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Menu

Practices to improve water quality

Cropping land

FAR

Healthy Farms Healthy Rivers
ACTIONS FOR CHANGE

Waikato Regional Council
Te Kaunihera ā Rohe o Waikato

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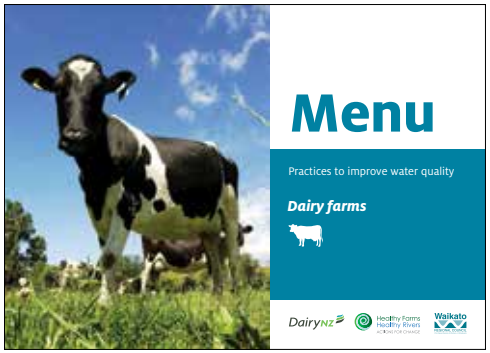

This menu has been developed by Waikato Regional Council and the Upper Waikato Primary Sector Partnership, a group of representatives from agricultural industry organisations working in the Upper Waikato catchment. The group aims to work together to help farmers improve nutrient efficiency and reduce losses.

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FAR

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Ballance agri-nutrients

DairyNZ

beef+lamb new zealand

Fonterra – Dairy for life

AGFIRST

Headlands – minimal footprint - optimal profit

Thank you for technical input from:

Ross Abercrombie, Don Harford, Blair Keenan, Alan Campbell, Jackie Fitchman and Angela Davies, Waikato Regional Council with technical writing assistance from Ange Bryant

Mike Scarsbrook, Bruce Thorrold, Adrian Brocksopp and Chris Glassey, DairyNZ

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Menu of practices to improve water quality: cropping land

About this menu

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

The menu is designed to support current industry initiatives, such as the work of the Foundation for Arable Research's (FAR) and HortNZ. The arable industry standard is the Farm Environment Template and Guidelines for Arable Enterprises and HortNZ is currently using the Good Agricultural Practices (NZGAP).

The starting point for using this menu is a nutrient budget and a farm system analysis which looks at farm goals, challenges and management approaches. These tools will help identify which water quality improvement practices will best fit your farm, taking into account flow on effects on other farm policies. Looking at the big picture will help ensure changes in one area do not create deficits or unbudgeted costs in another.

What's the issue?

Farmers, iwi, industry, local government and others have already done much to improve water quality, and continue to do so. However, more is needed to meet community desires for fresh water.

Water quality varies across the Waikato region from excellent to poor. This is largely due to variations in land use type and intensity, and also due to geology. In less developed parts of the region conditions are excellent and there have been few signs of deterioration. But water quality is poorer in intensively-farmed areas. In some areas, urban and other non-agricultural point sources also contribute to poor water quality.

In waterways across the region, slowly but steadily rising levels of nitrogen over the last 20 years are cause for concern. Nitrogen in groundwater can take decades to emerge into surface water, and 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.

Water quality benefits

To help determine the most effective water quality improvement practices for your farm, each practice's likely water quality benefits are rated. The ratings are based on latest research, and indicate likely effectiveness in reducing the amount of nitrogen (N), phosphorus (P), sediment and micro-organisms entering waterways.

Topography and management regimes vary from farm to farm, as do the need for and effectiveness of each practice listed. The ratings are an indicative best estimate and assume generally accepted industry good practice is followed.

Likely water quality benefits: estimated reduction (at whole farm scale) in contaminant reaching waterways

	Nitrogen (N)	Phosphorus (P)	Sediment	Micro-organisms
Low L	Less than 10%	Less than 20%		
Medium M	From 10 to 25%	From 20 to 50%		
High H	More than 25%	More than 50%		

Farm business impacts

Each practice's potential cost and economic benefit to the farm business are also rated. Individual farm circumstances will influence costs and benefits. However, the menu can help you identify a short list of practices for the farm management team to consider in more detail. Many of the practices' cost ratings are different to their benefit ratings. For example, a low cost practice may provide a high farm benefit. Also, some of the benefits may take some time to be realised.

Potential impact on farm business

	Cost	Benefit
Low $	Limited input of farmer time and expenditure. Limited practice change required.	Little change to farm profit as a result of this practice, or may require small changes to farm infrastructure.
Medium $$	Moderate input of farmer time and expenditure. Some practice change required.	Practice likely to result in a moderate increase in profitability or improved management.
High $$$	Significant input of farmer time and significant expenditure. Significant practice change required.	Very profitable practice or results in improved management e.g. large reduction in farm operational costs.

To copy mitigations into your farm environment plan go to **www.farmmenus.org.nz**.

Tell us what you think and register for updates

This menu reflects current knowledge and future editions will be produced as knowledge develops. We value your feedback, so if you have any concerns or suggestions, please contact a Waikato Regional Council Agricultural Advisor on freephone 0800 800 401 or info@waikatoregion.govt.nz.
To automatically receive future editions of this menu, please register at www.waikatoregion.govt.nz/menus.

