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A View from the Farm-gate: Farmers' Perspectives on Water Quality

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Introduction

Today I present preliminary findings of social qualitative research conducted during this year across the Hurunui Waiau region of North Canterbury. In broad terms, my research is evaluating the implementation of the Canterbury Water Management Strategy (CWMS) and its effectiveness as a collaborative governance approach to water management. More specifically, I'm looking at the setting and implementation of limits and the myriad issues it raises for the relationship between science, policy and politics, and the links between knowledge and on-ground action.

The research I'll discuss today, which contributes to understanding these broader issues, focuses on farmers' perspectives on water quality. My research contributes to gaps identified in the international water management literature of our understanding of the "socio-cultural aspects of how stakeholders interpret, translate and respond to measures designed to mitigate diffuse pollution" (Blackstock et al. 2010, p. 5632). This is an important focus for research given these authors' conclusion that:

> … well-reasoned, data based and logical messages should be effective in persuading farmers to adopt certain preventative measures or 'best management practice', *so long as* farmers are convinced that there is a problem and that their actions can solve it. However, we have shown that there is not always agreement that a problem exists, or that farmers bear some responsibility for it. … too many water management interventions proceed as if diffuse pollution from agriculture is an understood and accepted pressure, rather than taking the time to discuss this with their farming partners (Blackstock et al., 2010, p. 5635, my emphasis).

Citing Dwyer et al. 2002, these authors also maintain that this research gap extends to understanding the influence of advice and how it "interacts with farmers' identities and cultures" (Blackstock et al., 2010, p. 5635; see also Wynne, 1992; 2001).

These insights from the literature suggest that notwithstanding the momentum in Canterbury behind audited self-management, farm environment plans and broad acceptance that collaboration has brought together parties to agree that good water quality is important to everyone, a lack of agreement on the problem and who bears responsibility for it, could lead to the realisation of the

problematic risks for implementation of farm plans identified by Irrigation NZ (2013), for example:

- Limited buy-in and support from farmers
- Farm plans done but not backed by farmers
- Achieve compliance but no more
- Farm plan strategies not adequate to deal with issues
- Strategies not or only partially implemented

Theoretical Context

My research draws on theories of knowledge that accept both scientific and lay knowledges as legitimate yet contingent ways of knowing the world. From this perspective, understanding the mutually constitutive relationship between what we know, and how it is influenced by how we know, leads to the conception of knowledge as not merely an instrumental input to policy-making but constitutive of it (Jasanoff, 2004). Hence, acceptance of the science and modelling that substantiates regulations that outlaw what was lawful practice is not a simple matter of uptake – it is relational and influenced by socio-cultural factors:

> … scientific information is never, and can never be, a purely intellectual process, about reception of knowledge *per se*. People experience [it] in the form of material social relationships, interactions and interests … (Wynne, 1992, p. 281-82).

From this perspective, it should not be assumed that farmers are not listening to or understanding calls for change. Nor should it be assumed that apparent inaction is due to a lack of 'correct' knowledge – the so-called 'deficit model' (Irwin and Wynne, 1996). According to science studies theory, conceiving the water quality problem in terms of farmers being deficient in the 'correct' knowledge usually embodies its own solution, namely, to fill the assumed knowledge gaps. Wynne (1992; 2001) argues that this problem-solution framing can be not only counter-productive but alienating to those receiving reforming messages.

Research

To examine these theoretical ideas and conclusions from literatures that examine the socio-cultural aspects of diffuse pollution and agri-environmental policy in the context of limit setting in New Zealand, my research has asked the following question:

How are farmers interpreting calls for change in farming practices to manage water quality?

My study site is the Hurunui Waiau zone under the CWMS in North Canterbury (Figure 1).

