Greenhouse Gases: reductions being achieved on Manawatu dairy farms

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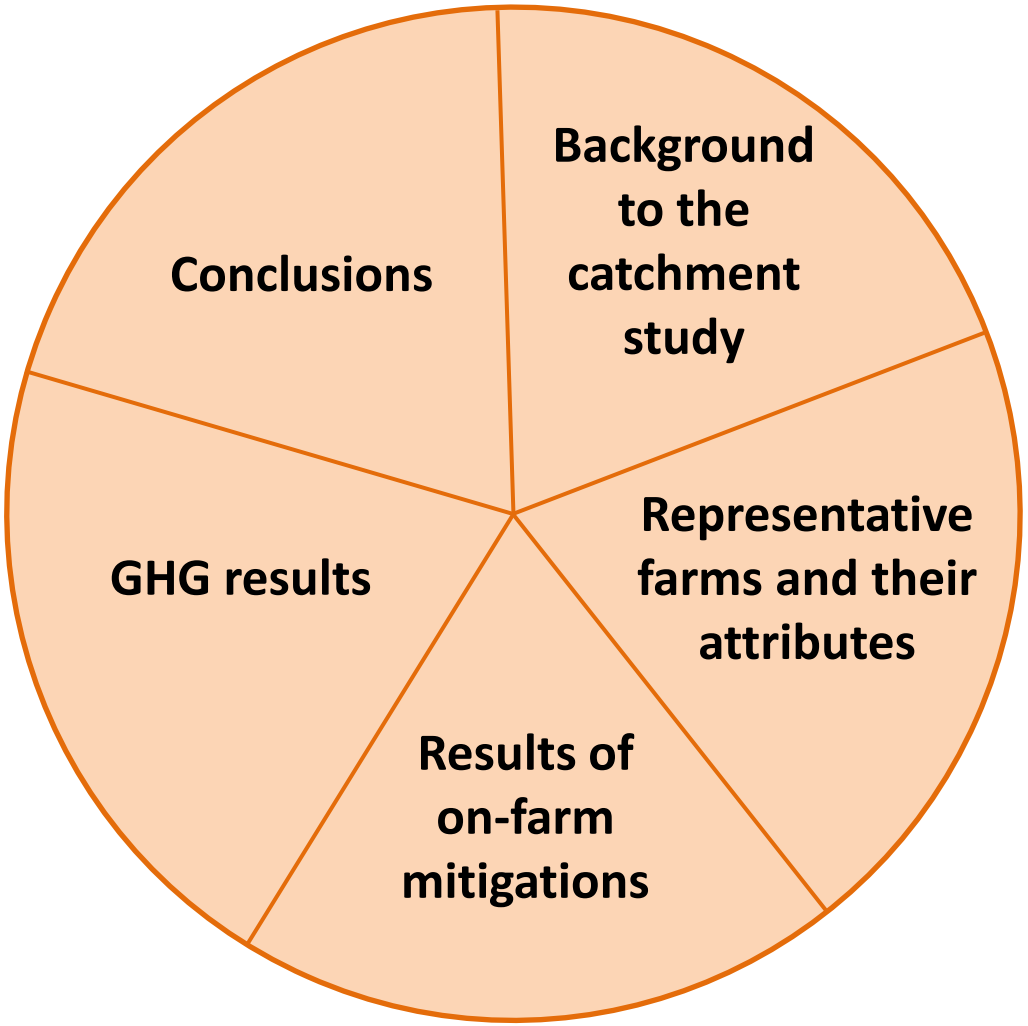
Presentation



Background

The Manawatu-Wanganui Regional Council has in place the One Plan (2014) for managing nutrient losses to water.

The One Plan requires all 384 dairy farmers to obtain a land-use consent to manage their nutrient, sediment and pathogen losses to waterways.

Nitrogen losses are capped and calculated using Overseer®. These caps are currently being revised using the latest version of Overseer.

Purpose of the Paper

As a result of the changes being undergone, how much of a reduction in GHG (if any) are being achieved on dairy farms in the region?

