMA. The plans of Regional Councils usually include rules that govern various activities, including the discharge of contaminants. The definition of a 'contaminant' given in the RMA includes fertilisers. The discharge of contaminants into the environment, which includes the application of fertiliser, is covered in Section 15 of the Act. Section 17 of the RMA states that every person has "a duty to avoid, remedy or mitigate adverse effects on the environment." As a result, rules governing the discharge of contaminants may appear in Regional Plans including Regional Air, Water, and Land plans. For nutrients derived from waste products the rules may be contained in Regional Waste Plans.

The Agricultural Compounds and Veterinary Medicines Act 1997 (ACVM)

This legislation covers the requirements for the fertiliser group of agricultural compounds. Fertilisers are broadly defined as substances or products that are used to encourage plant growth but are further classed as either:

- Fertilisers – used to provide nutrients to encourage plant health and growth
- Fertiliser additives – used to adjust the chemical or biological characteristics of soil to facilitate uptake and use of nutrients
- Soil conditioners – used to adjust the physical characteristics of soil.

All products that are either fertilisers or fertiliser additives are exempt from registration under the ACVM Regulation 9 as long as the requirements of the ACVM Regulations that cover the import, manufacture and trade in fertilisers and fertiliser additives are met. This means that the fertiliser must be fit for the purpose specified in the directions for use and include a label at the point of sale detailing information such as trade name, nutrient content, modifying pH, details of any precautions to be taken to prevent or manage risk and directions for use. The *Fertmark* Code is a compliant Code under ACVM.

The Hazardous Substances and New Organisms Act 1996 (HSNO)

The Minimum Degrees of Hazard Regulations 2001 and Hazardous Substances Regulations 2001 determine and describe the hazardous properties of substances. Some fertilisers may be hazardous substances under these regulations, in which case any controls applied under the HSNO regulations must be complied with. The controls may relate to any stage of the life cycle of the substance including manufacturing, transport, storage, use or disposal.

Most fertilisers fit into an Environmental Risk Management Authority (ERMA) group standard called 'subsidiary'. ERMA administers HSNO. Provisions around this group standard relate to labeling, signage, safety data sheets, advertising, storage and health and safety and transport. In general these provisions only affect the fertiliser companies. However, if the fertiliser is classified under the oxidiser group standard (e.g. nitrate products such as ammonium nitrate and potassium nitrate) then there are additional restrictions applied to the land manager (who must be an approved handler) and quantities stored on the property.

Transport Act 1987 and Transport Law Reform Act 1991

Users will comply with the requirements of the Transport Act and Transport Regulations when transporting fertiliser by road. Under these Acts it is the driver's responsibility to ensure:

- All freight is correctly restrained
- All hazardous substances are segregated correctly,
- The drivers license has the appropriate endorsements
- The safety equipment required, which is provided by the carrier is used.

The carrier is responsible for ensuring that this is achieved.

All carriers shall be aware of the Operators Handbook for the Transport of Hazardous Substances by Road (Land Transport Safety Authority).

The Health and Safety in Employment Act 1992 (HSE)

All employers and self-employed people must also comply with the Health and Safety in Employment Act. The key focus of this Act requires that people must:

(a) As employers, identify hazards to employees at work and manage these so that people are not harmed. Note that a driver's place of work includes the vehicle being driven.

(b) As employees, ensure personal safety and the safety of others, including using safety equipment as instructed.

Staff on the area being treated must know about the fertiliser application. Employees have a duty to comply with safety directives (including using safety equipment as instructed) to ensure their personal safety and the safety of others. Fertiliser users should seek information about their products from the supplier or a qualified consultant.

A safety data sheet should be available for all products used on the property.

Legislation and other nutrient management activities

Most nutrient management activities are covered by the Resource Management Act 1991. Check with the local Regional Council for specific requirements relating to these activities. There may also be other legislation and regulations that cover other operational activities undertaken on the property. Again check with the Regional Council for these. A Certified Nutrient Management Adviser will be able to assist land managers in identifying relevant legislative and regulatory requirements for a nutrient management plan.

Appendix 2: Industry Programmes

Industry programmes have been developed to promote improved nutrient management, some of which are listed below.

