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interim report 2010/2011

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INTEGRATED CATCHMENT MANAGEMENT PROJECT:

INTERIM REPORT 2010/2011

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EXECUTIVE SUMMARY

Managing the water quality of the Waikato region's waterways is a core role of the Waikato Regional Council. In 2006, the Waikato Regional Council piloted a three year integrated catchment management project (the ICM project) in the Little Waipa and Waipapa catchments. The ICM pilot project was implemented to test the integrated delivery of current policy tools such as education, incentives, and enabling compliance and enforcing regulations, to work with farmers and bring about changes in farmer practices to lower nutrient loss from farms.

The ICM project has the performance measure in the Waikato Regional Council's Long Term Plan (LTP)*:* Monitor farmer implementation of farm plans in Integrated Catchment Management (ICM) catchments. *2010/2011 target:* 60% (of actions implemented).

This document reports on the project for the 2010/2011 year. The follow is a brief summary of the project activities, coverage, and impact.

Key activities: In the twelve months from July 2010 to June 2011, the ICM project continued to engage farmers in the two catchments, conduct visits to update Farm Plans and collect information on actions undertaken, and work with industry on nutrient management.

Coverage: As of 31 July 2011 there were 103 farms[1] in the two catchments, and of these 57% (59) had a Farm Plan. This represents an increase in coverage from the previous year when 47% of farms had a completed Farm Plan. This year has also seen a small number of farmers declining to participate. This was not unexpected, as the project is voluntary, and as such at some point staff were likely to come across farmers who would choose not to be involved. This is consistent with work by Kaine (2004) and Kaine and Johnson (2004) who noted that a proportion of the population will not voluntarily adopt or opt in to an innovation, suggesting that other measures (for example, regulatory policy measures) may be required to increase adoptee numbers past a certain point.

Assessment visits: Fifty three of the 59 farms were visited by ICM staff as part of the assessment of change, 49 dairy and 4 drystock[2]. As part of the visit, each farmer was questioned using a structured questionnaire about any farm system changes, the relevance of the Farm Plan, actions that had been undertaken and those that had not, and reasons why or why not.

Key activities with industry: Coordinating meetings with the Upper Waikato Primary Sector Partnership, attending meetings of field staff from industry groups (Dairy and Fertiliser sectors), attending , presenting and offering in-kind support for the three new Sustainable Farming Fund Projects in the Upper Waikato, being involved at DairyNZ Discussion Groups and presenting at DairyNZ/Fonterra coordinated Rural Professional Networks.

Nutrient data: Analysis of the nutrient data from the 49 dairy farms visited shows that the average Nitrogen (N) and Phosphorus (P) leaching rates have decreased. On the 45 dairy farms in the Little Waipa, average N loss had dropped from 37kg/N/ha to 35kg/N/ha and average P loss had dropped from 1.3 kg/P/ha initially,

[1] Note: Due to land transfers the number of farms in the catchment changes from year to year, as some farms are amalgamated with existing ones and others are divided.

[2] Note: Of the 59 farms, 3 farmers refused a visit and 3 farms had not long completed the farm planning process so were excluded from the sample

to 1.1 kg/P/ha. In the Waipapa the sample was small (4 dairy farms) so results need to be treated with caution. However, the 4 dairy farms showed an average N loss fall from 41kg/N/ha to 34kg/N/ha and an average P loss fall from 2.7 kg/P/ha initially to 2.3 kg/P/ha, at re-visit.

Actions implemented: Analysis of the questionnaire data, collected during assessment visits, indicates that 50% of actions were implemented on-farm throughout the two catchments, and 15% were in progress. This percentage is lower than the LTP performance measure of 60%.

Assessment visit questionnaire data:

- Overall 'level of involvement' scores were calculated and showed that most (85%) farmers were highly or very highly involved with the issue of nutrient management, which means that the information that they are being presented with is more likely to inform their decision making.
- Ratings of the ICM project showed that the majority of farmers found the information received from ICM staff and through the Farm Plan, useful (98%), important in their decision making about nutrient management on farm (85%), and instrumental in changing decisions about managing nutrient loss on their property (69%).
- Further analysis showed that even when farmers considered they had high prior knowledge or understanding, the majority considered ICM useful and important and that it changed their decisions about their nutrient management practices. What these results indicate is that the ICM approach is effectively increasing knowledge and helping farmers to make decisions about nutrient management, even with farmers who consider they already have a high level of knowledge about nutrient loss and nutrient management.
- Behavioural intent data showed that the majority (96%) of farmers would continue to use a Farm Plan approach to nutrient management, indicating that farmers value the farm planning approach that has been an integral part of ICM, to the extent that they intend to continue using this approach in their farm system.
- ICM staff conduct data shows that ICM staff were considered by all the farmers in the sample, to be professional and courteous. These findings are consistent with previous ICM reports in which farmers have consistently reported positive feedback about the ICM staff.

In conclusion, the ICM project continues to be well received by farmers who are participating in it. Over half the farms have Farm Plans and farmers are making changes on farm, with 50% of recommended actions implemented, and another 15% in progress. Comparative data from dairy farm nutrient budgets, indicates that N and P leaching rates have dropped during the project's life, and the project has worked to develop partnerships and increase industry involvement and support for nutrient management issues on-farm. The assessment visit data provides clear indications of the role of the ICM project in farmers' nutrient management and decision-making, with the majority of farmers reporting increased knowledge and changes in decisions about nutrient management practices, as a result of ICM. The non-participation that has been noted in the past twelve months strengthens the need to consider regulatory policy initiatives if adoption rates are to increase. Overall, the findings support the extension work that ICM undertakes in terms of assisting farmers in their on-farm decision making about nutrient management.

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1.0 INTRODUCTION

This document reports on the Waikato Regional Council Integrated Catchment Management project (ICM) for the 2010/2011 year. A brief background is provided, followed by a summary of the project activities and impacts, then detail on coverage, on-farm results, industry involvement and future direction.

1.1 BACKGROUND

Managing the water quality of the Waikato region's waterways is a core role of the Waikato Regional Council. In 2006, the Waikato Regional Council identified that agricultural practices were contributing to rising nutrient levels within the region's waterways, and particularly within the Waikato hydro lakes. In response the Waikato Regional Council piloted a three year integrated catchment management project (the ICM project) in the Little Waipa and Waipapa catchments. The ICM pilot project was implemented to test the integrated delivery of current policy tools such as education, incentives, and enabling compliance and enforcing regulations, to work with farmers. The pilot project also aimed to bring about changes in farmer practices to lower nutrient loss from farms in the pilot catchments. Community consultation, working with individual farmers to develop farm management plans, and collation and modelling of data using OVERSEER®, to determine potential effectiveness were key activities within the project.

