IN THE ENVIRONMENT COURT
I MUA I TE KOOTI TAIAO O AOTEAROA

UNDER	of the Resource Management Act 1991
IN THE MATTER	of appeals under Clause 14 of the First Schedule of the Act
BETWEEN	**TRANSPOWER NEW ZEALAND LIMITED** (ENV-2018-CHC-26)
	FONTERRA CO-OPERATIVE GROUP LIMITED (ENV-2018-CHC-27)
	HORTICULTURE NEW ZEALAND (ENV-2018-CHC-28)
	ARATIATIA LIVESTOCK LIMITED (ENV-2018-CHC-29)

STATEMENT OF PRIMARY EVIDENCE OF CAIN ROSS DUNCAN FOR FONTERRA COOPERATIVE GROUP LTD AND DAIRYNZ LTD

04 February 2022

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WILKINS FARMING CO

(ENV-2018-CHC-30)

GORE DISTRICT COUNCIL, SOUTHLAND DISTRICT COUNCIL & INVERCARGILL DISTRICT COUNCIL

(ENV-2018-CHC-31)

DAIRYNZ LIMITED

(ENV-2018-CHC-32)

H W RICHARDSON GROUP

(ENV-2018-CHC-33)

BEEF + LAMB NEW ZEALAND

(ENV-2018-CHC-34 & 35)

DIRECTOR-GENERAL OF CONSERVATION

(ENV-2018-CHC-36)

SOUTHLAND FISH AND GAME COUNCIL

(ENV-2018-CHC-37)

MERIDIAN ENERGY LIMITED

(ENV-2018-CHC-38)

ALLIANCE GROUP LIMITED

(ENV-2018-CHC-39)

FEDERATED FARMERS OF NEW ZEALAND

(ENV-2018-CHC-40)

HERITAGE NEW ZEALAND POUHERE TAONGA

(ENV-2018-CHC-41)

STONY CREEK STATION LIMITED

(ENV-2018-CHC-42)

THE TERRACES LIMITED

(ENV-2018-CHC-43)

CAMBELL'S BLOCK LIMTED

(ENV-2018-CHC-44)

ROBERT GRANT

(ENV-2018-CHC-45)

SOUTHWOOD EXPORT LIMITED, KODANSHA TREEFARM NEW ZEALAND LIMITED, SOUTHLAND PLANTATION FOREST COMPANY OF NEW ZEALAND

(ENV-2018-CHC-46)

TE RUNANGA O NGĀI TAHU, HOKONUI RUNAKA, WAIHOPAI RUNAKA, TE RUNANGA O AWARUA & TE RUNANGA O ORAKA APARIMA

(ENV-2018-CHC-47)

RAYONIER NEW ZEALAND LIMITED

(ENV-2018-CHC-49)

ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND
(ENV-2018-CHC-50)

Appellants

AND **SOUTHLAND REGIONAL COUNCIL**

Respondent

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Introduction

1 My full name is Cain Ross Duncan. I am the Otago/Southland Sustainable Dairying Manager for Fonterra Co-Operative Group Limited (Fonterra).

2 I hold a Bachelor of Resource Studies and a Masters in Applied Science from Lincoln University, which were completed in 2000 and 2005 respectively. In 2014, I achieved two Certificate of Completions from Massey University for satisfying the course requirements for the Advanced Certificate in Sustainable Nutrient Management and the course requirements for Farm Dairy Effluent: System Design and Management.

3 In addition to the above qualifications, I hold a Certificate of Completion for satisfying the course requirements for Advanced Farm System Modelling from Massey University.

4 I am a current Certified Nutrient Management Advisor having satisfied the criteria under the Nutrient Management Advisor Certification Programme managed by the Fertiliser Association of New Zealand. I completed my last annual assessment for this programme in December 2021.

5 Prior to my employment with Fonterra I worked for the London Borough of Tower Hamlets and the London Borough of Haringey (United Kingdom) as a Planning Officer/Enforcement Manager in their respective Planning sections for a total of 7 years. Before moving to the United Kingdom I worked as a Compliance Monitoring Officer for Environment Canterbury.

