

Fertcare[®] – moving toward more effective nitrogen use

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Abstract

Fertilizers provide an effective way to replace valuable plant nutrients such as nitrogen (N) that are removed in crop and animal products. Environmental issues associated with nutrients are areas of policy focus and public debate. Excess nutrients moving from agricultural land can harm other eco systems. An example is the movement of N from agricultural land into the waters of the Great Barrier Reef.

The fertilizer industry has made a commitment to effectively manage environment issues by developing and delivering its' product stewardship program, Fertcare[®]. This program encourages effective use of fertilizers to optimise crop and pasture yield while managing offsite movement of nutrients.

With over 2,900 people trained, 300 Accredited Advisors and 80 Accu-Spread[®] contractor machines, Fertcare[®] is effective in communicating good practices in fertilizer use and reducing environment risks. Fertcare[®] provides assurance to government, consumers and farmers that sound practices are being followed, and the program integrates with nutrient management public policy.

Key Words

Nitrogen, nutrients, environment, advisor, Fertcare[®], Great Barrier Reef

Introduction

The Food and Agriculture Organization of the United Nations (FAO) estimate the world population is anticipated to reach 9.1 billion by 2050 requiring an overall food production increase of 70% between 2005/07 and 2050 (FAO 2009). It is generally accepted that much of the increased food production will come from intensification of agriculture. Higher yields will remove more nutrients. If soil fertility is to be maintained, these nutrients will need to be replaced.

Optimizing crop and pasture yield and profit through the addition of nutrients from fertilizer and other sources can increase the risk of offsite nutrient movement which can have a number of negative environmental effects.

The Australian fertilizer industry, through Fertilizer Australia has taken a responsible approach to manage risks associated with fertilizer use. The industry has made a strong commitment to promoting productivity while protecting the environment through the national product stewardship program Fertcare[®].

Fertcare[®] is designed to lift the skills and knowledge of everyone involved in the supply of fertilizer products and services. As the greatest environmental risks occur at the point of end use, Fertcare[®] focuses on providing high quality advice to users of fertilizers. This advice assists users to optimize productivity and minimize environment and food safety risks. It also provides a vehicle for the fertilizer industry to constructively engage with stakeholders and participate in public policy development on nutrient management and food safety matters.

There are 3 main components of the program:

- Fertcare[®] Training
- Fertcare[®] Accredited Advisor
- Accu-Spread[®].

This paper focuses on Fertcare[®] training and the Accredited Advisor parts of the program. A case study example of how the fertilizer industry has used Fertcare[®] to constructively engage in nutrient issues in the Great Barrier Reef (GBR) catchments is provided.

Fertcare[®] Training

The Fertcare[®] program trains industry staff in the competencies required to meet their responsibilities for food safety and environmental risk management. It includes the competency to warn, advise and refer customers to information about the risks and how to manage them.

An important theme running through the Fertcare[®] training material to aid effective use of fertilizer is what is now known internationally as 4R Nutrient Stewardship. The approach being to apply the right source of nutrients (product), at the right rate, at the right time and in the right place. Whilst the concept is simple, the implementation is knowledge intensive and site specific.

Fertcare[®] training was developed by professional educators and overseen by a technical committee that included leading public and private sector expertise in plant nutrition, food safety and environmental sciences. The Fertcare[®] program continues to be updated with the latest information, practices and guidelines as new science based information comes to hand.

Fertcare[®] training is delivered nationally by independent and qualified providers, through a Registered Training Organisation. Each training course meets national competency standards under the Australian Qualifications Framework.

At the time of writing, over 2,900 people have completed Fertcare[®] training since the competency based program began in 2003.

In addition to the competency based Fertcare[®] training, the program offers opportunities for advisors to augment their ongoing professional development through the provision of training opportunities on topical subjects such as nitrogen use efficiency and greenhouse gas management.

Fertcare[®] Accredited Advisor

Currently there are no legal or registration requirements to qualify an individual to provide soil management, plant nutrition or fertilizer recommendations in Australia. The quality of advice farmers receive from both fertilizer supply companies and independent advisory businesses can vary widely and may not always adequately address matters such as, crop yield and quality, profitability, nutrient use efficiency, environment or food safety.

The Fertcare[®] Accredited Advisor (FAA) program provides farmers and other stakeholders with confidence that soil management and fertilizer advice based on soil and or plant testing is of a high standard. It provides assurance that the process of making recommendations, the underlying supporting data, sampling methodology and laboratory competence are based on good practice and accepted science in Australia.

The FAA program assesses the competence of advisors to make nutrient recommendations. Assessment is based on standards set by Australasian Soil and Plant Analysis Council (ASPAC), which have been mapped to national competencies. The standards cover sampling, analysis, interpretation, recommendation and monitoring. Recommendations are tested for completeness and for appropriate management of environmental and food safety risks. The standards are based on accepted scientific consensus with new information incorporated as it comes to light.

Soil and plant nutrient analysis must be conducted by a laboratory that follows accepted procedures and participates successfully in the ASPAC inter-laboratory proficiency program.