The pilot was evaluated during the three years providing feedback to the team to enable refinement of processes. An evaluation was conducted in June 2009 to determine the effectiveness of the pilot project in seven key areas. The report provided a number of recommendations to the project and for Waikato Regional Council's work in on-farm practice change. Particular to the focus for this project were the recommendations that:

1. Waikato Regional Council consider a targeted approach to catchment delivery, based on environmental risk and potential environmental outcomes, as the findings suggest that a targeted approach may be more efficient in terms of environmental outcomes and resources.
2. Waikato Regional Council continue to work with industry and farmers to develop on-farm mitigation strategies that will reduce nutrient losses.
3. Waikato Regional Council investigate affordable ways to have an on-farm presence and work with farmers to effect change, for example working with appropriately qualified industry field staff to deliver farm planning advice that incorporates nutrient reduction targets.

By the end of the 2009/2010 year (June 2010), the ICM staff had completed Farm Plans with 49 (47%) of the 105 farms in the two catchments, and farmers were undertaking some of the recommended actions (an estimated 42% of actions had been completed, based on self-reports from a random sample of farmers). The evaluation of the project in that year recommended that the project staff continue to engage farmers, undertake repeat visits to support change, and develop processes to monitor actions over time.

In the past financial year (2010/2011) resources were directed as per the recommendations to increase the focus on working with industry, while maintaining the relationships in the two catchments to support on farm changes and encourage more participation in the project within the catchments. A programme of visits to update Farm Plans, including OVERSEER® modeling, was also undertaken.

The ICM project has the performance measure in the Waikato Regional Council's Long Term Plan (LTP)*:* Monitor farmer implementation of farm plans in Integrated Catchment Management (ICM) catchments. *2010/2011 target:* 60% (of actions implemented).

2.0 ICM PROJECT 2010/2011

2.1 INTRODUCTION AND SUMMARY

As stated above, in the past twelve months (2010/2011) the ICM project has continued to engage more farmers in the two catchments, conduct visits to update Farm Plans and collect information on actions undertaken, and work with industry on nutrient management.

Due to land transfers the number of farms in the catchment changes from year to year, as some farms are amalgamated with existing ones and others are divided. Therefore, as of 31 July 2011 there were 103 farms in the two catchments, and of these 57% (59) had a Farm Plan. Fifty three of these 59 farms were visited by ICM staff, in the 2010/2011 year, as part of the assessment of change, 49 dairy and 4 drystock (three farmers refused a visit, three farms had not long completed the farm planning process and were excluded from the sample). As part of the visit, each farmer was questioned using a structured questionnaire (see Appendix 1 for methodology and questionnaire) about any farm system changes, the relevance of the Farm Plan, actions that had been undertaken and those that had not, and reasons why or why not.

Overall the analysis of the questionnaire data indicates that 50% of actions were implemented on-farm throughout the two catchments, and 15% were in progress. This percentage is lower than the LTP performance measure of 60% (see Table 3, page 7).

Analysis of the nutrient data from the 49 dairy farms visited shows that the average Nitrogen (N) and Phosphorus (P) leaching rates has decreased a little. On the 45 dairy farms in the Little Waipa, average N loss had dropped from 37kg/N/ha to 35kg/N/ha and average P loss had dropped from 1.3 kg/P/ha initially, to 1.1 kg/P/ha. In the Waipapa the 4 dairy farms showed an average N loss fall from 41kg/N/ha to 34kg/N/ha and an average P loss fall from 2.7 kg/P/ha initially to 2.3 kg/P/ha, at re-visit (see Table 5, page 10).

The assessment visit data provided clear indications of the role of the ICM project in farmers' nutrient management and decision-making, with the majority of farmers reporting a high level of involvement, increased knowledge and changes in decisions about nutrient management practices, as a result of ICM. These findings are significant particularly in relation to farmers who rated their prior knowledge of nutrient management as high, yet noted that they found ICM information useful and important, and that it impacted on their decision making, including changing decisions about their on-farm nutrient management. Overall, the findings supported the extension work that ICM undertakes in terms of assisting farmers in their on-farm decision making about nutrient management.

Key activities undertaken with industry included: coordinating meetings with the Upper Waikato Primary Sector Partnership, attending meetings of field staff from industry groups (Dairy and Fertiliser sectors), attending , presenting and offering in kind support for the 3 new Sustainable Farming Fund Projects in the Upper Waikato, being involved at DairyNZ Discussion Groups and presenting at DairyNZ/Fonterra coordinated Rural Professional Networks.

The following provides more detail of the activities and achievements of the project in the past twelve months. An update on Farm Plan coverage and analysis of the visit data, including reasons why the farmers do or do not undertake the recommended actions, and their views of the project, is followed by an overview of industry engagement as this was significant in the past year.

2.2 CATCHMENTS AND COVERAGE

There are two catchments included in the ICM project – Little Waipa which, in 2010/2011 had 78 farms and 68 farmers and Waipapa which had 25 farms and 21 farmers[3]. In total, in the 2010/2011 year there were 103[4] farms (and 89 farmers) eligible to participate in ICM in the two catchments. As was mentioned, previously, by the end of the last financial year (30 June 2010) 47% of the farms in both catchments had completed Farm Plans, and as well, a further 8% were in the process of being completed.

In the 2010/2011 year staff have continued their on-farm visits and development of new and revised Farm Plans, and as of 31 July 2011 a total of 59 (57%) farms across the two catchments have had a Farm Plan completed. Of the 89 farmers in the catchment, 50 have a Farm Plan, 16 have had some contact (i.e. initial contact, farm walk), 16 have chosen not to participate, and 7 farmers have yet to be contacted.

Table 1 (below) shows the number of farms that have a Farm Plan, by farm and by farmer, and the percentage of each catchment that is covered by a Farm Plan, for the past four years. Figures 1 and 2 provide a visual representation of coverage.

TABLE 1: FARM PLANS IN 2009, 2010 AND 2011 AND % OF CATCHMENT COVERED BY COMPLETED FARM PLANS

	2008/2009 Year			2009/2010 Year			2010/2011 Year		
	No. of Farm Plans 2009	No. of farmers 2009	% of catchment covered by a farm plan	No. of Farm Plans 2010[1]	No. of farmers 2010[1]	% of catchment covered by a farm plan 2010	No. of Farm Plans 2011	No. of farmers 2011	% of catchment covered by a farm plan 2011
Little Waipa	25	21	21% (land area) 32% (farms)	43	36	51% (land area) 53% (farms)	52	45	62% (land area) 67% (farms)
Waipapa	4	4	37% (land area) 18% (farms)	6	5	44% (land area) 23% (farms)	7	5	46% (land area) 28% (farms)
Total	**29**	**25**		**51**	**41**		**59**	**50**	

Notes 1. The numbers of plans / farmers, each year are a cumulative total.

[3] The number of farms and farmers differs as some farmers own multiple farms.
[4] These figures differ from last year due to land transfers within the ICM catchments.

