GUIDELINES FOR DEVELOPING NUTRIENT MANAGEMENT CODES OF PRACTICE

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Abstract
Poor nutrient management has unwelcome consequences from both a production and an environmental perspective. Public perception is that incorrect use of fertilizers can damage the environment, and that it is the responsibility of the fertilizer industry to provide information about responsible use to farmers. Internationally, some governments have responded by bringing fertilizer use under legislative control. A regulatory response in Australia is undesirable from both the industry and end-user perspective, because of the risk of inflexible, blanket requirements. Self-regulation through the development of codes of best management practice is preferable. The Fertilizer Industry Federation of Australia, Inc. (FIFA), through the Nutrient Management Working Party, has taken pro-active steps aimed to improve nutrient management for production and environmental benefits, and which may help to avoid prescriptive legislation.

The variation in climate and farming systems in Australian agriculture are such that a single national Nutrient Management Code of Practice is untenable, and that internationally developed Codes are not appropriate. Instead, FIFA has decided to support and encourage individual industry or regional bodies to produce specific nutrient management codes of practice. As a starting point in this process FIFA has developed a draft document – Guidelines for Developing Nutrient Management Codes of Practice. The guidelines provide a framework of overlying principles for nutrient management, describe a process for developing codes of practice, and provide technical information on nutrient management tools. FIFA hope to further the initiative in partnership with the National Farmers Federation.

Real and Perceived Issues
Fertilizers are a valuable source of nutrients for healthy plant growth, and like all inputs must be managed responsibly. The nutrients contained in fertilizers, however, cannot be managed in isolation, but in the context of many other nutrient sources, sinks and movements in the environment.

Poor nutrient management has unwelcome consequences from both a production and an environmental perspective. Economic productivity relies on the most efficient use of inputs, and nutrient use efficiency can be reduced by both an under or oversupply of nutrients for plant growth. Increased nutrient concentrations in surface and ground waters, or in some cases the marine environment, are of concern for environmental and health reasons. Consumption of groundwater with high concentrations of nitrate has been associated with illness in the very young. Accumulation of nutrients is one factor contributing to the eutrophication of surface water and the development of blue-green algal blooms. Restricted plant nutrient availability can also contribute to land degradation from soil erosion and rising water tables.

Public perception is that incorrect use of fertilizers can contribute to environmental damage, and that it is the responsibility of the fertilizer industry to provide information about responsible use to farmers. Market research designed to gauge public perception of the fertilizer industry across a wide cross-section of stakeholders found, for the main part, opinion was that (Fletcher 1996):

- Fertilizers are integral to Australian agriculture, however they can damage the environment and need to be strictly controlled to prevent inappropriate or overuse
- Incorrect use generally occurs when farmers lack knowledge
It is a key responsibility of the fertilizer industry to provide this knowledge and convey it to farmers.

In order to do this, fertilizer companies should work together for the good of farmers and the environment.

FIFA responded by releasing the Australian Soil Fertility manual in 1999. The manual describes the types of agricultural soils, the interaction of soil, water and nutrients, and the management of individual nutrients for profitable and environmentally safe production. It is written in a style suitable for farmers, fertilizer dealers, extension workers, consultants and teachers.

Nutrient management was also identified as a priority in the FIFA Strategic Plan and in 2000 a FIFA Nutrient Management Working Party was established. The working party’s brief included a review of local and international nutrient management issues, practices and research. The review identified two main issues:

1. A precedent of legislative response to nutrient management issues had been set.
2. Best practice nutrient management was not well defined.

Legislative Responses
The Australian public’s perception of fertilizers as potentially damaging to the environment is not unique. Internationally, some governments have responded to real and perceived nutrient management issues by bringing fertilizer use under legislative control. In the US state of Maryland, declining water quality in the Chesapeake Bay led to the passage of the Water Quality Improvement Act of 1998. On agricultural operations with more than US$2500 gross annual income or eight livestock units, the Act requires (Simpson 1998):

- the development of nutrient management plans
- certification of persons writing nutrient management plans
- persons who apply nutrients to have an applicator voucher, and to be or hire a certified nutrient management consultant.

The passage of the Act has seen university and private sector personnel gaining certification as nutrient management consultants, and over 450 000 hectares placed under nutrient management plans to date.

In New Zealand, the Resource Management Act 1991 requires every person to avoid, remedy or mitigate any adverse effect their activities may have on the environment. The Act defines fertilizers as pollutants, and requires fertilizer application to meet the requirements of local Regional Plans. The fertilizer industry, farmer organisations and regional councils collaborated to develop a Code of Practice for Fertilizer Use. This has provided regional councils with the option of considering fertilizer application as a permitted activity under their Regional Plan provided it is carried out in keeping with the Code.

In Queensland, the Environmental Protection Act 1994 places a responsibility on all Queenslanders to meet a General Environmental Duty of Care. The Queensland Farmers Federation has developed an Environmental Code of Practice for Agriculture that, if followed, will allow primary producers to demonstrate their compliance with the Act. Rural industry sectors are developing more specific advice on environmental management at the commodity and regional level. Nutrient management is considered in the Codes of Practice, but broadly.

Best Management Practices
The Nutrient Management Working Party identified 235 Australian research projects with a nutrient management component. Of these, a large proportion had focussed on identifying the source and fate of nutrients in surface or ground water. However, with the exception of some work in the sugar industry and, to a lesser extent in the dairy industry, little progress had been made in translating the research results into best management practices.
Nutrient Management Codes of Practice

A regulatory response to nutrient management issues in Australia is undesirable from both the industry and end user perspective, because of the risk of inflexible, blanket requirements. Codes of practice are recognised internationally as an effective means of self regulation which do not incur the costs and inflexibility of formal regulations. The requirements for an effective Code of Practice are well understood (Dee 1998) and have been considered by FIFA in drafting industry codes dealing with purchasing, manufacturing, storage, distribution and blending. Some industry or support sectors, such as the Australian Fertiliser Services Association and Canegrowers groups, have already addressed nutrient management issues by developing Codes of Practice specific to their needs.

