

ORAL PRESENTATION PC1 – Robin Boom

Introduction

It is my pleasure to make this presentation and I do not envy your task of trying to wade through so many points of view and agendas on this important piece of proposed regulation for the Waikato Region. I believe that my team have real solutions to address real problems which the Waikato Regional Council is wrestling with regards to environmental pollution. I have been working as a self-employed agronomist at the coalface of soil, plant and animal nutrition for over 30 years now with a large client base of over 400 farmers and growers, the majority of whom farm within the Waikato Region. For many of my clients I have been an integral part of their business success regarding the application of fertiliser materials to their land. My philosophy in relation to soil fertility has been a blend of the 'balanced' approach advocated by American scientist Dr William Albrecht of Missouri State University https://en.wikipedia.org/wiki/William_Albrecht and the good soil science undertaken here in New Zealand. The fertiliser industry internationally by and large have tried to discredit Albrecht's work as he was critical of the simplistic NPK approach and focussed a lot on the importance of mineral balance, soil organic matter and the use of trace elements. Recent work by American soil scientist Dr Tim Reinbott from Missouri has shown the benefits of employing this sustainable approach. <https://scisoc.confex.com/crops/2017am/webprogram/Paper108671.html>

Nitrogen Reference Points Article (in initial submission)

As an adjunct to this article I would like to make reference to my clients Graeme and Rosemary Davison who made a written submission on PC1 about their predicament. I have been working with the Davisons since 1990, whose dairy farm and run-off border the Waipa River upstream of Otorohanga, both sides of Otewa Rd. Graeme has commented to me on a number of occasions he wouldn't know who to turn to regarding fertiliser advice if I went as there is nobody else doing what I do. On the paddocks close to the river over the past 28 years on both properties, the phosphorus inputs have been well under half what the Overseer model would indicate is needed and nitrogen inputs are also low. Under the old Overseer model their initial NRP was 17 on their dairy farm, but the later model showed it to be 23, whereas the average in their area is 40, and a dairy farm further upstream from them has a NRP of 70. Graeme is at retirement age and with children not interested in carrying on with farming, having a low NRP will impact severely on the value of their property if the proposed nonsense of being limited to historical NRPs happen. With N loss, the higher the NRP value, the increase in N not being recycled but leached to ground water increases exponentially, so in all likelihood, a typical dairy farm in Davison's catchment with a NRP of 40 is likely to be leaching more than double the N of the Davisons and one at 70 will be quadruple, so it is vital the high N leaching farms come down to the fifty percentile mark as I proposed, allowing lower leaching farms to come up should they so desire, and not disadvantaging good environmentally conscious farmers like the Davisons and their farm equity, having been good stewards of this land for the past 44 years.

Another client I had worked with from the early 1990's was Jack Davies on Piako Rd, Gordonton. He farmed on peat soils and his NRP back in 2012 using Overseer 2 came out at 22 kg/ha. Jack had not used any nitrogen fertiliser for the 20 years I advised him and neither did he use superphosphate – water soluble phosphate. Instead his fertiliser mixes for twenty years was blends of non water soluble RPR (Reactive Phosphate Rock) fertilisers, ideal for peat soils, plus potassium, sulphur and trace elements. His production was extremely high at 1800-1900 kg/ha of milk solids, double that of many farms, and even in the worst years of clover root weevil infestation his paddocks were still a sea of clover. In droughts, his farm was like a green oasis in the desert and by going onto Google Earth its boundaries clearly stood out compared to neighbouring farms. Although I have no photos to verify this, I did take some photos of another client's farm David McConnell who farmed on peat

soils on the corner of Holland Rd and Marshmeadow Rd just out of town, right next door to Dairy NZ's Lye Farm at Newstead. David also cut out nitrogen and used RPR based fertilisers and minerals similar to the Davies and I took these photos in the middle of the drought on 14th March 2013. The picture below is McConnells farm looking towards Lye Farm buildings in background.



The picture below is taken from Lye Farm entrance off Vaile Rd looking towards McConnells with line of McConnells poplar trees in background.



The picture below is the farm opposite McConnells on Holland Rd over the railway line who I know use a lot of urea.



Compare this to McConnells farm on the opposite side of the road. At the time McConnells farm was possibly the greenest farm in the Waikato as it was a severe drought that year. When at Lye Farm entrance, I met AgResearch scientist Bob Longhurst and suggest he drive around to Holland Rd and see for himself which he did, but probably still remains a skeptic about my approach to soil fertility.



I include these photos so you may understand how not applying nitrogen fertilisers results in overall pasture production improvements and environmental improvements, and hopefully will understand that the tenfold increase in nitrogen usage since 1990 is a major source of current water problems.