6 I have held my current position as Otago/Southland Sustainable Dairying Manager for Fonterra for 2 years, prior to which I was a Sustainable Dairy Advisor in Southland for Fonterra. In total I have 9 years' experience across these two roles.

7 The primary purpose of the Sustainable Dairy Advisor role is to provide advice and support to Fonterra shareholders to assist them in developing and adopting practices that will improve the sustainability of their farming operations.

8 I work one on one with Fonterra suppliers to, accelerate their adoption of good management practices (through a tailored Farm Environmental Management Plan process), utilise their 'Farm Insight Report' to optimise the use of nitrogen within their farming system, ensure they meet Fonterra's minimum standards and understand and comply with regional rules and resource consent conditions.

9 I participated in the Land Management/Farm Systems expert conferencing session (**Farm Systems JWS**), as a representative for Fonterra on 22 November and 6 December 2021. I am a signatory to the Joint Witness Statement in respect of the expert conferencing and confirm that it accurately records my contribution and the matters which I agree.

Code of Conduct

10 I have read and am familiar with the Code of Conduct for expert witnesses in the 2014 Environment Court Practice Note. I agree to comply with this Code of Conduct when participating in the conferencing. Except where I state that I am relying on the specified evidence of another person, my evidence in this statement is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions which I express.

Scope

11 Within my scope of expertise and from a practical farming perspective, I have been asked to provide my expert comments and opinion on the relief sought by Fonterra Co-Operative Group Limited and DairyNZ Limited ('the dairy interests'), including in relation to:

- The exclusion of ephemeral rivers from setback, stock exclusion, cultivation and winter grazing controls;
- Appropriate waterway setbacks and buffers;
- The role of Farm Environment Management Plans (**FEMPs)** in being able to improve water quality and how to get the most effective adoption of FEMPs by farmers;
- The use of physiographics; and
- Winter grazing of stock on pasture.

Executive Summary

12 Based on my experience, ephemeral rivers within a paddock are a feature of the topography of the land rather than an area that has specific natural or biodiversity

values. Ephemeral rivers (or ephemeral flow paths as suggested in the evidence of Mr Willis, and as referred to in this evidence) can be of varying depth and size and are mostly vegetated in quality permanent pasture. They have no defined bed or features that would identify them as a river and are not rivers by any common understanding of that term.

13 A requirement to fence off or adopt buffers/setbacks from ephemeral flow paths would result in large tracts of productive farmland being lost from production. The division of paddocks (where ephemeral flow paths cut across farmland) may create practical and logistic challenges on farm, due to the size and configuration of paddocks being made unsuitable. Access to existing infrastructure such as water troughs, lanes and shelter could also be impacted. The costs of undertaking stock exclusion and buffers/ setbacks from ephemeral flow paths (which cannot be distinguished from a paddock in most cases) and the subsequent losses of productive land would be significant and for some operators, in some areas, would challenge the continued viability of farming.

14 Not all ephemeral flow paths pose a risk to water quality or would be classified as critical source areas. Due to the range of factors that need to be considered when determining the risk an ephemeral flow path poses to water quality, it is appropriate that ephemeral flow paths are identified and managed appropriately through Farm Environment Management Plan (**FEMP**) processes, as outlined below.

15 Under Fonterra's FEMP programme (which I explain further, at paragraph 65 below), ephemeral flow paths are identified, where these are critical source areas (**CSA**), and appropriate site-specific actions are then developed to reduce contaminant losses to water, which in turn is likely to lead to improved water quality. What is necessary and effective will depend on the particular characteristics of the flow path and the topography and other existing features of the farm. Hence, the appropriate response can only be determined by farm scale assessment through the FEMP process.

