Genevieve Toop
30/11/2016

Marion Hughes
Senior Case Manager
Advertising Standards Authority
Greenpeace NZ Television - Complaint 16/400

Dear Marion,

Re: Greenpeace NZ Television - Complaint 16/400

Introduction

Greenpeace believes the advertisement in question complies with the Advertising Code of Ethics (**Code**). It says further that the advertisement serves the public interest by raising public awareness and generating discourse on water pollution while offering a critique of the impacts of the powerful and influential New Zealand dairy industry.

The context of this advertisement is that there is an ongoing national debate of significant public interest around the use, management, regulation, allocation and pollution of water resources. One of the major issues is the harmful impact of intensive dairy farming on water quality and how that impact may be managed and reduced. This impact is widely scientifically documented and implicitly acknowledged by the dairy industry itself.

Greenpeace is an environmental advocacy organisation, funded by private donations from individuals and receives no government or industry funding. Based on substantive publically available scientific information, Greenpeace holds the view that industrial dairy farming is having a substantial negative impact on the health of waterways in New Zealand, and that the effects of planned irrigation schemes and projected expansion of industrial dairying will worsen impacts and further degrade water quality.

The complaints

This series of complaints allege breaches of Rule 2 of the Code. It reads:

> **2** **Truthful Presentation** – Advertisements should not contain any statement or visual presentation or create an overall impression which directly or by implication, omission, ambiguity or exaggerated claim is misleading or deceptive, is likely to deceive or mislead the consumer, makes false and misleading representation, abuses the trust of the consumer or exploits his/her lack of experience or knowledge. (Obvious hyperbole, identifiable as such, is not considered to be misleading).

The Rule is alleged (in broad terms) to have been breached in the following ways:

(a) By alleging that dairy intensive dairy farming is primarily responsible pollution of New Zealand waterways.

(b) The use of imagery was misleading (as the waterways shown were not polluted through dairy farming and/or were in flood at the time the footage was filmed).

These complaints are responded to in turn below.

The advertisement is not misleading

The link between intensive dairy farming and water pollution in New Zealand

The link between intensive dairy and water pollution is well documented. Many of the relevant reports are publically available.

In essence, the research shows that:

(a) "Diffuse" pollution of waterways (i.e. pollution caused by runoff or leaching) is principally caused by pastoral farming.

(b) Diffuse nitrogen pollution of New Zealand waterways is mainly caused by animal urine (and to lesser extent fertilisers).

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(c) Nitrogen pollution has a significant impact on the water quality of New Zealand fresh waterways.

(d) Intensification of dairy farming has led to increased diffuse nitrogen pollution of New Zealand fresh waterways.

(e) This increase is set to continue in the foreseeable future.

"Diffuse" pollution

According to the Parliamentary Commissioner for the Environment pollutants that come from diffuse sources (non-point sources) are much more difficult to manage. Diffuse pollution often comes from a large number of small sources, but the term also covers the pollution that comes from an eroding river bank or seepage of soluble pollutants into groundwater (PCE, 2012: p.49).

In the dairy context, the main form of this type of pollution is nitrogen pollution. It occurs principally through animal urine. In a 2013 report, the Parliamentary Commissioner for the Environment (**PCE**) noted (PCE, 2013:p.16):

> Fertiliser is a much smaller source of nitrogen than animal urine. However, the increased use of urea fertiliser has, along with irrigation and supplementary feed, enabled higher stocking rates, and more animals mean more urine.

Impact of nitrogen pollution on waterways

In its latest State of the Environment Report, the Ministry for the Environment (**MFE**) explained the impact of nitrogen pollution on waterways as follows (MFE, 2015:p.54):

> Once in the soil, excess nitrogen travels through soil and rock layers, ending up in groundwater, rivers, and lakes…. The greatest impact of excessive nitrogen levels in New Zealand rivers is nuisance slime and algae (periphyton) growth. This growth can reduce oxygen levels in the water, impede river flows, and smother the riverbed and plant life, which fish and other aquatic animals depend on for food and habitat. About 49 percent of monitored river sites currently have enough nitrogen to trigger nuisance periphyton growth, as long as there is enough sunlight, phosphorus, and a lack of flood events for periphyton to bloom.