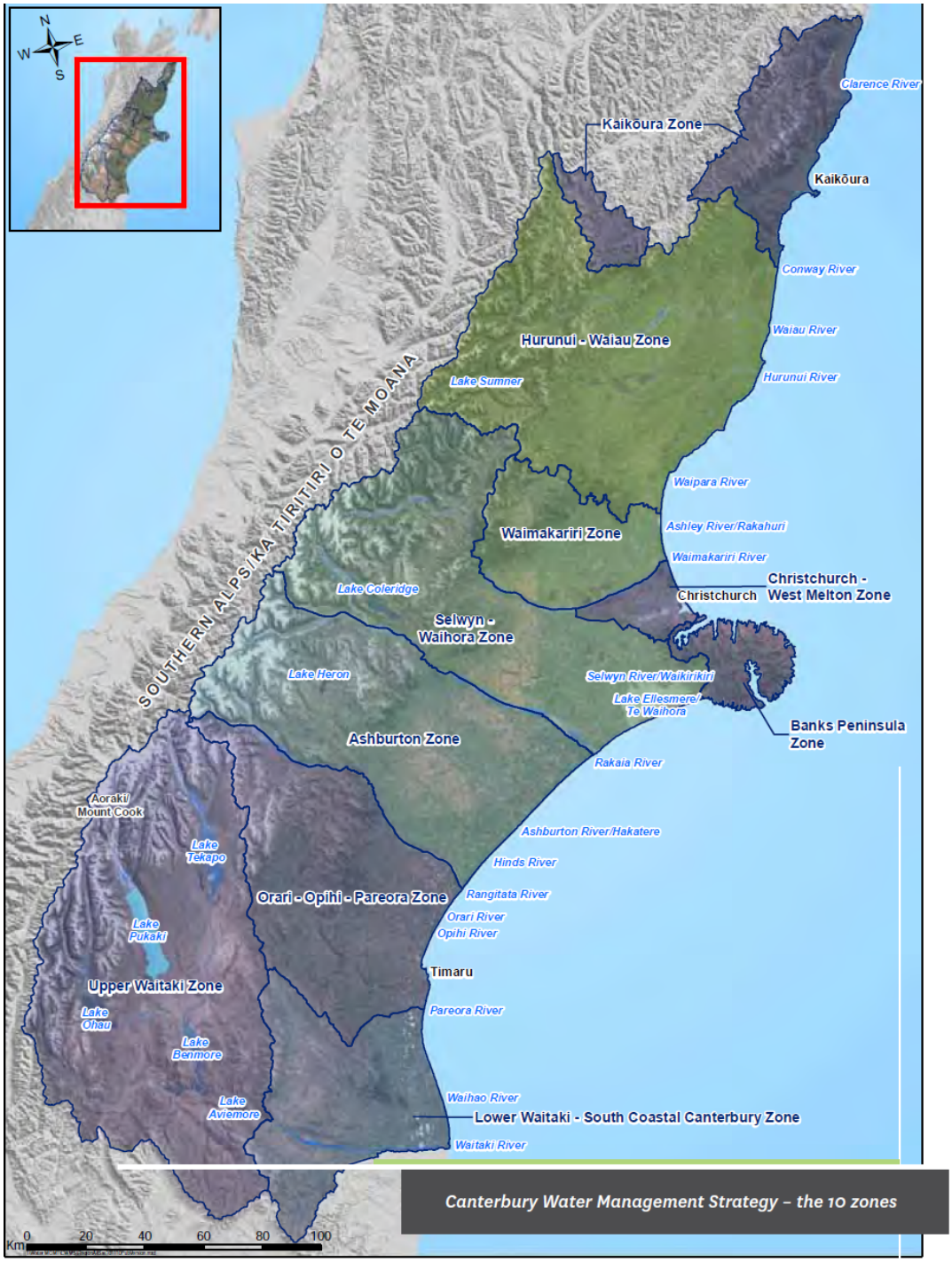

Figure 1: Map of the region of Canterbury showing CWMS governance zones with the Hurunui-Waiau Zone to the North. Source: www.ecan.govt.nz

This zone was the first to establish its zone committee under the CWMS, the first to finalise its Zone Implementation Programme (ZIP) and the first to have moved through the statutory process under the *Resource Management Act, 1991* with a regional plan having been informed by the collaborative process.

To date 15 interviews have been conducted with farmers across different areas and farm types (Figure 2).

