

THE ROLE OF NUTRIENT BUDGETING IN FARM AND ENVIRONMENTAL MANAGEMENT

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Introduction

Nutrient budgeting has become an essential tool for many farmers in New Zealand in both farm and environmental management. It has become essential to assist farmers improve the efficiency of nutrient applications on farm and essential in different regions in New Zealand as a tool to meet nutrient loss restrictions being imposed in regional plans and in farming consents. Nutrient budget on farms is carried out to make predictions for the properties fertiliser demand based on expected losses from crop and animal production and to the wider environment, as well as transfers between different nutrient pools within the farm.

The development and ongoing improvement of the OVERSEER® nutrient budgeting programme provides a powerful modelling tool for farmers and rural professionals to use for nutrient budgeting. OVERSEER has been adopted by many regional councils in New Zealand as a tool to model nitrogen and phosphorous nutrient losses to beyond the root zone and transferred to ground water and surface water.

OVERSEER has become an integral part of nutrient budgeting for achieving farm production and to better manage contaminant losses to water. However, it is not a tool that can be used in isolation. Managing nutrient movements on farm is a challenge for farmers, with the diffuse nature of losses, the higher risks associated with practices such as irrigation, winterfeed grazing, new crops and techniques not yet incorporated into OVERSEER.

The purpose of regulating for nutrient budgets and environmental management on Canterbury farms is to reduce contaminant losses to water, thereby better meeting current community expectations on water quality, (and possibly air quality in the future). Nutrient budgeting is a tool to assist meet this purpose, with OVERSEER the principal modelling tool for calculating nutrient losses.

Farm environment plans are an essential management tool for farmers who need to better manage their contaminant losses, maintain or enhance indigenous biodiversity and cultural values of the environment and to improve water use efficiency.

This paper shares experiences and learnings in Canterbury from a regional council perspective, with an emphasis on an integrated approach that includes nutrient budgeting and other tools that contribute to better environment management.

OVERSEER as a Nutrient Budgeting Tool

Use in production

OVERSEER is the best tool available for modelling nutrient movements in the farming system, including inputs, outputs and losses. It has real strengths and some limitations.

Strengths include:

- It is based on known science.
- It has been validated against field trials.
- It is the best available modelling tool for most farming systems.
- Its value as a predictive tool for modelling different farm system scenarios.
- It provides more robust fertiliser recommendations when used correctly.
- It is currently free to use the programme.
- National Data Input Standards provides guidance for users.

Limitations

- The use of OVERSEER requires specialist training to correctly use it with associated consultancy costs for farmers.
- Some farming systems (e.g. cropping systems) are extremely complex and require more consultancy time and therefore greater costs to farmers.
- The input interface of OVERSEER has opportunity for further development, which will improve user functionality.
- There is variability in the modelling due in part to the complex biogeographical systems which are challenging to model.
- There is a lag between new research data being produced and being incorporated in the model.

Not all farmers use OVERSEER, instead relying on soil test results alone for fertiliser recommendations, or relying solely on custom and practice in past fertiliser applications.

Use for regulation

Regulators have adopted OVERSEER as the most appropriate tool for modelling nutrient losses to water. OVERSEER was developed to assist farmers with their fertiliser recommendations and its ability to model nutrient losses has provided the option for regulators to adopt OVERSEER for regulatory purposes.

Strengths include:

- It is a commonly used tool by the farming industry.
- It is the best available modelling tool for most farming systems.
- It uses information already available that is relatively easily accessible.
- It is currently free to use the programme.
- It provides the option of modelling nutrient losses to water.
- Changes in some on-farm management practices generates changes in modelled nutrient losses to water.

Limitations

- Time consuming to establish the first OVERSEER budget
- Consultancy cost to farmers.
- Farmers are not able to do their own OVERSEER budgets.
- It requires Certified Nutrient Management Advisor (CNMA) registered consultants to carry out the OVERSEER modelling.
- There is an inevitable lag period between the development of new farm management practices and systems and the incorporation of the appropriate modelling in OVERSEER.
- Ongoing changes in OVERSEER versions and consequent changes in the modelled nutrient losses create some difficulties for Planners as they write plan rules.
- It is more complex for arable and horticulture operations, with greater variability and higher consultancy costs.
- Its limitations are criticised by a vocal minority of farmers and others.