The Davies won the national Westpac Dairy Excellence Award in 2005. At the age of 70 Jack decided to finish his farming career and sold his farm at auction and it received the highest per hectare price of any farm that year. <http://www.stuff.co.nz/business/6031066/Waikato-dairy-stud-farm-sale-record> Had NRPs been proposed back then, this would not have occurred, as potential buyers would have been put off by his low NRP. In May 2012, a couple of weeks before the new owners took over, a Field Day was held on the property where over 100 farmers came to see how such high production could be achieved using no urea or superphosphate. A retired soil scientist – Mike O'Connor – who attended this commented to me he hadn't seen pastures as good as theirs since the 1970's. Here is a photo from the Field Day taken in May 2012....note the absence of urine patches, with even deep green lush grass growth. The soil on this property was extremely biologically active and when digging down with a spade, the soil was very soft causing no resistance, like a knife through soft butter.



I believe the wrong fertiliser advice has not only caused a deterioration in water quality, but the advice has caused poorer economic returns and affected animal health, welfare and longevity in the process. Wrong fertilisers sold to farmers by fertiliser company representatives with vested interests in promoting their own products through their own little myopic views of soil chemistry is a prime reason for these problems. Employing more modern soil testing techniques and up-skilling the rural professionals involved in soil fertility by looking at all 16 elements plants require to grow rather than the standard six element tests most currently use is essential. I am happy to share my knowledge gained over the past 30 years as I approach retirement age to younger agronomists. Till now, science based organisations such as Dairy NZ, AgResearch, the NZ Fertiliser Association and the soil science

community generally have been resistant or actively opposed to my approach to soil fertility over much of this time, since it hasn't been 'scientifically proven here in NZ' they argue. Some of them have spoken to my farmer clients who have observed improvements on their farms, or seen this first hand, so criticism of me is less common as they only end up with egg on their faces from the farmer's perspective. It works and is used the world over. The Albrecht approach is part of the answer to solving our environmental degradation problems, but unfortunately there are also many who claim to be using Albrecht, yet are selling farmers expensive products or have no scientific training whatsoever and tend to be completely dismissive of the good NZ science, having no involvement whatsoever with any of the agricultural science related organisations. It should be a blend of both which can achieve results like this at the Davies property.



Overseas data has shown the nitrogen content of cow urine can vary twentyfold, based on a number of factors, but a principle one is the N content of the feed consumed by the animal. The problem with urea applications is that this increases the amount of non protein nitrogen of the grass grown which the cow cannot utilise and it is excreted out in the urine rather than turned into meat or milk. Using MUN (Milk Urea Nitrogen) levels which Fonterra and the smaller dairy companies now analyse everyday from milk samples collected from each farm, is an excellent guide on whether cows are being fed too much crude protein and non protein nitrogen. Research here in NZ and overseas has shown a strong correlation between MUN levels and urinary nitrogen levels. Where a farm has MUN levels in excess of 30, indicates some serious problems going on as ideally they should be half this range for optimum rumen performance. It also impacts on cow health and fertility rates, although DairyNZ dispute these claims. <https://www.dairynz.co.nz/feed/nutrition/milk-urea/> Researchers overseas advocate optimum rumen function when MUN levels are in the 10-14 mg/dl range <https://extension.psu.edu/interpretation-of-milk-urea-nitrogen-mun-values> whereas typically in NZ

levels are double this and sometimes triple where lots of urea boosted grass is fed. This means that the N urine content of our cows will be two to three times higher than what is ideal. I have on occasion asked a client what their MUN levels are like, and the majority seem to be at the lower end of the what Dairy NZ consider typical, so my clients who apply little artificial N to their pastures should have a lot less nitrogen concentration in their cow urine patches. A formula proposed by researchers overseas to determine how much urinary nitrogen a lactating cow excretes every day is $0.0259 \times \text{cow body weight (kg)} \times \text{MUN (mg/dl)}$ <https://www.ncbi.nlm.nih.gov/pubmed/11699460>. Fertiliser companies selling urea point to the urine patch as the largest source of leachable nitrogen the soil, rather than the fertiliser itself, although there is still some of the fertiliser N which leaches directly through the soil profile. But the reality is that increasing the amount of nitrogen in the grass consumed will have an exponential effect on the urine N content, so fertiliser N still has a significant impact. Formulas and correlations such as those mentioned above, based on daily MUN levels can act as a strong guide to nitrogen efficiency and leaching rates, and because these are provided daily to each dairy farmer, fast adjustments can be made to rectify. To incentivise this, dairy companies could penalise and reduce the milk price for having high MUN levels which is itself problematic for milk processing, or alternatively the farmers with lower, more ideal MUN levels get rewarded better, much like the kiwifruit industry does now with kiwifruit where an orchardist is paid on both volume and quality which is determined by the fruit dry matter percentage which affects taste and storage quality. Using MUN levels this way will provide a daily remedial incentive at no cost to the farmer for this information, rather than having expensive and exhaustive Nutrient Management and Farm Environment Plans done every three years or so and nothing in between if enough rural professionals can be found to do this.

