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**BEFORE THE ENVIRONMENT COURT**

*Under* the Resource Management Act 1991 ("Act")

*In the matter of* appeals under clause 14 of the First Schedule to the Act concerning the Proposed One Plan for the Manawatu-Wanganui Region and the topic of Surface Water Quality

*between* **FEDERATED FARMERS OF NEW ZEALAND**  
ENV-2010-WLG-000148

*and* **MINISTER OF CONSERVATION**  
ENV-2010-WLG-000151

*and* **DAY, MR ANDREW**  
ENV-2010-WLG-000158

*and* **HORTICULTURE NEW ZEALAND**  
ENV-2010-WLG-000155

*and* **WELLINGTON FISH & GAME COUNCIL**  
ENV-2010-WLG-000157

*and* **FEDERATED FARMERS OF NEW ZEALAND**  
ENV-2010-WLG-000148

*Appellants*

*and* **MANAWATU-WANGANUI REGIONAL COUNCIL**

*Respondent*

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**ADDITIONAL STATEMENT OF REBUTTAL EVIDENCE OF DR ALISON MARY DEWES  
ON THE TOPIC OF WATER QUALITY ON BEHALF OF THE MINISTER OF  
CONSERVATION AND WELLINGTON FISH & GAME COUNCIL**

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Dated: 15 MAY 2012

## **INTRODUCTION**

1. My full name is Alison Mary Dewes. A full description of my qualifications and experience was provided in my evidence in chief dated 14 March 2012, which was filed with the Court. I repeat the confirmation given in that evidence that I have read and agree to comply with the Code of Conduct for Expert Witnesses.

## **PURPOSE AND SCOPE OF EVIDENCE**

2. The statements of evidence in reply lodged by Dr Ledgard, Dr Scarsbrook, and Mr Willis on behalf of Fonterra contained, or referred to, new technical evidence in relation to land use and water quality modelling which was not contained in their evidence in chief.
3. The purpose of this evidence is to respond to specific points relating to this new technical evidence.
4. I have also read Dr Roygard's supplementary statement of evidence, dated 27<sup>th</sup> April 2012, Dr Roygard and Ms Clark's statement of further information dated 9 May 2012, Dr Ledgard's supplementary statement of evidence dated 26 April 2012, and Mr Hansen's supplementary statement of evidence dated 4 May 2012.
5. In this evidence, I comment on that material that relates to my areas of expertise.

## **ISSUES OF CONTENTION**

6. In his statement of evidence in reply (dated 18 April 2012), Dr Ledgard presents a number of potential future Dairy Farm N leaching scenarios, based on a number of assumptions. This modelling is then used by Dr Scarsbrook and Mr Willis in their statements of evidence in reply (dated 18 April 2012), to compare the outcomes of the land use/N-loss scenarios presented by Dr Ledgard with the outcomes of modelling undertaken by Dr Roygard and Dr Ausseil. Based on the results of this comparison, Dr Scarsbrook and Mr Willis then draw conclusions relating to the respective merits of the different management regimes proposed.
7. I have a number of concerns about the modelling undertaken by Dr Ledgard, and correspondingly with the attempt that Mr Willis and Dr Scarsbrook make at comparing the outcomes of the different regulatory approaches proposed

(Fonterra, Horizons, and WFGC)..I consider these mean that their modelling and their conclusions are invalid.

8. Dr Roygard in his supplementary statement of evidence (27 April 2012) discusses the limitations of Dr Ledgards modelling, I agree with his evidence and concur with his conclusions. Dr Ausseil discusses the limitations of the evidence provided by Dr Scarsbrook and Mr Willis I agree with his evidence and concur with his conclusions.
9. The following evidence discusses the modelling undertaken by Dr Ledgard (18 April 2012), and the failure of Dr Scarsbrook to account for intensification of land uses in his river SIN modelling (18 April 2012).
10. The issues I have identified from Dr Ledgards modelling evidence (Appendix B, 18 April 2012), and Dr Scarsbrook modelling evidence (section 20, 18 April 2012) are summarised below and elaborated on further later in this evidence as required:
  - a. Dr Ledgards use of average nitrogen leaching regional data rather than catchment specific nitrogen leaching data from dairy farms is not appropriate to determine catchment specific outcomes of modelling;
  - b. Assumptions made by Dr Ledgard in his modelling are unlikely to be correct, I do not have the information I would need to validate them, and I cannot clearly quantify them based on the limited data that has been provided to me;
  - c. Dr Ledgards modelling represents a “best case scenario”. It relies on farmers voluntarily reducing nitrogen leaching and is not solely based on the regulatory regime proposed by Fonterra. This means that comparisons cannot be made with Horizons and WFGC modelling, which represent “worse case scenarios” (by presuming that all dairy farmers including new dairy farms leach up to the maximum allowed LUC number), under their proposed controlled rules. Comparing the outcomes of regimes on this basis is not valid as it does not provide an equitable platform for comparing the merits of the different management regimes.
  - d. While Dr Ledgard does include dairy intensification scenarios over 10 and 20 years, these have not been used by Dr Scarbrook in his in river SIN load modelling (as is discussed further in the supplementary rebuttal evidence of

