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A view from the farm-gate: farmers' perspectives on water quality

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ABSTRACT

Regional and sub-regional policies and rules that set limits on diffuse nutrient losses from agricultural land are being put in place across New Zealand. In Canterbury, it is expected that water quality and nutrient loss limits, and irrigation expansion within those limits, will be achieved by existing irrigators (and new entrants) adopting good management practice and, where it is deemed necessary, going beyond it to best management practice. Research undertaken in North Canterbury shows that farmers' understandings of the relationship between land and water are out-of-sync with the scientific framing of the land-water relationship embodied in the Hurunui Waiau River Regional Plan. While easily dismissed as farmers' lack of recognition of their cumulative effects or their misunderstanding of the science, it will be argued that acknowledging and recognising how farmers frame the water quality problem is an important starting point for working with them in the implementation of these new policies and rules and the achievement of good and best management practice.

Keywords: planning, good management practice, resource limits, water quality, farmers

1. INTRODUCTION

Water governance, planning and management have shifted significantly in New Zealand in a short period of time. In 2011 a National Policy Statement for Freshwater Management (NPSFM) was introduced by central government, with amendments in July 2014. The key purpose of the NPSFM is "[s]etting enforceable quality and quantity limits" (MfE, 2011, p.3). In terms of quality, implementation of the NPSFM by Regional Councils is focused primarily on diffuse agricultural pollution and setting nutrient loss limits on agricultural land use. In the region of Canterbury, setting resource limits was underway before the NPSFM was introduced through the Canterbury Water Management Strategy (CWMS) (Canterbury Mayoral Forum, 2009). Since central government sacked the elected councillors of the Canterbury Regional Council (CRC) (Creech et al., 2010) and installed temporary commissioners in 2010, the CWMS has become the driving force behind what is promoted as a new paradigm of governance in the region with its collaborative approach to water planning and management. Importantly, it is expected by the CRC and industry groups that newly-imposed water quality and nutrient loss limits, and the expansion of irrigation within those limits, will be achieved by farmers shifting to good management practice and, where it is deemed necessary, going beyond it to best management practice (Brown et al., 2011; Dairy NZ, undated; Dairy NZ and Fonterra Co-operative Ltd, 2012; CRC, 2013a; CRC, 2014; HWZC, 2011a).

This article raises questions about this expectation. From an international review of agri-environmental policy and diffuse water pollution literature, Blackstock et al. (2010) conclude that gaining agreement on what is 'the water quality problem' is fundamental to approaches that seek

to engage farmers and change land management practices. These international insights are the starting point for the research discussed here.

The article proceeds as follows: Section 2 provides background on the Hurunui Waiau sub-region which is the case study for this research. It also explains how community socio-economic expectations for expanded irrigation, and environmental expectations on water quality, have been translated into land use rules. It also highlights the challenges now being faced in meeting these expectations in terms of reducing nutrient losses from agricultural land to meet in-stream water quality limits. Section 3 discusses farmers' perspectives on water quality derived from 20 semi-structured interviews conducted in 2013. Section 4 contrasts farmers' perspectives with how the water quality problem is framed by the CRC. Section 5 discusses how conceptions of the relationship between land and water held by farmers are out-of-sync with the scientific framing of the issue embedded in the Hurunui Waiau River Regional Plan (HWRRP). It will be argued that this divergence in how the water quality problem is framed has implications for how farmers are engaged in Audited Self-Management and the development of Farm Environment Plans that are now required under the HWRRP (Brown, 2012). Section 6 concludes that farmers' perspectives on water quality should not be dismissed as a lack of recognition of cumulative effects or their misunderstanding of the science but rather as an opportunity to reflect upon how farmers are being engaged to adopt and go beyond good management practice.

2. BACKGROUND

2.1. The Hurunui Waiau Zone

The Hurunui-Waiau is one of ten governance zones established under the CWMS and is the largest zone by land area (8,661 square kilometres). The largest river catchments in the zone are the Hurunui, Waiau, Waipara and Conway/Tutae Putaputa (CRC, 2012). The HWRRP does not cover the Waipara and Conway catchments (CRC, 2013b). Also, the HWRRP sits outside the recently notified Canterbury Land and Water Regional Plan. This sub-region had the first zonal committee under the CWMS, namely, the Hurunui Waiau Zone Committee (HWZC). It was the first to finalise its Zone Implementation Programme (ZIP), and the first to have its ZIP moved through the statutory process under the *Resource Management Act, 1991* (RMA) with the final HWRRP having been informed by a collaborative process under the CWMS (see Memon et al., 2012 for a preliminary review of the process).