I have on occasions told some of my farmer clients off if they use more than 100 kg of N fertiliser a year. Conversely I had a dairy client from South Auckland tell me his Dairy NZ Consulting officer told him off for only using 60 kg of N a year, and that to be more profitable he should be using 150 kg. That a rural professional in an industry good organisation would say this is an example of how ubiquitous the practice of applying artificial nitrogen has become. I know of farm consultants recommending clients use 300-400 kg/ha of N which leads to overstocking and high leaching rates. I would therefore like to see the use of artificial nitrogen on pastoral farms cut back severely which should see a significant drop in river nitrogen levels, using stocking rate and incorporating MUN levels as a daily guide, rather than a once three year Overseer review which at the end of the day is just a model and not a real time/hard data option.

In December last year the Parliamentary Commissioner for the Environment released a 140 page report on the suitability of Overseer to be used as a regulatory tool and highlighted its woefully inadequate ability to currently do this on many fronts. I am sure this has been drawn to your attention by other submitters, and you are aware of what it says. If not, it can be found here: <https://www.pce.parliament.nz/media/196493/overseer-and-regulatory-oversight-final-report-web.pdf> I would imagine that as a result of this report the government decided to invest money to fix this problem, hence the announcement last month that it will put \$45,000,000 over the next four years into research to improve Overseer. In the meantime the use of Overseer for regulatory purposes should be stalled, curtailed or completely abandoned. As the model in its current form was not designed for regulatory purposes and for things like attenuation to be accounted for we must get real science to quantify this, on all soil types, and this needs to be incorporated into the model. Once this happens, then it can be fit for the purpose Regional Councils want to use it for. Until then, the NRPs Regional Council is intending to use should be used as a guide only. As I have mentioned before, the 2014-2015 years should not be the baseline year as this is giving those dairy farmers who were highly overstocked and overusing urea because of the high milk solids payout that year, have an unfair advantage if grand-parenting based on those years is going to be used for benchmarking each property. In the future, having a hybrid of both an improved Overseer in four years time after

the Govt's \$45,000,000 investment into improving Overseer has been completed, and using daily MUN levels combined with stocking rate, management practices and farm infrastructure which help mitigate nitrogen losses should be considered. In the meantime current NRPs can be a useful guide to focus on the known worst polluters and low hanging fruit for Council to work on, i.e. those dairy farmers currently above the 50 percentile, and assist these farmers in reducing their N leaching by employing management practices advocated by experts in the field such as my support person Dr Hugh Jellie. The other low hanging fruit is intensive horticulture, particularly vegetable growers whose N leaching is often 3 times higher than neighbouring dairy properties. My own experience and expertise with horticulture is limited to but a handful of kiwifruit growers the past five years such as John McKain of Opotiki who has seen significant improvements in fruit quality, a massive reduction of N and P fertiliser inputs and making much more profit than he was when using fertiliser company reps five years ago. This was achieved by employing Albrecht soil principles and using composts instead of chemical fertilisers. Although I write a monthly article for the NZ Grower magazine, which goes to all commercial vegetable growers, I have not had any vegetable grower ask me to provide them fertiliser advice, so cannot make any personal validation of applying the Albrecht principles for them. Twenty years ago I met up with an American consultant who was advising almost all of the major carrot growers in California using Albrecht principles, and a Canadian consultant who was doing the same in the grape industry all over North and South America, so I cannot see why it won't work for our vegetable growers here.

As for nitrogen leaching on sheep, beef and deer farms, their effect on nitrogen water bodies is negligible and insisting on having NRPs on hill country farms should be scrapped completely, especially as attenuation effects here can be significant, or maybe at least wait until Overseer has been significantly improved. The exception is on heifer grazing blocks where NRPs could have value. As it is, the future of many steeper hill country properties could see significant areas being planted back into trees, even from a purely economic point of view should the Govt pursue its Zero Carbon objectives in relation to green house gases. Whether a farm converts from trees back to pasture or from pasture to trees should be up to the land owner. Only when being converted to dairy or dairy support or intensive horticulture should resource consent for such land change be mandatory.