Once advisors have been assessed as competent, they are subject to a biennial audit of randomly selected recommendations made in the preceding two-year period. The audit is a quality assurance process to ensure that competence is being routinely applied and provides mechanisms to improve and rectify any underperformance.

At the time of writing there were 300 FAA's operating across Australia.

The program draws on key texts and national industry initiatives like the "Better Fertiliser Decisions for Cropping Systems" project in the grains industry, "Better Fertiliser Decisions" project in the intensive

grazing industries and Six Easy Steps in the sugar industry, to ensure appropriate recommendations are made and that environment and food safety considerations are properly taken into account. The FAA program brings together sound science and good practice to inform and assist policy development and implementation.

Great Barrier Reef Case Study

Concern about effects of runoff from agricultural land causing negative consequences on the GBR is an example of eutrophication that has attracted local, national and international concern over several decades.

A study investigating the spatial and temporal dynamics of coral cover over a 27 year period identified 42% of the decline in the reef could be attributed to adult crown of thorns starfish (COTS) eating living coral tissue. Improving water quality i.e. the nutrient, sediment and pesticide characteristic of water entering the reef is considered one of a number of important strategies to reduce the population of COTS and therefore allow coral cover to be restored (De'ath et al 2012). Work reported by Fabricius et al 2010 and Brodie et al 2005 indicates water nutrient content (e.g. nitrogen and phosphorus) impacts on the availability of phytoplankton. Increased phytoplankton improves COTS larval development, growth and survival. COTS usually breed from December to April. Survival of the plankton on which larvae of the COTS feed is high in nutrient enriched flood waters. Few larvae complete their development in seawater with low phytoplankton concentrations, which suggests increased nutrient delivery from land contributes to increased numbers of COTS and therefore a reduction in coral cover.

In the early 2000's, Fertilizer Australia began examining the available scientific information and increased its level of interaction with the major stakeholders. The Commonwealth of Australia and Queensland Government established the Reef Water Quality Protection (Reef Plan) in 2003. This initiative was supported by a body of evidence showing a decline in water quality on the GBR. A comprehensive review of the evidence available at the time, "Summary Statement of the Reef Science Panel regarding water quality in and adjacent to the Great Barrier Reef" was prepared by a taskforce of experts led by Baker et al (2003). This report indicated land use such as cattle grazing, urban development, agricultural production, water use practices, extensive vegetation clearing and wetland drainage on coastal plains and development of acid sulphate soils were the main factors contributing to declining water quality. This paper focuses only on the nutrient issues associated with agricultural production.

A number of voluntary measures were undertaken by agricultural industries in the GBR catchments (land areas draining into the GBR) to address water quality issues. The fertilizer industry developed and began implementing Fertcare[®] in 2003, funded by the Australian Government. An independent and statically valid evaluation of Fertcare[®] by Cummins and Barclay (2007) demonstrated that Fertcare[®] training influences the advice provided to farmers about nutrient management in the GBR catchments.

The Queensland Department of Premier and Cabinet released a 'Scientific consensus statement on water quality in the Great Barrier Reef' in 2008 which stated, "current management interventions are not effectively solving the problem." To improve water quality outcomes for the GBR, Fertilizer Australia argued the case for more wide spread soil testing, and the use of appropriate analysis and interpretation methods to arrive at evidence based, site specific nutrient management plans at a paddock level. The basic premise being to match crop nutrient demand with the nutrient available from the soil, applied fertilizer and other nutrient sources e.g. mill mud etc. Minimising nutrient surplus to crop requirements will significantly reduce the potential for offsite nutrient impacts. These are some of the principles Fertcare[®] is based on.

Because the voluntary approach by farmers and graziers to the adoption of 'reef friendly' management practice was considered too slow to reverse the decline in the reef's health, reef protection measures were added to the Environmental Protection Act 1994 by the Queensland Government in October 2009. This legislation focused on the sugarcane and grazing industries in the Wet Tropics, Mackay-Whitsunday and Burdekin dry tropics catchments.

In the case of sugarcane, the dominate crop regularly fertilized on the north Queensland coast, the regulation requires farmers to soil test at the start of each crop cycle, use appropriate analysis and the prescribed methodology (Six Easy Steps developed by Bureau of Sugar Experimental Stations) to determine appropriate site specific nitrogen and phosphorus rates. Guidance notes on the regulation suggest that when farmers seek

professional fertilizer advice, they seek advice from someone who holds the same units of competency that the FAA program is based upon and cite Fertcare[®] as an example.

A change in the Queensland Government during 2012 saw a move away from enforcing the regulations and toward industry led best management practice (BMP). Canegrowers organisation secured State Government funding toward the end of 2012 for development of a sugarcane BMP known as Smartcane. Fertcare[®] assisted in the development of the BMP and is referenced in Smartcane. The sugarcane industry continues to engage growers in the rollout of Smartcane. The current Queensland Government has put a focus on compliance with the regulations in recent times.

The long term health of the GBR is closely monitored by the Great Barrier Reef Marine Park Authority with the Queensland State Government having oversight of land use issues impacting on water quality. On the issue of dissolved inorganic nitrogen entering the GBR, the 2014 Reef Report Card indicates that modelled annual average load reductions of 17% have been achieved from 2009 to 2014.

