New report values the benefits of OVERSEER®

In early February the OVERSEER® owners (MPI, AgResearch and the Fertiliser Association of New Zealand) released an independent report quantifying some of the benefits associated with New Zealand's nutrient budgeting support tool, OVERSEER. Independent consultant Phil Journeaux of AgFirst Waikato conducted three months' worth of field research to compile the report, which included interviewing 28 individuals from Regional Councils, MPI, MfE, MBIE, as well as agricultural, educational and science organisations. The report focused on the benefits of OVERSEER as a research tool, a tool for increasing the efficiency of fertiliser use, and a tool to assist in managing nutrient losses from farms.

Officially launched at the Fertilizer and Lime Research Workshop in February this year, the report, entitled "Valuation of the Benefits of the OVERSEER® Nutrient Budget Model", estimates that the average benefit value contributed by OVERSEER is approximately $271 million per year. This value projected over a 50 year lifetime is calculated as $3.3 billion.

The author concluded that alternative approaches to derive information similar to that produced by OVERSEER (e.g. direct measurement) would involve significant cost to users, especially farmers and regional councils, and “…may not be as accurate or effective in predicting nutrient use for individual farms.”

Dr Philip Mladenov, Chief Executive of the Fertiliser Association, said of the benefit valuation: "This report confirms what we knew intuitively, that OVERSEER provides significant benefits for New Zealand, including for the primary industries sector and the science community. It demonstrates that the investment of the OVERSEER owners has been more than justified and has created, and will continue to create, substantial value for New Zealand."

The report stated that many experts believed that in the absence of OVERSEER, an inputs-based regulatory approach would likely be adopted for agriculture in New Zealand, as has been adopted in other parts of the world. However, the firm belief of the primary sector is that trying to achieve the environmental outcomes we seek using input controls would require a huge investment in regulation, monitoring and compliance, while discouraging farming practice innovation, which would have a negative impact on agricultural output and profitability.

One thing all of the report’s interviewees agreed was that ongoing investment and research needs to go into OVERSEER to maintain and grow its value to New Zealand agriculture. Such development work is currently taking place, and its validity has been further strengthened by the findings of this report.

A full copy of the report can be downloaded from the OVERSEER website: www.overseer.org.nz

A NEW SERIES – FERTILISER ASSOCIATION’S INVESTMENT IN RESEARCH

Each year the Fertiliser Association invests well over $1 million in support of industry-good research for the benefit of New Zealand agriculture and New Zealand Inc. The overall focus of this investment is to help deliver the Association’s vision of supporting productive, economic and environmentally sustainable farming through responsible nutrient management. We seek to fund innovative research projects that lead to new tools and technologies that provide gains in production efficiencies while providing for environmental benefits.

In future editions of Fertiliser Matters we will be highlighting some of the many research projects and postgraduate students that we support as part of our research investment. Watch this space.
Valuing the benefits of an effects-based approach to agricultural regulation

While New Zealand agriculture is at a relatively early stage in its regulatory journey and is facing increasing costs of environmental compliance, its outputs-based approach to regulation is giving it a competitive edge.

In an interesting report prepared by Rabobank’s Food & Agribusiness Research and Advisory division, the authors pointed out that countries that have been operating under a mature regulatory regime for some time have incorporated environmental compliance into their cost structures. In contrast, in those countries at an earlier stage of regulatory reform, such as New Zealand, newly imposed compliance costs have the potential to impact negatively on relative competitiveness. This is a sobering thought for New Zealand producers, particularly as one of our key producing sectors, dairy, looks set for a period of more intense competition and lower returns for at least a year or even longer.

If New Zealand producers and exporters want to remain competitive relative to other producing countries, they will have to control the increase in their cost structures and manage within the new regulatory environment as efficiently as possible. Fortunately, we have one advantage over many of our key competitors in terms of our regulatory approach – our output-based system of regulation. Here, the focus is on estimating and managing the losses from a farm, such as nitrogen, or phosphorus, or greenhouse gases. In this way, regulators are focusing on the factors that directly impact the environment, not those one step removed from the potential impact, such as stock numbers or fertiliser application. It is generally conceded that this approach is a more cost-effective way of regulating agriculture. It is argued that it has the advantage of encouraging farmers to be innovative and flexible, allowing them to manage inputs in the most efficient and cost-effective way to maintain profitability, while also meeting agreed goal limits. However, is there any hard evidence to back-up this assumption?