FIGURE 1: LITTLE WAIPA CATCHMENT: ENGAGEMENT IN ICM BY LAND AREA

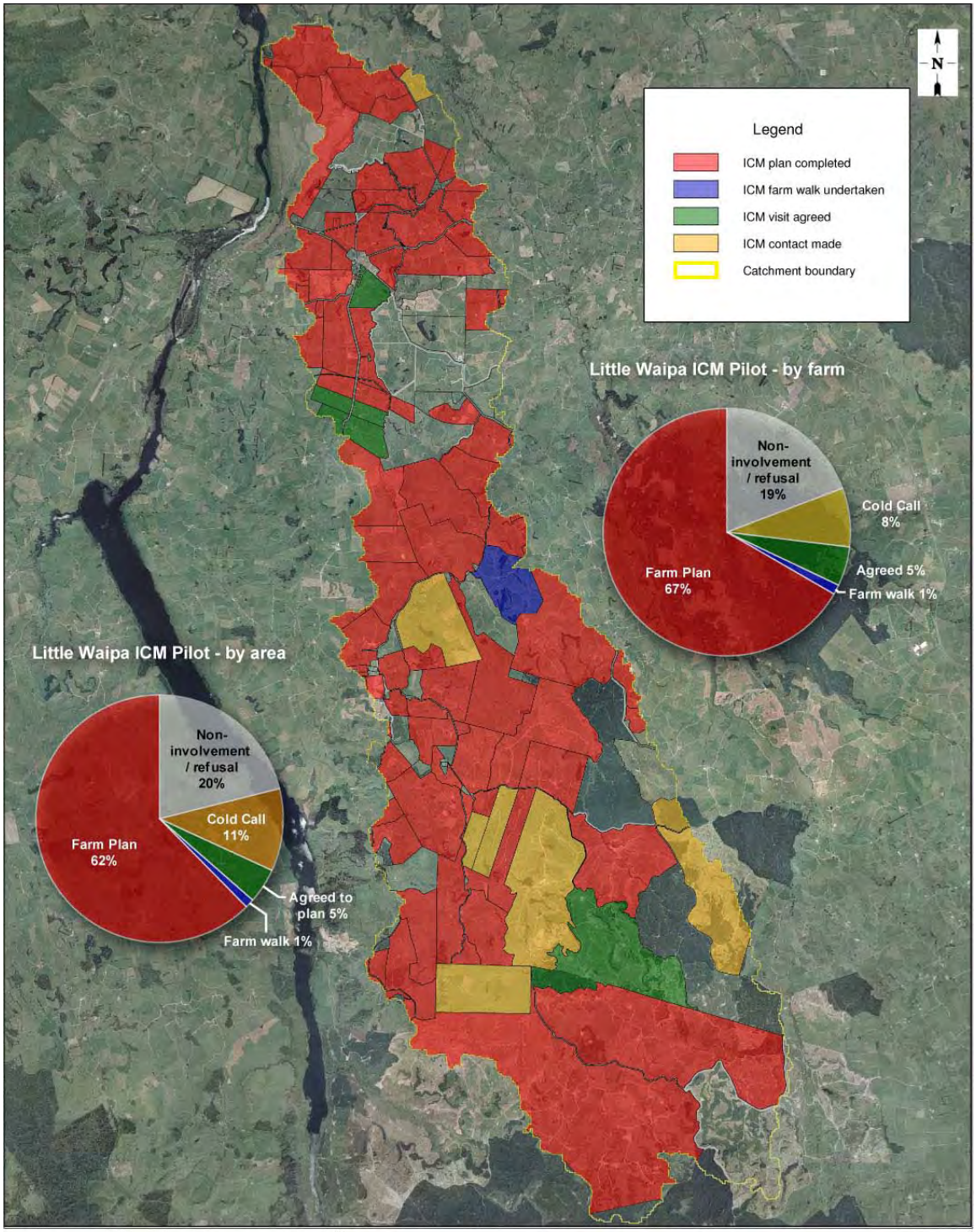
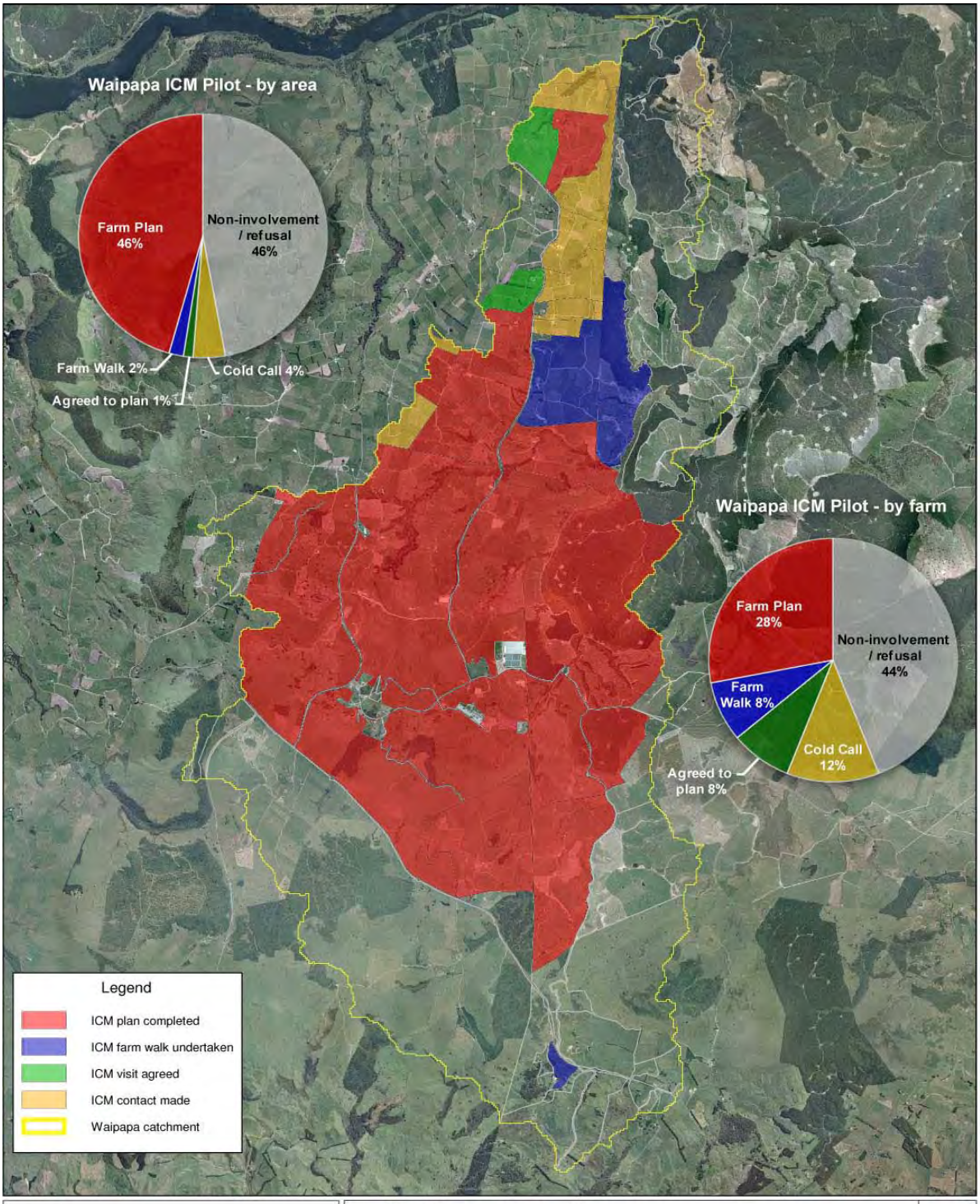