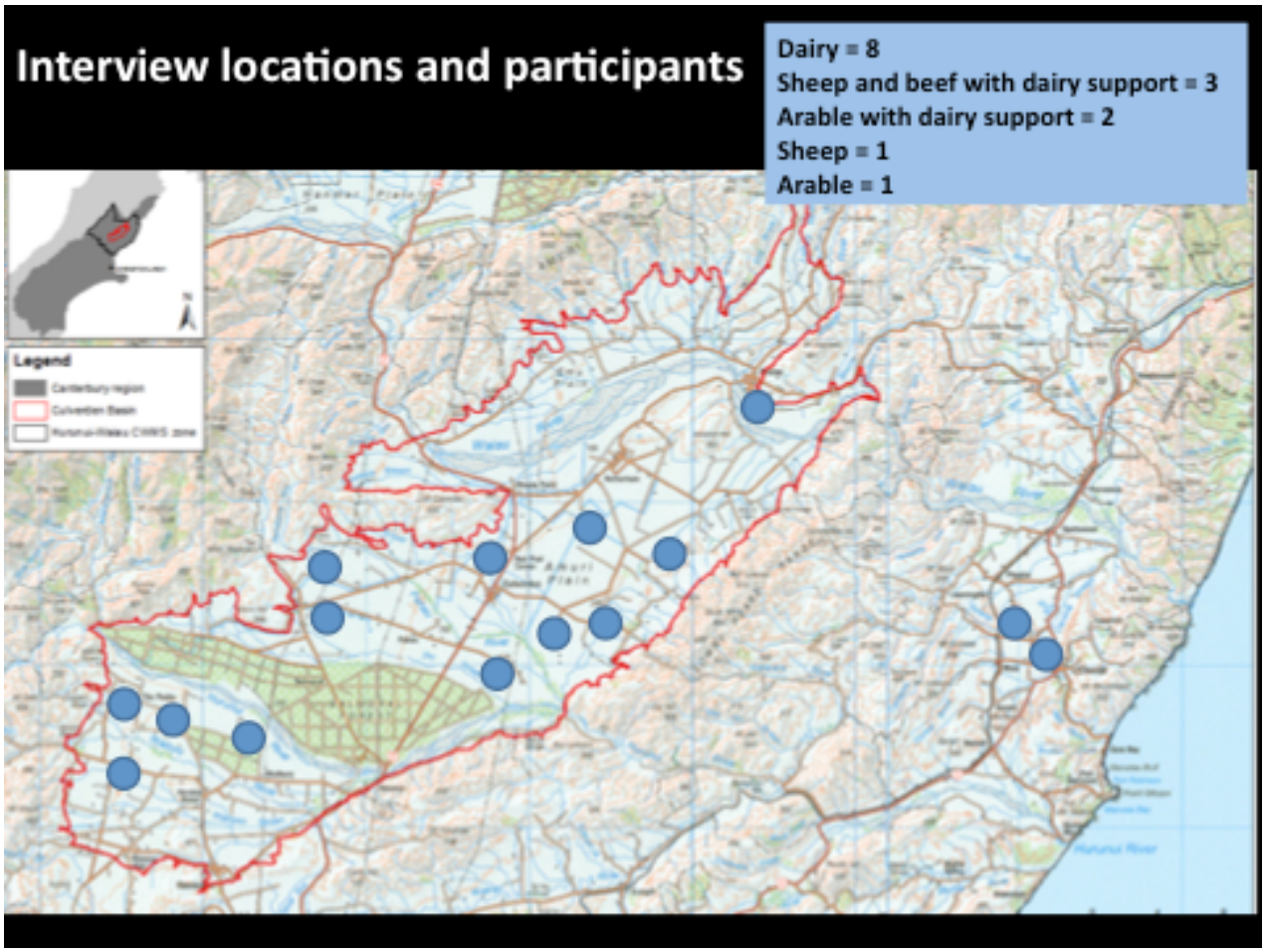

Figure 2: Indicative interview locations and farm type descriptions of participants

Today I discuss responses to questions that explore how participants understand the water quality issue, the relationship between land and water, their farms' contribution to the movement nutrients into waterways and their responses to the science that informs decisions on water quality for the region.

Background

A policy goal for the Hurunui Waiau region under the CWMS and its ZIP is to maintain water quality at its current level or to improve it. When translated into planning rules, this decision sets quantitative limits on the two key nutrients that contribute to the growth of nuisance algae, otherwise known as periphyton or, more commonly known as slime. This setting of limits is also required under the National Policy Statement for Freshwater Management and the proposed National Objectives Framework. Crucially, these goals for water quality are to be achieved alongside the development of water storage to irrigate a further 60,000 hectares across the Hurunui Waiau region.

