

SNAKES AND LADDERS: HELPING FARMERS IMPLEMENT THE NUTRIENT MANAGEMENT PROVISIONS OF THE ECAN LAND AND WATER REGIONAL PLAN

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Abstract

Environment Canterbury's operative Land and Water Regional Plan (LWRP) has a requirement for some 8000 farmers and growers to estimate their annual N loss below the root zone using the latest version of OVERSEER[®]. Additionally they are also required to estimate their baseline N loss below the root zone for the years 2009 to 2013 using OVERSEER[®].

The fertiliser industry, that is principally Ballance Agri Nutrients and Ravensdown, have around 140 technical service representatives and agri-managers between them nationwide. Around 15 of these staff operate in the Canterbury region and are trained and competent in using the nutrient budgeting tool.

While there is an expectation both within the fertiliser industry itself but also the Regional Council that fertiliser co-operative staff will be involved in providing both annual N loss estimates and baseline N losses to assist our shareholders to retain their 'licence to operate' it is also recognised that there is a capability shortage. Private agricultural consultants, Irrigation consultants and staff working within irrigation companies also prepare nutrient budgets using OVERSEER[®], which assists in bridging the capability shortage.

In order to ensure consistency in the delivery of nutrient management services consistent with the LWRP to the farmers and growers in Canterbury an informal 'Implementation Committee' was formed consisting of staff from the Regional Council, private consultants (NZIPIM), irrigation company representatives and the two fertiliser co-operatives.

This paper discusses some of the issues that have surfaced around farmer awareness of the Plan and its ramifications, prioritising which farms are modelled first, data inputs, what constitutes significant 'change' in a farm system, OVERSEER[®] capability in modelling farm systems and other initiatives taken to assist farmers meet the requirements of the Plan.

The fertiliser industry role in nutrient management

The fertiliser industry works to support our shareholder farmers to retain their 'licence to operate' by giving evidence at Regional Plan Hearings and in the Environment Court. Both companies are signatories to the Sustainable Dairying:Water Accord (SDWA) as Supporting Partners and as such provide nutrient budgeting services to all dairy companies so they can meet their N loss and nitrogen conversion efficiency (NCE) reporting requirements for the SDWA. Additionally both companies work actively with Regional councils to assist in the implementation of Plan Changes, for example this is especially happening in the ECAN, Horizons and Otago regions currently. Given that new rules are in place, Ravensdown has also initiated a commercial consultancy service (Optimiser[™] Environmental analysis and

planning service) for farmer shareholders who require nutrient advice, particularly around N loss, for consent purposes.

The fertiliser industry has neither the Rule Book (this is the regional councils' ambit) nor do we have the cheque book (that belongs to the farmer) but as much as we are able we assist to enable the farmers to retain their 'licence to operate' by using our nutrient management services. Under the LWRP as it is currently being implemented there is a requirement to provide Baseline N loss estimates (average of the years 2009 to 2013) and Annual N loss estimates (2014 onwards) for around 8000 dairy, dairy support, arable and sheep/beef/deer farms. These are required to determine whether the current and future farm activities fall into the consent categories of Permitted, Restricted Discretionary or Prohibited activities.

Implementation Committee

As the LWRP implementation process gathered steam a number of issues surfaced around the use of OVERSEER[®] to best model the many and various farm system permutations and combinations. It was also clear to ECAN that the fertiliser industry alone could not provide all the capability required for the task. In order to facilitate implementation ECAN formed an Implementation Committee comprising Council staff, private consultants, Dairy NZ, fertiliser industry representatives and irrigation company staff to discuss and advise on OVERSEER[®] use issues such as bug fixes, 'work arounds' (i.e., whereby it was not possible to exactly model parts of the farm system and what was the next best method), use of the Best Practice Data Input Standards, priority setting (i.e., which farm systems to deal with first) and discussions around capacity, capability and certification of nutrient management advisors.

