ACCELERATING THE ADOPTION OF GOOD ENVIRONMENTAL PRACTICE ON DAIRY FARMS IN THE UPPER WAIKATO CATCHMENT

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Abstract
The Upper Waikato Sustainable Milk Project is the largest environmental good-practice catchment project ever undertaken by the New Zealand dairy industry. Co-funded by the Waikato River Authority, Primary Growth Partnership and DairyNZ, the project aims to accelerate the adoption of good environmental practice on farm to ultimately improve the health of the Waikato River. Over a three-year period from June 2012, all 700 dairy farms in the Upper Waikato Catchment were offered one-on-one advice and support via the development of a farm-specific DairyNZ Sustainable Milk Plan (SMP). The SMP process involves consultants working with farmers individually to assess the current status of their farming system and identify risks in the key areas of nutrient, effluent, waterways and land management, as well as water use efficiency. An action plan is developed and follow-up support is provided by the consultant during implementation.

All individual actions implemented are documented to enable estimation of potential changes in nitrogen (N), phosphorus (P), sediment and *E. coli* losses off-farm before and after plan implementation. Preliminary results indicate an average 8% (range 0-49%) reduction in N and 16% (range 0-63%) reduction in P across the first 439 farms analysed. The project is on track to improve the health of the Waikato River through the collective actions of all 700 dairy farms in the catchment.

1. Introduction
The Upper Waikato Sustainable Milk Project is the largest environmental good-practice catchment project ever undertaken by the New Zealand dairy industry. The primary aim of the project is to support on-farm changes that will enhance water quality and ecosystem health in the Waikato River and demonstrate to policy-makers and the wider community the collective commitment of farmers to sustainable dairying in the catchment. The Vision and Strategy for the Waikato River (WRA, 2013) has been a key influencing factor in the progress of the project. This paper provides an overview of the project and a summary of preliminary results.

2. Methods and approach
This project is focused on the Upper Waikato Catchment which covers an area of 465,871 hectares from Huka Falls to the Lake Karapiro dam (Figure 1). The project is overseen by a steering group comprised of key stakeholders in the catchment. Overall water quality in the upper catchment is generally excellent or satisfactory at most of the sites monitored. However, it is acknowledged that there has been a declining trend for certain water chemistry parameters measured at some locations (Vant, 2013).

