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MANAGING DIFFUSELY SOURCED NUTRIENT LOSS – BUILDING ON LESSONS LEARNED

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Introduction

Managing diffusely sourced nutrients is both essential and difficult. Essential if we want to halt or reverse the decline in quality of our lakes and rivers to meet societal and market expectations. Difficult because we're dealing with incomplete information and complex interdependencies along with changing requirements needing a broad range of skills to resolve. It is as much a social, cultural and economic challenge as it is technical.

Managing diffusely sourced nutrients requires a fundamental shift in thinking and approach to managing land. Farmers have traditionally relied on development and intensification to keep ahead of inflation and grow their business. This often results in increased loss of nutrients to water. With a national imperative (NPS-FM 2014) to maintain (and in some cases, improve) water quality as a bottom line, development must now consider potential for increased loss and if so, incorporate mitigation.

Regional councils around the country have grappled with the challenge and lessons continue to be learned. That should not come as a surprise to anyone – our approach focusing on management of nutrient outputs means there's no clear precedent for us to follow hence we need to find out for ourselves what works and what doesn't. However while acknowledging that many lessons have been learned, we also want to acknowledge the many success stories and significant progress that has been made by many. There's is nothing more disheartening than to be told we're making no progress when so much is being done and for many the journey towards managing diffusely sourced nutrients is well underway.

In this article we share some of our personal observations and lessons learned with an emphasis on how we can build on those lessons. We have limited ourselves to five of each and make no claim this list is exhaustive, but certainly key from our perspective. We also highlight the important role rural professionals play in ensuring farmers meet the challenges that lie ahead.

Lessons Learned

Need to Focus on Outcome

The first lesson learned is the need to keep focused on the desired outcome – sometimes referred to as the end-game or 'keeping one's eye on the ball'. It's very easy to become bogged down in the detail and lose sight of the connection between action and result, whether one is drafting up a policy or rule in a plan, generating a Farm Environment Plan or shifting stock.

This needs a clear understanding of desired outcome which often involves multiple goals for areas such as the environment, the farm business and needs of markets and consumers. Goals for each of these areas could include matters such as:

Environment – Improved stream health, improved groundwater quality, improved slope stability, improved biodiversity, improved mahinga kai habitat and swimmable streams.

Farm Business – great working environment, strong resilient and profitable farming businesses.

Markets and Consumers – transparency, authenticity, integrity and understanding 'the story' behind the product.

The question we need to keep asking ourselves is '*What is the link between what I'm doing and the desired outcome*?' If we don't have a clear answer are we sure we should be doing it? Do we understand the cause before we take action? Are the actions we're taking the most effective and efficient? We need to keep asking ourselves these questions until we can answer them in the affirmative.

One of the challenges in driving water management largely via regulation under the RMA is that the RMA provides an environmental resource management framework and is less suitable for dealing with overall management of water which covers a far winder range of issues from economic to social.

Managing Diffuse Nutrients Needs a Fundamental Change in Approach

For the past 150 or so years that land has been actively farmed the additional loss of nutrients has not been a key consideration for most land-owners when deciding whether to intensify or develop their farm business. That now needs to change, requiring a fundamental change in thinking, given the reliance on intensification and development to grow the farm business and keep ahead of inflation.

The question that now needs to be asked alongside plans to intensify or develop is: will this increase the amount of nutrient leaving my farm? If so, how will I mitigate this increase?

In the same way that work-place health and safety requires a fundamental shift in approach towards safety in the work-place that requires much more than what the legislation can provide, so too the management of diffusely sourced nutrients requires much more than regulation. It needs a 'package' of tools that may include for example policies, rules and consents but also GMP, farm plans and incentives to manage environmental risk (e.g. through fencing). Above all it requires collaboration and leadership nationally, regionally and fundamentally at a community level.