Cropping land

Management area	On farm practice	Likely water quality benefit				Potential impact on farm business		Factors to consider
		N	P	Sediment	Micro-organisms	Cost	Benefit	
Whole farm planning	Whole farm business and systems analysis, including cropping areas	The farm analysis will identify water quality benefits and risks. Reductions in loss depend on the farm system and soil type.				$ - $$	$$$	Involves assessment of farm resources, stocking policies and farm business risks. A good starting point that will help clarify the most useful practices to consider. Should include industry good practices and a risk assessment of current practices.
Nutrient management	Do a nutrient budget to determine your crop nutrient requirement[1]	Benefits depend on soil test results				$	$$$	Use a fertiliser representative or a decision support tool (e.g. the most recent version of OVERSEER ®[1]) to develop a nutrient budget.
	Test the nutrient fertiliser content of manure, slurry, compost or effluent before application	H	H	-	-	$	$$ - $$$	Will ensure nutrients are not oversupplied and may mean crop can be grown without additional fertiliser, but soil nutrient status must be determined before planting. Application must follow industry good practice to minimise run off and should be undertaken at optimal growing times for crop. Can be challenging to calculate the application rate and optimal timing.
	Time N application to meet crop demand using split applications or slow release N	H	-	-	-	$	$$	By targeting crop demand better uptake of nutrients by crops and lower losses occur. Split applications are more costly and management intensive.
	Calibrate fertiliser spreaders to deliver the correct rate for the site	H	H	-	-	$	$$	Lessens the risk of fertiliser landing in waterways or being over and under applied. Self-operated spreaders require regular calibration. Fertiliser contractors should be Spreadmark certified.

[1] The OVERSEER® nutrient budgeting programme assumes many 'low' rated practices, such as appropriately timed nitrogen applications, are already in place. If these practices haven't been implemented, OVERSEER® is likely to underestimate nutrient losses. In stating this, this menu is focused on real change on the ground so all practices listed are worthwhile.

Management area	On farm practice	Likely water quality benefit				Potential impact on farm business		Factors to consider
		N	P	Sediment	Micro-organisms	Cost	Benefit	
Nutrient management *(cont.)*	Plant maize or other deep rooted crops to utilise or 'mop up' nutrients from high fertility soils e.g. effluent or whey blocks	L	L	-	-	$	$$	Useful for effluent blocks, winter grazing areas and land out of long term pasture, providing fertiliser inputs are reduced.
	Undertake regular soil tests, including deep N	M	M	-	-	$$	$$	Deep N tests are useful to confirm mineral N levels. One soil test per paddock is the most cost-effective approach but the sampling needs to be representative of the whole site, avoiding gateways and stock camps. Use GPS for repeated sampling. The cost of soil testing may be offset by fertiliser savings, especially for P and N.
	Use precision cropping tools for fertiliser application and tillage e.g. GPS guidance, crop sensing	H	H	-	-	$$$	$$$	Delivers more precise nutrient inputs for expected crop yield. Likely to become more widely used as tractors are upgraded over time.
	Select the right fertiliser product for the conditions	M	M	-	-	-	-	Consider using slow release formulations of both N and P to reduce the risk of nutrient losses from leaching.
	Manage Olsen P in optimal range	-	M	-	-	$$	-	All crops have an optimal range for P, which varies depending on soil type.

Cropping land

Management area	On farm practice	Likely water quality benefit				Potential impact on farm business		Factors to consider
		N	P	Sediment	Micro-organisms	Cost	Benefit	
Cultivation management – crop establishment	Reduce soil cultivation by adopting strip tillage or direct drilling, and minimising the number of passes over the paddock	L	H	H	-	$	$$	Effective for reducing run off and soil loss, and improving soil quality and infiltration. Soils that have been grazed over the winter may be compacted or pugged, requiring more cultivation or resulting in rough paddocks. Requires modified planter machinery to deliver good seed placement for even plant establishment. Additional expenditure might be required for insect pest control. FAR trials show a benefit of $200/ha to direct drilling if crop establishment costs and yields are similar.
	Cultivate along contours (rather than up and down the slope) where slopes greater than 3°	L	H	H	-	$	$$	Slows down run off and reduces erosion. Row orientation should follow contour.
	Install bunds along paddock edge to prevent water flow onto or off paddock	L	H	H	-	$	$$	Suitable for land with slope greater than 3°. Contains run off at bottom of paddock where sediment can settle out.
	Put in silt traps to settle out sediment from water before it enters drains	L	H	H	-	$	$	Suitable for land with slope greater than 3°. Should be used together with other measures to reduce erosion. Sediment must be returned to the paddock.
Cropping management	Establish in-field grass buffer strips on sloping paddocks	-	H	H	-	$	$$	Reduces risk of soil loss from heavy rain events.
	Use winter cover crops on fallow paddocks	H	H	H	-	$$	$$	Winter active cover crops utilise available soil nutrients, reducing the risk of nutrient losses if not grazed.