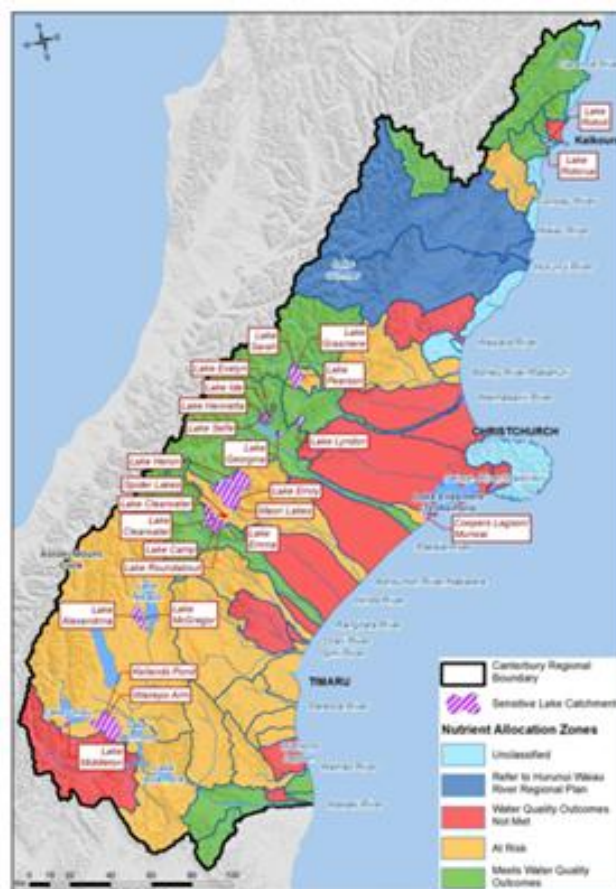


Figure 1: Nutrient Allocation Zones in Canterbury

What impact is the LWRP having on Canterbury farmers?

The restrictions around N loss depend on where the farm is situated relative to 5 different nutrient allocation zones across Canterbury (red, orange, green, light blue and dark blue – see Figure 1).

While all the above has been going on farmers have continued to farm (business as usual), have wished to get consent to change land use, have bought and sold land and entered into leasehold arrangements. Any farmer undertaking any endeavour outside of business as usual would have been wise to undertake due diligence with respect to Baseline N loss estimates compared to the annual N loss estimate for the planned farming operation.

The following Case Studies indicate some of the issues facing farmers in the new world of the LWRP.

Case Study 1: Lincoln University Dairy Farm (LUDF) – NOT business as usual

This farm, in the Selwyn-Te Waihora Water Management Zone (WMZ), lies in a **RED** zone where farms are not permitted to increase annual N loss above their baseline. These farms must apply for Restricted Discretionary Activity (RDA) consent by 2017 and must also have developed a Farm Environmental Plan (FEP).

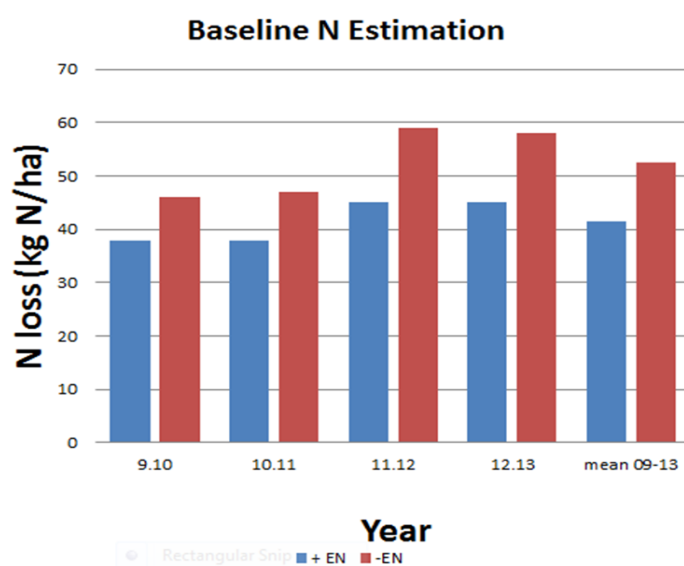


Figure 2: Baseline N loss estimates for LUDF

The Lincoln farm has an estimated average N loss of 52 kg N/ha over the years 2009 and 2013 when the effect of using Eco N is removed from the nutrient budgeting (red columns Figure 2). The Implementation Committee decided that where farms in Canterbury had used Eco N during the baseline period that this should not disadvantage those farmers. LUDF used Eco N over the 4 baseline years and the impact of that was to reduce average N loss to 42 kg N/ha (blue columns – Figure 2). The South Island Dairy Development Centre (SIDDC) Board and Lincoln University decided to voluntarily adopt the lower estimate (42 kg N/ha) as their baseline N loss, in order to show leadership to Canterbury dairy farms. A description of what happened during the change management process in the transition year dairy season (2013/14) is given elsewhere in these Proceedings. In the current dairy year (2014/15) further changes have been made (Table 1).

