in the matter of: the Resource Management Act 1991

and: submissions and further submissions in relation to proposed Variation 1 to the proposed Canterbury Land and Water Regional Plan

and: **Fonterra Co-operative Group Limited**
Submitter

and: **DairyNZ**
Submitter

Rebuttal evidence of Duncan Smeaton (farm systems / reductions)

Dated: 8 September 2014

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REBUTTAL EVIDENCE OF DUNCAN SMEATON

INTRODUCTION

1 My name is Duncan Colquhoun Smeaton.

2 My qualifications and experience are set out in my statement of evidence (*EIC*) dated 29 August 2014.

SCOPE OF EVIDENCE

3 In this evidence I address issues raised by Dr Alison Dewes in relation to the ability of farmers to make nutrient loss reductions.

4 As with my EIC, I confirm that I have read the Environment Court practice note and have complied with it in preparing this rebuttal evidence.

Achievability of N loss reductions

5 In her evidence, Dr Dewes infers that dairy farmers can reduce N loss by 60 to 80% whilst maintaining or in some instances even increasing farm profit.

6 However, I consider her findings are based on an assessment of farming systems which are not representative of farms across the catchment. It is unlikely that anywhere near the reductions set out in her evidence will be achievable on the vast majority of properties within the Selwyn Waihora zone – and for some properties, reductions will not be able to be achieved at all without a material and sometimes significant adverse impact on profit

7 In this regard, Dr Dewes provides three case study farms, which are all drawn from outside of the Selwyn Waihora catchment. These include a "*flood irrigated*" (borderdyke) property at Culverden with a high stocking rate (~3.8 cows per hectare) and two farms near Hinds and Ashburton on light soils with high fertiliser loadings and even higher stocking rates per hectare (~4 and ~4.5 cows per hectare).

8 Borderdyke is a relatively rare irrigation system within the Selwyn Waihora Zone – and only about 4% of the catchment remains in currently borderdyke irrigation compared to, as Dr Dewes notes, 18% across the rest of Canterbury. The farm examples of Dr Dewes from Hinds and Ashburton are also not representative of farm systems within the Selwyn Waihora Zone with stocking rates and nutrient losses that are considerably above the average of the farms analysed in my EIC.

9 In this context, based upon the analysis detailed in my EIC, and substantiated by similar robust studies carried out elsewhere in New Zealand, it is possible to reduce N loss by about 15% to 20% with an approximate 5% reduction in operating profit *on average*. Further reductions in N loss are likely to have an increasingly costly impact on operating profit. As is also noted in my EIC, there is substantial farm by farm variation in the response to strategies to reduce N loss.

10 Every farm is different and every farm needs to be considered on a case by case basis. Some farms can make material reductions in N loss with relatively limited cost and little reduction in operating profit. Other farms have very limited ability to further reduce N losses, due to a range of factors, without significantly affecting business viability. It all depends on their starting position.

The effect of mitigation upon profitability

11 A key issue point made by Dr Dewes (para 42, 44, 145, 188, supported by Appendix 2) is that on-farm mitigation which results in significant reductions in N leaching, is usually profitable and helps to reduce business risk even where capital cost is incurred.

12 In my experience, N loss mitigation usually reduces profit; on an increasingly steep response curve, such that increasing mitigation becomes ever more expensive. This point is highlighted in Figure 5 of my EIC.

13 In paragraph 137 & 138 Dr Dewes cites work carried out by myself and Dr Ledgard in the Lake Rotorua catchment in 2005-06 as an example of work that supports her view that mitigation improves profitability. While it is true that we did observe examples of individual farmers who were able to reduce N loss profitably, *on average* they could only reduce N loss by 13% without negatively affecting profit. Those that could reduce N losses profitably, were using N inefficiently in their base case farm scenario or were overstocked. However, since that time, it is my view that farmers have become more efficient users of N fertiliser as awareness of the need for more efficient resource use and stewardship has grown throughout the industry.

14 Dr Dewes also implies (note paras 142 to 165) that N loss mitigation is possible through reductions in stocking rate, which is often linked with increased production per cow. Again, Smeaton and Ledgard (2007) are quoted to support this. We did indeed observe this was possible in our modelling work on farms where the base or status quo scenario was highly stocked. However, as described in my EIC "*Further gains might be possible in the future, due to, for example, higher per cow production at lower stocking rates. In the meantime, this option in my opinion remains out of reach of more*

than 95% of existing dairy farmers." The reasons for stating this are detailed in my EIC, but in essence centre on the management difficulties of running low stocked farms, which rely upon high production per cow and on-going high pasture utilisation. Both these items require a very high level of management skill to achieve a successful result.

15 One significant exception to the point highlighted above is the conversion of a farm from border-dyke to spray irrigation. Such circumstances are likely to result in a substantial reduction in N loss and increases in operating profit, even after allowing for the capital expenditure required to make the change.