The link between increased diffuse nitrogen pollution of fresh waterways and intensive dairy farming

The link between intensive dairy farming and increased diffuse nitrogen pollution of fresh waterways is obvious. More cows mean more bovine urine, which in turn leads to more diffuse nitrogen pollution. This is well established.

In its 2013 report, the PCE noted (PCE, 2013:p.6):

> Unfortunately, [our] investigation has shown the clear link between expanding dairy farming and increasing stress on water quality. **Even with best practice mitigation, the large-scale conversion of more land to dairy farming will generally result in more degraded fresh water**.

NIWA has reached the same conclusion, and has identified dairy, and increased dairy conversion, as the primary source of the increase. In a 2010 report it notes (NIWA, 2010) (emphasis added):

> **Intensification of dairying has increased the pressure on New Zealand waterways, primarily through diffuse-source pollution**.
>
> The National Rivers Water Quality Network (NRWQN) and regional SoE monitoring show that diffuse pollution from land use is overwhelmingly the main cause of water quality degradation in New Zealand today. Research and monitoring have identified nitrogen (particularly its dissolved form, nitrate), phosphorus, faecal microbes, and sediments as the key contaminants from diffuse sources.
>
> **Pastoral farming – which accounts for 40 percent of New Zealand's land area – is undoubtedly the main source of diffuse pollution**. Evidence from the NRWQN and catchment studies generally show a gradient in water quality from excellent in native forest, to good in plantation forest, to poor in pastoral and urban streams. **Streams in dairy land are among the most polluted**.

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> **There is no doubt that our declining river water quality over the last 20 years is associated with intensification of pastoral farming and the conversion of drystock farmland to dairy farming, particularly in Waikato, Southland, and Canterbury**. For example, between 1992 and 2002, the number of cows in Waikato increased by 37 percent; during the same period nitrogen levels in the region's streams increased by 40 percent and phosphorus levels went up by 25 percent.

The MFE 2015 State of the Environment Report also records this increase (and noted its cause), and noted that 60 percent of freshwater sites it monitors exhibited a statistically significant increase in nitrogen levels (MFE, 2015:p.54/55) (emphasis added):

> Between 1990 and 2012, the estimated amount of nitrogen that leached into soil from agriculture increased 29 percent. **This increase was mainly due to increases in dairy cattle numbers** (and therefore urine which contains nitrogen) and nitrogen fertiliser use…
>
> Between 1989 and 2013, total nitrogen levels in rivers increased 12 percent, with **60 percent of the 77 monitored sites showing statistically significant increases**…
>
> **The increases in total nitrogen levels are likely to be due to an increase in nitrate leaching through soils, as a result of more intensive agriculture – especially from dairy farming expanding and intensifying in many regions**.

A report on diffuse pollution, prepared by NIWA scientists states that dairy farming is more troublesome in this regard, as nitrogen loss from dairying is higher than from other forms of farming (Howard-Williams et. al, 2010:p.128) (emphasis added):

> Of the pastoral land use category, which makes up 42% of New Zealand's land cover, dairy farming has the highest diffuse pollution footprint with 36.7% of the Total Nitrogen load entering the sea originating from the 6.8% of the land area occupied by dairy farming… This is not surprising given that **the nitrogen loss rates from dairy farms are four times higher than from other pasture** (cf. 39 kg/ha/yr compared with 8 kg/ha/yr from sheep and beef farms, and 5 kg/ha/yr from forest.

This observation was also made by MFE in a 2009 report (MFE 2009:p.2):

> Contaminant losses to freshwater are often greater per hectare of dairy land compared with other land uses. For example, dairying land occupies only 22 per cent of the land area in Waikato, but it is estimated by Environment Waikato to account for 68 per cent of nitrogen and 42 per cent of phosphorus entering the waterways of the region.