16 Waterway buffers can be used as a mitigation to prevent sediment, nutrients and pathogens contained in overland flow from reaching waterways where higher risk activities are occurring nearby, for example intensive winter grazing or cultivation. Where high risk activities are occurring close to waterbodies, research has shown that most sediment (and associated contaminants) are removed within the first few meters of a buffer strip. I therefore support the buffer widths proposed in the Planners JWS (December 2021) for cultivation and the wider buffer for intensive winter grazing, due

to conditions being more conducive to mobilising exposed soil over winter in an intensive winter grazing system.

17 Under the decisions version of the proposed Southland Water and Land Plan (**pSWLP**), there are no requirements for FEMP's to be certified or audited, nor any specific requirements for actions to target improvement of water quality within a catchment. I support the proposal for strengthened FEMPs, as contained in the Planners JWS, that requires FEMPs to be certified and audited by a suitably qualified person to confirm alignment with the requirements of Appendix N and to have clear and achievable actions to respond to the values that need to be improved (i.e. aquatic ecosystem health or human health).

18 As agreed by the Farm Systems JWS, FEMPs can be effective at achieving water quality improvements in phosphorus, sediment and microbial pathogens. In my opinion there are also measures in place in Appendix N (as revised and attached to the Planning JWS dated 10th December 2021) to reduce nitrogen losses.

19 Fonterra FEMPs have a focus on reducing nitrogen losses from dairy farms with several tools and resources developed (and being developed) to assist farmers in this objective. My evidence outlines six management areas that influence nitrogen loss on a dairy farm and how these management areas are used with Fonterra FEMPs to reduce a farms risk of nitrogen loss.

20 In my opinion, implementing actions within FEMPs that directly relate to reducing excess nitrogen in the soil and removing nitrate from overland flow and sub surface drainage will reduce the amount of nitrate being lost from a farming system, which will improve water quality.

21 Research by Snelder and Legard (2014)[1] and McDowell, et al (2021)[2] outlines how reductions in nitrogen losses could be achieved through the implementation of certain established and developing mitigations. Many of these mitigations are now established as actions or recommendations within FEMP's as outlined in Table 2.

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[1] Snelder, T., Legard, G. (2014). *Assessment of Farm Mitigation Options and Land Use Change on Catchment Nutrient Contaminant Loads in the Southland Region*. Aqualinc Research Ltd. Report No C13055/04.
[2] McDowell, R.W., Monaghan, R.M., Smith, C., Manderson, A., Basher, L., Burger, D.F., Laurenson, S., Pletnyakov, P., Spiekermann, R., Depree, C. (2021). *Quantifying contaminant losses to water from pastoral land uses in New Zealand III. What could be achieved by 2035?* New Zealand Journal of Agricultural Research, 64:3, 390-410, DOI:10.1080/00288233.2020.1844763

22 Physiographics are a helpful tool in determining the risk individual contaminants pose to water quality in a particular location and the pathway those contaminants are likely to take to reach water. Physiographics need to be sense checked on the ground to ensure the underlying assumptions are correct. For these reasons, physiographics are currently well suited for use within the FEMP process and for providing guidance on land use, but are not suited to use within inflexible rules that restrict land uses.

23 To achieve the best water quality outcomes, it is critical that the pSWLP does not restrict physiographics to the use of maps developed in 2016, which have now been further refined, as this could result in perverse outcomes from using inaccurate or outdated information.

24 I also support the use of a robust FEMP process as an alternative to changing the definition of intensive winter grazing or including a new rule to regulate higher risk winter grazing on pasture. Using the FEMP process means different pasture-based wintering systems can be assessed in the context of an individual farm and its natural capital. Mitigations can then be implemented that appropriately deal with the risk associated with the pasture grazing activity being carried out rather than 'across the board' requirements that may or may not be appropriate.

25 This approach is consistent with the National Environmental Standards for Freshwater (**NES-F**), which provide for the use of certified freshwater farm plans as an alternative pathway for managing the risk associated with intensive winter grazing in general.