16 Care does, however, need to be placed on pushing system upgrades for borderdyke irrigation. In particular, the initial capital expenditure required for converting from border dyke to spray is significant (estimated to be approximately $4,000 to $6,000/ha) – regardless of the longer term impacts on operating profit. In addition, even if upgrades are undertaken, Proposed Variation 1 (as notified) will potentially require further reductions over and above the substantial reductions already made, which could then reduce profit as seen in my EIC Figure 4 (case study farm 5).

17 It is therefore important to again turn back to the range of typical farm systems within the Selwyn Waihora Zone and focus on those in terms of what might be reasonably 'achievable' within the framework of Proposed Variation 1.

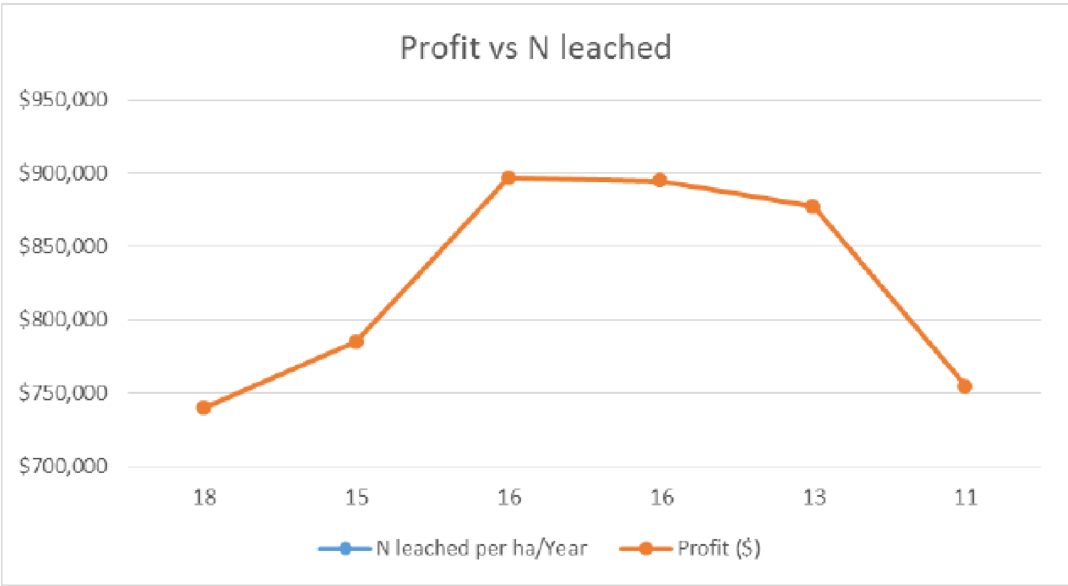
The effects of reducing N leaching upon profitability

18 In para 117, Dr Dewes states that "*a farm system (change) can improve profit from its baseline level, whilst reducing N leaching. But once a specific farm production system point is reached, farm profit decreases at an increasing rate with each additional unit of N leach reduction. The Fish and Game modelling that was undertaken for the submission on the pCLWP showed the same result*". Dr Dewes supports this statement through the use of Figure 5 in her evidence (see Figure 1 below).

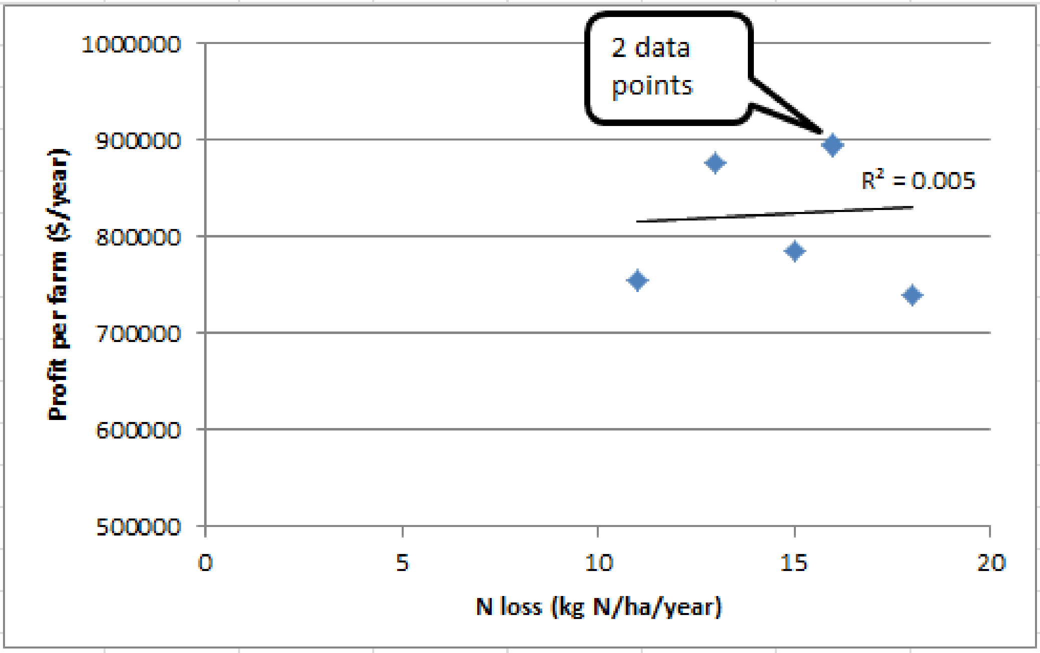
19 It is my understanding that Figure 5 (para 117) is incorrectly referred to by Dr Dewes supporting evidence in Appendix 2 as Figure 4. Moreover, it is my view that Figure 5 is plotted incorrectly (see x axis, Figure 1 below) and subsequently the interpretations by Dr Dewes are incorrect. I have entered the same data from Appendix 2 as Figure 2 below.

