What farmers will need from scientists over the next 20 years under a resource-capped environment

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Abstract

Farmers in the Lake Taupo catchment are operating under a Waikato Regional Council consent to farm that limits the amount of nitrogen that can be leached below the root zone. The main driver for nitrogen leaching is stock urine, effectively capping livestock numbers. This challenges current farm business models of intensifying stock numbers in response to rising costs. This paper outlines lessons from on-farm nitrogen-leaching trials carried out by AgResearch and Landcare Research. Farming in the Lake Taupo catchment will only be viable if consumers pay a premium for beef produced in a manner that protects the water quality of Lake Taupo sufficient to offset the increased costs of production. While this has been shown to be practical in the local area it may not apply in other areas of New Zealand or overseas. This raises a series of science priorities to support viable farming. Also discussed are the science needs indicated by the Lake Taupo Protection Trust formed to facilitate the removal of 20% of nitrogen leaching from farmed land. Currently science has provided no alternative permanent solutions other than removing farms from the catchment.

Keywords: water quality; farmer needs; science delivery; human food quality

Introduction

The water quality of Lake Taupo, whilst outstanding at present, is under threat from nitrogen leaching from agriculture (Vant et al. 2000). Following a process which began in 2000 and culminating in the passing into law of the Waikato Regional Council Plan, Variation 5 (RPV5) in July 2011, nitrogen discharges below the root zone of agricultural pasture have been capped. In addition 20%, or 170 tonnes, of the annual transfer of the manageable nitrogen derived from pastoral farming is required to be removed from the Lake catchment in perpetuity.

Less than 20% of the Lake catchment of 2,800 km^2 is farmed. Most of that 20% is extensive sheep and beef farms with four dairy farms. All streams have been fenced and riparian planted since 1983. In my own case, 22% of our farm, which exclusively produces beef, is in either conservation or riparian planting. Farmers in the Taupo catchment were described during questioning in the Environment Court hearing by Dr Stewart Ledgard as some of the most environmentally benign in the country, yet still we have an unacceptable impact on the Lake. Most other watersheds in New Zealand would have perhaps 80% of the catchment farmed. The consequent economic impact of limiting the farming nutrient losses will likely be an order of magnitude greater than the Taupo experience. Nitrogen discharges are also influenced by the species of animal grazing the pasture with the discharge associated with sheep and deer are both approximately 60% of that from cattle when measured as the g of mineral nitrogen per kg of nitrogen apparently consumed (Hoogendoorn et al. 2011).

All farms in the Taupo catchment have their nitrogen discharges determined by computer modelling using the Overseer® software (Wheeler et al. 2003). This means that nitrogen mitigation options currently available to Taupo farmers are limited to those that are accounted for by Overseer®.

From 2006 to 2010 AgResearch carried out one of the largest farm-scale nitrogen leaching trials they have so far conducted to explore possible options for increasing beef production under a nitrogen cap on our farm on the North-Western side of Lake Taupo. The trials were supervised by Dr Stewart Ledgard and project-managed by Keith Betteridge (Ledgard et al. 2007).

Nine-hundred-and-fifty ceramic-cup drainage-water collectors were installed in fifteen hectares. Four different treatment options were trialled along with a Control group on a replicated, randomised basis. Plots were 0.4 hectares in size with grass production and feed value measured every pre- and post-grazing event for four years. Trials using lysimeters, devices for measuring the percolation of water through soils and for determining the soluble constituents removed in the drainage, were carried out at the same time to validate the field data.

The treatment options explored were:

- Use of high sugar grasses,
- Use of salt as a diuretic,
- Oral drenching of nitrification inhibitors and

Figure 1 (a) Constructing the set of 12 lysimeters on our farm. (b) Established lucerne growing above one of the lysimeters on our farm. Photos supplied by M McLeod, Landcare Research.

(a)

(b)

- Difference in nitrogen leaching between steers and heifers.

Currently Landcare Research is in the second year of a four year lysimeter trial to assess the leaching status of a 'cut and carry' lucerne regime(Figure 1). The trial is supervised by Malcolm McLeod (McLeod 2011). The figures for lucerne nitrogen leaching presently in Overseer® are based on limited practical trial work and are largely modelled.

On account of the deep rooting nature of lucerne the lysimeters are 1.5 metres deep using undisturbed soil. Eight lysimeters contain lucerne which was established under industry best practice guidelines, with four of these having bio-char incorporated at the equivalent of 10,000 kg/hectare when establishing the lucerne, and four lysimeters have existing pasture to serve as a Control (Figure 1).

Working from the assumption that we can grow no more meat per hectare, and that my costs will inexorably rise, we need to find a way to grow the value of the meat that we produce. For the last two years we have been producing, branding and selling beef to high end markets in the Taupo region. The meat is verified by Waikato Regional Council as being produced in a manner that is consistent with meeting the standards associated with RPV5. They have developed an environmental 'quality mark' (Figure 2) for beef from farms that meet their audited standards. The brand is Taupo Beef (Figure).