Focus on Nutrient Loss Generally Sound

The focus on nutrient loss or 'output control' as opposed to 'input control' is generally sound, notwithstanding the additional challenges it provides. It is consistent with the desire to enable growth while maintaining or reducing impacts on water quality – a dual aim well expressed in the Mission Statement of the 'Our Land our Water' Science Challenge as '*To enhance primary sector production and productivity, while maintaining and improving our land and water quality for future generations.*'

Focus on nutrient loss has several significant benefits over focus on managing inputs, including:

- Better connection with outcomes sought – the outcomes are influenced by what is lost from land and enters water and that may or may not bear a direct relationship to increasing or decreasing inputs..

- Allowing for growth, flexibility and change in land use – focus on outputs allows for increasing intensity of existing land use or change in land use where subsequent losses can be mitigated to meet whatever limits apply.

- Promotion of innovation and opportunities for intervention - there are an increasing number of mitigations available to reduce nutrient losses from land, motivated by the opportunity provided by focus on outputs – the classic 'need is the mother of invention'. The Pastoral 21 Research Programme is a great example of innovative and focused research that has, within a very short time, come up with practical and effective measures to reduce nutrient loss from certain land uses.

However the focus on nutrient loss is not without its additional challenges:

- It may require extra support to provide clarity for land-owners wanting to know what they need to do to meet their obligations. Advising farmers and landowners it's up to them to ascertain how they meet their limit isn't appropriate given the considerable expertise required. Farmers require certainty to enable forward planning of mitigations and possible significant capital expenditure and changes to farm systems, to achieve compliance.

- Secondly it relies on the ability to reliably and affordably know how much nutrient is lost. The need to be affordable means that direct measurement is not an option – even if it

were possible to capture sufficient leachate and runoff to obtain reliable measurements. That means reliance on other tools such as OVERSEER®, discussed below.

- Thirdly whilst common outcomes may be identified, there remains a challenge to identify the individual effects of reducing nutrient loss on a single farm in a waterway and the cumulative effects of reducing nutrient loss at more than a broad scale.

OVERSEER® is a Very Useful Tool to Estimate and Manage Losses

OVERSEER® Nutrient budgets (OVERSEER) provides cost-effective estimates of losses from farm systems and provided it is used appropriately is a very useful tool to estimate and manage nutrient losses. It was developed for New Zealand farm systems by scientists who understand farm systems, giving it a unique advantage over other tools.

Appropriate use of OVERSEER requires a sound understanding of the model to ensure any regulatory framework using the model fits the model, not the reverse. Given the ongoing investment and improvements, resulting in frequent updates and better estimates of losses, the model is best used in manner that relies on its ability to generate comparative rather than absolute estimates. If it is to be used in an absolute manner then version control becomes critical, as occurs for example in the regulation of nitrogen losses within the Lake Taupo catchment.

Given the model's reliance on a thirty-year climate dataset to provide estimates, use of the model to provide annual estimates also requires scrutiny to ensure appropriate use. Guidance on appropriate use is addressed in these proceedings in the paper written by Warwick Murray and Mike Freeman (Freeman *et al*, 2016).

While it was originally envisaged that OVERSEER budgets prepared for other purposes would also be suitable for use in regulation, that has not been the case for several reasons. One is that the budgets may not cover the same period – those used for regulation tend to be year-end based on actual inputs whereas those used to support fertiliser recommendations are predictive. Another reason is that budgets used in regulation may require information not needed to support fertiliser recommendations and require greater care to ensure they are an accurate representation of the farm system. Often this translates into a need for additional skills on the part of the professional preparing the budget. This in turn has meant a shortage of trained professionals capable of completing the large numbers of budgets required, hence backlogs in meeting regulatory timeframes.

At the heart of its value is that it is a tool that can help councils and landowners identify and manage areas of significant environmental risk on farm i.e. activities that generate significant leaching issues.