Dr Ausseil). This means that the modelling by Dr Scarsbrook does not include the contribution new dairy farms leaching at LUC year 1 targets make to in river SIN loads;

- e. Mr Willis proposes a 10 year timeframe instead of a 20 year timeframe in regards to modelling. In my opinion a 20 year timeframe is more appropriate as farmers affected by such a regime require a degree of business certainty, in order to plan and invest capital, either in their own land, or in new land acquisitions.
  - f. As Dr Scarsbrook's modelling is based on the in river SIN load modelling of Dr Roygard, it assumes that all other Land Uses remain leaching at their current levels (ie: Sheep and Beef extensive farms remain at 10 kg N leached per ha per year in perpetuity) and does not account for any support for potential growth in dairying, or growth and intensification of cropping on a range of land uses, or of Horticulture. It therefore does not establish whether or not the Fonterra approach is robust enough to account for intensification of land use while still maintaining or improving water quality.
11. In summary my conclusion is that the modelling undertaken by Dr Ledgard does not represent a basis for fair comparison between Fonterra's approach and that of Horizons and WFGC. My conclusion is that Fonterra's proposals have not been modelled on reasonable assumptions. Consequently, the comparisons of Fonterra's proposed regime made by Mr Willis and Dr Scarsbrook, with the proposals of other parties who have modelled their proposals, are inappropriate and invalid.

## **USE OF REGIONAL AVERAGE DATA**

12. In order to enable me to validate Dr Ledgard's scenario modelling assumptions including the use of the 27kgN/ha/yr threshold, WFGC requested the farm information including supporting OVERSEER files used by Fonterra in informing regional nitrogen leaching distributions (as summarised under paragraphs 10 and 11, Dr Ledgard, EiC, 2012), along with the Ravensdown farm survey data, and supporting OVERSEER files (paragraph 2, Dr Ledgard statement of evidence in reply, 2012).

13. In response to these requests for information by counsel for WFGC, Fonterra provided selected sections from the DairyNZ nutrient budget report, but did not provide a catchment specific breakdown of the raw data, or the supporting OVERSEER files, nor did they provide the Ravensdown farm survey data or supporting files.
14. Dr Ledgard in his evidence in reply refers to a communication from A Metherell of Ravensdown. WF&GC initial request for this resulted in Dr Ledgard's supplementary statement of evidence dated 26 April 2012, however this evidence does not contain the data requested by WF&GC
15. WF&GC then requested the information from Ravensdown. Ravensdown, provided the email exchange (dated 11 April 2012) between Mr Metherell and Dr Ledgard with some further data (attached as Appendix 1). However, none of that contains the information that WFGC requested or I require.
16. The limited data, and email exchange between Alistar Metherell and Dr Ledgard (dated 11 April 2012) provided by Ravensdown provide summaries of the following:
  - a) Average Concentration of N in groundwater;
  - b) Number of Dairy Herds Grazed off, (but no detail on how many animals nor period of time);
  - c) The number of Fodder Crop Blocks over the total number of blocks, and d) the number of farmers using Eco N - very few.
17. This information indicates that one of Dr Ledgard's assumptions in regards to 20% use of winter crops (paragraph 2, statement of evidence in reply, 2012) is likely to be incorrect, with the percentage more likely to be 36%. A. Metherell states in his email correspondence, that there are 49 fodder blocks out of a total of total 521 Blocks from the total overseer data. However, he notes this probably means 49/134 farms or 36%).
18. As I have not been provided with any useful data for modelling to allow me to validate Dr Ledgard's assumptions, or compare similar catchment modelling scenarios with catchment specific data from the Fertiliser Industry Dataset (point