	Baseline Years	2014/15 Season
Total MS (kg)	284000	280000
MS/ha	1755	1750
Peak cows	650	560
Stocking rate (c/ha)	4.05	3.50
Supplements (kg DM/cow)	388	300
N fertiliser (kg N/ha)	285	150
Farm working expenses (\$/kg MS)	\$3.74	\$4.00

Table 1: Change management at LUDF required to stay at baseline N loss.

Essentially, there has been a significant reduction in cow numbers with a focus now on per cow performance rather than per hectare production and a decrease in the amount of fertiliser N applied (Table 1). What the table does not show is the pasture and herd management changes that are being required to ensure maintenance of pasture quality and growth rate and cow production and live weight. Whether or not the production goal of 280000 kg milk solids (MS) will be reached this season is yet to be seen.

A future challenge for this farm is that the Selwyn – Te Waihora WMZ Committee have proposed in Variation 1 of the LWRP that all dairy farms must reduce their baseline N loss by 30% by 2022!

Case Study 2: The ‘Starship Enterprise’ – an automated dairy farm

This farm in South Canterbury (Figure 3) was converted in 2013 from a dairy support to dairy farm, complete with robotic milking machines and all that they entail.



Figure 3: The South Canterbury automated dairy farm

The farm is in an **ORANGE** zone where annual N loss must be ≤ 5 kg N/ha compared to the baseline N loss, must apply for an RDA by 2016 and have an FEP. This farm was a dryland

dairy support (young stock and cow wintering) and using OVERSEER[®] data input guidance from ECAN the baseline N loss estimate was 38 kg N/ha (using Version 5.9.3). When the planned irrigated dairy farm was modelled (154 ha, 400 cows, 200,000 kg MS) the N loss was estimated at 42 kg N/ha (Version 5.9.3). Thus, this was within the 5 kg N/ha allowable increase and was granted a consent on that basis. However, an OVERSEER[®] version change (Version 6.1.3) altered the N loss estimates to 25 and 37 kg N/ha respectively. The farm was now outside the allowable 5 kg N/ha increase. At the same time the Best Practice Data Input Standards were produced for the first time and ECAN requested that the calculations be repeated following these Standards. The baseline N loss estimate then became 8 kg N/ha and for the dairy farm 20 kg N/ha. At this N loss, the dairy farm becomes a Permitted Activity rather than an RDA.

However, the farmer has said that under the current operating environment the farm is not profitable enough and he wants to increase cow numbers to 500, production to 250,000 kg MS and will use less N fertiliser. The estimated annual N loss from this system is 22 kg N/ha which puts the farmer back into an RDA category.

An important footnote here is that while the estimate of N loss changes depending on the OVERSEER[®] version and how data is entered, the actual N load reaching the receiving water has not changed, except where the land use changed from dairy support to dairy.

Case Study 3: Land Use Change in the Hurunui/Waiau WMZ

This area has its own Plan – the Hurunui Waiau River Regional Plan. This WMZ is shown by the **DARK BLUE** area in Figure 1. In this WMZ a Permitted Activity Consent can be given provided that there is no more than a 10% increase in estimated N and P loss.

The farmer wanted to convert his 498ha dairy support block into a dairy farm. The farm contains a mix of well to poorly drained soils, winters 3000 cows and in calf heifers and 1000 yearlings. Fodder beet, maize and triticale are grown as well as pasture silage (some of which is exported). The farm is irrigated and on average 166 kg N/ha is used. The dairy support operation was estimated to have an N loss of 37 kg N/ha and a P loss of 0.7 kg P/ha (including 43 kg P from ‘Other sources’).