Certification of Nutrient Management Advisers

In 2012 DairyNZ commissioned the Fertiliser Association to establish the *Nutrient Management Adviser Certification Programme* as part of the Ministry for Primary Industries' Primary Growth Partnership. The aim of the programme is to build and uphold a transparent set of industry standards for Nutrient Management Advisers to meet so they provide nationally consistent advice of the highest standard to farmers. Certification is open for all Nutrient Management Advisers who have the required prerequisites and meet the standards set for New Zealand.

A list of certified advisers is available on the programme website:
http://www.nmacertification.org.nz/site/nutrient_management/

Fertmark

Fertmark is an independently assessed fertiliser and lime quality assurance programme run by the Fertiliser Quality Council. It provides quality assurance on the claimed nutrient content of each *Fertmark* registered fertiliser product. Independent audits are made on product quality and the quality systems of the participating fertiliser or lime companies.

Fertmark registered manufacturers, importers and suppliers also have an advertising code of conduct, so they should be able to verify the claims they make about the products they sell. The bright green *Fertmark* tick stands for fertiliser quality assurance.

Spreadmark: Code of Practice for the Placement of Fertiliser in New Zealand

The *Spreadmark* Code of Practice for the Placement of Fertiliser in New Zealand enables farmers and land managers to optimise value for their fertiliser dollar through a fertiliser placement quality assurance programme. Like *Fertmark*, it is also administered by the Fertiliser Quality Council. There are two sections to the *Spreadmark* programme. One applies to ground spreading and another to aerial topdressing.

Spreadmark: Ground Spreading

The *Spreadmark* programme was established by the NZ Ground Spread Fertilisers Association in 1994. It was subsequently expanded by a group with representatives from Federated Farmers, the NZGFA, fertiliser companies and the Fertiliser Association, and came under the Fertiliser Quality Council by 2002.

It has as its objective the placement of fertilisers in locations where they can be of the most agricultural benefit and the least environmental harm. The scheme registers spreading companies provided they have certified spreading machinery that can operate with accuracy within defined bout widths, trained operators and an appropriate quality management system which ensures that farmer/land manager outcomes are met and environmental sustainability is protected. Overall systems are subject to an independent audit.

Spreadmark: Aerial Application
In June 2006 the Fertiliser Quality Council introduced a programme for aerial applicators (fixed wing and rotary) of fertiliser. This was developed with the NZ Agricultural Aviation Association. The *Spreadmark* module can be completed as part of the NZAAA Accreditation Programme. Like the ground spreaders, aerial companies must have an active quality management programme, have spreading test patterns for their equipment, and competent operators. The programme assists in the management of risks, and has traceability of the application.

Code of Practice for the Management of Nutrient Solutions Released from Greenhouses

This Code is designed for the management of nutrient solutions associated with soil-less production of vegetables and flowers in modern greenhouses – in particular, it addresses responsible discharge of nutrient-rich solution which may reach ground or surface water.

Nitrates are the principal nutrients addressed by the Code which aims to:

- assist in management decisions
- retain access to international markets as part of a quality assurance scheme
- help growers to meet their responsibilities under the RMA.

Three main sections include:

- design and operation of a soil-less system
- solution collection and storage
- fact sheets with information, figures, calculations and tables for assessing viable options for nutrients stored and discharged

Clean Streams Accord

The Accord promotes sustainable dairy farming in New Zealand. It focuses on reducing the impacts of dairying on the quality of New Zealand streams, rivers, lakes, ground water and wetlands.

Market Focused

An environmental management system for New Zealand dairy farmers. Market Focused assists dairy farmers to meet their industry requirements.

Appendix 3: Fertiliser Activities and Environmental Concerns

Nitrate leaching to ground water

Indicator: Increasing nitrate nitrogen in ground water

Note: *Nitrate leaching is not easily measured by users so the emphasis should be on avoiding leaching by following Good Management Practices such as nitrogen fertiliser application, animal grazing and dairy effluent irrigation rather than remedial action after it has occurred.*