10 Ledgard EIC), but rather have been provided with limited data that appears to be at least partly in conflict with Dr. Ledgard's earlier evidence, I find it impossible to compare the various regimes based on Dr Ledgard's modelling, or draw any conclusions from it which would be of use to the Court. In my opinion, without an opportunity for me and for other witnesses to assess the data Dr Ledgard relies on for his modelling, Dr Ledgard's modelling cannot be relied upon by the Court.

19. Dr Roygard and Ms Clark's statement of further information on 9 May has now provided a summary of data held by Horizons, including catchment statistics. While this information is useful in determining catchment specific nitrogen leaching summary statistics, it cannot be used to validate the assumptions made by Dr Ledgard.
20. Dr Roygard discusses the issues associated with Dr Ledgard's use, in his scenario modelling, of regional average nitrogen leaching data rather than catchment specific nitrogen leaching data. I concur with Dr Roygard's comments and conclusions. In addition I would add that this averaging in itself presents a problem, as the averaging of data across a rainfall differential of 1000 mm (range between 900 mm in the coastal Rangitikei to 1800 mm Mangatainoka) means that there could be significant biophysical and climatic challenges that are not able to be differentiated. The impact of this rainfall differential (1000mm) on Overseer derived nitrogen leaching rates may be as much as 20-30%.
21. Also, the assumption in paragraph 8 of Dr Ledgard's statement of evidence in reply (18 April 2012) that "*the relativity of the different LUC classes remains the same as for current dairying in the region and that the conversions would operate at the LUC class N leaching limits (ie an overall average of 22.8kg N/ha/yr)*" is inaccurate.
22. The use of regional average LUC derived leaching rates is inappropriate in regards to modelling catchment outcomes, as the distribution of LUC class land and corresponding Table 13.2 derived LUC based nitrogen leaching rates are catchment specific. This means that catchments with a higher proportion of high class (LUC class I to IV) LUC land will have higher nitrogen leaching loss values, in comparison with catchments with more LUC class IV to VII land, under intensification of new dairy scenarios. The zone average leaching rate based on application of table 13.2 year 1 LUC targets, for examples, is 21.8kgN/ha/yr for

Hopelands, 22.2kgN/ha/yr for the Mangatainoka catchment, and 25.2kgN/ha/yr for the Coastal Rangitikei catchment.

23. Dr Ledgards scenario two as modelled by Dr Scarsbrook, does not take into account new dairy farming which is proposed to be controlled under rule 13-1B if they can meet the Table 13.2 year 1 LUC limits. Both Horizons and WFGC included 11% intensification of dairy farming in their modelling, and WFGC also included 18% intensification of dairy, which the experts in conferencing have also agreed is likely. Determination of total leaching from current and new dairy farming needs to take into account the addition of new land under dairy which is leaching at the year 1 LUC targets specified in Table 13.2. It is the total or catchment specific cumulative nitrogen leaching amount, which is important.

#### **DR LEDGARDS MODELLING ASSUMPTIONS AND APPLICATION OF 'POTENTIALLY ACHIEVABLE SCENARIOS' RATHER THAN 'WORSE CASE SCENARIOS'**

24. Dr Ledgard in modelling Fonterras proposed regulatory regime has proposed a number of scenarios based on assumptions around reduction in nitrogen leaching. For scenario 2 (20.6kgN/ha/yr) which was adopted by Dr Scarsbrook and used to determine water quality outcomes, Dr Ledgard assumed that farms leaching above 27kgN/ha/yr would voluntarily reduce leaching by 7.6kgN/ha (22% drop) over a timeframe that is unclear, through adoption of tier 1 mitigation measures, and that of those farms leaching below 27kgN/ha/yr  $\frac{1}{4}$  would adopt N mitigations and reduce leaching voluntarily, while  $\frac{1}{2}$  would stay at grand parented rate, and  $\frac{1}{4}$  would increase leaching by 10% (I note that as proposed by Mr Willis those farms wishing to increase leaching from their grandparented rate would need to be consented under the proposed rule 13-1A Restricted Discretionary).
25. Dr Ledgard makes an assumption that farmers will voluntarily implement the Tier One mitigations as long as it is reasonably practical to do so. The assumption is also made on the basis that farmers will do this voluntarily, and there is no set time frame within which, farmers will need to implement these changes.
26. A number of Tier one mitigation options are more than just small changes, and are likely to involve some capital investment and alignment of the farm system in a way that will require commitment and change. It is unlikely that farmers will feel