A recent report by agricultural economist, Phil Journeaux, provides some important insight on this question. In his study, aimed at valuing some of the benefits of the OVERSEER® Nutrient Budget Model (see our article on page 1, “New report values the benefits of OVERSEER®”), he sought to quantify the benefits of using OVERSEER to manage nutrient and greenhouse gas outputs from farms. In his discussions with a range of people with expertise in agri-environmental issues, almost all (90%) felt that the most likely approach in the absence of OVERSEER was that regulators would need to go to an input control regime. Most felt that such input controls would need to be overly precautionary, and hence relatively onerous and across the board, to ensure the required reductions in farm losses. Journeaux then estimated the value of an outputs-based system centred on the use of OVERSEER to estimate and manage such losses, versus an inputs-based approach. His analysis showed that this approach was associated with an overall benefit of approximately $113 million per year (range of $73–$137 million) at this time. In his report, Journeaux pointed out that further work is required to obtain more representative data, but nonetheless this is the first piece of rigorous analysis demonstrating that an effects-based approach to agricultural regulation will deliver cost-benefits to producers and exporters relative to many competitors. This suggests that, although New Zealand agriculture is at an earlier stage in its regulatory journey compared to many of its competitors, the effects-based approach being taken by regional councils is on the right track and with ongoing development will assist our producers and exporters to meet the environmental expectations of our premium end consumers at least cost.


FlRC hosts another successful workshop

Each year the Fertiliser and Lime Research Centre (FLRC) at Massey University hosts a workshop on a theme of importance to the New Zealand primary industries. FLRC has hosted these workshops since 1987 and the participants include researchers and educators; representatives from the fertiliser industry, primary industry bodies, and central and regional government; as well as agricultural consultants and progressive farmers.

The 29th Annual Workshop was held this year between 9–11 February on the theme: “Integrated Nutrient Management for Sustainable Farming.” It was a busy event with 97 papers presented and 282 participants. As usual, the workshop proved to be a stimulating forum for exchange of information and debate on issues related to sustainable farming. It also provided excellent opportunities for networking that encouraged a more informal exchange of information and ideas.

The Fertiliser Association funds a broad range of research projects related to the sustainable use of agri-nutrients, and the FLRC workshops provide an excellent forum for dissemination of some of the results of the research we support. Here is a sample of some of the research funded by the Association and that was presented at the Workshop this year:

1. Steven Howarth from AgFirst Waikato presented a paper on the outcomes of his work assessing nitrogen leaching mitigation strategies for dairy farms and their economic impacts. Steven’s work showed that there are a large number of mitigation strategies available to dairy farmers but that there is no one size that fits all. All farms are different and the...
Phosphate fertiliser production in New Zealand

New Zealand farmers are fortunate to have access to a reliable supply of high-quality, domestically manufactured single superphosphate produced by 100% farmer-owned companies. Between them, Ravensdown and Ballance Agri-Nutrients operate five strategically located superphosphate production facilities at Mount Maunganui, Napier, Christchurch, Dunedin and Invercargill.

The fundamental process for producing superphosphate dates back to 1843 when an English chemist, John Bennet Lawes, treated naturally occurring rock phosphate with sulphuric acid. By this means he created a form of phosphate “manure” that had the desirable quality of being rapidly released into the soil where it could be readily used by plants. All modern-day single superphosphate production facilities around the world still utilise this same basic principle.

New Zealand producers source the rock phosphate they require from quarries from around the globe, including North Africa and the Middle East (see the September 2015 Issue of Fertiliser Matters). They produce the sulphuric acid on site from elemental sulphur imported mainly from Canada. The sulphur is melted and then combusted in an industrial furnace. The resulting sulphur dioxide is reacted into sulphur trioxide with the aid of catalytic converters and this gas is dissolved in water to form sulphuric acid. The sulphuric acid is then mixed with finely ground rock phosphate and water. The mixture reacts for about 30 minutes in an enclosed conveyer, known as a den. The fresh material is broken up with cutters and then granulated before transfer to a storage area for curing (the completion of the reaction). Following curing, the product is ready for dispatch.

Although simple in principle, large-scale production of single superphosphate is a complex process that must be monitored precisely to consistently produce a high-quality product with the greatest efficiency. This is because the composition of the rock phosphate, including its phosphate content, varies naturally depending on its source. The rock phosphate must therefore be reacted with the sulphuric acid in precise proportions in order to consistently produce a product with acceptable physical properties in terms of its particle size, dryness and strength, so that it can be easily spread and released into the soil. On-site engineers and laboratory personnel are responsible for monitoring the exact composition of the phosphate rock being used and the overall production process to ensure the end-product has the desirable attributes.