Possible cause	Good Management Practices for remedial action	Fact sheet
Nitrogen input exceeding nitrogen uptake	• Reduce nitrogen input.	6,9
	• Increase nitrogen uptake in plants by matching nitrogen applications to plant growth.	9
	• Ensure low or excessive pH is not directly or indirectly restricting N uptake.	9
	• Ensure pastoral growth is sufficiently abundant to cope with the uptake. Pasture should be at least 25 mm high (approx. 1000 kg DM per ha) before nitrogen is applied.	9
	• Balance nutrients (fertiliser inputs).	9
	• Avoid winter application of N when the temperature is low and /or it is wet.	6,9
High nitrogen application rates (e.g. greater than 200 kg N/ha/yr)	• Reduce nitrogen input.	8,9
	• Ensure high nitrogen uptake by: - *Timing for growth periods* - *Splitting dressings* - *Ensure appropriate placement*	8,9
Applying nitrogen in a single application	• Split the nitrogen applications so that smaller amounts are applied more frequently.	9

Heavy rainfall (i.e. >20mm within a day of applying N) or irrigation within a day of applying fertiliser	• Check weather forecast and avoid application if heavy rain seems likely. • Avoid applying fertiliser when soil is above field capacity (i.e. puddles on the ground). • Select a less mobile nitrogen fertiliser (containing ammonium N rather than nitrate N). • Apply fertiliser after irrigation (e.g. border-dyke irrigation) especially when ground cover is low (<80%).	9 9 5,9 9
Permeable soils which can cause nitrogen leaching. (i.e. if puddles disappear quickly after heavy rainfall)	• Apply smaller amounts of fertiliser more often. • Reduce the amount of nitrogen applied. • Select a less mobile nitrogen fertiliser e.g. Ammonium N rather than nitrate.	9 9 5,9
Nitrogen fertiliser not securely stored	• Ensure nitrogen is contained within the storage area on an impervious floor. • Protect stored N from rain.	6 6
High water table present	• Reduce amount of N applied per application. • Match application to plant uptake.	9 6,9
Contamination from loading sites	• Ensure no spillage when loading in or out of storage, or into application equipment.	6

Contamination of surface water from fertiliser run-off

Indicator: Algal blooms/excessive weed growth – elevated nutrient levels (e.g. nitrogen and phosphate)

Possible cause	Good Management Practices for remedial action	Fact sheet
Slope too steep for vehicle access or natural drainage lines running down to open water	• Use slower release fertilisers, or split fertiliser applications. Apply smaller amounts more frequently. • Develop and maintain riparian strips. • Avoid applying fertiliser when the ground is saturated. • Increase buffer distance between application site and the open water.	6,9,13 9 9 9
High rainfall or irrigation within a day of fertiliser application	• Check weather forecast and avoid application if heavy rain seems likely. Avoid irrigation in excess of field capacity. • Use slower release fertilisers, or reduce the fertiliser application rates in wetter conditions. • Split the application rates. Apply smaller amounts more frequently. • Apply fertiliser after irrigation (in the case of, border-dyke irrigation) especially when the ground cover is low (<80%). • Check irrigation technique is appropriate for the crop.	9 9,13 9 9 9
Less than 80% ground cover (e.g. pasture less than 25 mm high or approx. 1000 kg DM/ha)	• Increase ground cover before applying fertiliser. • Maintain resilient and productive ground cover that is capable of efficiently using the fertiliser. • Plant row crops on contour. • Ensure pasture is not over-grazed (reduce stocking rate or grazing time). • Avoid pugging damage.	9 9 - 9 9

	• Install and maintain riparian strips. • Surface incorporate, drill or directly apply fertiliser to the root zone.	9 9
Saturated soils (puddles forming)	• Delay fertiliser application until soil conditions improve. • Use a less soluble or slow release fertiliser.	9 9, 13
Excessive rates of application	• Set realistic crop yield goals and apply fertiliser at times of maximum plant uptake. • Account for all sources of nutrients and apply nutrients in correct proportions.	8,9 8,9
Uneven application	• Use equipment suitable for the conditions. • Use calibrated equipment and experienced operators.	3,4 3,4
Soil permeability low, soil cracking (macropores)	• Improve soil draining characteristics (subsoiling). • Reduce soil compaction. • Reduce stocking rate. • Split fertiliser application rates. Apply less fertiliser more often.	- 2 - 9
Storage site too close (less than 50 metres) to open water	• Improve the storage facility so that all fertiliser is effectively contained (under a roof).	6
Loading site too close (less than 50 metres) to open water	• Minimise spillage of fertiliser when loading into or out of storage. • Move loading site away from open waterway.	9 9
Outflow from tile drainage system	• Apply fertiliser when tile drains are not running. • Avoid application when soil is saturated.	9 9