Fonterra's On-Farm Sustainability Programme

26 Fonterra employs 48 Sustainable Dairy Advisors (**SDA**) across New Zealand, including 6 in Southland. The core requirements of an SDA's role are the delivery of FEMPs, driving the adoption of Good Farming Practices, and assisting Fonterra farmers in optimising their farming systems meaning that fertiliser and feed inputs are not higher than what is required to achieve the milk production outputs.

27 Fonterra also employees a team of 7 Environmental Programme Leads, who develop new tools for Fonterra farmers and SDA's; giving greater insights into a farm's environmental footprint and how this could be reduced. These tools include a nitrogen risk assessment or scorecard for individual farms, a purchased nitrogen surplus metric to quantify the risk of nitrogen loss, and a farmer insights report that benchmarks an individual farm's purchased nitrogen surplus against their regional peers. This allows

farmers and our team of SDA's to identify possible efficiency gains in relation to the use of nitrogen, both in fertilisers and feed.

28 Our Environmental Programme Leads also develop internal programmes to support current and future changes on farm to meet community and market expectations as well as regulatory pressures.

29 Achieving Good Farming Practice (**GFP**) is fundamental to Fonterra's FEMP programme, with farmers needing to achieve industry agreed GFP's as well as regulatory bottom lines. All Fonterra FEMPs have clear time bound actions, where a GFP or regulatory bottom line is not being met. The programme is also designed to be agile and clearly signal to farmers when further change or mitigations are required; for example, once limits or targets are set in Southland through the 2023 plan change to implement the National Policy Statement for Freshwater Management 2020 (**NPS-FM**).

Ephemeral Rivers

30 The term ephemeral river is defined by the pSWLP as *"rivers which only contain flowing or standing water following rainfall events or extended periods of above average rainfall"*.

31 In my opinion, this definition could apply to a wide range of landscape features, such as a depression in a paddock that is vegetated in quality permanent pasture (as shown on Figures 1 & 2 below), through to an intermittent river with a bed predominantly devoid of terrestrial vegetation. Although I recognise that the pSWLP defines intermittent rivers separately.

32 Within a paddock, ephemeral rivers are topographic features of varying depth and size that are typically vegetated in permanent pasture. They have no defined bed or features that would identify them as a river and are not rivers by any common understanding of that term. On this basis, I will refer to these features as ephemeral *flow paths*, from this point forward, as suggested in the evidence of Mr Willis.

33 On occasions when prolonged or high intensity rainfall events occur, ephemeral flow paths may temporarily have a flow of shallow water across their surface. At most times of the year, these areas would be indistinguishable from the rest of a paddock other than via their topography.

34 Ephemeral flow paths within a farm setting have been grazed, fertilised, cultivated and resown, for many decades. I am not an ecologist, but I consider it highly unlikely these features would have any aquatic biodiversity or habitat values that would be enhanced or maintained by excluding stock, or by avoiding cultivation and fertiliser applications.

35 Not all ephemeral flow paths connect to surface water bodies or subsurface drainage systems, nor will the overland flow they transport always pose a risk to water quality. The risk an ephemeral flow path poses to water quality depends on several factors such as:

- Connectivity to a surface waterbody;
- The size of the catchment feeding into an ephemeral flow path;
- Types and intensity of animals being grazed (i.e. dairy, sheep, beef, deer);
- Land use (permanent pasture, intensive winter grazing, horticulture, etc)
- Nearby point sources (silage pad, laneways, etc)
- Soil type (some soils are more prone to erosion or better at denitrifying);
- Soil drainage classification (well drained soils, less risk of overland flow through ephemeral flow paths);
- Climate; and
- Topography.

36 Due to the range of factors that need to be considered when determining the risk an ephemeral flow path poses to water quality, it is appropriate that ephemeral flow paths are identified and managed through the FEMP process as opposed to a 'one size fits all' rule.