The sulphuric acid production process releases large amounts of heat which can be captured and used to generate steam to produce electricity. This is used to meet power requirements at four of the five manufacturing sites in New Zealand, with the excess being fed into the local electricity grid.

One tonne of rock phosphate will produce about 1.65 tonnes of superphosphate.

New Zealand’s five super-phosphate production facilities produce approximately 1 million tonnes of fertiliser each year. This feeds into a nationwide network of more than 150 local storage and re-distribution centres where fertiliser can be collected or dispatched for delivery to the farm gate.

New Zealand is very fortunate to be an efficient and low-cost producer of sufficient single superphosphate to meet all of its domestic requirements for this important nutrient source. This is of great benefit to New Zealand farmers and the primary sector as a whole, as fertiliser comprises a significant portion of on-farm costs. New Zealand’s five superphosphate production facilities are thus a vital component of the country’s agricultural-led economy, ensuring that high quality fertiliser is produced and delivered efficiently and cost-effectively to grow the productivity of our agricultural sector and maintain its competitiveness.

Further reading:
Fertiliser Handbook, BoP Fertiliser Ltd, 95 pages
effectiveness of the strategies used depends on the individual farm situation. He showed that using currently available mitigation strategies, reductions of nitrogen leaching of up to 20% are possible with minimal impacts on profit; beyond this, however, farm profitability is generally negatively impacted.

2. **Phil Journeaux, also from AgFirst Waikato**, presented the results of his analysis valuing the benefits of the OVERSEER® model for managing on-farm nutrient flows. The front-page article provides more in-depth information about this report.

3. **Jo-Anne Cavanagh from Landcare Research** presented a poster paper showing the interim results of a large and ongoing research effort examining the uptake of cadmium in economically important vegetable, pasture and forage species. This work is showing that uptake of cadmium into plants is a complex process influenced by the species and cultivar of the plant being grown and the properties of the soil in which it is grown.

4. **Edward Abraham from Dragonfly Data Science** provided a summary of up-to-date data related to the management of cadmium in New Zealand’s agriculture and food systems. As part of this work, Abraham analysed trends in levels of cadmium in phosphate fertilisers going back to 1995 and confirmed that cadmium levels have been consistently below the agreed voluntary limit throughout this period. In all, cadmium levels in 8835 soil samples collected between 2006–2015 were reviewed. He presented results from measurements of cadmium levels in 3,936 soil samples collected between 2012–2015 from 1,980 farms from across New Zealand, including pastoral, arable, horticultural and fruit growing operations. He found that in more than half of all districts around the country, all farms sampled were within the range of background levels of cadmium in soils. Those farms with soil cadmium levels above the background range were present mainly in Waikato and Taranaki. This is a legacy from pre-1996 use of phosphate fertilisers derived mainly from high cadmium containing Nauru rock phosphate. The phosphate fertilisers used since then have a much lower cadmium content. He also found that only four out of the 1,980 farms sampled had soil cadmium levels that might require no net accumulation under the Tiered Fertiliser Management System. Abraham also presented some information on trends in cadmium levels in the typical diet of New Zealanders showing that cadmium intake is well below World Health Organisation recommended limits.

5. **Aaron Stafford, a PhD candidate at Massey University**, presented his latest findings on cadmium uptake in a range of forage species used in New Zealand livestock grazing, including the increasingly popular specialist forage crops, chicory and plantain. His work will improve current models for assessing risk of cadmium accumulation in livestock offal.

6. **Mahdyeh Salmanzadeh, a PhD candidate at the University of Waikato**, presented the results of her work thus far to use cadmium isotopes to distinguish the sources of cadmium in soils at the long-term fertiliser trial sites at Winchmore Research Station. This work is helping us better understand the causes of the observed plateauing of cadmium accumulation in Winchmore soils since 1997.

The results of the work reported on by Jo-Anne, Edward, Aaron and Mahdyeh will help inform the multi-stakeholder Cadmium Management Group’s ongoing programme of risk management of cadmium in New Zealand agriculture and food systems.

It is very satisfying to see the results of the excellent work being carried out by talented established and emerging researchers that the Fertiliser Association has the privilege of supporting. Papers providing more details of the work of all of these researchers and their collaborators will be available on the FLRC website from April.