Drought (excessively dry soils allowing high surface run-off because of slow infiltration rate)	• Delay applying fertiliser until sufficient regrowth has occurred after rain.	8

Contamination of open water from direct application of fertiliser

Indicator: Algal blooms/excessive weed growth – evidence of elevated nutrient levels (e.g. nitrogen and phosphate)

Possible cause	Good Management Practices for remedial action	Fact sheet
Aerial application	• Use fertiliser with larger particle sizes (less wind effect). • Choose alternative aerial techniques to allow more precise placement e.g. use of GPS and GIS. • Use methods other than aerial application. • Use selective application techniques (cover part of the area).	3,4 3,4 3,4 3,4
Ground application close to open water (e.g. less than 10m away)	• Allow a larger margin between fertilised area and open water. • Use application techniques that direct or specifically place the fertiliser. • Use fertiliser with larger particle size. • Erect a physical barrier/riparian strip around the water.	4,9 4,9 4,9 -
Wind speed greater than 5km/hr towards open water	• Apply fertiliser when wind direction is away from open water. • Use fertiliser products and application techniques that confine fertiliser to the target zone. • Change application techniques e.g. drill fertiliser at planting rather than broadcast.	4 3 4

Fertiliser particle sizes with poor ballistic properties (e.g. less than 1 mm in diameter for dry material)	• Use fertiliser with larger particle sizes. • Use application techniques that direct or specifically place the fertiliser.	4 3,4
Storage site within 50 metres of open water	• Move storage site away from open water. • Ensure the storage facility effectively contains the stored fertiliser (under a roof).	9 6
Fertiliser loading/handling operations less than 50 metres from open water	• Relocate the loading site away from open water. • Use wind shelters around the loading site to contain fertiliser.	9 9

Social/third party effects

Indicator: Complaints from affected parties

Possible cause	Good Management Practices for remedial action	Fact sheet
Use of dusty fertiliser	• Use fertiliser with a larger particle size (dry material). • Use other forms of fertiliser (e.g. slurry/liquid/suspensions). • Ensure the wind is blowing away from sensitive areas. • Apply fertiliser only at agreed times.	4, 6 4 4 -
Noise during fertiliser application	• Change to quieter application equipment. • Change time of day when fertiliser is applied. • Change operational technique to reduce effects of noise on affected parties. • Apply fertiliser only at agreed times.	4 4 - 4
Off-target contamination (solids and liquids)	• Use fertiliser with larger particle size. • Use precise application techniques. • Apply fertiliser only when the wind direction is away from affected parties. • Apply fertiliser only at agreed times.	4,6 3,4 4 4

Appendix 4: Nutrient Management Plan Template and User Guide

Nutrient Management Plan User Guide

Part A: Property details

This section identifies the property and the people responsible for the nutrient management plan.

- Complete the contact details.
- State the farm areas – total, effective (i.e. in production or fallow in preparation for production; exclude non-effective areas such as lanes, buildings, farm shelter belts) and irrigated (if any).
- State the irrigation type(s).
- Tick all of the enterprise types that apply.
- The template provides a sample statement of purpose. You can add to this if you wish.

Part B: Plan objectives, land management units and environmental risk

- Code specific objectives are supplied in the template and must be adopted if they apply. If you choose to reject any of these, attach justification (e.g. a farm map showing that there are no areas of significant vegetation or wildlife habitat).
- There is space for additional 'property management objectives'. Write in any extra objectives the owner or manager chooses to set – e.g. objectives about achieving particular nutrient level targets or objectives about farm practices such as soil testing.
- There is space to identify 'land management units' (LMUs) for the farm – i.e. areas of the farm that are under similar management and that will respond to management in similar ways. Consider such things as soil types, slope, management activities (e.g. dryland or irrigated, significantly different crop types, areas receiving dairy effluent) and differences in historical management.
- If all of the farm is managed similarly and responds to that management in similar ways, only one LMU is needed.
- Make a brief note distinguishing each LMU in the table and note the area it covers.
- Mark these on a farm map and attach it to the NMP.
- On a separate piece of paper, make a list of farm nutrient management activities and their possible environmental consequences – e.g. nitrogen fertiliser use might lead to contamination of surface or ground water. For each of these, estimate the likelihood of adverse environmental effects and the consequences of such events. (See Chapter 4, step 3, page 20) of the Code for more information about assessing likelihood and consequences.)
- Consider only the inherent risk caused by the activity and *do not* discount the risks because good management will overcome it. Good management will be highlighted in Part C of the template.
- Note any activities that have medium or higher likelihood of adverse environmental effects and/or medium or higher consequences in the table of environmental risks. Tick the LMUs on which these will occur.
- Add any comments you want to make about the risks identified. For example, you might note industry rules or regional concerns about farm activities.