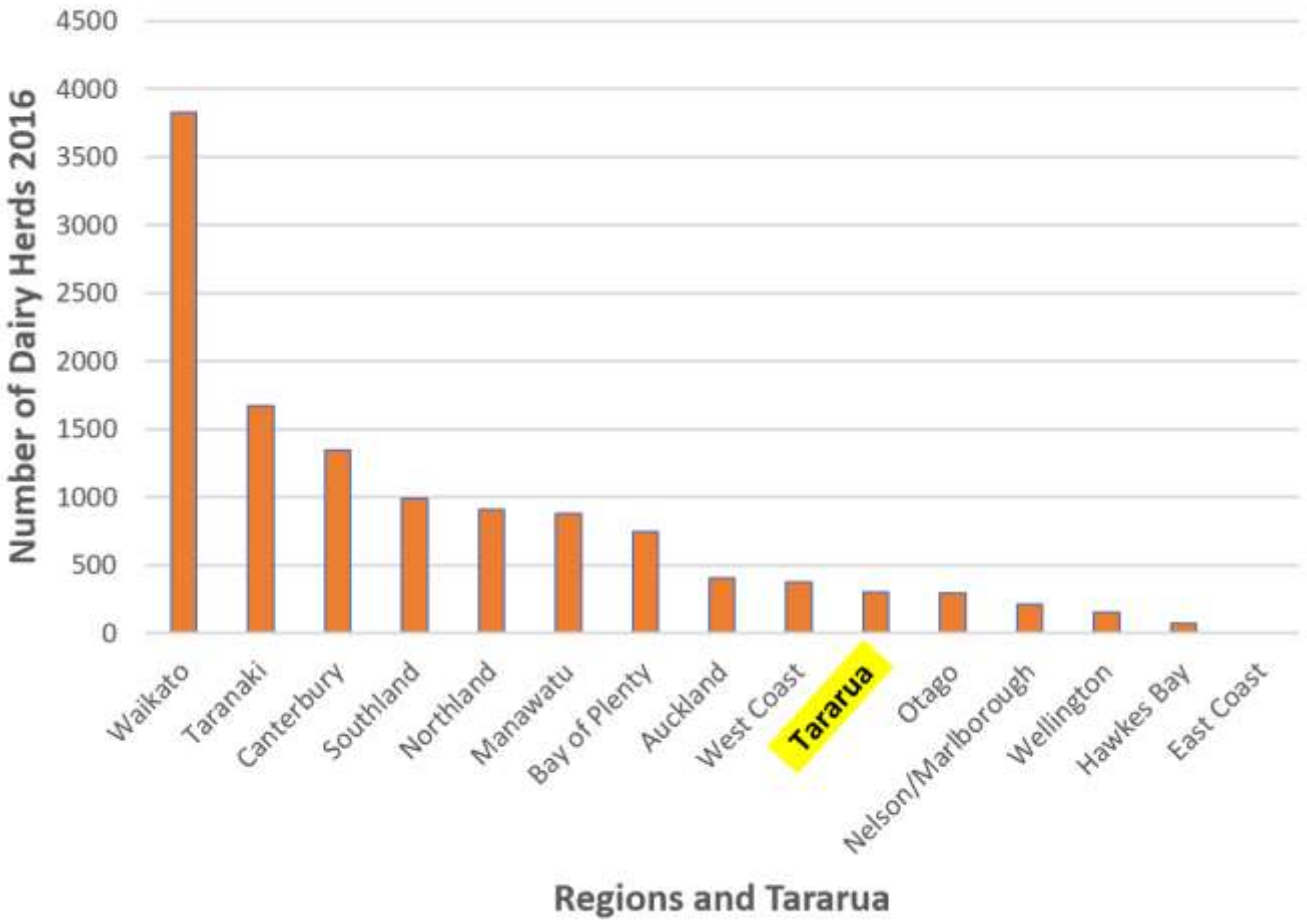
Is the level of reduction sufficient to indicate that changes on-farm might already be significantly contributing towards achieving the country's GHG objectives?

Our analysis into potential catchment management used a case study of representative farms drawn from cluster analysis of all dairy farms in the Upper Manawatu River catchment of the Tararua District.

It is a whole-of-catchment study rather than single farm study

Overseer® analyses were used to calculate expected nitrogen and GHG losses.