37 Where the FEMP process determines an ephemeral flow path poses a risk to water quality, it is appropriate these flow paths are managed as CSAs. The FEMP will specify how different CSAs will be managed during conditions that result in the flow of water across their surface and identify mitigations that will be used to minimise their impact on water quality. Due to the range of factors that apply when determining the risk any CSA may pose to water quality, not all CSAs will, or should be managed in the same way.

Figure 1 – Ephemeral flow path following prolonged heavy rainfall

Figure 2 – Fenced open waterway with ephemeral flow path shown in blue

38 From a farm management perspective, additional reasons why an ephemeral flow path should not be treated as a "river" for the purpose of the pSLWP farming rules are set out below (and addressed later in my evidence):

- Rivers are subject to requirements for permanent stock exclusion (fencing) and setbacks (buffers); and
- The division of paddocks (where ephemeral rivers cut across farmland) may create practical and logistic challenges on farm, due to the size and configuration of paddocks being made unsuitable, as shown in Figures 3 and 4; and
- Access to existing infrastructure, such as water troughs could also be impacted; and
- The costs of undertaking stock exclusion and setbacks from ephemeral flow paths would be significant and for some operators, in some areas, would challenge the continued viability of farming (see paragraphs 43-45).

Examples of the practical implications of treating ephemeral flow paths as rivers

39 Figure 3 below, depicts a dairy farm in the Waituna catchment of Southland. The farm is 193ha on flat to slightly rolling topography, which is typical of many dairy farms in Southland. The green lines represent surface waterbodies (including intermittent rivers) on the farm with the black lines showing ephemeral flow paths that are in permanent pasture and form part of the associated paddock.

40 The locations of the ephemeral flow paths and waterbodies was determined by mapping undertaken on a FEMP farm visit with the assistance of aerial imagery and LIDAR. This data was used to manually draw the ephemeral flow paths on the farm into Fonterra's Tiaki GIS software to produce the map in Figure 3.