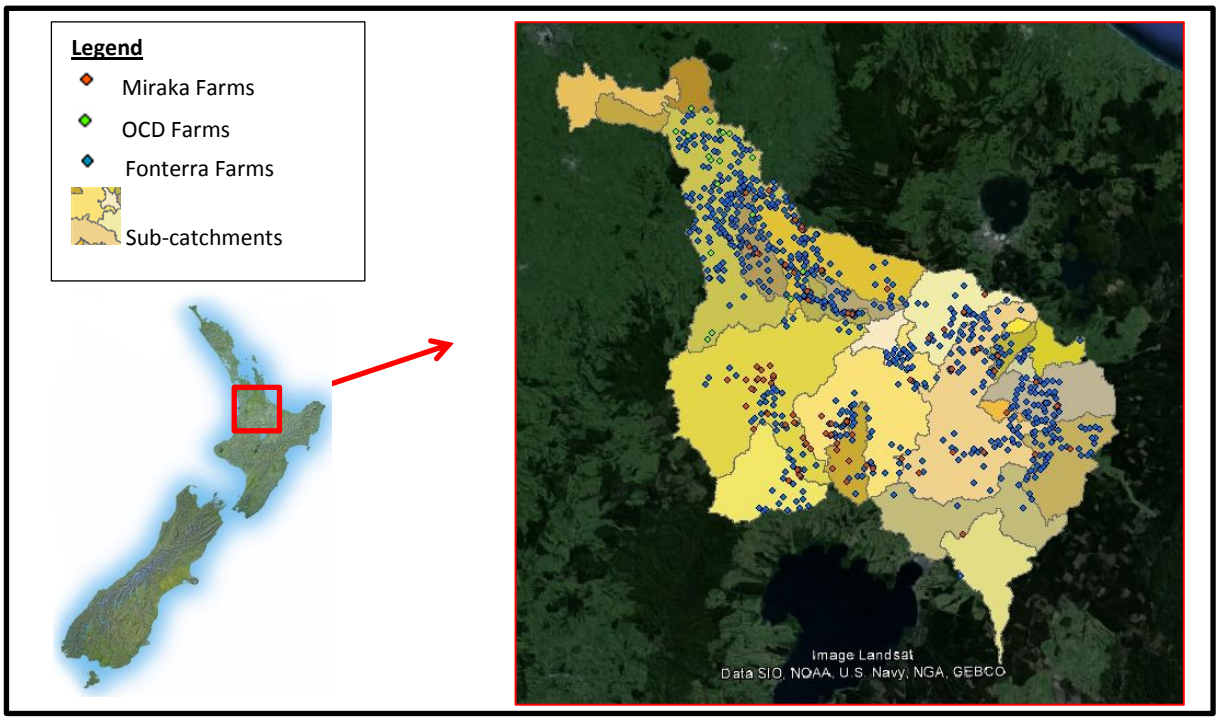

Figure 1: Location of the Upper Waikato Catchment and the 700 dairy farms. The 24 individual sub-catchments are shown in various shades of brown.

Sustainable Milk Plan Process

Over a three-year period from June 2012, all 700 dairy farms in the Upper Waikato Catchment were offered one-on-one advice and support via the development of a farm-specific Sustainable Milk Plan (SMP). The SMP enables farmers to prioritise their existing and proposed activities into one, simple document. A key characteristic of the SMP is that it contains the farmers' own agreed actions and a timeline for implementation.

The SMP process is focused on five main management target areas; nutrient, effluent, land, and waterways management, as well as water use efficiency. Objectives for each management area were developed through the steering group and wider stakeholder discussions. The objectives focus on what would be effective in reducing contaminant loads in the river.

After an initial on-farm assessment the consultant provides the farmers with on-going advice and support over 6-8 months. The final call visit evaluates and records completed or additional actions and provides feedback on the SMP process.

Action analysis

To date over 650 farmers have agreed to take part in the SMP process and 591 have had plans delivered. A total of 5300 individual on-farm actions were recorded for the first 591 farms plans analysed to date. This reflects 9 actions per farm distributed across the five management target areas. Individual actions and achievements were classified into the five target areas, 40 categories and 143 sub-categories. Categories were chosen to broadly reflect various stages of planning and development, infrastructure investment, implementation, operational management and training, and education.

Potential reductions in nutrient loading following the assumed successful implementation of all recorded on-farm actions were estimated for the first 436 farm plans. For each farm, the percentage reduction in N and P loading was estimated based on the likely effectiveness of each recorded action category with a direct impact on nutrient loading and the initial farm nutrient losses derived using the Overseer farm nutrient model. The estimates for N and P reductions are based on a combination of Overseer modelling (Wheeler et al, 2013) and expert judgement, derived from existing scientific research.

Further analysis of the sub-categories, including the use of catchment modelling tools, will be undertaken to demonstrate the collective success of on-farm mitigation measures, evaluate beneficial impacts this has on Waikato River water quality and ecological health and provide valuable information to underpin future policy development.

3. Results and trends to date

Action analysis

The majority of all the actions are focused on nutrient management (31%) followed by effluent management (27%) and water use management (20%). Land management represents 12% and water ways management 11% of all recorded actions.

While water use management had a lower total number of individual actions than the other target management areas, four of the top ten sub- categories that farmers have agreed to on their SMPs relate to water use management (Table 1).

Table 1: Summary of the top ten (of 143) action subcategories expressed as a percentage of the total number of farms

Rank	% of farms	Management area	Action
1	65%	**Nutrient Management**	**Utilise nutrient budget and scenarios to understand nutrient loss drivers, optimal nutrient requirements, efficiency rates and strategies to manage nutrient losses**
2	59%	**Nutrient Management**	**Update whole-farm nutrient budget to Overseer V6**
3	44%	**Water Use Management**	**Investigate efficiency options (Smart water use booklet, leak detector, reduce wash-down water, water savings)**
4	33%	**Effluent Management**	**Assess current and/or future effluent storage requirements (Dairy Effluent Storage calculator)**
5	30%	**Water Use Management**	**Complete/ Apply/ Submit/ consent**
6	26%	**Water Use Management**	**Install water meter**
7	26%	**Nutrient Management**	**Improve records of fertiliser, effluent and/or supplementary feed applications (Dairy diary)**

8	23%	**Water Use Management**	**Monitor water use (establish baseline flow, meters, leak detection devices, measuring water used in tank, establish water requirements**
9	23%	**Nutrient Management**	**Review optimal effluent block size, location and/or application rate**
10	21%	**Waterway Management**	**Carry out/re-establish Riparian planting**

Quantification of potential nutrient load reductions

Preliminary results suggest that mean reductions in farm nutrient losses across all farms are 8% for N and 16% for P. Potential N load reductions on individual farms range from 1 to 49% where actions targeting N are being implemented (Figure 2). Actions around wintering strategies and improved feed management had large impacts on reducing nitrogen losses on some farms (>30 % farm N reduction) but these strategies are being implemented only on a small number of farms overall. Reductions in P loading ranged from 1 to 63 % across all farms with actions targeting P. The largest reductions (>50% P reduction) are associated with riparian management plus management of critical source areas, stock exclusion and dairy effluent-nutrient application.