compulsion to reconfigure their farm systems under a voluntary regime to the extent assumed by Dr Ledgard. Although, these changes may deliver more profitable and resilient farm systems, as described in my EIC.

27. Adoption of tier 1 mitigation measures assume that farmers will reduce their use of nitrogen fertiliser and configure their systems to use more bought in, low protein feeds to fill the “gap.” See Table 1 below. In order to do this in a sound, highly efficient and profitable manner, farmers will need to invest in feeding infrastructure to ensure low rates of feed wastage and utilisation. These sorts of changes will require a degree of system change, and investment. A feed pad with the associated infrastructure, to utilise maize silage is generally required in order to ensure that the low protein feed is efficiently utilised. This could be a cost in the order of \$200-\$350K for a farmer to configure the system appropriately..
28. Similarly, the use of in shed feeding, for the safe, efficient and profitable use of brought in concentrate cereal feeds as described by Andrew Hoggard in his EiC, would be in the range of \$50-100K for the infrastructure to allow this reconfiguration of a farm system for an average farm. It cannot be assumed that all farmers will undergo this sort of investment and embark on a conscious effort to reduce leaching, if in fact they are only subject to the voluntary regime being proposed by Fonterra.

**Table 1. Tier 1 and 2 Mitigation Options and Degree of Potential System Change and Investment**

<b>Tier 1 Mitigation Choices</b> (from table 3 Ledgard EIC)	<b>Potential changes/investment required to realise full benefit.</b>
Reduce N use and replace with low protein feed.	May require installation of in shed feeding system or feed pad + feed out wagon +/- improved effluent storage capacity to ensure high rates of feed and nutrient utilisation (farm system change)
Bought in Feed: Use low protein feed sources rather than bought in pasture silage.	May require installation of in shed feeding system or feed pad + feed out wagon +/- improved effluent storage capacity to ensure high rates of feed and nutrient utilisation (farm system change)
Farm Management Options:	May require in shed feed system or bought in low protein, low



<p>“optimise per cow efficiency” (eg increase milk solids production per cow and decrease stocking rate etc)</p>	<p>fibre feed sources +/- or feed out pad + wagon +/- increased effluent storage.</p> <p>Will also require degree of up skilling in nutrition and management (farm system modification)</p>
<p><b>Tier 2 Mitigation Choice</b></p> <p>Use stand off pads or animal shelters during autumn/winter.</p>	<p>May require significant up front cost, but benefits of improved FCE, pasture protection and feed utilisation are likely to be realised over a 10-20 year time frame (refer to my EIC Appendix A)</p>

29. Dr Ledgards modelling is based on ‘potentially achievable’ scenarios. This means that it represents “best case” outcomes by relying on farmers voluntarily reducing nitrogen leaching. Because it is not solely based on the regulatory regime proposed by Fonterra comparisons between it and Horizons and WFGC modelling, cannot be made. This is because Horizons and WFGC modelling represent “worse case scenarios” by presuming that all dairy farmers will leach up to the maximum allowed under their proposed controlled rules. The outcomes of the different management regimes cannot be usefully compared on this basis, as it does not provide an equitable framework for comparing their merits or likely outcomes.

## TEN YEAR MODELLING TIMEFRAME VS TWENTY YEAR MODELLING TIMEFRAME

30. Mr Willis proposes a 10 year timeframe instead of a 20 year timeframe in regards to modelling. In my opinion a 20 year timeframe is more appropriate because in simple terms: business needs certainty. For farmers to be certain that capital expenditure is appropriate and the true cost benefit is to be realised over time, then consideration of the overall regime and policy framework they are operating under is an important consideration. In my experience, farmers are demonstrating a desire to future proof their farm systems. In fairness to them, a regulatory regime should be established which, from the outset, gives all farmers a degree of business certainty for the longer term (at least twenty years), around how they design their mitigation strategies, and invest their capital.