Initially, it was assumed that existing farmers, in particular those across the north of the Culverden Basin, could (and should) reduce their nutrient leaching loads by around 50% by improving management practices. This, it was assumed, would create the needed 'headroom', as it's become known, below calculated catchment nutrient load limits to allow for the further expansion of irrigation, in particular, across the southern end of the Culverden Basin.

As deadlines approached for the initial notification of the regional plan in 2012 (and the lifting of a Water Conservation Order on Lake Sumner), there was concern that the 50% reduction in nutrient leaching was too optimistic. The questions being asked were: from where would the expected windfall gains come and at what cost? Another important question was when – how long would it take for existing farmers to change their practices if the gains were there? With further analysis, it was determined that, at best, 17% was a more realistic figure without sacrificing profitability. These issues contributed to the controversial decision made by the regional council to increase the catchment nutrient load for nitrate-nitrogen by 20% in the proposed regional plan. Without it, it was unlikely that the proposed irrigation projects that were already integrated into the goals of the zone implementation programme could get off the ground. This would have been *un*parallel development.

Although there has been an increase in the nitrogen load limit, which has become an increase of 25% due to the addition of another year's data to the rolling average, many are asking whether it's enough to allow for the envisaged expansion of irrigation. Importantly, based on the conclusion that the Hurunui River is phosphorus-limited, the load limit for phosphorus wasn't increased. Also, the plan makes permitted activity status and consents for land use change conditional upon nutrient concentrations remaining under ecological and drinking water standards in both the main stem and tributaries of both the Hurunui and Waiau Rivers. Hence, attention is still very much focused on the need for existing farmers to adopt better management practices via farm plans to reduce their nutreint losses.

Results

In general, the farmers I spoke to understood the issues of concern for water quality in terms of nitrogen and phosphorus. Some farmers also talked about pathogens and sediments. All were adamant that they wanted good water quality and did not want to contribute to rivers being in poor condition. Nobody objected to limits being set as long as they were fair and reasonable, did not cut across economic viability and profitability and were implemented with sufficient transition times. Many, including dairy farmers, commented that they thought limits were necessary. There appeared to be general acceptance that water quality was an important issue. There was also broad agreement that farmers were responding with fencing stock from waterways, managing effluent, using Overseer, doing nutrient budgets, improving fertiliser application and planting trees. Many farmers talked about these practices as if they had become part of their systems and had been for some time. Dairy farmers were concerned that there was a tail end of their industry or a minority that was letting the side down. They also raised the point that it was often the case that water quality breaches went hand in hand with staffing issues. Several dairy farmers commented that they knew instinctively if a farm was badly-managed – it was a matter of observation and 'gut-feel'. 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 and nutrients.

When asked if they were seeing problems with the water quality in their local area, e.g. slime growing in the rivers, the majority of responses were that they hadn't, or if they did, it was minimal or occurred at times of low flow and high temperatures, but then it would get washed away with a fresh or in winter. Many talked about recreating in the rivers fishing, boating and swimming and how their kids swam in the rivers. They also said they would have no hesitation drinking water in the Waiau or the Hurunui, although they did express hesitation about drinking from tributaries in intensive dairying areas.

Some talked about how water going into the Pahau River had been visibly degraded in the past due to drainage from border dyke wipe-off water. I was told that a group of farmers had sorted out these issues with the help of Environment Canterbury and with the subsequent transition from border-dyke to spray irrigation. As far as those that spoke about this were concerned, the problem was fixed and in the past. One farmer said that his family had stopped swimming in the Pahau but were now happy to swim there again as these issues were no longer a problem.

Hence, for farmers, water quality issues come and go in different years and under certain conditions that are highly variable. Given this, some farmers, in particular dairy farmers, were at a loss to understand the prospect of governments imposing strict regulations that appeared to them as substantially disadvantaging their businesses. Nor could they see the sense in forging ahead with extensive irrigation plans that could put the economic viability of not just their businesses at risk but also new irrigators if expensive mitigation ws to be imposed to meet stringent nutrient limits, particularly if assumptions about nutrient losses turned out to be wrong. The concern here was with the over-mitigation of a problem that exists in the modelling that later turns out not to exist in reality.