FIGURE 2: WAIPAPA CATCHMENT: ENGAGEMENT IN ICM BY LAND AREA



2.2.1 Non Participation

In the past twelve months a small number (16) of farmers have declined to participate in the ICM project. It was anticipated that at some stage recruitment to this voluntary project would drop off. This project's initial focus was to work with the 'willing' for example those that came to the community meetings in the first year and members of streamcare groups. Subsequently the emphasis has been on making personal contact so that relationships, understanding and trust between ICM staff and farmers could be established. However, all farmers were, and continue to be, informed (via information mail-outs) of the project.

As the project is a voluntary one farmers are not required to participate, nor are they required to provide a reason if they choose not to participate or to withdraw from the project. However, reasons given by farmers to ICM staff, about the why they chose not to participate, indicated that some farmers did not consider that ICM would add value to their system and, for some, this was because they considered that their farm system was already operating with good practice in terms of nutrient management. Anecdotal evidence from ICM staff also indicates that for some farmers the fact that the project is not compulsory is a reason for choosing not to participate.

These findings are consistent with the work by Kaine (2004) and Kaine and Johnson (2004) that was discussed in the June 2009 ICM Project report (Hungerford, 2009)[5]. Kaine et al. (2004) explain that whilst a certain proportion of a population will adopt or 'opt in' to an innovation (in this case the ICM project) voluntarily, and the rate of adoption can be increased by some non-regulatory initiatives (e.g. extension, promotion, incentives), there will be some within the population who will not voluntarily adopt and to increase the number of adoptees past a certain point, regulatory policy measures may be required.

2.3 2011 Assessment visits

In the past twelve months, staff re-visited 53 farms (49 in Little Waipa, and 4 in Waipapa) to gather information on a range of factors, including the relevance of the Farm Plan and any changes to the farm system. As Table 2 shows, of the 53 farms visited, almost half (25, 47%) had made changes to their system since the plan was prepared, 2 (4%) had updated their Farm Plan, 18 (34%) had reviewed their nutrient budget. The majority (49, 92%) considered their Farm Plan still relevant.

Table 2: Reported changes to farm systems and relevance of farm plans

Question	Yes		No		Not recorded		TOTALS
	#	%	#	%	#	%	#
Have there been any changes to your farm or system since your Farm Plan was prepared?	25	47%	26	49%	2	4%	**53**
Have you had your Farm Plan reviewed or updated since it was first prepared?	2	4%	48	91%	3	6%	**53**
Have you had your nutrient budget reviewed since it was first prepared?	18	34%	32	60%	2	4%	**53**
Do you consider your Farm Plan is still relevant to your system?	49	92%	2	4%	2	4%	**53**

5 Waikato Regional Council document number # 1509211.

2.4 ACTIONS IMPLEMENTED

This section is based on the data given by farmers at the assessment visits. As was mentioned in Section 1, the ICM project has a LTP performance measure of 60% of actions implemented that are recommended in the Farm Plan prepared by the ICM staff. The actions recommended in Farm Plans include:

- Increase effluent area
- Lower N use to within safe ranges
- Use riparian fencing and planting
- Assess the use of DCDs
- Assess putting in a stand off pad
- Plant out steep/low producing slopes in trees
- Lower stocking rate
- Update / regularly test soil fertility
- Mine Olsen Ps
- Do VSA to test soil health
- Create water detention structures in paddock
- Stop using Urea N in winter
- Stop using N on effluent area
- New effluent storage system
- Increase wintering off
- Assess putting in a feed pad
- Deal with hot spots
- Fence off springs on farm / managed grazing
- Grow maize on effluent block
- Measure effluent application depth
- Test effluent nutrient
- Create cut offs on tracks and races
- Bridge over a stream

The number of recommended actions, per farm, ranged from 1 to 19, with an average of 12 actions per farm and a total of 613 actions being recommended across the 53 visited farms. All farmers who were visited were asked to clarify how many of the recommended actions they had undertaken and reasons why or why not, for each action. The overall finding was that farmers self-reported they had implemented 50% (306) of the recommended actions[6] on-farm throughout the two catchments.

TABLE 3: SELF-REPORTED UPTAKE OF ACTIONS ACROSS THE 53 FARMS

	Done	In progress	Intending to do	Not doing	Total
Number of actions	306	90	133	84	**613**
Percentage of actions	50%	15%	22%	14%	**100%**

2.4.1 REASONS FOR AND BARRIERS TO UPTAKE

As has been mentioned in other ICM project reports and, as well, by other authors (e.g. Crouch, 1981; Davies, Kaine and Loury, 2007; Kaine, 2004), the reasons why farmers voluntarily adopt innovations are multi-faceted and inter-related. The bio-physical context (e.g. topography, soil type, rainfall), the socio-economic context (e.g. financial resources, time, labour), the farm context (e.g. type of farming, layout of shedding, irrigation systems, farm goals and visions), all impact on whether a farmer adopts an innovation or not. Additionally, the ICM staff are recommending actions that are of benefit to the environment, but not necessarily of benefit to the farmer. Therefore the farmers' belief that there is a water quality issue that their practices affect, is also factor in whether they take action or not. The ICM project works with individual farmers to ensure that the actions recommended are ones that are workable for their farm system, however the farmers still have to determine themselves whether they will implement the action(s) or not.

[6] Note that these findings are self-reported by the farmers. In some cases staff may have also observed that the actions had occurred, particularly if the action was 'one-off' (e.g. riparian planting/fencing) while for others observation was not practical as it was an on-going action (e.g. not spreading Winter N).

The farmers from the 53 farms, gave a number of reasons why they had completed, started or were intending to start, the actions they did. These included:

- the action had another farm specific benefit (for example, improved herd health)
- the action had a financial benefit (for example, feed pad economic in a drought)
- there was an outside influence (for example, drought conditions)
- there was a change in the farm system (for example, intensification required larger effluent storage)
- the action had an aesthetic benefit (for example, riparian fencing and planting)
- the action had an environmental benefit (for example, increasing effluent area to reduce N leaching)
- the action has a productivity benefit (for example, improved pasture production from expanding effluent area)
- the action was a compliance issue (for example, effluent management practice required by industry)

Reasons why farmers had not undertaken an action included:

- the financial cost (for example, bridging stream; riparian planting)
- time constraints (for example, busy on farm so fencing riparian areas incomplete)
- that they were prioritising (undertaking one action at a time) (for example, farm development before investing in feed pad)
- that they required more information (for example, advice on effluent pumps)
- that they were not sure of how to do it (for example, unsure of where to get effluent tested)
- outside factors (for example, poor clover growing season)

The following table provides a sample of the types of actions that were completed, in progress, intended or not done, and the reasons given.