OVERSEER is a modelling tool available and suitable for both production and regulatory purposes. There are inevitable limitations in the model and with increased investment in development, some of these limitations will ease.

Good Farm Environment Management

Good environmental management requires farmers to identify their environmental risks, where the risks are located on the property, what the impacts on the environment may be, and to identify the actions they will take to reduce those risks. Environment Canterbury requires a combination of Farm Environment Plans (FEPs), Good Management Practices (GMPs) and a cycle of audits of the FEP, and application of GMPs.

Farm Environment Plans

Environment Canterbury has mandated this through the Land and Water Regional Plan for the areas and farms in Canterbury that are at the higher risk of nutrient loss and where water quality issues are present. The most common situations include Land use consents, Effluent discharge consents and Irrigation consents (water permits). Some other consents may require farmers to have a FEP.

Several irrigation schemes in Canterbury have the responsibility holding the irrigation consent which may have a Nitrogen Discharge Allowance. They have the responsibility of overseeing the individual farm environment plans and managing the audit process.

Farm Environment Plans include seven areas, each of which has a management objective. The management areas to be addressed are:

- Nutrients.
- Irrigation.
- Cultivation and soil structure.
- Animal effluent and solid animal waste.

- Waterbodies (riparian areas, drains, rivers, lakes, wetlands).
- Point Source management (silage pits, farm rubbish pits, offal pits).
- Water use (excluding water associated with irrigation) – stock water and wash-down water.

Each management area has a management objective and a range of targets that farmers need to meet through their Farm Environment Plan and its management actions.

Good Management Practices

The proposed Plan Change 5 (Nutrient Management section) of the Canterbury Regional Council Land and Water Regional Plan (LWRP) has been developed to strengthen management of nutrient losses on farm, and to encourage farmers towards Good Management Practice (GMP).

Good management practices have developed from a collaborative process involving:

- Foundation for Arable Research.
- New Zealand Pork.
- DairyNZ.
- Beef+Lamb New Zealand.
- Horticulture New Zealand.
- Deer Industry New Zealand.
- Environment Canterbury.

This group agreed on a suite of good management practices relating to water quality, as part of the Canterbury Matrix of Good Management Project (MGMP). The MGMP has produced a booklet with higher level GMPS for each industry, which is the basis for the guidance material the respective industries produced for their FEP templates.

The management areas that have the greatest influence on GMP loss rate include:

- Irrigation management practices
- Managing winter feed grazing
- Understanding and applying GMP to nutrient management on the farm.

These are key focus areas for Environment Canterbury Land Management Advisors in their work assisting farmers move towards GMP and reduced contaminant loss to water.

FEP Audit

Audit is a critical part of the good farm environment management for reducing contaminant losses and achieving better environmental outcomes.

Audits are carried out by rural professionals who have been trained by Environment Canterbury. Auditors are required to continue with their professional development as part of keeping up to date and in maintaining audit standards.



Effective audit carried out by trained and professional auditors is essential to set and maintain auditing standards and good auditing practice, thereby setting minimum standards for managing environmental risk through the FEP and GMP practices on farm standards.

Auditors are expected to make decisions based on sighting objective evidence provide by the farm staff. This could include:

- Actual data, photographs, records, reports
- Stated practice, justified with other information provided
- Observation of actual Good Management Practice
- Nutrient budgets
- Field evidence

The certified FEP auditor provides the audit grade and nitrogen losses described in the farmer’s consent to Environment Canterbury. Farmers are expected to achieve the minimum of a B grade for a satisfactory audit standard. Achievement of a C or D grade requires remedial action by the farmer and may trigger intervention by Environment Canterbury.

Overall audit grades are derived from the levels of confidence auditors determine for each FEP management area. Auditors may award a low, medium, or a high level of confidence for each management area after determining how well the objectives in each management area have been met. “A” grades are awarded if the auditor determines a high level of confidence in each management area. “D” grades are awarded where low levels of confidence are awarded in each management area.