- Tick the box at the bottom of the page to indicate nutrient management activities that you will address in your planning. Three common activities are already listed – add your own labels for the other boxes if necessary.

You can add any objectives you like, but be aware that Good Management Practices should then reflect these and set out steps to achieve them.

Part C: Management guides

- Pages for management planning are provided for nitrogen fertiliser use, phosphate fertiliser use and dairy effluent application. Complete these if they apply for the property.
- Where required seek advice from a Certified Nutrient Management Adviser.
- Note the types of applicable fertiliser, application rates and locations where they will be spread (LMUs).
- List any specific requirements your industry has about this nutrient use or activity.
- List any specific requirements your Regional Council has about this nutrient use or activity. These will include conditions that must be met for the activity to be a 'permitted activity' or conditions imposed as part of any resource consent held by the farm for this nutrient management activity.
- List the Good Management Practices (GMPs) that the farm will use to reduce environmental risks from this activity.
- There are tables of GMPs in Chapter 5, page 30 of the Code. Choose suitable practices from these tables and note them in the NMP.
- It is not necessary to adopt all the possible GMPs for a particular risk or activity but the practices chosen need to be suitable for managing the inherent risks identified for the property.
- For each GMP included, note how the manager will check that these are implemented – e.g. diary entry or noted on a farm map.
- Use the management guide pages as a model for further activities if necessary. In each case, check that the activity itself is reasonably explained (e.g. fertiliser types and application rates, LMUs treated), industry or Regional Council rules are stated and Good Management Practices have been listed.

Doing self-assessment

- The property manager needs to complete a self-assessment at the end of the season, checking that the management practices did achieve the objectives set at the beginning.
- For each nutrient management activity included in the management guides, check through the industry and Regional Council requirements and tick 'yes' or 'no' to show whether these were met.
- For each management practice listed at the planning stage, tick 'yes' or 'no' to show whether these were actually practiced.
- Now consider the effects of this nutrient management activity overall. Were the Code specific and property objectives achieved? Tick 'yes', 'no' or 'partially' (if only some objectives were met and/or objectives were barely achieved or the manager was not satisfied with performance).
- If you have ticked 'no' or 'partially' then changes in management practice are required. Note the new management practices that will be used, the person responsible for ensuring these are implemented and a deadline for completion or introduction.
- Write in the actual completion date when each new management practice is adopted.
- The person responsible for the NMP (owner or manager) needs to sign off and date the self-assessment.

Farm map

- Check that there is at least one farm map attached, showing the land management units or other distinctions between management areas.
- Extra farm maps can be added – e.g. to show areas receiving particular fertiliser types, to show riparian strips or protected vegetation that are not treated, etc.

Nutrient budgets and soil test results

- Check that there is at least one nutrient budget attached for each land management unit, this is particularly relevant where you identified significant environmental risks from nutrient management activities.
- This nutrient budget should use the planned nutrient inputs and the expected production outputs from the area. If several fertiliser options were considered then the nutrient budget should support the final choice.
- Soil test results are important for establishing initial soil nutrient levels for nutrient budgeting.
- Further soil tests are useful checks on trends in soil fertility over time to compare actual changes with those expected and planned.
- Where required seek advice from a Certified Nutrient Management Adviser.