For completeness, it is noted that diffuse nitrogen pollution is only one of the aspects of the pollution caused by intensive dairying, sediment and pathogen pollution (further discussion below) also occurs. As noted by Howard and Williams et al (Howard-Williams et. al, 2010:p.126):

> With a prognosis for increased land use intensification, further water quality degradation seems highly likely… The 'universal' diffuse pollutants: nutrients, fine sediments, and pathogens, all of which are mobilised by livestock, predominate in New Zealand waters.

Diffuse nitrogen pollution from intensive dairy farming is set to increase

The PCE has indicated its expectation that this form of pollution is expected to increase in coming years. Its 2013 report noted (PCE, 2013:p.6/12):

> The results of the modelling exercise show that the amount of nitrogen entering fresh water every year in virtually every region of the country will continue to rise. This is especially so in regions where dairy farming is expanding and is occurring despite concurrent increases in forestry.
>
> Greater production from agriculture is anticipated. The Government has set a target of doubling the value of agricultural exports by 2025. Increases in dairy production have come from increasing both the stocking rate on dairy farms (cows per hectare) and the milk yield from each cow. The Government has also allocated funding to support new irrigation schemes and this will enable further expansion of dairy farming and other types of intensive farming.

Please see appendix 1 for graphs related to this section.

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Risk to safe swimming and drinking water

The main ways in which swimming and drinking water are already being jeopardised and are at further risk from industrial dairying include; nitrogen pollution causing toxic algal blooms (discussed above), *E.coli* and pathogen contamination, and nitrate pollution.

MFE's 2009 report which drew together monitoring data from 14 dairy farming catchments in New Zealand states that (MFE, 2009:p.vvii):

> Faecal contamination of waterways poses a public health risk. Illness may be contracted as a direct result of ingesting bacterial, viral and protozoal pathogens that occur in faecal material.

The report concluded that:

> The majority (10) of the monitored catchments had median Escherichia coli concentrations that indicate higher levels of faecal contamination than the 'average' lowland pastoral farming catchment in New Zealand. (MFE, 2009:p.vvii)

A paper summarising findings from the Pathogen Transmission Routes Research Program observed:

> Grazing livestock are considered to be the dominant source of faecal contamination to New Zealand's freshwaters (Collins et. al, 2007:p.2)

The same paper further notes that faecal contamination of freshwater can arise through the deposition of faeces by animals directly into waterways, on riparian strips and through indirect transmission routes.

On direct contamination one study found that the water quality impacts of a dairy herd crossing the Sherry River in New Zealand showed very high levels of faecal contamination, with concentrations of the faecal bacterial indicator E.coli temporarily elevated to more than 100× background levels (median around 300 per 100 ml) and greatly exceeding guidelines for contact recreation. (Davies-Colley et al. 2004)

On indirect contamination, Collins noted that (Collins et. al, 2007:p.4):

> Subsurface artificial drains commonly underlie dairy pastures where soils have some form of intrinsic drainage restriction. The presence of subsurface drains reduces saturation of the soil and the propensity for surface runoff, a process that can rapidly transfer microbes to waterways.

This indirect contamination can be (and already is) made worse by irrigation. The same paper notes that (Collins et. al, 2007:p.5):

> The irrigation of water to encourage pasture growth can promote the flushing of faecal microbes, from faeces deposited on pasture by livestock, down through the soil horizons (particularly via bypass flow) with the potential to cause contamination of groundwater. Border-strip irrigation, in particular, has led to the faecal contamination of wells up to 11 m below ground level (Close et al. 2005). Campylobacter were identified in 12% of groundwater samples with concentrations ranging between <0.6 and >3.1 per 100 litre. As groundwater is often used directly for drinking purposes without treatment, these concentrations raise implications for public and animal health. Generally, the highest Campylobacter and E.coli concentrations found in the wells occurred approximately 20–30 days after a period of grazing had coincided with a border strip irrigation event or a large rainfall event.

