Menus of practice to improve water quality – a Waikato example of collaboration in action

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Abstract

Water quality in the Waikato Region is highly variable, despite ongoing efforts from farmers, iwi, industry, local government and other stakeholders in the region. Intensive farming is a major contributor to areas of poor water quality. Levels of nitrogen in the region's waterways have been rising slowly but steadily over the last 20 years. Nitrogen in groundwater can take decades to emerge into surface water. Hence, this indicator of water quality will worsen before it improves. Levels of micro-organisms are moderate to high, but stable. Sediment levels are high in places, and phosphorus levels vary. Menus of good practice to improve water quality arose from direct requests by farmers and have been developed by collaborative effort between the Waikato Regional Council, research and industry bodies. They provide farmers and consultants with a decision support tool that is both scientifically rigorous, and flexible enough to meet the needs of individual farmers' circumstances by providing an objective assessment of the relative benefits of a range of practices for their mitigation of nitrogen, phosphorus, sediment and bacterial discharges from farms. The procedures can also be used as a contribution to the review of the current Regional Plan.

Keywords: water quality; limits, integrated catchment management; on-farm change; menu; sustainability

Background

In 2006, the Waikato Regional Council identified that agricultural practices were contributing to rising nutrient levels within the region's waterways, particularly the Waikato hydro lakes. In response, they launched a three year project to pilot an integrated catchment management approach to raise knowledge of nutrient management, package information for planned policy reviews, and engage farmers in implementing on-farm change to achieve improvements in water quality.

The integrated catchment management pilot project initially focussed on two of the region's sub-catchments, the Little Waipa and the Waipapa catchments. These catchments were chosen because they were of a manageable size to work with over three years, were representative of land use within the Waikato region with a large agricultural component, had long term water quality monitoring stations that showed trends of increasing nitrate and phosphorous in stream and did not have significant geothermal issues which could mask the impact of on-farm changes in water quality (Hungerford 2009).

The integrated catchment management project had a strongly collaborative focus. In the initial consultation phase of the project farmers asked project staff to provide a 'menu' of on-farm 'best practices' to help them pick and choose from technology available to reduce nitrate leaching. A menu, in this context, is a list of a range of practices related to a specific outcome, in this case to improve the quality of water run-off across the ground surface or through the soil profile, from a particular farm. The early menu that was developed from these consultations covered topics of nutrient budgeting, nutrient management planning, storing effluent, increasing effluent land application area, riparian management, tracks and races, hotspots and wintering practices (Waikato Regional Council, Unpublished data. Internal reference number 1136969).

After the development of this early menu, farm planning, which also met nutrient management planning guidelines at the time, was carried-out on just over 60% of farms in both of the integrated catchment management catchments. Farmers were comfortable with the themes covered within the plans and there was sound uptake of planned actions (Hungerford 2009). However, farmers were still seeking further information on the likely costs and benefits of the actions described in their farm plans. For this reason, the Waikato regional Council initiated a programme to understand the likely costs or benefits of changes in nutrient management practices. Initial financial analysis work was carried out with AgResearch in 2008, looking at four dairy farms across the two integrated catchment management catchments. The project was enlarged when the Waikato Regional Council contracted AgFirst Waikato Ltd. to analyse ten dairy and four sheep and beef farms throughout the upper Waikato. The work was co-funded and supported by the dairy and fertiliser industry and Waikato regional Council partnered with DairyNZ, Fonterra, and Ballance AgriNutrients (AgFirst 2009). The outputs of both of these reports were influential in driving farmer uptake, and have been important inputs for Waikato regional Council in considering future policy directions.

Since 2009, the integrated catchment management pilot project has been largely completed, although contact is maintained with farmers who were involved in the projects, through

ongoing newsletters and limited on-farm contact as requested. The primary sector organisations operating in the Upper Waikato catchment have now embarked on an extension programme using the results of the pilot project to encourage uptake of good practices by farmers across the catchment. The extension programme includes the Sustainable Milk Plan project led by DairyNZ and the development of the Menus of practices to improve water quality.

In 2011 the Waikato Regional Council, alongside the Upper Waikato Primary Sector Partnership, started work on the most recent phase of the menu. This work started with a review of current literature around cost/benefit analyses of on-farm mitigations, compiled by the Waikato Regional Council for review by the working group. This group considered each mitigation technology, discussed each within a farm system and nutrient budget context and injected practical factors to consider. In undertaking this collaborative work, the group aimed to reach consensus on each technology. In doing so some research gaps were identified, many ratings of technologies changed, and the group came away with a high level of 'buy-in' from working together on the three documents developed for the dairy, drystock and cropping sectors respectively. An outline of the management areas, farm practices, the likely benefit to be derived in water quality and the potential impact on the farm business through the outlined change in practice, considered for the dairy sector menu, is shown in Table 1. Detailed menus for each of the three sectors are available on-line at *http://www.waikatoregion.govt.nz/menus*.