2.2. Creating Headroom for New Irrigation

A key socio-economic goal of the ZIP is to substantially expand irrigated agriculture, for example, by an estimated 30,000 ha through the construction of the proposed Hurunui Water Project (HWZC, 2011a, p. 57). Notably, the ZIP refers to 100,000 ha of irrigable land across the region (HWZC, 2011a, p. 32). In terms of environmental outcomes, the ZIP identified that water quality should be maintained at current levels or improved (HWZC, 2011a, pp. 34-36). When translated through the statutory RMA process into planning provisions in the HWRRP, the expected outcomes in the ZIP have seen the establishment of 'cumulative effects of land use on water quality' objectives and policies (policies 5.3 5.3A and 5.3B, pp. 14-15). These articulate in-stream water quality limits on the main stems and adjoining tributaries of the Hurunui and Waiau Rivers. They relate to periphyton cover and concentrations of: chlorophyll a, nitrate-nitrogen and dissolved reactive phosphorus (DRP).

These policies are linked in various ways to the take, use and allocation of surface and groundwater, land use change, and permitted activities. In relation to the latter, for example, if statistically aggregated concentrations at the monitoring point of a main tributary of the Hurunui River, e.g. the Pahau, go beyond 3.6 mg/L, permitted activities across the catchment that result in "a discharge of nitrogen or phosphorus which may enter water" (CRC, 2013b, p. 25) no longer have permitted status. Such activities become discretionary and would require a resource consent. Furthermore, the take, use and allocation of surface and groundwater, and land use change, are linked to nutrient load limits for dissolved inorganic nitrogen (DIN) and DRP (tonnes/year) which trigger changes in activity status if exceeded. As yet, nutrient load limits for DIN and DRP have been calculated only for the Hurunui River using a 2005-2011 data set of

instream nutrient concentrations and river flow measurements (CRC, 2013b, pp. 14-15 and Schedule 1, p. 31).

Importantly, when the ZIP was finalised, the Zone Committee's expectation was that 'nutrient headroom' required to allow new irrigation to occur within environmental limits (i.e. with water quality staying at a *status quo* level), would be created by existing farmers adopting good management practice and moving beyond it. It had been maintained by the CRC that to create headroom to significantly expand irrigation a reduction in nutrient losses of between 30-50 per cent would be required from existing land users (Brown, 2012, clause 34). Initial assumptions about what might be possible in terms of reductions in nutrient losses were informed by a study commissioned by the CRC that had calculated potential reductions of an average of around 50 per cent for the Culverden Basin with the implementation of specific mitigation practices (Brown et al., 2011, Appendix 6; Lilburne et al., 2011, p. 26-27). It was on this basis the HWZC stated in the ZIP that "[t]he Zone Committee believes that existing good farm management practices and the adoption of future best practices by all land/water users can result in both future nutrient load limits being met and full irrigation development occurring in the Hurunui Basin in future years" (HWZC, 2011a, p. 34).

However, during the HWRRP hearings (which the author attended and observed), assumptions underpinning the modelling were drawn into question (e.g. the proportion of farms that remained to be converted from border dyke to spray irrigation) (Williamson, 2012, clauses 39-49), as was the premise that existing farmers could and should go beyond 'technical efficiency' to create headroom for the benefit of new entrants (Williamson, 2012, clauses 39-49; Dairy NZ and Fonterra Co-operative Ltd, clauses 42-53; Brown, 2012). At the hearings, it was maintained that 17 per cent was a more realistic figure for on-farm nutrient loss reductions from existing land users (Williamson, 2012; Dairy NZ and Fonterra Co-operative Ltd, 2012).

Another important question raised during the preparation of the ZIP was how long would it take for existing farmers to change their practices and when could new irrigators use the created headroom? These issues led to the CRC decision to raise the nutrient load limit on the Hurunui River for DIN in the notified HWRRP (HWZC, 2011b; Memon et al., 2012). Without the increase, it would not be possible for the proposed irrigation expansion already integrated into the goals of the ZIP to get off the ground.