31. While Dr Ledgard has modelled a 20 year timeframe taking into account intensification of new dairy farming, this has not been modelled in regards to

water quality outcomes. However, Mr Willis states in his rebuttal evidence (footnote 22 in the Rebuttal Evidence of Gerard Willis for Fonterra on page 18) that *“I note that Dr Ledgard also modelled a 20 year scenario. That shows less reduction due to the greater number of conversions that might be expected over the additional 10 years. While there are reductions likely over this time frame, these are more modest (the mostly likely scenario shows an average 0.9 kg N/ha/year reduction)”*. Given my comments above in regards to the assumptions made by Dr Ledgard in his scenario modelling as representing ‘potentially achievable’ scenarios based on voluntarily reducing N leaching, it would appear that Fonterra’s approach at year 20 may not maintain or improve water quality.

## LAND USE INTENSIFICATION SCENARIOS

32. No assessment of potential intensification of land had been made by either Dr Ledgard in regards to non-dairy land uses, or by Dr Scarsbrook in regards to intensification of new dairy farms leaching at table 13.2 LUC targets, or intensification of non-dairy land use. Instead it is assumed that farmers will adopt the Tier one options when there is no clear regime at a whole of catchment level that takes into account improved water quality, where the extensive farms are not included. As discussed in my evidence in chief (paragraphs 5.26, 5.27 and 5.28 ), I believe that dairy farmers will naturally choose to shift their externality of N leaching to the unregulated portion of the catchment, thereby unravelling any potential improvements that could be made should dairying alone take the responsibility for N loads. This presents a significant risk to any proposed regime.
33. The Fonterra Regime, proposes that many of the best available options for mitigation are those that are supported by the use of low protein feeds, and higher feed conversion efficiencies per cow (3 of the top tier 1 mitigation options) yet no allocation for increased cropping or support for dairy by extensive sheep and beef farms has been considered in the modelling scenarios presented by Dr Ledgard, nor considered in his assumptions.
34. This is especially concerning as Dr. Ledgard has highlighted, in regards to supplementary feeding of dairy cows to reduce nitrogen excretion in urine and increase productivity, in his statement of evidence in reply (paragraph 43, 2012) the risk of maize being grown in the catchment, and the corresponding increase

in the contribution of nitrogen to the catchment load. Dr Ledgard states that *“There are a range of N mitigations available to farmers, including use of low-N supplementary feed. This can be a valuable option for intensification and increasing milk production with little increase in N leaching per hectare. However, the relatively high N leaching per hectare from land used to grow the supplementary feed needs to be accounted for, especially if grown within the catchment”*. I agree with Dr. Ledgard on the point 43 in his rebuttal evidence, that more home grown maize can lead to an increased risk of nitrogen and phosphorus leaching/losses from the land, and that is why evidence presented by both myself and Dr Ausseil has given this significant consideration, and has allowed for these mitigations to be shouldered by the balance of the catchment, has modelled this, and explained our assumptions in depth in our evidence in chief (Table 2).

35. Dr. Scarsbrook and Dr. Ledgard provide no explanation as to what the long term trends might be for other land uses to shoulder the responsibility for the SIN loads.

**Table 2. WFGC regime and modelling included and allowed for the following scenarios:**

- Expansion of Dairying of 18% across the whole catchment
- Support for dairy by extensive farms – allowing for a 20-30% increase in leaching from these blocks as they support the dairy industry, or intensify themselves
- Extension of cropping in all catchments, to allow for the implementation of the Tier One Mitigation Options as proposed by Dr. Ledgard such as increased use of low protein feeds – if in fact they were grown in the catchment as an option.
- Intensification of all dairying, up to the allocated LUC numbers as proposed in Table 13.2 of the NV POP.
- Worst case scenario modelling for the whole of catchment.
- A gradual approach to change – with clarity for planning farm system change that is clear at the outset – with a 10 year and 20 year approach for N leaching reductions, allowing for more technical extension, adoption, adaptation and innovation by all classes of agriculture.