The challenge that the focus on OVERSEER has created is a preoccupation with nitrogen when managing water quality and diffuse sources of contaminants is influenced by for example phosphorus, sediment and faecal bacteria.

Allocation of Nutrients Within a Cap Remains a Significant Challenge

As with the allocation of any finite resource such as water, the allocation of nutrients has been a source of angst and anger, dividing communities and often becoming the focus in limit-setting discussions, rather than the need for and appropriateness of the actual limit. Social acceptability is a challenge that regulators and those engaged with the water quality debate find challenging.

There is no simple answer – what is fair or unfair is strongly linked to one's perspective. To someone with high nutrient losses who has invested considerable capital and taken significant risks in developing their properties it is likely to come across as terribly unfair if they're asked to scale back their losses to a catchment average and potentially lose their investment. However, to someone who has not developed and whose losses are much lower than their developed neighbour on similar soils, it may seem horribly unfair that their options to develop are now removed, despite them often seeing themselves as not having caused or contributed towards the problem.

There are several options for allocation nutrients but rather than discussing these we ask three questions for readers to consider:

1. Firstly, over the long term, can we avoid some form of re-balancing?

2. Secondly, who is best placed to decide on allocation? Are councils or the Courts (on appeal) best placed to make that decision?

3. Thirdly should it be left to each community or region to decide for themselves how nutrients should be allocated, or should there be some form of national guidance?

Now would seem a really important time to be analysing the approaches that have been taken so far to managing diffuse sources of nutrients gathering those lessons and looking to learn from them rather than adhering dogmatically to one of approaches already adopted.

Building on Lessons Learned

Accept Reality

While there is considerable debate around the extent of New Zealand's water quality issues, that should not distract from the fact that many of our waterways are degraded beyond the level considered acceptable by the community and this cannot be ignored. Such a view does not undermine or minimise the considerable good work that has gone on and that fact that many degraded waterways have been restored, particularly those affected by point source discharges. But many waterways continue to degrade, often from past land use practices that have resulted in discharges that have not yet reached water – the 'lag' effect. As mentioned in the Introduction there is now a national imperative to maintain (and in some cases, improve) water quality as a bottom line hence ongoing degradation cannot continue. The issue will not go away, with markets also giving signals that they will pay a premium for food grown safely

with a strong link between clean water and safe food. The ability to demonstrate that our food is grown sustainably is becoming increasingly important in some markets.

All of this presents an important challenge for rural professionals, given that their views strongly influence the views of their client farmers. Those advising farmers will be providing an important service and helping them run sustainable businesses if they can help them face reality, they will be able to advise what it means for their farm and aspirations and help them start the journey if not already begun.

Need for Honest and Effective Communication

The second way we can build on the lessons learned is to encourage and promote honest and effective communication, getting away from jargon and the practice of 'keeping ones powder dry' to preserve positions for future adversarial processes. Such engagement needs trust and empathy – a willingness to walk in the shoes of others, to understand their perspectives and accept them as valid even if not shared. In our experience the vast majority of farmers see themselves as responsible guardians and stewards of their land, seeking to pass it on in better shape than when they took over, with strong inter-generational ethics. They want clean swimming holes and rivers fit for fishing as much as anyone.

Equally there is a need for others to be able to walk in the shoes of farmers and rural communities trying to run businesses and support their families.

If the desired environmental outcome can be agreed and shared as a common value then discussion can focus on what needs to be done to get there and how quickly, given the need to ensure other outcomes such as resilient and profitable farm businesses and prosperous rural communities are also met. Obtaining agreement on a common outcome will often require considerable effort and patience, including work in explaining why a particular river or lake is valued and a realistic understanding of what it takes to maintain or enhance those values.

Perhaps by increasing farmer knowledge of their catchment, its values, and its environmental risks, they will gain a better appreciation and understanding of their local environment. This may help motivate farmers into action, and provide catchment specific foci in terms of contaminant management. Catchment stories like those used by Hawkes Bay Regional Council in the Tukituki Catchment have proven useful in achieving stronger linkages between rural communities and their local environments.