Results

It is not my place to present the results of the AgResearch trials, which at the time of writing they are not yet formally available, and the Landcare Research trials are not yet complete. However, as the farmer who has implemented the trialled AgResearch mitigation strategies on a daily basis for four years, and having debated with the team of scientists involved, the interim results, I have started to form a series of questions around the role of science and the nutrient emissions associated with farming. This thinking has been further tested and refined during my role as Chairman of the organisation 'Taupo Lake Care Inc.' This is a group that represented private and Maori farmers in the Taupo Catchment during the hearings and Environment Court Stages of the development of RPV5.

The initial three month trial of Taupo Beef has shown that consumers with discretionary income will definitely pay a premium for high quality beef that is produced under a catchment wide model that protects Lake Taupo. The Waikato Regional Council's verification of our claims regarding water quality is critical to the success of the brand. We have continued with Taupo Beef at the request of all of the trial restaurants and hotels for the last two years. In addition we retail beef through a Taupo butcher for those consumers who wish to cook their meat at home. This has proved equally successful. We are struggling to keep up with demand despite significant wholesale and retail premiums.

The Lake Taupo Protection Trust (LTPT) is a Council-controlled organisation formed as a result of RPV5. It is required to permanently remove 20% of the manageable nitrogen entering Lake Taupo annually from farming. A budget of $81 million was made available by Central Government, the Waikato Regional Council and the Taupo District Council to facilitate this work. A nitrogen trading market was established under RPV5. The statutory responsibilities placed on the LTPT meant that only permanent, verifiable nitrogen reductions could be considered when purchasing nitrogen credits. The 20% reduction was to be achieved by 2018. By the time this paper is presented the required nitrogen purchases will very likely have been completed. In every case the nitrogen purchases resulted in either converting whole farms into forestry or permanent stocking rate reductions on the properties that remained farming. No other alternatives were available to the LTPT.

Discussion

Lessons from the practical application of science to farm nutrient caps

From a practical farmer perspective the key lesson I have learnt from my involvement with attempts to use science to drive productivity increases under a nitrogen cap in Taupo are:

- There is little else I can do to reduce my nitrogen leaching profile short of reducing stocking rates,
- Our farm is in the top quintile, as assessed by the Beef + Lamb Economic Service for beef production/hectare and dollars earned per hectare. There is little else I can do to increase my per animal performance,
- There are very few solutions on the immediate science horizon that will allow me to increase my production while staying under my nitrogen cap,
- Winter cropping and regrassing may well become a very limited option in the near future as it is a very nitrogen 'leaky' activity and
- I am capped at my 2004 stocking levels yet in that time my costs have increased by 45%.

These realities will likely occur for any farm on free draining soils throughout New Zealand as catchment limits roll out.

Questions for science related to nutrient caps

- Is the science community considering ways to deal with these realities?
- Are science funding priorities established in a manner that recognises these challenges?
- Can science genuinely provide methods that allow farmers to continue to intensify in order to stay ahead of rising costs?
- If science can do this what are the timelines? I need to know how long I have to tread water in my current business before I can grow again.
- If science cannot facilitate production increases under emission caps that keep pace with cost increases, I need to know now as do all those farming in other catchments that are beginning the process of setting catchment limits. The economic implications of capping emissions are an order of magnitude greater under a scenario where farms can no longer intensify.
- The only science that is of use to me is that which is embedded in Overseer®. Is your science linked to that software?

Lessons from Taupo Beef

Consumers will pay a premium for food produced in a way that protects water quality.

Figure 2 Quality mark produced by Waikato Regional Council for verification for Taupo Beef.

Figure 3 Taupo Beef brand established by the Barton family.

However, a number of additional lines need to be woven into the story for it to truly resonate with them. Consumers tell us they want verifiable certainty of food safety, quality, nutrient status, flavour and animal welfare. I need a verifiable way of attracting a premium that keeps me ahead of rising on-farm costs in the short and medium term.

Questions for science related to Taupo Beef

- Can science confirm the nutrient levels of food produced under different farm systems? Is grass fed beef really better for you than grain fed beef?
- How do I farm such that I get the maximum amount of meat, of the highest quality, with the least impact on water quality, now and into the future?
- Can science develop a practical mechanism for describing and verifying the emissions profile of food under different farming systems such that consumers, world-wide, can make informed decisions about food purchases based on food labelling?

Lessons from my time with the Lake Taupo Protection Trust

Reducing the amount of farmland in a catchment to decrease nutrient emissions is a highly controversial, socially difficult and expensive process. It should be the strategy of last resort in any catchment. How we ended up in that situation is a complex socio-political process, but it does highlight for me the lack of strategic direction that surrounds the science pertaining to the environmental footprint of food and fibre production in New Zealand.

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