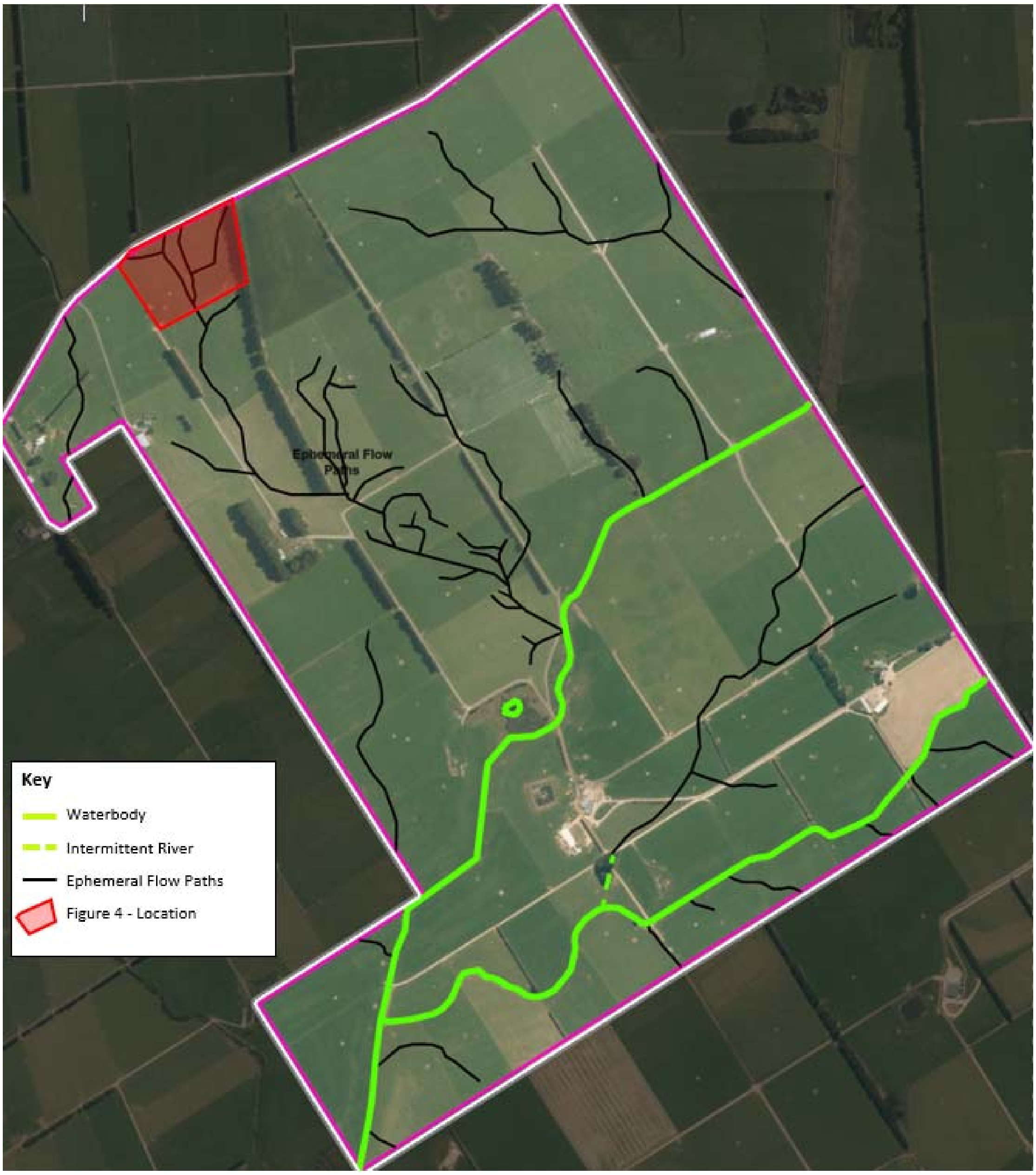

Figure 3 – Map of a Southland Dairy Farm showing Waterbodies and Ephemeral Flow Paths

41 The ephemeral flow paths spread out over a large area of the farm, dissecting many of the paddocks on the property.

42 Figure 4 is an enlarged view of a 3ha paddock that is split by multiple ephemeral flow paths. If these ephemeral flow paths were required to be fenced it would effectively split the paddock into 5 separate areas of less than 1ha. These paddocks are all too small to be useful in a normal grazing round and would likely be lost from productive use.

43 In some instances, smaller paddocks could be reconfigured or combined to make larger more useful paddocks, however, this would require new lanes to be installed, old lanes to be removed, re-fencing of large areas of the farm, removal of established trees that provide stock shelter and the installation of new infrastructure such as water troughs. Even if this could occur, many areas would still be lost from production as they would not be able to be reconfigured into a productive area.

Figure 4 – 3ha Paddock Split by Multiple Ephemeral Flow Paths

44 For the farm in Figure 3, approximately 17.5km of fencing would be required to permanently fence off the ephemeral flow paths. At approximately $5 per meter for dairy fencing, this would cost approximately $90,000. This cost does not account for the removal of old fences, other fencing associated with reconfiguring paddocks or infrastructure costs associated with new lanes, replacement water and effluent lines, planting of new stock shelter, and new culverts to cross ephemeral flow paths and water bodies.

45 While the costs of fencing, reconfiguring paddocks, and infrastructure are significant, the largest costs will be incurred from the loss of productive land due to the inability to re-create viable sized paddocks. These costs range between $28,000 - $40,000/ha for dairying land, depending on the location and productivity of the land (Country and Co Realty Ltd, personal communication, 24 January 2022)

46 Based on my experience as a farm sustainability adviser, contaminant losses through ephemeral flow paths are normally not derived from animals standing in these areas but arise from the accumulation of contaminants that have been transported into the ephemeral flow path from surrounding areas.