## CONCLUSIONS

36. Due to the limitations of the modelling undertaken by Dr Ledgard and Dr Scarsbrook, no fair and rational comparison can be made between Horizons, WFGC and Fonterra's modeled water quality outcomes. In order to enable a comparison between the proposals put forward by Horizons and WFGC against Fonterra's proposal, further modelling of Fonterra's proposal would need to be undertaken. This modelling would need to include use of catchment specific data, model the actual regulatory regimes proposed by the parties, apply the same assumptions (as appropriate and where validated) in all proposals modelled, and should include adoption of the intensification scenarios as discussed in my evidence in chief (2012) and as modelled by Dr Ausseil (Table 19 and 20, EIC 2012).
37. The regime proposed by WFGC, and associated modelling, takes into account the need for long term planning when farmers are considering changes to their farm systems. The WFGC regime, takes into account a whole of catchment approach, and also proposes a sinking lid of N reductions. That way, farmers will plan, there will be evidence based adaptation on farm, and there will be increasing rates of innovation in this area. It is for this reason, that I believe a further reductions in N leaching, as proposed by WFGC, are able to occur over this prolonged 20 year time frame.
38. In summary my conclusion is that the modelling undertaken by Dr Ledgard does not represent a basis for fair comparison. My conclusion is that Fonterra's proposals have not been modelled on reasonable assumptions, and that consequently the comparisons made by Mr Willis and Dr Scarsbrook in respect to the proposal put forward by Horizons and WF&GC have not been carried out on an equitable basis, and are therefore not valid.

**APPENDIX 1. Email correspondence from Mr Alistar Metheral to Dr. Ledgard (dated the 11 April 2012)**



**Corina Jordan**

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**From:** Craig Malone [Craig@berrysimons.co.nz]  
**Sent:** Wednesday, 16 May 2012 12:21 p.m.  
**To:** Burns, John  
**Subject:** FW: Manawatu nutrient budget summary

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**From:** Mark Christensen [mailto:mark.christensen@andersonlloyd.co.nz]  
**Sent:** Tuesday, 1 May 2012 11:58 a.m.  
**To:** Craig Malone  
**Subject:** FW: Manawatu nutrient budget summary

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**Mark Christensen**  
Partner

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**From:** Alister Metherell [mailto:Alister.Metherell@ravensdown.co.nz]  
**Sent:** Monday, 30 April 2012 10:14 a.m.  
**To:** Mark Christensen  
**Cc:** Richard Christie; Shaun Burkett; Samuel Hutchings  
**Subject:** RE: Manawatu nutrient budget summary

OK by me. It supports Stewart's supplementary evidence. I note that there is grammatical problem in Stewart's statement

*DCD use:* Dr Metherell received information from G. Costello (Ravensdown eco-n business manager) on actual eco-N (a commercial DCD product) use in the Region and he advised me that 2% is used by dairy farmer customers.

which should be that eco-n is used by 2% of dairy customers in the region.

Regards

16/05/2012





Alister

**From:** Alister Metherell [<mailto:Alister.Metherell@ravensdown.co.nz>]  
**Sent:** Monday, 30 April 2012 9:43 a.m.  
**To:** Mark Christensen  
**Cc:** Richard Christie; Shaun Burkett  
**Subject:** FW: Manawatu nutrient budget summary

Emails to Stewart Ledgard as requested.  
 Regards  
 Alister Metherell

**Alister Metherell**

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**From:** Alister Metherell  
**Sent:** Wednesday, 11 April 2012 5:03 p.m.  
**To:** 'Ledgard, Stewart'  
**Cc:** Ants Roberts  
**Subject:** RE: Manawatu nutrient budget summary

Hi Stewart,  
 Greg has just sent me a table which shows that about 2% of dairy customers in the region used eco-n.

For fodder crops I would actually say 49 blocks from 134 farms, so 36%. However this will include summer crops such as maize.  
 I can't easily determine the summer - winter split without looking at individual nutrient budgets. We should get some input from the locals on this aspect.

Cheers  
 Alister

**From:** Alister Metherell [<mailto:Alister.Metherell@ravensdown.co.nz>]  
**Sent:** Wednesday, 11 April 2012 3:04 p.m.  
**To:** Ledgard, Stewart  
**Cc:** Ants Roberts  
**Subject:** Manawatu nutrient budget summary

Hi Stewart,  
 For the 2010 nutrient budgets that I had summarised for the earlier exercise only one block in the region has winter N checked.