Collins highlights a particular concern that (Collins et. al, 2007:p.5):

> Close et al. (in press) also conducted an epidemiological assessment of people living in areas encompassing dairying within major irrigation schemes (c. 55% border-strip irrigation), and demonstrated a statistically significantly increase in incidence of campylobacteriosis, cryptosporidiosis, and salmonellosis compared to control groups elsewhere in Canterbury.

Another established risk to drinking water quality is nitrate toxicity in groundwater and aquifers arising from intensive dairying. Leached nitrates have been found to get into groundwater and accumulate in deep aquifers over time. This poses human health risks to those sourcing their drinking water from contaminated bores.

Drinking Water Standards for New Zealand set a Maximum Acceptable Level (MAV) of 50mg/L for nitrate. This is equivalent to 11.3mg/l nitrate-nitrogen. Excessive levels of nitrate in drinking water have

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been linked with blood disease in infants (commonly known as “blue baby syndrome”), which can be life-threatening. Adults with specific rare metabolic disorders may also be at risk.

GNS Science noted in a 2009 report that (GNS, 2009):

(a) Nationally, 4.8% and 13.2% of monitoring sites had median NO3-N levels above the MAV defined in the DWSNZ (11.3 mg/L) and the toxicity-related TV specified in the ANZECC guidelines (7.2 mg/L) (p.15).

(b) The regions with the highest median NO3-N concentrations are Waikato (4.2 mg/L), Southland (3.4 mg/L) and Canterbury (3.4 mg/L) (p.3).

These correlate with catchments in areas with intensive dairy farming. Of all the dairy farming regions in New Zealand Waikato has the most dairy cows (28% of national total), followed by Canterbury (19% of total) followed Southland (12% of total).

The link between intensive dairy farming and nitrate aquifer contamination has been reiterated by MFE. On its website, the Ministry notes that (http://www.mfe.govt.nz/more/environmental-reporting/fresh-water/groundwater-quality-indicator/nitrate-groundwater):

> Monitored groundwater sites with nitrate concentrations that breach health standards are found in most regions, but are most common in the Manawatū and Waikato regions. In the Waikato, elevated nitrate concentrations have been attributed to intensive land uses such as dairying and market gardening in areas where free-draining soils overlie a shallow water table.

Recent groundwater testing in Canterbury has produced similar result. One study from 2015 notes (Foote, 2015:p.6):

> Testing in Canterbury groundwater wells in 2012 showed 11 % of tested wells did not meet the drinking standards, up from 7 % in 2011. Elevated NO3 levels in groundwater are an issue because about 40 % of New Zealand’s population relies on groundwater for drinking.

The Canterbury District Health Board also advises people to get their private bores tested as follows (CDHB, 2013):

> Many rural drinking water bores in Canterbury are at risk of elevated nitrate levels, with some private bores exceeding the recommended safe level of nitrates.

Again, this is unsurprising given the leaching rates from dairying are disproportionate to most other land uses, as noted earlier in Howard-Williams, 2010. One study from 2015 notes (Foote, 2015:p.5):

> Leaching rates vary widely from farm to farm but an irrigated dairy farm in Canterbury was found to be leaching 180 kg of nitrogen per hectare per year.

Of special note in relation to the management of nitrate pollution are the legacy issues that relate to extended residence times of polluted groundwater. Howard-Williams notes (Howard-Williams et.al, 2010:p.131):

> The effects of current farming will not show up for several decades into the future. The policy response to this legacy of nitrogen in groundwater has been termed “the load to home.

The use of imagery in the advertisement is not misleading

A number of the complaints take issue with the footage showing a stream in flood. This is said to be misleading, as it does not depict the relevant waterway as it would normally occur.

Greenpeace does not accept this allegation. Nothing in the advertisement suggests that the waterway is depicted in its usual flow. It is also worth noting that the evidence shows that storm and flood events in fact increase the likelihood of faecal contamination as manure on streambanks is washed into the waterways, and/or can be pushed into shallow groundwater. As noted by MFE (MFE, 2015:p.55):

> E.coli can spike to high levels in rivers and streams for 2–3 days after heavy rainfall or during low river flows, particularly in lowland areas.