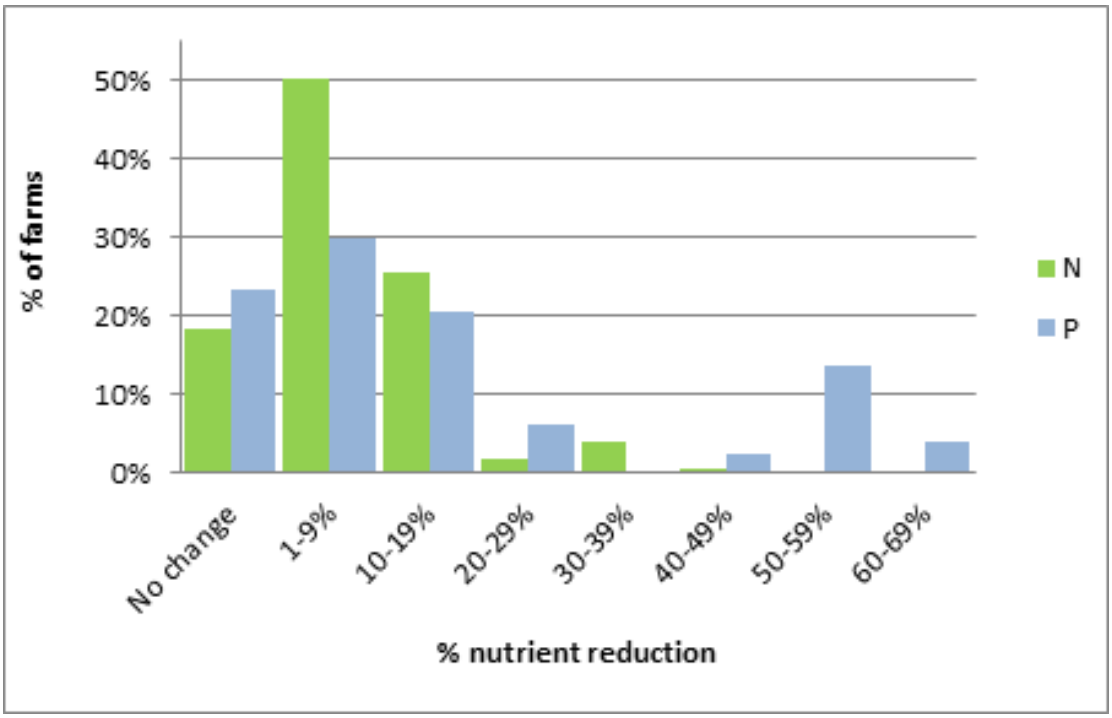

Figure 2: Estimated % reductions in farm N and P losses following the assumed successful implementation of actions in SMPs, based on a combination of Overseer modelling and expert judgement, derived from existing scientific research. Analysis is based on the first 436 farms in the SMP process. No change represents farms with actions which did not have a direct impact on N or P load reduction, although will have indirect benefits for improvement in environmental performance.

4. Summary

The protection and restoration of the Waikato River is an inter-generational undertaking (WRA 2013), but every landowner in the catchment has the potential to reduce sediment, nutrient and faecal loads to the river right now. The extent to which these loads need to be reduced to meet freshwater objectives is currently unknown. However, achieving good practice on farm does not need to wait for regulation. This project provides guidance on what good practice looks like, support to implement appropriate changes, and highlights that there is potential for significant gains to be made in river water quality.

To date the project has delivered Sustainable Milk Plans to 591 Upper Waikato catchment farms with an additional 50 farms agreeing to take part in the process to date. There are a number of positive signals coming from our preliminary analysis of actions. Farmers have committed to increasing their understanding of the environmental effects of their farming activities and setting out specific actions for improving performance. This indicates the project is on-track to achieving its stated measures of success.

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