Get Ahead of Regulation

A common reason given for honest and effective communication not taking place is the view that positions need to be preserved for future adversarial processes and the more one concedes and discloses before-hand, the weaker one's position at future adversarial processes. Fortunately there is a solution, namely to get ahead of the need for regulation and the adversarial processes that seem to be part and parcel of creating them. This may seem overly optimistic and perhaps even naïve, but adversarial processes whereby control over the

outcome is handed over to others will for many be strong motivation to examine other alternatives.

The earlier the engagement with regulatory processes the better one can inform and influence, but getting ahead of them puts control fairly and squarely in the hands of those often best-placed to know what needs to be done to achieve outcomes and can be most creative and innovative in taking the right actions to ensure they are met. It requires agreement and commitment to common outcomes and shared understandings and strong leadership, but has multiple benefits with regulation essentially relegated to dealing with the unwilling who may otherwise compromise the ability to achieve agreed outcomes.

Use OVERSEER® Appropriately

As mentioned earlier OVERSEER is best used in manner that relies on its ability to generate comparative rather than absolute estimates. If it is used to determine compliance with fixed thresholds in plans, version change needs careful management, for example Lake Taupo catchment where the version is fixed; or Rotorua Lakes where there is a proposal to use reference files to update thresholds whenever a new version is released. Regardless of how it is used in regulation, preparing an OVERSEER budget requires qualified professionals and compliance with a common set of standards.

While OVERSEER is often criticised for any number of reasons including the fact that it is a model and often produces different estimates when new versions are released, we believe that used appropriately it is a very useful if not essential tool in managing diffusely sourced nutrient losses. Any debate around allocation and re-allocation of nitrogen within a cap becomes meaningless without a tool such as OVERSEER to estimate losses from various alternative land uses. It allows farmers the flexibility to intensify and change land use and demonstrate that losses before and after are within whatever limits apply. It enables regional councils the ability to quantify the environment's ability to absorb nutrients and if reductions are required at source, provides a tool farmers can use to determine their options in achieving those reductions.

As mentioned earlier, guidance on appropriate use is addressed in these proceedings in the paper written by Warwick Murray and Mike Freeman.

Building Capacity

Last but certainly not least, it is clear to us that the relatively new challenge of managing diffusely sourced nutrients requires a new set of skills for all involved – regulators, rural professionals, land-owners and many others. It needs knowledge of nutrient sources and sinks, options for mitigation, prioritising mitigations and generating action plans, Farm Environment Plans, audits and how to ensure consistency

It requires knowledge of the effectiveness of interventions and cost-benefit of determining which ones suit a particular property given all its specifics. It requires knowledge of farm

systems and OVERSEER, the ability to participate and lead collaborative processes, working with those who hold different and opposing views, the list goes on.

This begs the question as to who should take the lead in building this capacity – is this a role for professional institutes? Academic establishments? Government? All of these? Regardless of the answer, it is clear that upskilling has to occur and that will only happen if that is acknowledged and steps taken to address.

Key Messages

Without detracting from the multiple messages set out above, about which we could write a lot more, we would like to leave the reader with three key messages.

1. Firstly, the need to manage diffusely sourced nutrients is here to stay. It is not a passing fad that will go away after the next election;

2. Secondly rural professionals have a significant role to play – the challenge posed by managing diffusely sourced nutrients needs leaders willing to help their clients face reality and guide them through the process of understanding what it means for their farm businesses. For many it may involve just multiple small actions that cumulatively add up to a significant drop in loss with time to prioritise and address, rather than any drastic change; and

3. Regulation on its own will not address the challenge and may not be the best place to begin but is likely to be there at the finish – it needs all the tools in the toolbox with broad commitment generated by genuine buy-in to addressing and dealing with the challenge.

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