47 Fencing stock out of ephemeral flow paths during dry conditions, avoiding cultivation, and avoiding the application of fertiliser will have minimal benefit as the flow path itself is not where most contaminants are generated. Managing CSAs through the FEMP process on the other hand will deliver targeted improvements on farm. It is important that discretion of what actions are best suited to address/mitigate CSAs is generally preserved through the FEMP to provide a pathway for industry experts (certifiers and auditors) to guide a landowner on the most suitable actions required to contribute to site specific and catchment wide water quality improvements.

48 Applying a blanket rule that effectively turns every contour on a farm into a 'river' that must be managed differently does not target key risk areas on a farm and is not practical or necessary to improve water quality in Southland.

49 A situation where a blanket rule would be appropriate is to restrict the cultivating and grazing of winter crops in CSAs (including, as appropriate, ephemeral flow paths). In this situation, vegetative cover over the soil is removed, resulting in an elevated sediment source combined with a transport pathway that is activated more frequently during winter. Outside of this, restrictions and requirements for general pastural farming should be considered within the context of a FEMP.

50 A robust FEMP process is a more practical and effective mechanism for mitigating the impacts of ephemeral flow paths on water quality (where this is necessary). The management of ephemeral flow paths needs to be assessed at a specific farm scale as opposed to through a generic rule. In my opinion, generic rules are not capable of identifying if an ephemeral flow path is a risk and if it is a risk what the best mitigation is to utilise.

51 Under Fonterra's FEMP programme, ephemeral flow paths are identified where these are CSAs. CSAs are then managed with site-specific actions developed to reduce contaminant losses to water, which in turn is likely to lead to improved water quality. Site specific actions may include (for example):

- excluding stock during wet conditions;
- having wider riparian buffers where CSAs enter surface waterbodies; and
- trialling the use of emerging technologies such as edge of field sediment traps, wetlands, or bio-filters.

52 Again, what is necessary and effective will depend on the particular characteristics of the flow path (e.g. its size and catchment area) and the topography and other existing features of the farm itself. Hence, the appropriate response can only be determined by farm-scale assessment, which is best managed through the FEMP process.

Waterway Setbacks and Buffers

53 Waterway buffers can be used as a mitigation measure for preventing sediment, nutrients, and pathogens contained in overland flow from reaching waterways. There is a body of international and New Zealand literature that discusses waterway buffers and their resulting effectiveness at filtering contaminants as buffer widths increase.

54 Waterway buffers are only effective at dealing with contaminants from surface run-off, with other transport mechanisms, such as artificial drainage and direct deposition, bypassing any buffer zone. The main way vegetated filter strips remove contaminants, is by providing resistance to flow that reduces the flow velocity and sediment transport capability of overland flow. This leads to a greater deposition of sediment and contaminants attached to sediment particles e.g. phosphorus (Gharabaghi et al, 2002)[3].

55 Surface run-off is a transport mechanism for sediment, nutrients and pathogens attached to sediment and soluble contaminants such as nitrate. Riparian buffers have been shown to be effective at filtering sediment and nutrients attached to sediments (such as phosphorus), but less effective at trapping soluble contaminants as infiltration

[3]Gharabaghi, B., Rudra, R., Whiteley, H.R., Dickinson, W.T. (2002). *Development of a management tool for vegetative filter strips*. Journal of Water Management Modeling R208-18. doi: 10.14796/JWMM.R208-18.

into the soil and not deposition is the primary mechanism for removal (Gharabaghi et al, 2002)[4]. Most particulates are deposited within the first few meters of the filter strip (Gharabaghi et al, 2002)[4] with finer sediment being harder to filter as they remain in suspension.

56 My observations of overland flow on flat to rolling farmland in permanent pasture, is not of sheet flows of water moving across paddocks and into a waterbody; I have never observed this occurring. Overland flow into waterbodies occurs via areas of lower topography in a paddock, such as small depressions, swales, and shallow gullies (i.e. the types of landscape features that may be critical source areas, as discussed above). Having a 10m buffer along all waterways, and for all farming on low slopes, (as suggested by other parties) would have minimal impact in terms of the filtering of contaminants for most Southland dairy farms, because minimal overland flow would occur through most parts of these buffers.