Phosphorus (in initial submission form)

Because I prefer the American developed Mehlich III extraction I have come under a lot of criticism from fert reps, consultants and scientists who do not understand these figures, and who like to keep themselves in ignorance rather than learn how to interpret them. My question is why are we still using 1950's technology in the twenty-first century when there are much better tests available for an element which is a major driver of both production and environmental degradation? The current Overseer model uses the Olsen P figures and Anion Storage Capacity logarithms to ascertain P losses. The number produced by Overseer is highly likely to be quite different to reality. For an extra \$17 per soil test, Hill Laboratories in Hamilton will do the multi-element Mehlich III extraction from which specific Phosphate Saturation Index figures can be determined. Overseer currently does not accept Mehlich III figures, and there is resistance in certain quarters to use this more modern and accurate soil testing technique and stick with the same old same old and its raft of shortcomings, resulting in a high percentage of dairy farms with phosphorus levels well above biological optimum levels.

Again there has been no traction and a complete indifference by industry and Regional Council staff to look at what I have been doing for my many clients and see the merit in it. Contrary to this I have had environmental advocate, Anna Mayne, who has also made a submission on PC1, do an in depth analysis comparing some of my dairy farmer clients to similar farmers using fertiliser company reps and the results clearly indicate overall win-wins in so many ways for my clients. She too has tried in

vain to gain traction with Regional Council, DairyNZ, Fonterra and smaller Dairy companies to seek interest and funding to continue her study which to date she has done completely at her own expense using considerable amounts of her own time, money and resources given to achieve this, and she has her own story to tell on this.

My support team here are all advocates of Biological Farming and have various skills, experience and knowledge to make a real difference to water quality. Dr Hugh Jellie, who has also made a submission on PC1 and initially contacted me after seeing the huge drop in N leaching on my aforementioned client Brett Martin's Mamaku property under my fertiliser regime, made a proposal himself to the BOP Regional Council which he believed he could clean up Lake Rotorua just by altering certain management practices on all 26 dairy farms in the Rotorua catchment which would make them both economically and environmentally viable. Again Hugh could get no assistance to prove the concept. All he could go on was the radical improvements observed on Brett Martin's farm which they have subsequently sold the nitrogen rights, and in 2020 will be planted into trees to reduce nutrients going into the lake. Lake Rotorua's algae problem has now been sorted chemically by alum dosing the lake, which binds up soluble phosphorus into insoluble forms, similar to what happens on allophonic soils. Continual alum dosing of the water however may have some negative impacts further down the track, and more economical and environmentally sustainable solutions will need to be found for these dairy farmers. We have credible solutions to these problems which work for farming business enterprises, the soil and water, as well as the spiritual values of iwi and their desire to see the land and environment cleaned up.

Many of my sheep and beef farmer clients use RPR based fertilisers, as it is ideally suited to hill country application, being higher analysis to superphosphate which saves on cartage and spreading costs out of a plane. RPR also has a mild liming effect as well as being both soil and environmentally friendly. It is almost 100 times less soluble in water than superphosphate and DAP (Diammonium Phosphate). If particles do end up in the waterways, with water being close to neutral pH, the phosphorus is likely to remain in an insoluble form. Dr Bert Quin, once head of the Soil Research Division at Ruakura, presented a paper at the Annual Fertiliser and Lime Research Centre conference at Massey University challenging the inherent bias in our agricultural science community, and proposed a method for converting all farms to RPR fertilisers. This can be seen here: http://flrc.massey.ac.nz/workshops/12/Manuscripts/Quin_2012.pdf Dr Quin was also the whistle blower on our increasingly higher cadmium levels 25 years ago, and consequently certain high cadmium phosphate fertiliser products were taken off the market then, and alternatives found. Unfortunately there have been substandard RPR products sold in New Zealand by a number of companies, and these have not performed well, and some farmers have gone off them as a consequence. There are certain chemical and physical attributes to RPR fertiliser we know will prove their effectiveness, and I make sure my clients are purchasing from a supplier whose product meets these standards, and consequently they are happy to continue using them because they work.

Sedimentation (in initial submission)

As an adjunct to this submission I would like to add that the average female koi carp produces 300,000 eggs annually and will vacuum and expel three times its body weight of mud daily. Estimates are that there is up to 4000 kg of koi carp biomass per hectare in slow moving waters of the lower Waikato River and Waipa Rivers and lowland lakes. This means up to 12 tonnes of mud per hectare can be sifted through and expelled daily by these pest fish. No wonder the colour of lowland lakes are all a muddy brown, and outbreaks of toxic algal blooms such as the red algae observed at Lake Te Kauwhata two summers ago happen. Until there is a viable solution found to reduce and ultimately exterminate koi carp from these waterways, insisting farmer's fence off all permanent waterways on their farms is just window-dressing in comparison.