For some farmers, water quality was relative. Overseas experiences provided reference points for many with which to compare South Island rivers. They concluded that rivers in their region 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.

When asked to what extent they considered their farm was contributing nutrients to the rivers the responses were consistent – participants considered their contributions to be minimal or well within a reasonable range. Several were using Overseer and knew their leaching rates while others referred to their nutrient budgets and were confident they weren't wasting much fertiliser. They equated applying too much 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.

Farmers identified a range of practices that were contributing to reducing their nutrient losses. Many would be classed as good management practices, such as the reduction of fertiliser use or improvement in the way it was applied and its timing. For example, one farmer's spreading contractor was crushing fertiliser as it was spread into a powder. He maintained that this substantially reduced the amount of fertiliser needed for the same amount of grass production. He indicated it was costing a bit more for the spreader but it was worth it. There was also fencing stock from waterways, converting from border dyke to spray irrigation, riparian plantings and better control systems for irrigation and land application.

Importantly, farmers also talked about biophysical, geological or geographic reasons that explained why their contributions were minimal. These included:

- Distance from the river
- No major water courses on the property
- Dilution effects of high rainfall events (i.e. everything is flushed away quickly)
- Not on shingle soils next to rivers
- Clay soils or clay soil layers
- Nutrients impeded by a series of underground aquifers (i.e. filtered out on the way to river)
- Depth of top soil
- Tile drains
- Digging straw back into soil
- Not a dairy farm
- Low rainfall area
- Building up organic matter in soil over shingle

These explanations are important for the insights they provide into farmers' levels of responsibility, which appear to be mediated by these physical characteristics of the landscape. It might be inferred from these responses that farmers lack the correct understanding of the movement of nutrients via surface water or through groundwater into waterways. Yet, some or all of these processes are relevant and could be occurring or influencing the movement of nutrients in various ways. The fact is, little is known about what happens beyond the root zone beyond

modelling and assumptions about attenuation. As far as farmers are concerned, this relationship is not direct – there are many factors that can impede the movement of nutrients from the farm to the river and, it would seem, moderate responsibility.

In contrast, to how participant farmers see the land-water relationship, science policy frames this relationship, and farmers' responsibility for it, as direct and unimpeded. For example, a search for images of diffuse pollution throws up an array fact sheets and educational resources that depict such a relationship (Figure 3).