Frequency of Audit

Farmers outside of an irrigation scheme may achieve a 3-year return audit period with an A grade, 2 years with a B grade, 1 year for a C grade and 6 months for a D grade. A and B grades are compliant grades, C and D grades are non-compliant.

Auditors must undergo training through a recognised Primary Industry Training Programme.

Integrating GMP and Nutrient Budgeting

Integrating GMP and nutrient budgeting requires a nutrient budgeting tool (based on OVERSEER) where a suite of proxy OVERSEER inputs modelling good management

practices replace actual farm management practices in OVERSEER. This produces a modelled GMP loss rate for a property. This GMP model is proposed in Plan Change 5 of the Canterbury Regional Council Land and Water Regional Plan in the regionwide policy and rules for nutrient management. This proposal attracted submissions from individuals and industry bodies and the proposed plan has not completed the appeal process at the time of writing.

The PORTAL and GMP

The proposed changes include the development of a web based model “The Portal” where farmers may submit their OVERSEER budget which is used to generate and GMP loss rate for nitrogen. The development of the Portal and the matrix of Good Management sets out an alternative to that of relying solely on setting OVERSEER modelled limits to effectively manage nutrient losses. Farmers have a time available to prepare themselves for these changes.

Farmers are expected to farm at good management practice (GMP) to reduce their contaminant losses to the environment to a level that can be reasonably expected. The PORTAL provides GMP Nitrogen loss targets for that farming system. This may require changes to farming practices to achieve those modelled GMP loss rates.

The PORTAL is a licensed version of OVERSEER, with GMP proxies built into it and is accessed through the Portal. (<https://farmportal.ecan.govt.nz/>).

Farmers will use the PORTAL to establish GMP loss rates for the baseline years and for their annual nutrient losses. The loss rates are generated when the relevant OVERSEER™ files are uploaded in to the PORTAL, which then generates the GMP loss rate.

Farmers are expected to adopt the industry agreed GMPS and to have incorporated these into their FEP.

In this way, farmers will be assessed on their ability to manage their nutrient losses through applying appropriate good management practices on farm which are incorporated in their FEPs and assessed through the Audit process.

The “Gatekeeper” – N-Check

Currently many farmers are in a position where they need to have an OVERSEER budget to determine if they need an OVERSEER budget.

Some other farmers struggle with the complexity of OVERSEER budgets as they apply to their property. Because of this, the Arable and Horticulture industry have been allowed to use NCheck as a modelling tool instead of OVERSEER until 2020.

Farmers may use NCheck to establish if they need a consent which requires an OVERSEER budget. This provision allows farmers to quickly check if their farming system is within or outside of a plan limit or threshold requiring a land use consent.

NCheck is available through the Portal and is a coarser model than OVERSEER. Validation tests have shown reasonable alignment with OVERSEER nutrient budgets.

The strengths of NCheck are:

- It is available on-line.

- It is quick and easy for farmers to use.
- It requires fewer inputs as it includes built in assumptions about inputs such as soil tests, fertiliser, irrigation practices and livestock performance.
- The model is spatially aligned with land parcels and SMap soil types. All consents within the selected land parcels are identified.

Limitations include:

- Coarser modelling.
- Inability to differentiate some farming systems (e.g. low fertiliser input systems, high producing systems).

Conclusions

The challenge to farmers of reducing contaminant losses to water is considerable. It is one of the most significant challenges farmers may experience in their lifetime as farmers. The need to reduce contaminant losses to water is increasingly demanded by local communities and overseas markets.

OVERSEER is an essential tool to assist farmers manage farm production better, and manage their contaminant losses to water within a more stringent regulatory environment. Alone, the use of OVERSEER creates additional challenges for farmers and for regulators such as Environment Canterbury.

The development and use of additional tools that include the Farm Environment Plan, Good Management Practices in operating a farm, regular audits to independently confirm how well farmers are managing their environmental risks are essential in providing a more robust and grounded approach to reducing nutrient losses to water.

Farmers have increasingly accepted the need to employ registered and trained rural professionals for developing their OVERSEER budgets, and Farm Environment Plans, as well as carrying out independent audits of their farming practices.