Management area	On farm practice	Likely water quality benefit				Potential impact on farm business		Factors to consider
		N	P	Sediment	Micro-organisms	Cost	Benefit	
In-paddock management to reduce water movement	Use wheel track ripping and wheel track dyking to slow run off and reduce erosion	M	H	H	-	$$	$$	Ripping increases rainfall infiltration and reduces soil movement. Dyking creates a series of closely spaced indentations within a row, slowing run off and soil movement and increasing infiltration.
Riparian management	Leave grass buffer strips (2m or more) for cultivated land next to waterways	L	M	M	-	$$	$	Effective for filtering run off and reducing the risk of fertiliser loss during spreading. More benefit on greater slope but wider buffer required. Grazing of buffers only appropriate for ephemeral waterways during summer dry. May require weed management but can provide habitat for beneficial predatory insects, reducing need for pest control.
	Fence stock out of waterways	L	M	L	H	$-$$	$$	Fencing could range from permanent 8 wire to temporary electric fencing during grazing periods, depending on individual farm needs and preferences. Two wire electric with sheep undergrazing may be appropriate where exclusion of large stock is the priority. Provide a minimum setback of at least 3m. Fencing adds capital value, reduces stock losses and benefits animal health. Can also be used to improve subdivision and pasture utilisation. Costs include reticulated water.
Irrigation	Measure and record soil moisture and rainfall to develop a soil water budget	-	-	-	-	$	$	There is value in collecting and using farm data to inform management decisions. Note that one will need local evapotranspiration data to complete the water budget
	Use the soil water budget and crop information to schedule irrigation	M	L	L	-	$$	$$	Water scheduling increases water efficiency. Benefits will depend on current practice, soil type, irrigation efficiency and farm system. Seek professional advice on soil moisture monitoring and irrigation scheduling.

Cropping land

Management area	On farm practice	Likely water quality benefit				Potential impact on farm business		Factors to consider
		N	P	Sediment	Micro-organisms	Cost	Benefit	
Irrigation *(cont.)*	Keep soil water status above the trigger point for crop yield loss	H	L	-	-	$$$	$$$	Only applicable where crop irrigation is possible. High initial cost for system and ongoing cost for operation. Provides the opportunity for precise management of crop nutrients by reducing the risk of yield loss caused by water stress. Requires regular measurement of soil moisture throughout the life of the crop. Irrigation must be scheduled to match water supply with crop demand. Important to maintain at least 85% irrigation efficiency to minimise wastage of water and run off risk.
	Maintain even water application and do not exceed the soil's water infiltration rate	M	M	M	-	$	$$	Reduces the risk of ponding, run off and crop damage from water logging.
	Maintain irrigation equipment	-	M	M	-	$$	$$	Check pump performance and ensure pipes are not leaking and nozzles are not blocked. Poorly performing systems waste energy and water.
Grazing management	Strip graze towards waterways, rather than away from them.	L	M	M	M	$	$	Applies to grazed paddocks in wet weather with overland flow that converges to form small channels of running water. Have as large a grass strip as possible between the winter grazed strip and the waterway, for as long as possible. Benefits will depend on fertility and slope.
	Use controlled grazing regimes on winter crops (back-fencing and onoff grazing) to reduce risk of N leaching, run off, soil loss and compaction	L	M	M	M	$$	$$$	Maintains soil drainage allowing water to infiltrate rather than run off. Can result in long term reduction in soil quality and may require cultivation to remove compaction. Grazing of feed crops should be avoided during wet periods, which restricts feed options. Post-grazing soil tests (e.g. deep N) will ensure grazing nutrients accounted for in new crop establishments.

Management area	On farm practice	Likely water quality benefit				Potential impact on farm business		Factors to consider
		N	P	Sediment	Micro-organisms	Cost	Benefit	
Post-crop management	Reduce fallow time by sowing another crop/ grass to cover losses and harvest nutrients	H	L	L	-	$$$	$	Cover crops other than grass can provide greater benefits for soil quality and nutrient uptake but tend to be low yield.
Farm training	Embed environmental management into farm practices by training and incentivising staff.	M	M	M	M	$	$	The level of benefit will depend on the staff members' experience in environmental practice and ability to influence on farm practice change.

Please note: This document assumes generally accepted industry good practice is followed in all aspects of cropping.
Refer to www.far.org.nz for more information and advice on overall environmental good practice for cropping land.

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