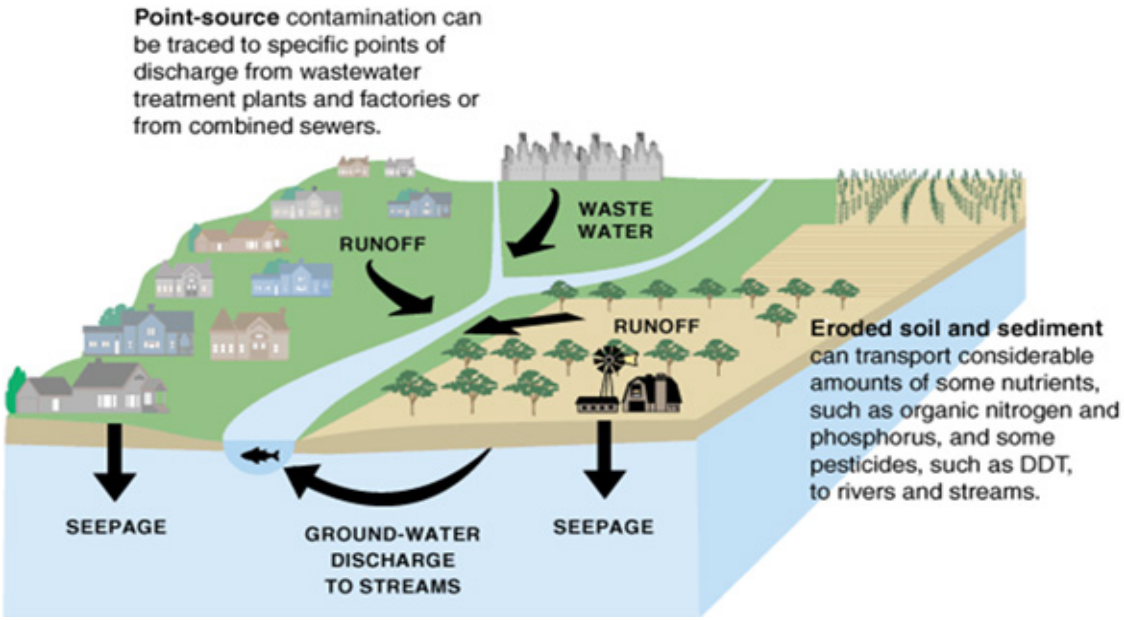

Figure 3: Example representation of the relationship between land and water for diffuse pollution http://www.coastlearn.org/water_quality_management/concepts-ps.html

I'm not arguing that waterways are not the ultimate fate of nutrients or that governments shouldn't be regulating to take account of their cumulative effects. Nor am I suggesting that we should reject the science or wait until there is conclusive evidence to take action. What I am suggesting is that it is significant that farmers' conceptions of this relationship are quite different to the science policy framing embodied in the regional plan. This divergence, in my view, has implications for the development and implementation of audited self-management, farm environmental plans and the sub-catchment approach. Blackstock et al. (2010) maintain that gaining agreement on what is the problem is fundamental to recipients of information being persuaded that there is a need for change. In other words, problem framing precedes understanding and action. My research highlights the extent to which conceptions of 'the problem' are out-of-sync. Farmers (i.e. those who are expected to change their ways) see the problem as temporary and contingent upon a range of highly variable factors and its effects influenced and impeded by a number of equally unknowable circumstances. In contrast, the regional council, with the aid of monitoring and modelling, conceives and represents this

relationship as ever-present, if not visible, and a matter of cause and effect. In other words, the relationship is assumed to be, ultimately, direct and unimpeded.

The following statements from participants illustrate the contingencies farmers are grappling with in their attempts to reconcile what they know about their land and how it works, what they see occurring on their properties and across the land, and how they align their understanding with what the science policy actors are telling them.

Now we've been told that because it's quite shallow groundwater that it is only taking seven years from the time of an on-farm change for it to reach the rivers but I'm not so sure about that … we're still not convinced on the lag phase – I still have a gut feeling that seven years is probably still a bit short.

(Interview 4, Dairy Farmer)

We think we've got a very good understanding of what happens in the root zone … but what happens between the root zone and waterways? … You've got such a slow path of travel from between this paddock to … the main waterways and that to the coast – there's going to be no quick science to prove anything there … I don't doubt that there are practices that happen in the paddock that impact on water quality … but I think they're probably jumping the gun a little bit making some assumptions that, I don't know, I feel they're very risky some of the assumptions they're making.

(Interview 3, Dairy Farmer)

… we get pugging issues when it's … really wet like last winter but the winter before we hardly had any mud and ponding of water and …. so, I don't know … it all depends on what comes out of the sky in the winter. But a lot of that's superficial too. If it looks muddy, it looks terrible, everyone jumps up and down but what's actually happening? I don't know if we know enough about it yet because in theory, the river, you know, it's raining, the river's at its highest for that week or whatever, so isn't it going to take it away faster?

(Interview 7, Sheep and beef with dairy support).

I dug a hole here and struck water, and it smelt like Hanmer Springs – sulphur. Now that could be stagnant water not moving at all so how long does it take to smell like that? More than seven years I'd suggest – it's been sitting there since god knows – where does that sit in the argument?

(Interview 9, Dairy Farmer)

> *it's just the sheer volume of work involved in trying to assemble what's going on in a 7-8 hectare paddock … that would do 400 cows for 7 weeks plus I'm also putting on this amount of straw and am putting on that amount silage and maybe a wee bit of hay. You put all that in the one area – well where's all the urea and the faeces going from there? Is it staying in the ground or is it getting utilised in the spring time or is it sitting a metre down, sitting there for a big flush to flush it a bit further down or what? It's something I don't know how on earth they're really going to quantify, is it damage or is it not a problem?*
>
> (Interview 5, Arable with dairy support).