19.1 The correct interpretation of the data supplied (see Figure 2 below) is that there is no relationship between farm profit and N loss. This is visually obvious and confirmed by the very low R^2 value. In general, this result is not true either as demonstrated by my EIC Figures 3, 4 and 5. My case study examples showed that *on average (Figure 5),* it becomes increasingly expensive to reduce N loss. In addition, every farm has its own response curve (Figures 3 and 4, my EIC). Some can make relatively large reductions in N loss without much effect on operating profit, others cannot. It all depends on their starting position. The only exception we were able to observe was the "win-win" case allowed by technology such as conversion from borderdyke to spray irrigation. My earlier work at Rotorua (Smeaton and Ledgard, 2007) also indicated that wasteful users of N fertiliser can achieve a similar outcome.

19.2 **Figure 1:** Figure 5 from Ms Dewes Evidence, para 117.



19.3 **Figure 2:** Data from Appendix 2 in Ms Dewes submission plotted correctly.



Representativeness of case study farms

20 As I have noted earlier in my evidence, Dr Dewes refers to three case study farms to support her generalisations. I regard Dr Dewes case study findings as at the high N use and N loss end of the distribution curve rather than typical. Although she states (para 2, Appendix 4) that they were chosen to represent "*typical higher risk farms…that essentially represent worse case scenarios*", I question the validity of this.

21 On the basis of her three case study farm examples she concludes (1) that significant reductions in N loss are possible (60 to 77% reduction) and (2) that these are associated with increases in farm profit, expressed as increased return on capital.

22 I am concerned that:

22.1 These three farms are atypically high in terms of their quoted base N loss (81 to 146kg N/ha/year) and N fertiliser use (241 to 364kg N/ha/year). The average of our eight case study farms was 29kg N loss/ha/year (range 8 to 52), and a raw average of 213kg N applied/ha/year, (range 97 to 350). Our case study values and ranges fit with a similar range for 14 other farms in the same catchment (Ants Roberts, *pers. comm.*); and

22.2 Further, Dr Dewes suggests (para 153) that "24/7" off paddock cow wintering is a profitable option (with caveats) and diminishes N loss significantly. I agree that good evidence supports the latter comment, but a rigorous analysis by Taylor et al (2012) suggests that capital intensive high input systems are less profitable (under most circumstances) than less intensive systems, when expressed on an Internal Rate of Return or Net Present Value basis. That is, they can be profitable (operating profit per hectare per year) but do not cover the cost of capital and destroy equity over time. In addition, farmers who install barn systems (along with associated effluent storage and spreading facilities) often need to intensify to help pay for the new infrastructure, thereby increasing their N loss values back to the base level again (Journeaux, 2014).

23 Further, as I have already noted earlier in my evidence, one of the case study farms that Dr Dewes considered involved the conversion of border dyke to spray irrigation. In fact, as I noted earlier in my evidence only 4% of dairy farms in the Selwyn-Waihora zone are now border-dyke irrigated. I think little weight should be placed on this case study in terms of demonstrating what might typically be possible within the Selwyn Waihora Zone.

The adoption of good management practice

24 While I agree with a number of statements made by Dr Dewes, including for example that good management practice (GMP) needs to be defined as a matter of urgency, there are a number of statements in Dr Dewes evidence that I disagree with including the statement that: "*GMP …… will not provide any beneficial net reduction in modelled load*".

25 In fact, in my EIC I observed, on average, a modest (5%) reduction in N loss in a restricted sample of representative case study farms as a result of adoption of GMP: a small but important benefit from adopting GMP.

26 I also observed that some farms will make no gains from adopting GMP as they already operating efficiently.

Dated: 9 September 2014

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Duncan Smeaton

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