The proposed dairy farm would milk 1500 cows at peak and produce 690,000 kg MS. No crops would be grown on the property and 634 tDM of barley would be imported as supplementary feed. Pasture silage (503 tDM) would be made and fed out on farm. The farm dairy effluent would be collected into holding ponds, the solids separated and the liquid sprayed onto 321 ha of the farm. An average of 238 kg N/ha would be used with maintenance P and S. When entered into OVERSEER[®], the N loss estimate remained at 37 kg N/ha (while this may seem coincidental careful consideration to the system design meant that the farm productivity goals could be achieved while ensuring animals were well fed). However, the whole farm P loss estimate increased from 0.7 to 1.0 kg P/ha and included 231 kg P from ‘Other Sources’. This increase in Other Source P is in spite of the fact that cows are no longer wintered on forage crops and no cultivation is used. The actual Block P losses decreased from 0.7 to 0.6 kg P/ha, but the Other Sources pushed the whole farm average above the allowable 10% increase in P loss. The P generated from ‘Other Sources’ when converting to dairying are assumed to come from farm infrastructure like tracks, hard stand areas and so on (D Wheeler, *personal communication*) but were originally not included in the P loss sub model in OVERSEER[®] (R McDowell, *personal communication*). In order to get this consent through the Council, it is necessary to attempt to provide other evidence (than just the P loss estimate) to support the application and this proves difficult to find.

Case Study 4: Proposed increased dairy support plus irrigation in North Canterbury

This large 1489 ha sheep/beef/deer/dairy support farm sits astride two zones (Fig. 4) – **RED** and **LIGHT BLUE** (where N loss is permitted to increase by ≤ 5 kg N/ha compared to the baseline N loss)



Figure 4: North Canterbury farm showing the two nutrient allocation zones.

This farm has a range of soils from well to poorly drained soils and currently runs 1525 ewes, 679 beef, 135 deer, 800 dairy heifers and 680 dairy cows (wintered). Along with pasture 34ha of kale and 40ha Lucerne is grown. The overall N fertiliser applied is 20 kg N/ha. The farmer wished to increase the amount of dairy support on this farm and add a small area of irrigation to benefit dry season feed supply. The baseline N loss for the current system was an existing loss of 18 kg N/ha from the red zone and 5 from the light blue zone on the farm, which gave a whole farm average loss of 12 kg N/ha (Table 2). The question was what changes would be required to remain compliant with the Permitted Activity consent conditions for the nutrient allocation zones relevant for this farm.

The system redesign required the following changes: The increase in dairy support by bringing in 3000 dairy cows to winter and to run 2050 R1 and R2 dairy heifers as well as add 30ha irrigation on the lighter country required that the beef cows were sold off, the winter kale was replaced with fodder beet and the Lucerne area reduced from 40 down to 10ha. A pasture cut and carry block was also required on the lighter irrigated soils. Provided the changes required (through scenario modelling using OVERSEER[®]) were carried out the new system would meet the PA consent conditions of no N increase in the red zone and ≤ 5 kg N/ha increase in N loss from the light blue zone (Table 2).

	Baseline System	New system
N loss (kg N/ha) red	18	18
N loss (kg N/ha) blue	5	7
Whole farm (kg N/ha)	12	13

Table 2: Comparison of N loss estimates between current and proposed farm system

Concluding Remarks

As the LWRP begins to be implemented there have already been significant impacts on farmers and farm systems. These include an increased cost of compliance (time, effort and money) and in order for some farmers to move their businesses forward there has been significant farm system change required to minimise the effect of restrictive consent conditions on their business and/or permit farmers to operate the system they deem best suited to their business objectives.

One lesson from this is that accurate farmer record keeping and retention (of these records) is important to enable the best estimate of the baseline N loss for a farm. The author understands that banks are requiring N loss information before approving loans to ensure that the purchaser will be able to do what they plan on the property in question and additionally that some sale and purchase and lease agreements have failed, as well as development plans either not able to be completed or at best requiring significant modification.

While the LWRP is the overarching Plan for the Canterbury Region, each Water Management Zone Committee is and may well recommend even more stringent N loss reduction targets in the future. This has already happened with the Selwyn-Te Waihora WMZ (Plan Change 1) and is imminent with the Hinds WMZ (Plan Change 2). Depending on the severity of the loss reduction targets, it can be expected that this will impact further on farmers and their businesses.