Notwithstanding the finalised increase in the DIN load limit of 25 per cent (CRC, 2013b, p. 31) (which creates some headroom for nitrogen, much of which has been allocated to new irrigation), CRC and HWZC attention is still very much focused on existing farmers and their potential to reduce nutrient losses. Attention has also turned to phosphorus as the load limit in the Hurunui River has now been exceeded, thus putting on hold irrigation development in the catchment notwithstanding the allocated headroom for nitrogen (HWZC, 2014a).

It is important to note that expectations on headroom to pursue an expansion of irrigation have elevated tensions. Questions raised by existing farmers go beyond what headroom is possible to who should deliver it and at what cost? Dairy farmers are asking who owns or should benefit from the headroom already moving through the system arising from their adoption in the past and present of what are now classed as good and best management practices, for example, the conversion of border dyke to spray irrigation that has occurred across the Culverden Basin in recent years (Brown et al., 2011; CRC, 2014; Dairy NZ, undated; HWZC, 2014b; Williamson, 2012).

3. FARMERS' PERSPECTIVES

3.1. Already improving water quality

Interviews with farmers involved 12 participants with irrigation on dairy farms and eight participants with irrigation on sheep/beef/arable farms with dairy support in and around the Culverden Basin, North Canterbury. Participants were selected from submissions made on the ZIP and the proposed HWRRP, and using snowball sampling. Of the 20 participants, 13 were identified as distant from the process, having little knowledge of it, and seven were identified as close, given that they had attended HWZC meetings and demonstrated an understanding of the process.

In interviews, farmers were asked, *inter alia*, how they were responding to calls to change land management practices to improve water quality. They explained that they were fencing stock from waterways, managing effluent, using Overseer®, calculating nutrient budgets, improving fertiliser application and planting trees along waterways. Many farmers talked about these practices as if they had become part of their farm systems and had been for some time. Dairy farmers indicated they no longer had a choice – if they wanted their milk collected they had to comply with new requirements. Dairy farmers were concerned that there was a tail end of their industry or a minority that was 'letting the side down'.

3.2. Water quality is relative

Many farmers compared South Island rivers with what they had seen overseas. They concluded that rivers in their area were good in comparison. Participants also talked about degraded urban waterways. Several were perplexed as to why people living with degraded rivers in cities expected rivers in agricultural areas, their workplace, to be pristine. They felt these were unrealistic expectations.

All farmers appeared to have an intimate understanding of their soils, how they varied across their properties and what this meant in terms of the movement of water, nutrients and sediments.

When asked if they were seeing problems with the water quality in their local area, e.g. slime growing in the rivers, many maintained that they had not, or if they had, it was minimal or occurred at times of low flow and high temperatures and it would get washed away with a fresh rain or in winter.

3.3. We want good water quality too

Many talked about leisure activities in the rivers such as fishing, boating and swimming and how their kids swam in the rivers. They also said they would have no hesitation drinking water from the Waiau or the Hurunui (and many do for their drinking water supply), although they did express hesitation about drinking from tributaries in intensive dairying areas. Farmers talked about how water going into the Pahau River had been visibly degraded in the past due to drainage from border dyke irrigation wipe-off water. I was told that a group of farmers had sorted out these issues with the help of the CRC and with the subsequent transition from border-dyke to spray irrigation the issue was now in the past. One farmer noted that his family had stopped swimming in the Pahau in the past but was now happy to swim there again as there is no longer a problem.

3.4. Farm-scale contributions

When asked to what extent their farm was contributing nutrients to the rivers, participants considered their contributions to be minimal or well within a reasonable range. Several were using Overseer® and knew their leaching losses while others referred to their nutrient budgets and were confident they were not wasting fertiliser. They equated inefficient fertiliser use with throwing money away. One dairy farmer equated fertiliser use with productivity and because productivity was increasing, the suggestion that nutrients were leaching was incongruous – nutrients are going into grass not water. When asked about cow urine, it was maintained that the build-up of grass and organic matter was encouraging underlying soil organisms (e.g. worms) to work in and soak up nutrients.