TABLE 4: EXAMPLES OF ACTIONS UNDERTAKEN AND REASONS WHY OR WHY NOT

Action Uptake	Examples of types of actions	Reasons	Example
Done	▪ Feed Pad	Financial Benefit Other benefit (e.g. herd health) Outside influence (e.g. drought)	Action: feed pad. *Reason: Feed pad now in place. Having a feed pad in a drought is very economic. Herd health improvements with feed pad and supplementary feeding.*
	▪ Maintain tracks	Other benefit (e.g. herd health)	Action: Regularly maintain tracks and races. *Reason: To minimise animal health and sore feet. Need to move around the farm efficiently and quickly.*
	▪ Effluent storage	Farm system change (e.g. intensification)	Action: increase effluent storage capacity. *Reason: Intensification needed more storage of effluent to have increased from 3 days to 4 months storage.*
	▪ Effluent management	Compliance	Action: Pipe the effluent from the shed to the effluent pond. *Reason: Have to, Fonterra visited and said it had to be done.*

	▪ Hot spot	Compliance	Action: Build an apron for the effluent sand to dry on before removal. *Reason: Compliance*
In progress	▪ Riparian Planting	Time constraints Financial cost	Action: Riparian fencing and planting *Reason: All done (90%) Some to do on runoff across road but too busy. Reason: Two sections left, SWEIF funding in progress.*
	▪ Effluent area	Need more information	Action: Continue to utilise the shed effluent for the benefit of added grass growth. *Reason: Seeking outside advice concerning pumps.*
	▪ Measure effluent	Compliance	Action: Measure the depth of effluent being applied using ice cream containers across the path of the travelling irrigator. *Reason: To be compliant.*
Intending	▪ Bridging stream	Financial cost	Action: Bridging stream crossing. *Reason: Too costly may assess if necessary.*
	▪ Feed pad	Prioritising	Action: Consider a wintering pad. *Reason: Only after [a current major farm development] is sorted.*
	▪ Riparian planting	Prioritising	Action: Consider planting the surrounds of the effluent pond with flaxes. *Reason: On the list*.
Not doing	▪ Effluent testing	Unsure of process	Action: Get the effluent analysed for its nutrient contents. *Reason: unsure of where to get effluent tested.*
	▪ Effluent storage	Financial cost	Action: Consider storage for effluent. *Reason: cost.*
	▪ Adapt effluent storage	Financial cost Prioritising	Action: excessive sand accumulation, consider reducing the problem prior to it entering the yard (e.g. Step barrier). *Reason: No desire to spend capital before building new shed.*

2.5 NUTRIENT DATA

One of the key aspects of the ICM project has been the collection of data from farmer's nutrient budgets when they first engage in the project (i.e. initial on-farm visit) and then again at future visits (i.e. re-visits). This data is then modelled to determine the nutrient leaching levels. Of the 53 farms remodeled, the four drystock farms were excluded from analysis in this section, due to the small sample size and different farm systems.

Analysis of the data across 49 dairy farms in the catchments indicates that average leaching rates have dropped across the two catchments, although there are some farms (usually conversions) where rates of N loss have risen[7]. The following table shows the average Nitrogen (N) and Phosphorus (P) leaching rates , at the first (initial) visit and then at the most recent re-visit (2011). As the table shows the average N leaching rate for the farms in the Little Waipa, at the initial visit was 37kg/N/ha and this has dropped to 35kg/N/ha based on the data collected at the re-visit. The average Phosphorus loss for the farms in the Little Waipa

[7] In relation to the conversion farms, the increase in N loss was not an unexpected outcome: where production had not reached targets set at conversion more fertiliser N and supplements were added to bring milk production and profit back to that planned.

has also dropped from 1.3 kg/P/ha initially, to 1.1 kg/P/ha, at re-visit. In the Waipapa the average N leaching rate for the farms at the initial visit was 41kg/N/ha and this has dropped to 34kg/N/ha based on the data collected at the re-visit. The average Phosphorus loss for the farms in the Waipapa has also dropped from 2.7 kg/P/ha initially to 2.3 kg/P/ha, at re-visit[8].

TABLE 5: NUTRIENT LEACHING PRE-ICM AND AT RE-VISIT (DAIRY FARM ONLY)

Catchment	Nitrogen Leaching		Phosphorus Loss	
	Initial	Re-visit	Initial	Re-Visit
	Average kg/N/ha (range)	Average kg/N/ha (range)	Average kg/P/ha (range)	Average kg/P/ha (range)
Little Waipa (N= 45 farms, 7288 ha	37kgN/ha (23-54)	35kgN/ha (25-54)	1.3 kg/P/ha (0.2-5.2)	1.1 kg/P/ha (0.2-4.8)
Waipapa (N= 4 farms, 1288 ha)	41 kg/N/ha (31-47)	34 kg/N/ha (24-45)	2.7 kg/P/ha (0.7-3.9)	2.3 kg/P/ha (0.6-3.3)

2.6 Views on Nutrient Management

During the re-visits farmers were also asked to answer a series of questions about their views on nutrient management. The questions were self-completion and used a seven point rating scale to measure involvement with the issue of nutrient management where involvement is how personally important an object or issue is to an individual. This scale was adapted from Mittal(1995) as applied by Bewsell (2010) to test individual's involvement in New Zealand's biosecurity (see Appendix 1: Part D questions 1-5).

The purpose of applying the involvement scale was to get an indication about whether or not farmers participating in the ICM project were highly involved with the issue of nutrient management. Involvement is an indicator of the amount of cognitive energy people will put to the task of searching out, digesting and acting on information. It also tells us how much attention people are likely to pay to the issue. Overall involvement was calculated after reverse coding the four negatively framed questions. The lowest involvement score possible is 5 and the highest score 35. Individuals were then grouped into one of four categories based on their involvement score, where scores of 5-14 were categorised as low involvement, scores of 15-24 as medium involvement, scores of 25 – 34 as high involved and a top score of 35 categorised as very high involvement. The table below shows the percentage of respondents in each involvement category.