This is not restricted to pathogen contamination, but applies to all diffuse pollution sources. Howard and Williams noted (Howard-Williams et.al, 2010:p.130):

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Because surface runoff mainly occurs during and immediately after rainstorms, diffuse pollution from this pathway tends to correlate positively with stream flow.

Response to specific complaints

This section addresses specific issues raised in the complaint by Dairy NZ and Michelle Pye, both of which are more detailed then the remainder of the series.

Dairy NZ

Dairy NZ's complaint includes the following:

> We believe the two of the statements made in the television commercial are false and misleading; further, we believe the smaller stream depicted in the TVC is, in fact, in flood and therefore not an accurate portrayal of what it would look line under every-day conditions.
>
> 1. The statement that intensive dairy farming is responsible for the pollution of the river water shown in the TVC is false. Beef and sheep farming are carried out up-stream of the river depicted, as is forestry. Therefore to lay the blame solely on dairying is, at best, inaccurate.

Greenpeace rejects this allegation. First, no reasonable viewer would interpret the advertisement to suggest that dairy farming is *solely* responsible for the pollution of the depicted river. Any reasonable viewer would understand that, in an industrial and post-industrial society, there are a variety of sources of pollution. It is never stated nor implied that dairy is the sole cause of water pollution.

Second, the statements made in the advertisement are general, and no individual river is named. In those circumstances, the reasonable viewer would not infer that dairy farming is the sole cause of pollution of the depicted river. It is used as a representative image for New Zealand rivers and streams in general. For completeness, it is noted that flooding events are not an uncommon occurrence.

For completion, it is noted that the footage of rivers used in the advertisement are from Waikato, which is the most heavily dairy farmed region in New Zealand, home to 1.4 million cows, and accounting for 28percent of the national total of dairy land (more than any other region). (Dairy NZ, 2015)

The statement that "dairy is polluting our rivers" and the depiction of a river in the dairy intensive Waikato Region that is partially or substantially polluted by dairy farming is a fair and reasonable communication.

> 2. The claim in the TVC that people used to be able to drink water from our rivers and now they cannot because of dairy farming is also misleading, and, potentially, runs the risk of a public health issue should people believe that they might be able to safely drink river water.
>
> 3. The drinking water standard requires levels of E coli <1 per 100ml. Streams and rivers, even in national parks are unlikely to be able to meet this standard. Our lowland streams and rivers would never have met the drinking water standard.

The inference form the statement that "our rivers *used* to be safe to drink from" (emphasis added) is that they are *no longer* safe to drink from. It is illogical to assert that by our pointing out that rivers are no longer safe to drink from gives rise to public health risk on the basis that people will somehow interpret the statement to mean they can safely drink water from rivers.

It is true that it used to be safe to drink water from our rivers. That does not imply it was always safe to drink water from all rivers at all times. The reasonable viewer would not interpret the advertisement in that way. The advertisement does not purport to indicate which (if any) New Zealand rivers are currently safe to drink from.

The simple message is that the number of rivers, which are not safe to drink from, have increased in recent years. This is a fair assertion in light of the science which shows ongoing degradation of river water quality over many years.

That dairy farming continues to play a major role in the degradation of water quality and thus the non-drinkability of river water (and other water sources) is supported by extensive science on the matter.

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Any inference that people cannot safely drink river water (nor even swim in it in many instances), in part or primarily because of increased industrial dairy farming, is therefore completely reasonable.

Finally in this context, we note that Dairy NZ is a dairy industry advocate and is funded by a levy that is determined by the volume of dairy milk solids produced annually. It has a vested interest in opposing efforts to restrict the expansion or intensification of dairying in New Zealand. Its complaint must be viewed in that light.