Two main factors inhibit the preparation of national nutrient management codes of practice in Australia:

1. The variation in climate and farming systems mean that a single code would be either too broad in order to be universally relevant, or too lengthy in order to be sufficiently specific for all situations.

2. Research evaluating best management practices is in progress or is yet to be undertaken.

Keeping these issues in mind, FIFA has decided to support and encourage individual industry or regional bodies to produce nutrient management codes of practice which are specific to their situation, which encourage the evaluation of best management practices, and which have the flexibility to change as understanding improves.

“Cracking the Nutrient Code”

As a starting point in this process, FIFA has developed a draft document – “Cracking the Nutrient Code: Guidelines for Developing Nutrient Management Codes of Practice”. Input was sourced from specialists in environmental management systems, and the guidelines are developed on the basis of the principles of the International Management Systems Standard ISO 14001.

The guidelines were developed for use by farmer, industry, research or resource management organisations, local state or federal government departments and Landcare or Catchment groups. The document aims to:

- provide a framework of overlying principles within which specific industry or regional Codes may reside,
- describe a process for developing specific Codes,
- provide technical information on nutrient management tools,
- result in Codes that are not prescriptive and which foster a process of continuous improvement.

Following a step-by-step process (Figure 1), guideline users will gain an understanding and awareness of key nutrient management risks (Figure 2), evaluate current activities, consider the environmental context, prioritise nutrient management risks and identify best management practices which form the basis of a Nutrient Management Code of Practice. However, the document then encourages Code developers to foster a process of continuous improvement of management practices (Figure 3). In this way the Code of Practice is no longer a static document, but becomes a vehicle for learning. Finally, information on the nutrient management tools which can be used to plan, implement and monitor best management practices is provided, along with suggestions for further reading or contacts.

The document is by no means a fait accompli. By investing in its development the fertilizer industry has taken pro-active steps aimed at improving nutrient management for production and environmental benefits, and which may help to avoid prescriptive legislation. At this point FIFA has invited end users to become involved in furthering the process, through the National Farmers Federation (NFF). The NFF Environment Committee has appointed a sub-committee which will work with FIFA on addressing the issue of nutrient management codes of practice. The sugar industry is also reviewing the draft document as part of a project to help farmers adopt sustainable cane growing practices.
References


Acknowledgements

The input of EMS specialists, *Outsourced Environmental* is acknowledged in the preparation of the draft document “Cracking the Nutrient Code”. Input from the members of the FIFA Nutrient Management Working Party in the preparation of this paper is also gratefully acknowledged.
Figure 1. The steps to “Cracking the Nutrient Code”.

Figure 3. The process of continuous improvement.
<table>
<thead>
<tr>
<th>Risk</th>
<th>Description</th>
<th>Processes/Principles</th>
<th>Potential Consequences</th>
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| Leach | Water carrying dissolved nutrients or colloids (soil or organic matter) moving beyond the root zone | Application of nutrients at rates greater than soil holding capacity and/or plant requirements  
Application of nutrients at times when leaching potential is greatest  
Efficient irrigation management strategies  
Spills and loss of containment of fertilizers from transport, storage and handling facilities leading to a concentrated migration of nutrients into soil and surface and ground waters | Nutrient loading and contamination of ground water potentially making it unsuitable for stock and domestic purposes  
Soil acidification from nitrate leaching  
Loss of valuable nutrients from the plant root zone |
| Load  | Application and accumulation of nutrients and undesirable substances  
Application of nutrients to non targeted areas | Undesirable impurities accumulating in the soil e.g. cadmium in mineral fertilizers or microbial contaminants from organic fertilizers  
Imbalances in plant nutrition  
Imprecise application techniques  
Inappropriate use of organic fertilizers  
Spills and loss of containment in transport, storage and handling of fertilizers  
Liberation of greenhouse gasses such as carbon dioxide and nitrous oxide | Uptake of harmful substances/impurities in farm produce  
Mineral imbalance in produce  
Poor produce handling and storage characteristics  
Microbial contamination of produce / livestock  
Nutrient loading in operational areas contaminating soil and leading to potential point source impacts  
Negative impact on soil quality  
Possible contribution to depletion of the ozone layer |
| Run   | Storm and surface water runoff carrying nutrients | Surface water leaving the farm paddocks (or transport, storage and handling facilities) carrying dissolved nutrients and nutrients associated with soil and organic material e.g. nitrogen & phosphorus  
Application of nutrients at times when runoff risk is greatest  
Direct application of fertilizers to water ways | Algal blooms  
Contamination of surface water making it unsuitable for uses such as stock and domestic purposes  
Soil fertility decline |
| Blow  | Air quality impacts associated with fertilizer handling, application and emissions arising from soil | Dust emissions in handling and application of mineral or organic fertilizers  
Ammonia escape from transport, storage and application equipment  
Wind erosion of soil due to inadequate plant cover | Poor air quality  
Ammonia toxicity in plants and animals  
Soil fertility decline |
| Mine  | Decline in soil fertility due to net export of nutrients in produce without replacement | Export of nutrients in produce greater than nutrients being replaced  
Burning or removal of crop residues  
Soil organic matter decline  
Soil acidity increasing | Soil fertility decline  
Loss of soil organism bio-diversity  
Loss of enterprise flexibility  
Poor nutritional quality of produce or pasture |