These statements do not indicate a rejection of the science and modelling but illustrate farmers' attempts at reconciling its methods and conclusions with their existing knowledge. Importantly, they highlight how farmers' ways of knowing involve gut feeling, observation, questioning assumptions and common sense. Hence, as argued by Wynne (1992, 281), "scientific information is never, and can never be, a purely intellectual process, about reception of knowledge *per se*".

Conclusions

According to Margerum (2011, p. 17), "[e]ffective collaboration … is not just about producing a consensus but also about producing results from consensus". Notwithstanding High Court challenges and the ongoing smoothing out of the devil in the detail of the regional plan, the Hurunui Waiau zone is moving beyond consensus into an implementation phase. This is a new and different phase to what has preceded it. Implementation could easily be considered merely as a matter of backfilling an existing path – in this case the implementation of the ZIP under the rules set out in the regional plan. If so, the estimation of effort and requisite resources are likely to be substantially under-estimated. Implementation is going to require a new set of governance arrangements and new ways of bringing many more people together. The top-bottom-up-down approach that is the CWMS has to, in my view, begin to put down roots to build a stable foundation for achieving the goals of the ZIP over the long term. Finding ways to accommodate how farmers conceive 'the problem', the relationship between land and water and the responsibility they bear for it is an important precursor to prepare the ground into which these roots need to grow.

According to the literature, how farmers conceive 'the problem', and the responsibility they bear for it, are important foundations for moving forward. The years of collaboration and negotiation that have, understandably, tired so many involved in the roll out of the CWMS might give the impression that there is agreement on what the problem is and who bears what onus of responsibility. While it is acknowledged that my findings are preliminary and, as yet, draw from a small number of participants, they already show that conceptions of 'the problem' are out-of-sync. Many farmers believe they are already taking responsibility for water quality and this is evident, as far as they are concerned, in their actions (if not from the concentrations of nutrients and

pathogens in the river). They also see the problem as temporary and contingent upon a range of highly variable circumstances, and its effects influenced and impeded by a number of equally contingent and potentially unknowable forces and resistances. In contrast, the regional council, with the aid of monitoring and modelling, conceives this relationship as a matter of cause and effect – it is assumed to be, ultimately, direct and unimpeded.

The question is, how are these divergent worldviews to be reconciled to move forward with implementation? And, more fundamentally, can they be reconciled and should they? I don't yet have answers to the latter questions but in terms of the former, theory tells us that seeking to educate farmers with governments and industry groups assuming what farmers need to know and telling them what to do without also seeking to understand and work with the ways they see and grapple with the world will almost certainly lead to the realisation of the risks identified by Irrigation NZ in terms of a lack of farmer support and plans not or only partially implemented. Recognising implementation as a new phase and a new beginning would be a first step in providing opportunities for answering these questions.

References

Blackstock, K.L., Ingrahm, J., Burton, R., Brown, K.M. and Slee, B. 2010. 'Understanding and influencing behaviour change by farmers to improve water quality'. *Science of the Total Environment*, 408, 5631-5638.

Dwyer, J. Eaton, R., Farmer, A., Baldock, D., Withers, P. and Silcock, P. 2002. 'Policy mechanisms for the control of diffuse agricultural pollution, with particular reference to grant aid'. English Nature Research Report No. 455, Peterborough.

Irrigation New Zealand (2013) Draft report*: Audited Self Management for Irrigation: Managing Water Quality and Quantity within Limits*

Irwin, A. & Wynne, B. 1996. (eds) *Misunderstanding science?: the public reconstruction of science and technology*. Cambridge University Press: Cambridge.

Jasanoff, Sheila. 2004. 'Ordering knowledge, ordering society', pp. 13-45 in *States of Knowledge: the Co-production of Science and Social Order*. Sheila Jasanoff (ed). London: Routledge.

Margerum, R. 2011. *Beyond consensus: improving collaborative planning and management*. MIT Press: Cambridge (MA).

Wynne, B. 2001. 'Creating public alienation: expert cultures of risk and ethis on GMOs'. *Science as Culture* 10(4), 445-481.

Wynne, B. 1992. 'Misunderstood misunderstanding: social identities and public uptake of science', *Public Understanding of Science* (1), 281-304.