Contact details:

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F: 09 473 6551
E: info@fertiliser.org.nz
W: www.fertiliser.org.nz
PO Box 11519
Manners Street Central
Wellington 6142

Nutrient Management Plan

Prepared by

For

Date

Part A: Property details

Property name:
Owner: ***Postal address:*** ***Phone No.*** ***Mobile No.*** ***E-mail address:***
Manager: ***Postal address:*** ***Phone No.*** ***Mobile No.*** ***E-mail address:***

Property area (ha):		
Effective area (ha):		
Area under irrigation (ha):	water	effluent
Irrigation type:	water	effluent

Enterprise type

Dairy	Dairy grazing	Sheep & Beef	Deer	Cropping
☐	☐	☐	☐	☐
Horticulture	Viticulture	Arable	Forestry	Other
☐	☐	☐	☐	☐

Purpose of plan

Part B: Plan objectives, land management units and environmental risk

Objectives:

- *Comply with all legal requirements related to nutrient management activities.*
- *Take all practicable steps to maintain or enhance the quality of the property's water resources.*
- *Take all practicable steps to ensure that there is an adequate supply of soil nutrients to meet plant needs.*
- *To take all practicable steps to contain nutrients within the property boundaries.*
- *Take all practicable steps to minimise the risk of nutrient contamination of any areas of significant vegetation and/or wildlife habitat.*
- *Undertake a nutrient budget.*

Property management objectives
Production

Financial

Environmental

Personal

Land management units

We have identified the following land management units on this property. (See LMU map in Code Appendix 4, page 59

Unit	Description	Approximate area (ha)
A		
B		
C		
D		

Environmental risks

We have identified the following environmental risks for these land management units.

		Inherent risk assessment (see Fig. 3)			
Activity	**Potential risk/s***	**LMU A**	**LMU B**	**LMU C**	**LMU D**

* **Potential risks**	**Met requirements** Yes	No
Contamination of ground water	☐	☐
Contamination of surface water	☐	☐
Undesired changes in soil nutrient status	☐	☐
Nutrient application to non-target land	☐	☐
Accumulation of non-nutrient impurities in the soil profile	☐	☐
Excess stocking rate	☐	☐
Pugging and compaction	☐	☐
Poor cultivation methods	☐	☐
Others (specify below)	☐	☐

Comments about specific risks identified.

From the table above, we have chosen the following nutrient activities as significant. These are addressed in management plans.

N fertiliser use	P fertiliser use	Effluent disposal	Supplement use
☐	☐	☐	☐

Part C: Management guides

Nitrogen fertiliser use

Fertiliser applications

Fertiliser type	Rate of application (kg/ha)	LMU where it is applied

Industry and legal requirements

Specific industry requirements *(Contact industry representative for details)*	**Met requirements** Yes	No
	☐	☐
	☐	☐
	☐	☐

Specific Regional Council requirements *(Contact local Regional Council for their requirements)*	**Met requirements** Yes	No
	☐	☐
	☐	☐
	☐	☐

Management practices

We have identified the following management practices to meet the objectives as set out in Part B of this plan.

Management practices implemented to achieve our objectives *(See Chapter 5, page 37 of the Code for examples)*	Verification method	Checklist Yes	No
		☐	☐
		☐	☐
		☐	☐
		☐	☐

		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐

Self assessment for nitrogen fertiliser use

Did the management practices achieve the Code objectives and any farm objectives?

Yes ☐ Objectives achieved
No ☐ Fill out table below
Partially ☐ Fill out table below

Changes in management practices required	**Person responsible**	**Timeframe for completion**	**Completion date**

Verification
I verify that the information supplied above is correct.

***Property owner* / manager**

Signature ………………………………….

Date ……………………….

Phosphate fertiliser use

Fertiliser applications

Fertiliser type	Rate of application (kg/ha)	LMU where it is applied

Industry and legal requirements

Specific industry requirements (*Contact industry representative for details*)	**Met requirements** Yes	No
	☐	☐
	☐	☐
	☐	☐

Specific Regional Council requirements (*Contact local Regional Council for their requirements*)	**Met requirements** Yes	No
	☐	☐
	☐	☐
	☐	☐

Management practices

We have identified the following management practices to meet the objectives as set out in Part B of this plan.

Management practices implemented to achieve our objectives (*See Chapter 5, page 37 of the Code for examples*)	Verification method	Checklist Yes	No
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐

		☐	☐
		☐	☐
		☐	☐
		☐	☐

Self assessment for phosphate fertiliser use
Did the management practices achieve the Code objectives and any farm objectives?