TABLE 6: LEVEL OF INVOLVEMENT WITH THE ISSUE OF NUTRIENT MANAGEMENT

Involvement	Percentage of respondents (n=48[9])
Low (5-14)	0
Medium (15-24)	15
High (25- 34)	70
Very high (35)	15

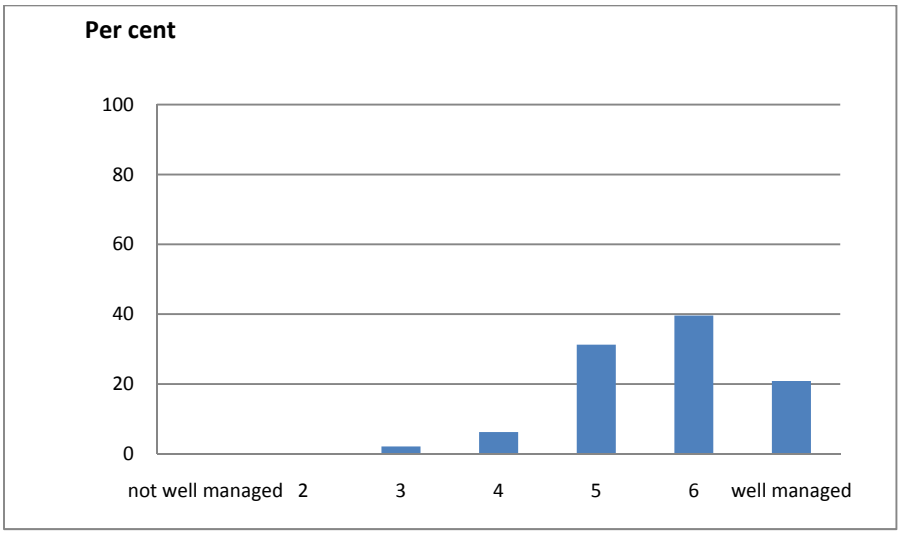
The ICM project did not benchmark the participants for involvement, which means it is not possible to say that involvement has been lifted by exposure to this project. However, it is good to note that participants

[8] Note: The higher P loss in the Waipapa is attributed to pumice soils.
[9] Note: Of the 49 farmers at the assessment visits, one did not complete Sections D-E of the questionnaire, so the sample size for Sections D to E of the questionnaire is 48.

are highly involved with the issue of nutrient management as this means that the information that they are being presented with is more likely to inform their decision making.

Farmers were also asked to rate their management of nutrient losses on their farm on a seven point scale where 1 meant that they felt nutrient losses on their farm were not well managed and 7 meant they felt that they were well managed (Appendix 1: Part D question 6). The graph below shows that nearly all farmers felt that nutrient losses on their farm were managed, with a fifth indicating they felt that they were "well managed".

FIGURE 3: FARMER'S RATING OF MANAGING NUTRIENT LOSSES ON FARM



These results are consistent with other research. For example, White and Wilson (2007) found that the majority of farmers they surveyed were happy with how they managed water quality on farm, and reported being confident in dealing with most issues including dairy shed effluent, wintering management and general nutrient management (p.20). However White and Wilson (2007) also noted that there was a body of evidence (e.g. slow progress of Clean Steams initiatives, RMA breaches) that indicated that water quality issues were often not managed well, despite farmer perception. They suggested therefore, a need to increase farmer understanding of the impact of farming on water quality (p.20). The following sections provide evidence in relation to the impact of the ICM approach on farmers' understanding and views of their management of nutrient loss on farm.

2.7 OPINION OF ICM PROJECT

During the assessment visits farmers were also asked to answer a series of questions about their views on the ICM project, their knowledge of nutrient management prior to the project, and the usefulness of the ICM project for managing nutrient loss on their farm. The questions were self-completion and used a five point rating scale where 1 was strongly disagree and 5 was strongly agree (see Appendix 1: Part E of survey).

Overall, the findings indicated that the ICM staff were well-received by farmers, the information provided was useful, and the project had encouraged change, even amongst those who rated their prior knowledge as high. Farmer understanding and knowledge of nutrient management and loss on-farm had increased and farmers reported an intention to continue using a Farm Plan approach in their system (see Appendix 2: for more detail on these results). The findings support the extension work that ICM undertakes in terms of

assisting farmers in their on-farm decision making about nutrient management. These results are discussed more specifically below.

PROFESSIONAL CONDUCT

In terms of professional conduct, ICM staff were well-received by farmers with all strongly agreeing or agreeing that the ICM staff were professional and courteous. These findings are consistent with previous ICM reports in which farmers have consistently reported positive feedback about the ICM staff.

KNOWLEDGE AND IMPACT OF ICM

In terms of nutrient management knowledge and understanding, results showed that about half (52%) of the farmers considered they had a good level of knowledge, and forty per cent considered they had a high level of understanding of nutrient management, prior to ICM. At the other end of the scale, one fifth (19%) of the farmers considered their level of knowledge to be low and one quarter (25%) considered their understanding to be low, prior to ICM. The remainder gave their prior knowledge and understanding a neutral rating.

In terms of farmer views of ICM the results indicate that overall farmers considered that ICM had assisted them in their decision making about nutrient management. The majority of farmers found the information received from ICM staff, and through the Farm Plan, useful (98%) and important in their decision making about managing nutrients on their property (85%). Two thirds (69%) of the farmers also reported that the ICM project changed their decisions about managing nutrient loss on their property.

Further analysis comparing farmers' prior knowledge or understanding rating, with their ratings for ICM usefulness and impact on their decision making, was undertaken. This analysis showed that even when farmers considered they had high prior knowledge or understanding, the majority found ICM and Farm Plan information useful and important and that it changed their decisions about nutrient management. For example, sixty eight per cent of the farmers who rated their prior knowledge as high, stated that the ICM project changed their decisions about managing nutrient loss. In another example, eighty four per cent of farmers who rated their prior understanding as high, stated that the ICM information and Farm Plan was important in decision making about nutrient management on their property.

As with the involvement scale above, the ICM project did not benchmark the respondents knowledge prior to participating in the project, however these results certainly indicate that participants feel that the ICM approach is increasing knowledge and helping them to make decisions about nutrient management, even when farmers consider they already have high level of knowledge and understanding about nutrient loss and nutrient management.

BEHAVIOURAL INTENTION

One of the questions sought information about the farmers' intentions in terms of their future practice regarding nutrient management; specifically would they continue to utilise a farm planning approach. The majority (96%) of farmers reported that they would continue to use a Farm Plan approach to nutrient management. These findings indicate that farmers value the farm planning approach that has been an integral part of ICM, to the extent that they intend to continue using this approach in their farm system.

2.8 LEARNINGS FROM THE ICM PROJECT

The ICM project has been in place for five years (July 2006-June 2011). Key learnings to come out of the project have been around the farm planning process, with a template now able to be used as an example when discussing industry standards. There has been an increased focus on working with industry, which

resulted from an understanding that farm planning goes beyond the available WRC resources. Involving industry is seen as a way to increase the spread of nutrient management information to farmers.