Michelle Pye

Ms Pye's complaint includes the following:

> The NZ Annual Report on Drinking Water Standards 2014-2015 shows an overall improvement in achievement against the Standards from 2013-2014 (79%) to 2014-2015 (79.4%) - a fact that seems ignored in the ad. Also the advertisement implies that dairy farming and massive irrigation schemes are to blame for the pollution of drinking water. I do not believe this to be fact. Some of our most polluted rivers are in cities (ie Avon and Heathcote) and the pollution in these rivers is not the fault of dairy farming or irrigation.

The manner in which pollution of drinking water is caused by intensive dairy farming is discussed in detail above. Urban rivers represent a small minority of rivers in New Zealand. Statistics New Zealand notes on their website that (http://www.stats.govt.nz/browse_for_stats/environment/environmental-reporting-series/environmental-indicators/Home/Fresh%20water/river-water-quality-bacteria-ecoli.aspx):

> About 48.4 percent of New Zealand's river length is fed by catchments that are mainly influenced by indigenous land cover, while 45.7 percent are influenced mainly by pasture, 5.1 percent by exotic forest, and 0.8 percent by urban land cover.

Sue Fox

Ms Fox' complaint includes:

> Ad suggests that the government is allowing pollution of NZ rivers. Regulation prohibits pollution. Must be an overstatement. Lack of balance and emotional blackmail in manner of adverts. Suggests that if you give your name (and no doubt donation) they can do something to stop the pollution. This is an overstatement of their influence. Greenpeace put 100 Percent blame on industrial dairy farming which at best is an oversimplification of the problem.. It demonizes a certain section of our business community unfairly. Has capacity to incite hatred against them.

Some of the matters raised in this complaint are addressed above. In relation to the remainder of the allegations, Greenpeace makes the following observations:

a) The advertisement expresses the opinion that the public subsidies to irrigation schemes and the current regulatory environment allow for and facilitate continued intensification of industrial dairy farming throughout New Zealand (MFE, 2016). The natural consequence of continued intensification is further degradation of the quality of New Zealand fresh waterways (as discussed above). Greenpeace is an advocacy organisation that works, in part, to promote regulatory change at the national and regional level for better environmental outcomes. Greenpeace does not accept that a reasonable viewer would have understood the advertisement to make any claim that signing the petition would guarantee a stop of pollution freshwater pollution.

b) Greenpeace denies that the advertisement in any way demonises dairy farmers as a group. The advertisement highlights the environmental effects of industrial dairy farming (particularly on fresh waterways), and serves to encourage public, political and industry action to address this issue. This is a political issue that centres on resource management regulations and public subsidies to irrigation schemes, which facilitate more industrial dairying, rather than individual farmers. It is submitted that a reasonable viewer would have understood it to not be targeting individual farmers.

Please get in touch if you require clarification or further information regarding this response.

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Yours Sincerely,

Genevieve Toop
Sustainable Agriculture Campaigner,
Greenpeace

References

Howard-Williams, C. *, Davies-Colley, R. **, Rutherford, K. ** and Wilcock, R. **(2010) *Diffuse pollution and freshwater degradation: New Zealand Perspectives* (Link)

Collins, R. Mcleod, M. Hedley, M. Donnison, A. Close, M. Hanly, J. Horne, D. Ross, C. Davies-Colley, R. Bagshaw C. & Matthews L. (2007) *Best management practices to mitigate faecal contamination by livestock of New Zealand waters*, New Zealand Journal of Agricultural Research, 50:2, 267-278 (Link)

Canterbury District Health board (2013) *Nitrate in Drinking Water: Frequently Asked Questions* (Link)

Dairy NZ, 2015. *Quickstats about dairying*. (Link)

Davies-Colley R. Nagels D. Smith, R. Roger G. Young & Chris J. Phillips (2004) *Water quality impact of a dairy cow herd crossing a stream*, New Zealand Journal of Marine and Freshwater Research, 38:4, 569-576

GNS Science Consultancy Report (2009) *National Groundwater Quality Indicators Update: State and Trends 1995-2008* Prepared for the Ministry for the Environment. (Link)

Foote, K. Joy, M. Death R. (2015) *New Zealand Dairy Farming: Milking Our Environment for All Its Worth*. (Link)

Ministry for the Environment (2009) *Water Quality in Selected Dairy Farming Catchments: A baseline to support future water-quality trend assessments*. Link.