These tables shows the number of farms using dairy graze off and the relationship with average N leached (concentration and kg/ha).

Region

Manawatu/Wanganui

16/05/2012



Count of Region	DairyGrazeOff		Grand Total
	Average nitrate conc. in drainage (mg N / ml)	No	
2		3	3
3		4	10 14
4		8	16 24
5		9	19 28
6		7	12 19
7		4	8 12
8		5	5 10
9		1	3 4
10		1	2 3
12		1	1
13			1 1
na		1	6 7
<b>Grand Total</b>		<b>44</b>	<b>82 126</b>

kg N leached / ha

Region Manawatu/Wanganui

Count of Region	DairyGrazeOff		Grand Total
	Leach_N	No	
8		1	1
9			1 1
10			2 2
11	2		1 3
12	1		3 4
13			1 1
14	3		7 10
15	3		7 10
16	1		9 10
17	1		6 7
18	2		1 3
19	4		4 8
20			4 4
21	3		5 8
22	2		3 5
23	2		3 5
24	1		4 5
25	2		2 4
26	1		2 3
27	2		2
28			1 1
29	3		1 4



30	3	4	7
31		3	3
32		3	3
33	1	1	2
34	1		1
36		1	1
37	1		1
39	3	3	6
41	1		1
<b>Grand Total</b>	<b>44</b>	<b>82</b>	<b>126</b>

There were only 5 blocks (out of 359) with fodder crops and they all right at the top of kg N leached / ha (41 to 98 kgN/ha).

I was a bit sceptical of the low number of fodder crops. It may just reflect Account Manager confidence in using the model at that time, so I have run the summary for nutrient budgets since March 2011, with the following result. The Rows are kg N leached / ha.

Region Manawatu/Wanganui  
FarmType Dairy

#### Count of BlockType Column Labels

Row Labels	Fodder Crop	House	Pastoral	Riparian areas	Trees	Grand Total
3		2	1	5	24	32
5			2			2
6			2			2
7			6			6
8		1	5			6
9			9			9
10	1		24			25
11		1	14			15
12			34			34
13		2	19			21
14	1		18			19
15			32			32
16	1		27			28
17	2		27			29
18			13			13
19			23			23
20			25			25
21			22			22
22			21			21
23	1		19			20
24	2		10			12
25	2		11			13
26	5		8			13



27	1	6	7			
28	3	7	10			
29	2	13	15			
30		7	7			
31		4	4			
32	1	5	6			
33	3	5	8			
34	1	2	3			
35	2	1	3			
36	2	1	3			
37	1	1	2			
38	2	5	7			
39	1	2	3			
40	1		1			
41		1	1			
42	3	1	4			
44		1	1			
45	3		3			
47		1	1			
48	1		1			
49	2		2			
50		1	1			
52		1	1			
53	1		1			
84	1		1			
92	1		1			
96	1		1			
185	1		1			
<b>Grand Total</b>	<b>49</b>	<b>6</b>	<b>437</b>	<b>5</b>	<b>24</b>	<b>521</b>

This is the distribution of N leached (farm average kg N / ha), by wintering off classification, for the recent data. Again there is not a big effect.

Region Manawatu/Wanganui  
Dairy Dairy

#### Count of Dairy DairyGrazeOff

Leach_N	No	Yes	Grand Total
6		1	1
7	1		1
8		1	1
9	1	2	3
10	2	2	4
11	4	6	10
12	2	6	8





13		4	4
14	1	3	4
15	1	4	5
16	3	9	12
17	5	5	10
18	5	2	7
19	1	5	6
20	6	2	8
21	5	2	7
22	3	2	5
23	1	1	2
24	2	3	5
25		3	3
26		2	2
27	2	3	5
28		1	1
29	1	5	6
30		4	4
31		1	1
32	1		1
33	1	1	2
35	1	1	2
36		1	1
39		1	1
47	1		1
52	1		1
<b>Grand Total</b>	<b>51</b>	<b>83</b>	<b>134</b>

Only 7 out 437 pastoral blocks with winter N in the recent dataset.

Greg Costello has agreed to send some stats on Eco-n usage, but says that it will be very low in the Manawatu.

I hope that this helps with your submissions on the regional plan.

Regards

Alister

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