3.5. GMP already in place

Farmers identified a range of practices that were contributing to reducing their nutrient losses. Many would be classed as good management practices by the regional council and industry (Brown et al., 2011; CRC, 2014; Dairy NZ, undated). They included the reduction of fertiliser use or improvement in the way it was applied and its timing. There was also fencing stock from waterways, converting from border dyke to spray irrigation, riparian plantings along waterways and fence lines, and better control systems for irrigation and land application of effluent. Farmers on dairy support farms also talked about not concentrating cows in small areas.

3.6. Other factors

Importantly, farmers also talked about a range of other factors to explain why their farm contributions were minimal. For example:

- The distance from the river
- No major water courses on the property
- Not on shingle soils next to river
- The presence of clay soils or clay soil layers
- Nutrients impeded by underground aquifers

It could be inferred from these responses that farmers are not recognising their cumulative effects or they misunderstand the science on the movement of nutrients from land via surface water or through groundwater into waterways. Yet, many of the factors they raised are relevant or could be influencing contributions to the movement of nutrients in various ways. The reality is, little is known about what happens beyond the root zone outside of modelling and assumptions about attenuation (HWZC, 2014b; Woodward et al., 2013).

In summary, for participant farmers, water quality is relative and the relationship between land and water is not direct – there are many factors that, from their perspectives, can influence or impede the movement of nutrients from land to water. For example, the presence of nuisance algae comes and goes in different years and under conditions that are highly variable.

4. THE SCIENTIFIC PROBLEM FRAMING

In contrast to how the farmers in this study see it, the CRC and the HWRRP frame the land-water relationship, and farmers' responsibility for it, as direct and unimpeded by factors considered relevant by farmers (see CRC, 2012, diagrams on pp. 32-33). For example, Rule 10.1, which relates to permitted activities, applies to "any existing land use … that results in a discharge of nitrogen or phosphorus which may enter water" (CRC, 2013b, p. 25). Hence, no matter where a farm is situated across the region, nutrient losses are assumed to be a threat to water. These requirements and provisions are at odds with how farmers conceive the relationship between land and water.

5. DISCUSSION

5.1. Problem framings out-of-sync

Blackstock et al. (2010) maintain that gaining agreement on what is 'the problem' is fundamental to approaches that seek to engage farmers to change land management practices. It has been shown that farmers in this study in and around the Culverden Basin view the water quality problem as temporary and contingent upon a range of highly variable factors that influence nutrient movement and a farm's contribution. By contrast, the CRC conceives and represents this relationship between land and water as direct and unimpeded (CRC, 2012, pp. 32-33).

It is not being argued that the CRC should not regulate cumulative effects or that there is no water quality problem. However, international research tells us that the success of policies, plans and regulations hinge on empowering the people who live on the land (Morton and Brown, 2011). From this perspective, divergent problem framings are likely to hinder regional council directed efforts to encourage farmers to achieve good management practice and go beyond compliance in the development and implementation of Audited Self-Management and Farm Environment Plans now required under the HWRRP (Brown, 2012).

As far as participant farmers are concerned, while there is always room for improvement, they are taking responsibility for water quality, and this is evident in their actions, if not reflected in current nutrient concentrations in the Hurunui River and its tributaries. It is important to note that lag effects complicate water quality mitigation given that it can be some time before changes in practices are reflected in concentrations in waterways. Without close monitoring, understanding lag effects can be difficult given the inability to attribute change to specific measures. Also, intensification of land use in other parts of a catchment can overwhelm reductions in nutrient losses from mitigation.

6. CONCLUSIONS

It has been argued from the research that conceptions of the water quality problem in the Hurunui Waiau sub-region are out-of-sync. Participant farmers conceive the water quality problem as important but contingent upon a range of highly variable factors and circumstances. In contrast, the CRC, in the HWRRP, conceives the land-water relationship as direct and unimpeded by the factors farmers' see as mediating the movement of nutrients.

This divergence could easily be dismissed as farmers' lack of recognition of cumulative effects or a lack of understanding of the science. In my view, such dismissals fail to recognise not only how farmers see their world, but also that this is a critical starting point for the implementation of new policies and rules and the achievement of

expectations that farmers will go beyond compliance.

Epilogue: This research has been presented to and discussed with the HWZC. The disconnect it highlights between farmers, the HWZC and the CRC has been acknowledged and concerted efforts are being made to remedy the issues raises in this paper.

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