Factors that have contributed to this reduction, include implementation of best management practices by canegrowers, implementation of Fertcare[®] by the fertilizer industry, State Government regulation of sugarcane and the Federal Government Reef Rescue incentive investments. Fertcare[®] and the State regulations encourage soil testing and appropriate analysis and interpretation methods to arrive at evidence based, site specific nutrient management plans.

Below is a summary of the Fertcare[®] participation in the Wet Tropics, Mackay-Whitsunday and Burdekin dry tropics catchments:

- 195 people have successfully completed Fertcare[®] training since 2003
- 24 current Fertcare[®] Accredited Advisors
- 81 people participated in Fertcare[®] Nitrogen Use Efficiency Workshops

Whilst the reduction in nitrogen loss to the GBR is a step in the right direction, the Report Card highlighted the need to accelerate the rate of change and drive innovation to meet the ambitious 2050 Reef Plan targets of at least a 50% reduction in anthropogenic end-of-catchment dissolved inorganic nitrogen loads in priority areas on the way to achieving up to an 80% reduction in nitrogen by 2025.

Clearly it will take decades to see the full benefits of the changes in land management practices currently being implemented flow through to increased coral health and cover of the GBR. The Fertcare[®] Accredited Advisor program provides assurance to government, consumers and farmers that sound practices are being followed by the fertilizer industry and recommended to growers. Fertcare[®] stands ready to incorporate new evidence based information and improved practices over time.

Conclusion

World populations are growing, increasing food demand. As the available agricultural land is limited, fertilizer will be one of the tools used to sustain and increase food production. Increasing the concentration of nutrients in the soil can also raise the environmental risk associated with nutrient movement.

Fertcare[®] is effective in achieving the practical application of the 4R approach to optimising yield whilst managing nutrient risks. It has been developed by the Australian fertilizer industry to equip industry people to provide advice to farmers and provide assurance that competence is being routinely applied and sound practices are being followed in the development of fertilizer recommendations based on soil and plant analysis.

When engaging with public policy issues, the fertilizer industry is committed to basing its position on the best available science. The Fertcare[®] program is offered as an effective tool in implementing science based policy programs and standards. This approach is the basis for strong and credible engagement with Government, land managers, industry bodies and environmental organisations. The GBR is an example of how Fertcare[®] and an evidence based approach can be used to assist in driving improved outcomes for all stakeholders. Clearly as new scientific information and technology becomes available, Fertcare[®] must adapt this into practical advice for industry staff to pass on to farmers.

References

- Great Barrier Reef Report Card 2014. Australian Government and Queensland Government report. Available at <http://www.reefplan.qld.gov.au/measuring-success/report-cards/2014/assets/gbr-2014report-card-detailed-results.pdf>
- Baker J, Furnas M, Johnson A, Moss A, Pearson R, Rayment G, Reichelt R, Roth C, Shaw R, Murphy P, Hill G (2003) Summary statement of the reef science panel regarding water quality in and adjacent to the Great Barrier Reef. Commonwealth of Australia and Queensland Government report.
- Brodie J, Binney J, Fabricisu K, Gordon I, Hoegh-Guldberg O, Hunter H, O'Reagin P, Pearson R, Quirk M, Thorburn P, Waterhouse J, Webster I, Wilkinson S (2008) Scientific consensus statement on water quality in the Great Barrier Reef. Queensland Department of Premier and Cabinet report. Available at <http://www.reefplan.qld.gov.au/about/assets/scientific-consensus-statement-on-water-quality-in-the-gbr.pdf>
- Brodie J, Fabricius K, De'ath G, Okaji K, (2005) Are increased nutrient inputs responsible for more outbreaks of crown-of-thorns starfish? An appraisal of the evidence. *Mar Pollut Bull* 51:266-278.
- Cummins T. Barclay E, (2007) An evaluation of the Fertcare program. A report to the Fertilizer Industry Federation of Australia by Tim Cummins and Associates December 2007. Available at <http://www.fertilizer.org.au/Portals/0/Documents/Fertcare/Fertcare%20Evaluation%20Final%20Report%20071214.pdf?ver=2016-02-04-111623-200>
- De'ath G, Sweatman H, Puotinen M, (2012) The 27 year decline of coral cover on the Great Barrier Reef and it's causes. *Proceedings of the National Academy of Sciences* October 30, 2012 vol 109 no 44 17995-17999.
- Fabricius KE, Okaji K, De'ath G, (2010) Three lines of evidence to link outbreaks of the crown-of-thorns seastar *Acanthaster planci* to the release of larval food limitation. *Coral Reefs* 29:593-605.
- Food and Agriculture Organisation of the United Nations (2009) How to feed the world in 2050. Available at http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf
- Queensland Government (2009) Great Barrier Reef Protection Amendment Act 2009. Act 42 of 2009 Available at <http://www.legislation.qld.gov.au/LEGISLTN/ACTS/2009/09AC042.pdf>