ICM staff also report observing an increase, over the years, in farmers' level of knowledge and understanding about nutrient management. Ironically, staff also report that this increased knowledge has sometimes translated into farmers declining some of the recommended actions (for example DCDs) as farmers have researched and assessed the pros and cons of a recommendation and determined that it is not feasible for their system. However, the results from the re-visit questionnaire, previous years' evaluations, and as well, staff observations, do indicate that the project has increased farmers' understanding of nutrient management. Staff also report that the project has provided the ICM staff with a grounded understanding of what is possible and what is feasible in terms of nutrient management on-farm in these two catchments in the Waikato region.

2.9 INDUSTRY INVOLVEMENT

One of the key activities of the ICM project, in the past two years, has been to strengthen industry involvement in nutrient management issues within the two catchments. The farming sector has a range of key industries (e.g. fertiliser companies, dairy companies, farm consultancies, industry good and agricultural research organisations) who work with and communicate regularly with farmers, in a variety of ways including directly and on-farm. Farm systems are integrated, and on-farm nutrient management is relevant to a range of farming outcomes, not limited to environmental outcomes. For example, making efficient use of effluent application and storage is related to productivity, optimum grass growth and as well, financial cost (i.e. the amount of fertiliser required to be bought in). As well, farming does impact on water quality, and as such it is in the best interests of farmers and their industry partners to be aware and work towards developing ways to maintain farming in the future as economically viable without compromising water quality.

The ICM project has been working with various partners in the industry to build relationships and networks to encourage industry to become involved with on-farm nutrient management issues in order to build capacity within the catchment in relation to nutrient management issues on-farm. One of the learnings from the ICM project has been that the farm planning approach, to develop solutions is effective in encouraging voluntary change to some extent, but it is labour intensive. As such, if industry partners who are working with individual farmers, can build nutrient management into their work with farmers then this increases the reach of the ICM project beyond the staffing limits of the project. In order for this to work, however, industry and Waikato Regional Council need to be working together and sharing information about what works so that the same messages are being promoted. ICM staff have provided overviews of past evaluations and reports to industry groups to highlight overall learning of ICM and what changes farmers can make. ICM staff have also been in discussions with Dairy and Fertiliser industries regarding templates for nutrient management plans. There is also a growing demand for WRC staff to present the current state and trend of water quality at different locations, and provide the future policy context for farmer and industry groups (e.g SFF groups, rural professional networks or new landcare groups).

One of the outcomes of the ICM project, has been an increase in ICM and Waikato Regional Council staff knowledge about on-farm solutions, and as well knowledge about where the 'gaps' are. Strengthening ties with industry partners is beneficial as they often have access to resources that the project does not. There have been a number of initiatives, undertaken by industry, that have been beneficial to expanding knowledge, guidelines and tools. For example, ICM staff report that DairyNZ is working on an accreditation scheme for the effluent design and pond construction industry. They have developed draft guideline for

ponds, guidelines for effluent engineers, a storage calculator (developed jointly with Massey, Horizons and Waikato Regional Council), and have been training the effluent consultants. The development of tools and accreditation schemes offers the ICM team more to work with on farm and to link their farmers into.

There are a number of different tools and projects being trialed and other initiatives being undertaken in the region, by industry partners such as Fonterra, Ballance, and DairyNZ. For example, Fonterra's "every farm every year inspection"; Ballance NMP, DairyNZ's "nutrient efficiency benchmark project". While these are being undertaken by other agencies Waikato Regional Council are providing support and information for many of these initiatives.

2.10 FUTURE DIRECTION

The ICM project has been included in the draft LTP. The draft LTP recognises that the ICM work so far has identified (i) a range of solutions for farmers to reduce their nutrient losses, (ii) constraints to adoption of these practices, and (ii) that supporting information, advice and management systems must be in place for farmers to be able to make farm systems adjustments that will be expected in the near future. Other contextual frameworks that relate to the ICM project include: the Regional Plan review which is expected to put policies in place in 2014 to manage the load of nutrients entering the river, and the sustainable agriculture strategy which identifies the importance of working collaboratively with industry to address nutrient management issues.

As has been discussed in the previous section, the ICM project has been working with industry to develop and implement methods that will support the transition on farms in the catchment. The draft LTP notes that in the future, it would be expected that the ICM will inform policy development in relation to the respective roles of industry and WRC in a co-management context.

It is also expected that the project will continue to work within the two catchments of Little Waipa and Waipapa, maintaining the work and relationships with farmers engaged in the project, updating Farm Plans and monitoring action uptake. The two catchments may be utilised as 'focus catchments' with farmers providing support, information, and the benefit of their experience with managing nutrient loss on farm, to other farmers in the wider catchment. There are also indications in the draft LTP that expanding some of the work into the Upper Waikato is likely and as well, working to gather some information on drystock farms is an area of focus.

It is important to note that the above future directions are internal to the Waikato Regional Council, are still in draft at the time of writing this report, and are subject to constraints (e.g. staffing, resourcing) that are still to be taken into account. They should therefore be considered to be indications of where ICM might progress in the future, rather than definite statements of where the project will go.

2.11 LIMITATIONS

As stated earlier in this report, this evaluation made use of a structured questionnaire to explore participant's views and experiences of the project, including change in their understanding of nutrient management and involvement in the issue of nutrient management. A practical limitation of this approach is that these questions were applied after participation in the project, and are subject to respondents' recollections of their prior level of knowledge , with no baseline data to compare results available for comparison.

The concept of involvement is a novel approach for understanding farmers' responses to environmental policy (Bewsell and Brown, 2011) and is yet to be widely tested for validity. Therefore, the results reported on participants' involvement in nutrient management are to be applied with caution.

3.0 CONCLUDING COMMENTS

Overall the ICM project continues to be well received by farmers who are participating in it. Over half the farms (57%) have Farm Plans and farmers are making changes on farm, with 50% of recommended actions implemented, and another 15% in progress. Comparative data from dairy farm nutrient budgets, indicates that N and P leaching rates have dropped during the project's life, and the project has worked to develop partnerships and increase in industry involvement and support for nutrient management issues on-farm. The assessment visit data provides some clear indications of the role of the ICM project in farmers' nutrient management, with farmers reporting increased knowledge and changes in decisions about nutrient management practices, as a result of ICM. Also of note is that while farmers have appreciated the farm planning approach and have indicated intention to continue to use farm planning, it is only one approach and as the project progresses, further complementary approaches may be added as ICM works to encourage on-farm change. The non-participation that has been noted in the past twelve months strengthens the need to consider regulatory policy initiatives if adoption rates are to increase. Overall, the findings support the extension work that ICM undertakes in terms of assisting farmers in their on-farm decision making about nutrient management.

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APPENDIX 1: RE-VISIT METHOD AND QUESTIONNAIRE

PARTICIPANTS

During the latter half of the 2010/2011 year, ICM staff contacted farms that were involved in ICM and to ask them to participate in a re-visit. There were 59 farms involved in ICM. Of these, three had not long completed the farm planning process and so were excluded from the sample. The remaining 56 had Farm Plans and of these, three refused a visit, and 53 (49 dairy and 4 drystock) agreed to participate in a re-visit.