Yes ☐ Objectives achieved
No ☐ Fill out table below
Partially ☐ Fill out table below

Changes in management practices required	Person responsible	Timeframe for completion	Completion date

Verification
I verify that the information supplied above is correct.

***Property owner* / manager**

Signature ………………………………….

Date ………………………

Dairy effluent application

Do you apply dairy effluent?

Yes ☐
No ☐

If yes, fill in the following, if no, go to next section

Effluent application

Rate	LMU (site/location)

Industry and regulatory requirements

Specific industry requirements *(Contact industry representative for details)*	**Met requirements** Yes	No
	☐	☐
	☐	☐
	☐	☐

Specific Regional Council requirements *(Contact local Regional Council for their requirements)*	**Met requirements** Yes	No
	☐	☐
	☐	☐
	☐	☐

Management practices
We have identified the following management practices to meet the objectives as set out in Part B of this nutrient management plan.

Management practices implemented to achieve our objectives *(contact your local Regional Council for their requirements or refer to DairyNZ ‘A Farmers Guide to Managing Farm Dairy Effluent’*	Verification method	Checklist Yes	No
		☐	☐
		☐	☐

		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐

Self assessment for dairy effluent irrigation

Did the management practices achieve this Code's objectives and any farm objectives?

Yes ☐ Objectives achieved

No ☐ Fill out table below

Partially ☐ Fill out table below

List changes in management actions required	**Person responsible**	**Timeframe for completion**	**Completion date**

Verification

I verify that the information supplied above is correct.

***Property owner* / manager**

Signature …………………………………

Date ………………………

Farm map

If you are filling this in on your computer or online, slot your farm map in here after printing the completed plan.

If you don't have a farm map, discuss this section with your fertiliser adviser or consultant.

A farm map might be an aerial photograph of your land, a topographical farm layout, or another document you have created to show your farm's layout and specific details.

Detailed nutrient budgets and soil test results

Include the most recent nutrient budgets (using the fertiliser applications detailed in the Nutrient Management Plan) and soil tests to support the Nutrient Management Plan. Historic soil test results are also useful to show soil fertility trends over time. Also include effluent area and its location.

Appendix 5: Sample Monitoring and Recording Templates

The following tables show one method of recording fertiliser application details on a paddock recording sheet. Template A shows a completed example with a blank template B provided.

Individual paddock sheets make it easy to add up total nutrient applications in each season. Land managers with small properties may choose to combine all paddocks or blocks on a single recording sheet, listing the paddock name alongside the date and fertiliser type.

Most land managers will develop their own abbreviations – e.g. ‘A’ for aerial application by aeroplane, ‘H’ for helicopter, etc. In the example, ‘spinner’ refers to the land manager’s own tractor-mounted spreading equipment. There is no need to repeat the operator name or other details if these are always the same – e.g. one company is used for all ground spreading.

Template A: Sample paddock recording sheet for fertiliser applications

Paddock Name: No. 12

LMU: A

Present Use: Pasture

			Major Nutrients (kg nutrient/ha)								
Date	**Fertiliser type**	**Application rate (kg/ha)**	**N**	**P**	**K**	**S**	**Mg**	**Ca**	**Operator**	**Method**	**Other nutrients; comments**
23/5/06	30% potash super	250		16	38	20		35	Bob's GS	Truck	
28/7/06	Urea	87	40						Self	Spinner	Had to leave wet area beside boundary - see map
18/10/06	Cropmaster 20	300	58	30		38			Bob's GS	Truck	
20/11/06	Urea	65	30						Self	Spinner	
20/12/06	Urea	65	30						Self	Spinner	
	Total for the year		158	46	38	58		35			

Template B: Paddock recording sheet template for fertiliser applications

Paddock Name: ____________________

LMU: ____________________

Present Use: ____________________

			Major Nutrients (kg nutrient/ha)								
Date	***Fertiliser type***	***Application rate (kg/ha)***	***N***	***P***	***K***	***S***	***Mg***	***Ca***	***Operator***	***Method***	***Other nutrients; comments***

Fertiliser Association

Shaping profitable and sustainable farming

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(With Emphasis on Fertiliser Use)

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