Table 1: Outline of the farm practices considered within defined management areas for the menus developed for the dairy sector menu. N = Nitrogen; P = Phosphorus; L = Low (<10% change for N, <20% change for other); M = Medium (10 to 25% change for N, 20 to 50% change for other); H = High (>25% change for N, >50% change for other). The number of $ signs indicates the relative magnitude of the response in terms of the cost and benefit of the practice.

Management area	On-farm practice	Likely water quality benefit				Potential impact on farm business	
		N	P	Sediment	Micro-organisms	Cost	Benefit
Whole farm planning	Business and systems analysis	Dependent on farm attributes				$	$$$
Nutrient management	Nutrient budget	Dependent on practices in use				$	$$
	Nitrogen fertilizer application rate	M	-	-	-	$	$$$
	Soil testing	-	M	-	-	$	$$$
	Diet substitution	M	-	-	-	$$	$
Riparian management	Fence stock out of waterways	L	M	H	H	$	$$
	Use of culverts	L	M	H	H	$-$$$	$$
	Fence stock out of wetlands	M/L[1]	L	H	M	$-$$	$$
	Constructed wetlands	M	M	M	M	$$$	$
	Riparian planting	L	M	H	H	$$$	$
	Sediment trap	L	M	M	L	$$$	$
Effluent management	Application area	L	L	L	M	$	$$
	Storage and application system	M	H	L	H	$$-$$$	$$$
	Reduction of effluent volume	L	L	L	L	$	$$
	Grow maize on effluent block	L	L	-	-	$	$$
	Export effluent solids	M	L	L	M	$	$$
	Low rate effluent irrigation	L	M	L	M	$$-$$$	$$
	Increase storage volume	L	M	M	H	$$$	$$
Off-pasture options	Controlled grazing regimes	L	M	M	M	$-$$$	$$$
	Off-pasture facilities	H	H	H	H	$$-$$$	$$
	'Cut and carry' pasture management	H	H	H	H	$$$	$
	Grazing stock off-farm for a period	M	M	M	M	$$	$$
Managing critical source areas	Reduce run-off from tracks and races	L	M	M	M	$	$$
	Move troughs and gateways from flow paths	L	M	M	M	$	$
Protecting soil health	Manage grazing of heavy stock on steep areas	L	M	M	M	$	$-$$$
Cropping management	Reduce soil cultivation	M	H	H	-	$	$$
	Cultivate along contours	L	H	H	-	$	$$
	Time nitrogen application	H	-	-	-	$	$$
	Manage grazing of winter forage crops	L	M	M	M	$$	$$
	Use placement tools (GPS guidance)	H	H	-	-	$$$	$$$
	Buffer strips adjacent to waterways	L	M	L	-	$$	$
Emerging technologies	Precision fertilizer application	L	M	-	-	$	$
	Use of gibberellic acid	L	-	-	-	$	$

Process of developing the menu

As a starting point for discussions, a widespread literature review of New Zealand based technologies was undertaken to outline the current suite of technology available on-farm to mitigate on-farm losses. This review was particularly focussed on trials and research around the country assessing the cost/benefit of various mitigation methods. Many of these articles were commissioned within sensitive catchment studies and undertaken by AgResearch or farm consultancy groups with small numbers of farms. When comparing results the context in which articles were written differed depending on policy context around the country. Initially the Waikato regional Council considered a quantitative approach to try to normalise each technology and the associated cost/ benefit. This approach was discounted due to the range of farm systems and farm contexts within which the studies were undertaken. Nevertheless the issue was discussed at length with the working group as one mitigation technology can have a wide spread of applicability on-farm and the cost/benefit can vary widely. To counter this it was noted that any one technology cost benefit ratio was indicative, and needed tailoring to each on-farm situation.

Taking results from the Waikato Regional Council literature review, a small working group of local experts and industry representatives was assembled. Meetings were coordinated by the Waikato regional Council, with much of the work carried out within a meeting context. The membership and skills represented by this working group were crucial in ensuring that the range of necessary skills was incorporated within the working group. Members were sought who understood on-farm context, policy settings in which the Waikato Regional Council operates within the Waikato, and who had enough technical knowledge to provide useful debate. For this reason a mix of agency representatives from DairyNZ, Fonterra, Beef + Lamb New Zealand and the Foundation of Arable Research, farm consultant agencies including AgFirst Waikato Ltd and Headland consultants, and political organisations representing farmers encompassing Waikato and Rotorua/Taupo Federated Farmers were recruited. Waikato Regional Council was charged with coordination and project oversight.

Policy and implementation context in Upper Waikato

One of the first uses of the menu, other than on-ground extension, was to inform Waikato Regional Council's policy team, and other collaborative groups, of the upcoming policy review of the current suite of mitigation technology available. This was planned as an early input to the Healthy Rivers, Plan for Change project which is due to start in 2013. By packaging the suite of technologies available alongside pastoral sector agencies, the menus assist non-farm specialists to understand the breadth of technology available, relative usefulness of each and, more importantly for farmers, the cost/benefit of changes on-farm.