The four ICM staff were also interviewed for this report.

MATERIALS

A structured questionnaire (see page 17) was designed by Waikato Regional Council staff for use at the re-visit. The questionnaire was designed to elicit information about farm system changes, the relevance of the Farm Plan, actions that had been undertaken and those that had not, and reasons why or why not. The questionnaire was specifically designed for the re-visit, and whilst it used some questions from previous evaluations of the ICM pilot it also contained new questions and scales to gather information on involvement and attitudes.

The ICM staff were asked a series of open ended questions about the project, to determine what they had done in the 2010/2011 year, what had been achieved, what had worked well, what challenges had occurred, and what the project's future intentions were.

PROCEDURE

The ICM staff carried out the re-visits to the farms. During the visit, the staff asked farmers the questions in Part A, B and C of the questionnaire and recorded the answers. Farmers were asked to self complete Part D. On return to the Waikato Regional Council the information from the questionnaires was entered into an Excel spreadsheet and analysed. Information from dairy and dry stock farms was analysed separately, and as well, data from each catchment was also able to be analysed separately.

The Momentum researcher contacted ICM staff and made appointments to speak with each staff member separately. Interviews took the form of a guided discussion, and answers were handwritten by the researcher. Information from the interviews was used to write the report sections about the project, the learnings from the project, industry involvement and the future direction.

Integrated Catchment Management Project	
Name:	
Position:	
Catchment:	
ICM staff member	
Visit date:	

PART A : Original Farm Plan

Your original Farm Plan was developed with EW in Month Year, have there been any changes to your farm or farm system since then?

eg: changes in stocking rate, effluent system, fertiliser applied, timing of nitrogen application, feed input?

☐	Yes	☐	No

Record changes:

Have you had your EW Farm Plan reviewed since it was first prepared?

☐	Yes	☐	No

Who did it?

Have you had your nutrient budget reviewed since it was first prepared?

☐	Yes	☐	No

Who did it?

Do you consider your current Farm Plan is still relevant to your system?

☐	Yes	☐	No

Done – Why did you decide to do ___ ? Would you have done this or considered this without the input of the Farm Plan? How long did it take to get this in place?

Intending – When are you planning to do this? Why are you waiting to do __? Is there anything that would encourage you to do this sooner?

Not doing – why have you decided not to do __? Is there anything that would encourage you to do this?

In progress – why did you decide to do this? What actions have you taken so far? What's next? When do you think you'll be completed by?

Benefits - Thinking about the things that you have done, what has been the benefit, for you of ...? (match the benefits they are reporting to the action they have undertaken)

PART B: Farm Plan						
Actions	**Undertaken?**				**Why?**	**Why not?**
From original Farm Plan	**Done**	**Intending to do**	**In progress**	**Not going to do**		
		When?	**Completion**			
		(Y)	(Y)			
		(date)	(date)			
		(Y)	(Y)			
		(date)	(date)			
		(Y)	(Y)			
		(date)	(date)			
		(Y)	(Y)			
		(date)	(date)			
		(Y)	(Y)			
		(date)	(date)			

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PART C: Farm Plan Scenarios
Before we re-run OVERSEER, below are the scenarios that were given in your original farm plan:
Which scenario did you find most useful? Why was that?

PART D: Tell us a bit about your views on nutrient management								
Would you say that managing nutrient losses on your property								
Means a lot to me	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	Means nothing to me
Is nutrient leaching from your property								
Of no concern to me	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	Of concern to me
How important is it for you to make management decisions that lower nutrient leaching from your property								
Important to me	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	Unimportant to me
How much does it matter to you that nutrient losses are minimised from your property								
Matters to me	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	Doesn't matter to me
How significant is the issue of nutrient management on your property								
Significant	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	Insignificant
Do you feel that nutrient losses on your farm are								
Not well managed	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	Well managed

PART E: Help us with running the ICM project			
How would you like to be kept up to date?	Phone ☐	Email ☐	Newsletter ☐
We may run some field days this year, is there a particular topic you are interested in?			

Thinking about the ICM project, do you agree or disagree with the following?	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Don't know**
The ICM staff are professional and courteous	☐	☐	☐	☐	☐	☐
My understanding of what was needed for nutrient management on my farm was high before I participated in the ICM project	☐	☐	☐	☐	☐	☐
The information I received from the ICM staff was useful to me for making decisions about managing nutrients on my property	☐	☐	☐	☐	☐	☐
I will continue to use a Farm Plan approach to managing the nutrients on my property	☐	☐	☐	☐	☐	☐
Before participating in the ICM project my I considered I have a good level of knowledge about nutrient management	☐	☐	☐	☐	☐	☐

The ICM project changed my decisions about managing nutrient loss on my property	☐	☐	☐	☐	☐	☐
The information I received from the ICM staff and through the Farm Plan was important in my decision making about managing nutrients on my property	☐	☐	☐	☐	☐	☐

Do you have any comments about the ICM project, the Farm Plan process, or the ICM staff?	
What works well? What doesn't work well? What else could we do?	
Do you have any requests that you would like us to follow up on?	
Do you have any comments you'd like to make about interactions you may have had with EW since we saw you last? (you may like us to give feedback, or follow up on something)	
We'd like to update your contact details	
What's your most preferred phone number?	
What's your email address?	

Thank you for your time, this information is valuable to help us evaluate the project and provide good service.

Your updated Farm Plan will be sent out to you within the next month.

APPENDIX 2: TABLES

TABLE 7: FARMER VIEWS ON ICM PROJECT (N=48)

Statement	Rating					No Answer	Total
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't know/ No answer	
The ICM staff are professional and courteous	0 (0%)	0 (0%)	0 (0%)	13 (27%)	35 (73%)	1 (1%)	48 (100%)
My understanding of what was needed for nutrient management on my farm was high before I participated in the ICM project	0 (0%)	12 (25%)	16 (33%)	17 (40%)	2 (4%)	0 (0%)	48 (100%)
The information I received from the ICM staff was useful to me for making decisions about managing nutrients on my property	0 (0%)	0 (0%)	1 (2%)	32 (67%)	15 (31%)	0 (0%)	48 (100%)
I will continue to use a Farm Plan approach to managing the nutrients on my property	0 (0%)	0 (0%)	2 (4%)	29 (60%)	17 (35%)	0 (0%)	48 (100%)
Before participating in the ICM project my I considered I have a good level of knowledge about nutrient management	0 (0%)	9 (19%)	13 (27%)	24 (50%)	1 (2%)	1 (2%)	48 (100%)
The ICM project changed my decisions about managing nutrient loss on my property	0 (0%)	5 (10%)	10 (21%)	24 (50%)	9 (19%)	0 (0%)	48 (100%)
The information I received from the ICM staff and through the Farm Plan was important in my decision making about managing nutrients on my property	0 (0%)	2 (4%)	5 (10%)	27 (50%)	14 (19%)	0 (0%)	48 (100%)