Ministry for the Environment & Statistics New Zealand (2015). *New Zealand's Environmental Reporting Series: Environment Aotearoa 2015*. (Link)

Ministry for the Environment (2016) *Irrigation subsidies* accessed via the Official Information Act on June 24 2016.

NIWA (2010) *How Clean are our Rivers* Water and Atmosphere, 22 July 2010 written by Dr Fiona Proffitt Link

PCE, Dr Jan Wright (2012) *Water quality in New Zealand: Understanding the science* (Link)

PCE, Dr Jan Wright (2013) *Water quality in New Zealand: Land use and nutrient pollution* (Link)

PCE, Dr Jan Wright (2014) *Proposed amendments to the National Policy Statement for Freshwater Management 2011 Submission to the Ministry for the Environment* (Link)

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Appendix 1

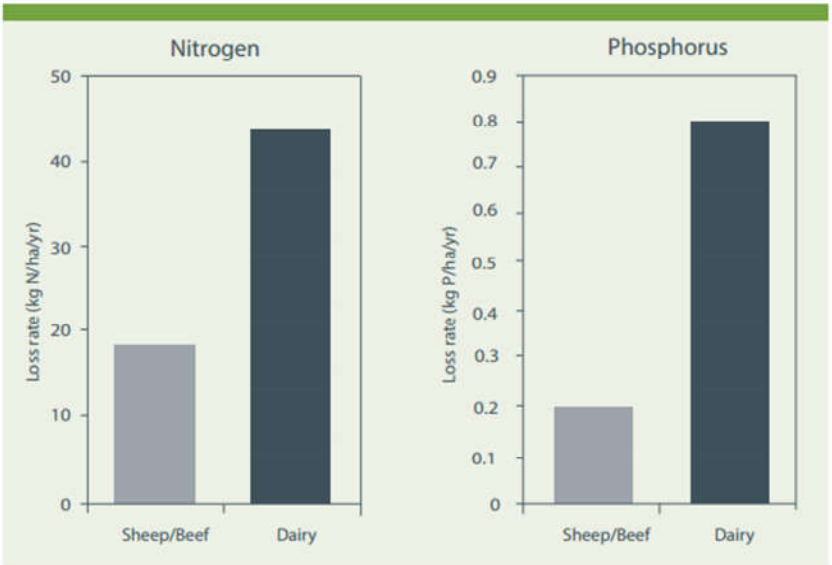

Figure 4.4 Nitrogen and phosphorus loss rates on an intensive sheep/beef farm on alluvial soil in Canterbury converting to an intensive dairy farm. The impact of such a farm conversion on nutrient losses varies, but the change shown above is 'conservative'.[46]

(PCE, 2013:p.37)

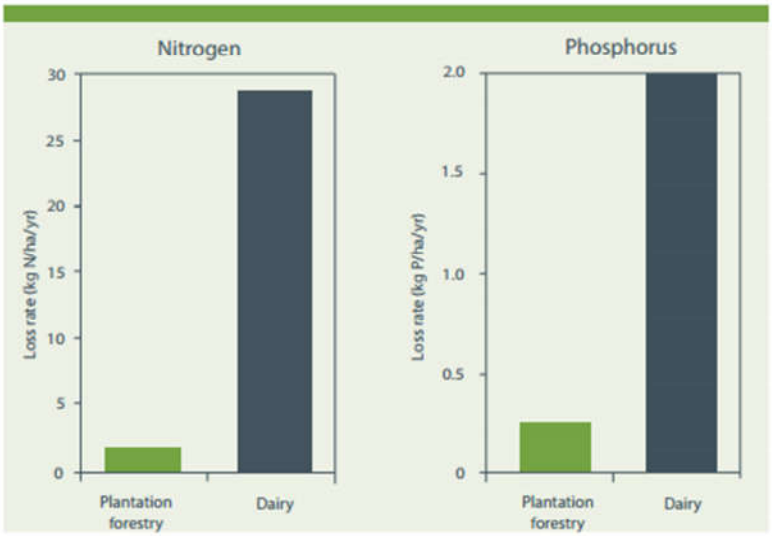

Figure 4.6 Nitrogen and phosphorus loss rates from a plantation forest on pumice soil in the Volcanic Plateau converting to a dairy farm. [47] In this type of land conversion, loss rates of both nutrients increase by an order of magnitude.