Tararua 304 dairy herds



Attributes of Catchment Dairy Farms

Cluster	Number of farms	Soil Order	Rainfall (mm)	Milking Platform Area (ha)	Milking Cows (Peak)	Production per Cow (kgMS/cow/yr)	Production per Hectare (kgMS/ha/yr)	Dairy System Type (I-V)	Pasture Consumption (kgDM/ha/yr)	Initial Nitrogen Loss to Water (kgN/ha/yr)	Phosphorus Loss to Water (kgP/ha/yr)
1	27	Allophanic	1,376	116	370	327	896	III	10,513	40	0.9
2	10	Recent	1,211	112	336	369	968	III	10,903	46	1.0
3	18	Gley	1,241	99	256	340	917	II	10,843	26	1.3
4	16	Brown	1,255	131	385	387	1,136	IV	10,195	47	1.0
5	55	Brown & Pallic	1,354	108	270	336	830	II	9,520	39	0.9
Medians of all farms in the catchment	126	Brown	1,298	111	309	340	902	II	10,092	39	1.0

Farm 1 … allophanic soils, moderate stocking rate, lower MS/ha
Farm 2 … recent soils, higher stocking rate, average MS/ha
Farm 3 … gley soils, lower stocking rate, average MS/ha, low costs
Farm 4 … brown soils, irrigation, largest farm, higher stocking rate, highest MS/ha
Farm 5 … most common farm: brown soils, lower stocking rate, lowest MS/ha

Mitigation Results from 5 Representative Farms

Representative Farms	Initial Farm Attributes				Final Farm Attributes			
	Nitrogen Loss to Water (kgN/ha/yr)	Peak Milking Cows (cows/ha)	Annual Milk Production (kgMS/ha)	Operating Profit ($/ha)	Nitrogen Loss to Water (kgN/ha/yr)	Peak Milking Cows (cows/ha)	Annual Milk Production (kgMS/ha)	Operating Profit ($/ha)
1	40	2.9	942	1921	24	2.0	810	1838
2	46	3.0	1107	2387	28	2.3	987	2379
3	26	2.6	880	1293	28	2.4	1008	1737
4	47	2.9	1137	2407	22	2.7	1081	1748
5	39	2.5	840	1533	24	2.5	793	1119

Farm 1 … allophanic soils, moderate stocking rate, lower MS/ha -> reduces stocking rate, reduces MS/ha, reduces profitability

Farm 2 … recent soils, higher stocking rate, average MS/ha -> reduces stocking rate, reduces MS/ha, maintains profitability

Farm 3 … gley soils, lower stocking rate, average MS/ha, low costs -> reduces stocking rate, increases MS/ha, increases profitability

Farm 4 … brown soils, irrigation, largest farm, higher stocking rate, highest MS/ha -> reduces stocking rate, reduces MS/ha, reduces profitability

Farm 5 … most common farm: brown soils, lower stocking rate, lowest MS/ha -> maintains stocking rate, reduces MS/ha, reduces profitability

GHG Results from 5 Representative Farms

Representative Farms	Dairy System Type (I-V)	Initial Farm CO_2 equivalents (t/ha/yr)				Final Farm CO_2 equivalents (kg/ha/yr)				Reduction in GHG totals (%)
		Methane	N_2O	CO_2	Total	Methane	N_2O	CO_2	Total	
1	III	7.16	3.13	0.91	11.20	5.38 (25)	1.59 (49)	0.50 (45)	7.47	33%
2	III	6.61	2.81	0.78	10.20	5.66 (14)	1.78 (37)	0.45 (42)	7.9	23%
3	II	5.43	4.9	0.78	11.10	5.57 (-3)	4.77 (3)	0.82 (-5)	11.16	<1%
4	IV	7.43	5.81	1.45	14.68	5.92 (20)	3.02 (48)	1.04 (28)	9.97	32%
5	II	6.32	2.96	0.81	10.08	5.49 (13)	1.52 (49)	0.72 (11)	7.73	23%
Average for the catchment representative farms	III	6.58	3.65	0.92	11.15	5.55 (16)	2.19 (40)	0.71 (23)	8.45	24%

Percentage reductions in GHG components are shown in brackets

- Reductions in stocking rate reduce methane
- Reductions in stock & nitrogen fertiliser reduce N_2O
- Reductions in vehicles & fertiliser (man) reduce CO_2

Conclusions

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- Nitrogen discharges can be reduced by 38%
- GHG discharges can be reduced by 24%
- 0.64% GHG reduction per 1% reduction in nitrogen losses
- Discussion and consultation required to ensure that GHG regulations are complementary to regional water quality policies