Current drivers to the Waikato Regional Council to review the Waikato Regional Plan are similar to other regions throughout the country. Firstly, the Waikato Regional Council is soon to reach the 10 year plan review threshold, to review plans under the Resource Management Act (2009). Secondly, the National Policy Statement for Freshwater Management 2011 (Ministry for the Environment 2011) directs that Regional Councils are required to set limits and policies for all water bodies within their regions with a plan for how to improve water allocation and water quality by 2030. This includes a staged approach to management. Thirdly, in the Waikato River catchment the Waikato Regional Council is now required to work with the five core river iwi to meet the objectives of the Waikato Vision and Strategy that is embedded into the Waikato Regional Council's Regional Policy Statement 2012 for the Waikato and Waipa River catchments to protect and restore water quality alongside efforts of the River Cleanup fund.

These are all strong drivers for review of policy, and the context within which the Waikato Regional Council and agricultural industries are currently working. The menu assists in providing early information for policy reviews. It has also been worthwhile in having discussions at a technical and on-ground implementation level around what is practical and achievable, as well as bringing earlier suites of technology up to 2013 levels of understanding. In 2012 the Land and Water Forum came out with their recommendations of how Councils should engage industry and communities when undertaking plan changes. Collaboration is the focus of these documents, and the menu has been a strong body of work where collaboration has worked to engage a number of parties to reach consensus on an agreed output.

It is envisioned that as we move into a more resource limited operating environment many more technologies and mitigation combinations will be developed as the agricultural sector meets the needs of their farmers. For this reason the menus will require regular updates in print and web copies.

Planned extension, use and future directions

In discussions with the Upper Waikato Primary Sector Partnership working group about on-farm use of the menus it was felt that the starting point for any use would be a farm plan or analysis of farm systems alongside a nutrient budget. Without such tools, a farmer may still uptake technology based on a cost/benefit approach, but may address areas of the farm that did not lead to overall benefits to

production efficiency, or lower loss of nutrients, sediment or micro-organisms. For this reason, where consultants exist, such as in the dairy and fertiliser sectors, it was planned to extend this tool via rural professional and consultant networks. For other sectors, especially drystock, where consultant numbers on the ground are low, it was felt some support from industry representatives and the regional council could assist. Much of the on-farm delivery would be via highly involved, skilled and interested farmers.

In 2013 the launch of the menu was undertaken by the Waikato Regional Council at the National Agricultural Fieldays at Mystery Creek. This was very well received and both farmers and industry representatives liked the logical list of on-farm solutions/technologies outlined.

Industry partners see that this tool will sit well with existing hard copy communication material and can be extended through existing programmes. In the Dairy Sector the first and largest extension will be through the Upper Waikato Sustainable Milk Project funded by DairyNZ and the Waikato River Authority. This project was started to create Sustainable Milk Plans with the 700 dairy farms in the Waikato catchment. The Dairy sector also has identified that the menu will be used in other sensitive catchments throughout New Zealand and there is the possibility of tailoring it for use in other regions.

In the drystock and arable cropping sectors the menu will be used in the Land and Environment Plan extension over the coming year, and in other extension events in the cropping world undertaken by the Foundation of Arable Research and seed merchants such a Pioneer for maize production in the Waikato. Future development steps of the menu include developing a web based, smartphone or tablet friendly website for use by farmers and consultants. This may also be downloadable to ensure users are not at the mercy of internet connections, especially in remote rural areas. The Upper Waikato Primary Sector Partnership working group will continue to develop this web decision support system tool and has shown interest in future revisions and editions.

Conclusion

Farmers around the country, and within the Waikato, are now operating in a tightening policy context. Central Government policy and regional drivers mean Regional Plan reviews will soon commence. For this reason farmers and their agencies will require packaged solutions to farm within limits. The menus of practice to improve water quality achieve part of this need, alongside advice and support from rural professionals and the primary sector agencies.

In identifying the challenges of working within limits the Waikato Regional Council, working alongside eight primary sector agencies in the Upper Waikato, have packaged the most up-to-date literature, checked this against in-field use and refined a suite of current practices to improve water quality in the Waikato. In doing so, this group has taken the menu theme initially sought by farmers in the integrated catchment management pilot catchments as a useful tool to build upon. In modern terms this could be seen as a basket of technologies, or a decision support tool.

This menu provides a range of practices for farms to improve nutrient management and reduce impacts on water quality. It is designed to help identify the best options for individual circumstances. The practices listed are generally a step ahead of current regulatory expectations. They will also help farmers to better meet future sustainability challenges.

The set of three menus for the dairy, drystock and cropping sectors will be widely applicable for on-farm use by farm consultants and advisors. There has been widespread interest from around New Zealand from other Regional Councils to inform current and future reviews of Regional Plans.

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