(PCE, 2013:p.38)

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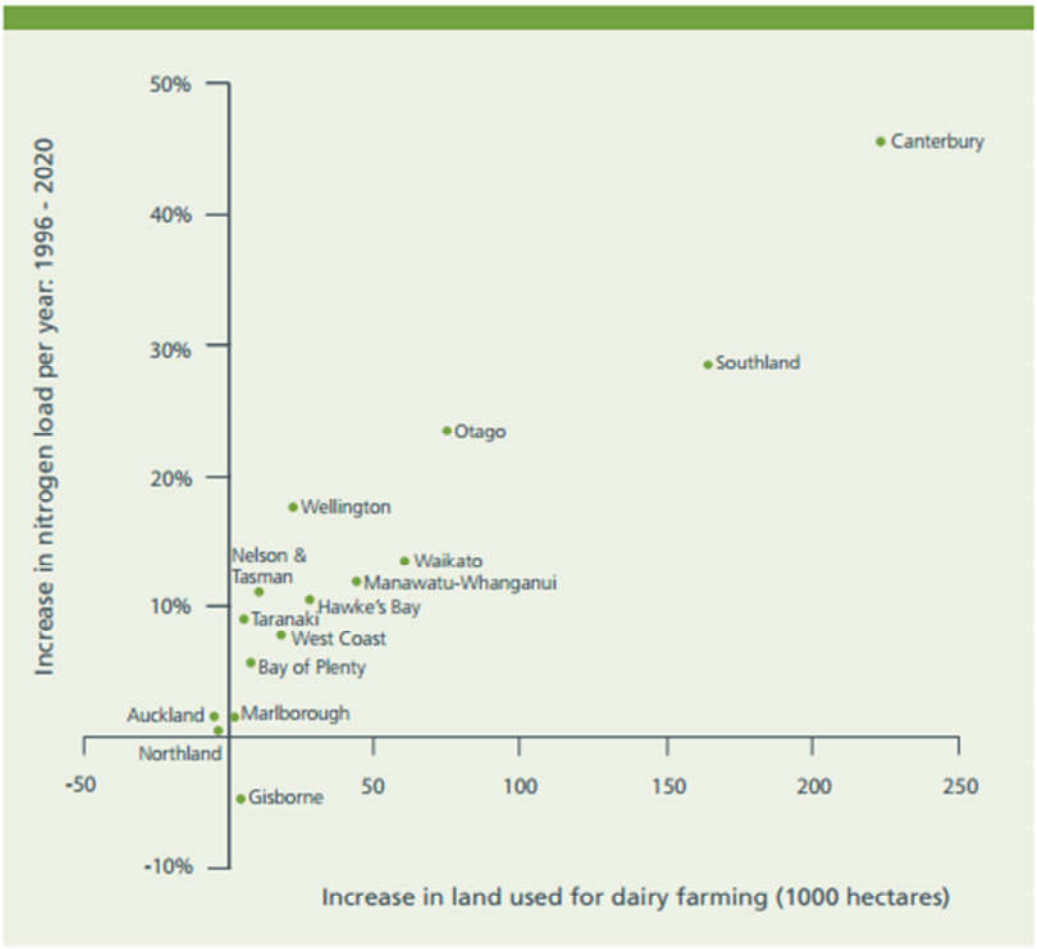

Figure 7.1 Large-scale land use change to dairy farming leads to an increase in the amount of nitrogen that gets into fresh water. The graph shows the differences between 1996 and 2020.

(PCE, 2013:p.66)

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