57 A source of sediment is required in order to be transported. In many pasture-based farming systems this is not present in any significant quantities, unless paddocks are being cultivated or intensively winter grazed. Soil in a flat to rolling paddock, covered in pasture, is not easily eroded or mobilised by an overland flow event on most of the dairy farming land in Southland.

58 In my opinion, targeting wider waterway buffers in CSAs is a more effective way of improving the filtering of sediment and the infiltration and uptake of soluble contaminants, relative to uniformly wider buffer widths. There is a low risk of sediment loss from land covered in pasture and as such no obvious need for a blanket approach to buffers around waterways unless a 'high risk' activity is occurring nearby. In summary, targeting protection of CSAs would achieve a better environmental outcome at a reduced cost to landowners.

59 Stock exclusion from waterways (excluding ephemeral flow paths), regardless of buffer widths, will also help prevent waterway bank erosion, which can be a significant contributor to waterway sediment loads. In Waituna Creek, which is a typical Southland lowland stream, sediment from bank erosion was found to be contributing up to 94% of the sediment loading (McDowell et al, 2013)[5].

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[4] Gharabaghi, B., Rudra, R., Whiteley, H.R., Dickinson, W.T. (2002). *Development of a management tool for vegetative filter strips*. Journal of Water Management Modeling R208-18. doi: 10.14796/JWMM.R208-18.
[5] McDowell, R.W., Norris, M., Cox, N. (2013). Waituna Sediment Fingerprinting Study. AgResearch Ltd Report RE500/2013/136.

Waterway Buffers and Setbacks – Higher Risk Activities

60 While most paddocks in a pasture-based farming system are in pasture all year round, there are times when individual paddocks are conventionally cultivated to renew pasture or to grow winter crops. During these periods (and during the grazing of winter crops) there is exposed soil and a greater risk of sediment transportation to waterways[6].

61 Cultivation in Southland generally occurs in mid to late spring when the water table has lowered, and soils have dried out. These factors reduce the risk of an overland flow event occurring, compared to winter and early spring, however there is still exposed soil and thus a source of sediment that could be transported. As a result, an appropriate waterway buffer should be implemented while a paddock remains devoid of pasture cover, while also continuing to manage overland flow through CSAs.

62 Given that most sediment is removed in the first few meters of a buffer strip, I therefore support the recommendations in the planners JWS in relation to Rule 25 (Cultivation), for 5m buffers on slopes less than 10 degrees and 10m buffers on steeper slopes; based on the lower risk of an overland flow event occurring, but a sediment source being present. I consider that the buffer should be implemented in conjunction with appropriate CSA management through an effective FEMP process.

63 Intensive winter grazing occurs during winter when water tables are higher, so soils are more likely to be saturated and overland flow events are prone to occur on a relatively regular basis. In my opinion, this is the highest risk period for sediment loss to nearby waterbodies, as there is a source of sediment combined with a frequent transport mechanism.

64 During intensive winter grazing of annual forage crop between the 1st of May and 30th of September, greater mitigations should be in place around waterways due to the active transportation mechanisms and sources of sediment. I support a 10m waterway setback in Rule 20A (Intensive Winter Grazing), due to the higher risk activity that is being carried out. This also accords with the work undertaken by the Ministry for the Environment in 2020[7], which contained studies showing high sediment removal

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[6] Not all crops and new pastures are established using conventional cultivation. There is increasing use of nil or minimum tillage cultivation techniques for crop and pasture establishment, reducing or even eliminating exposed soil and thus the risk of sediment loss.

[7] MfE (Ministry for the Environment). (2020). *Regulatory Impact Analysis: Action for healthy waterways Part II: Detailed analysis.*https://www.mfe.govt.nz/regulatory-impact-statements/action-for-healthy-waterways-part-1

efficiencies in 10m wide buffer strips, but significantly reduced efficiencies beyond 10m (Figure 5 below).

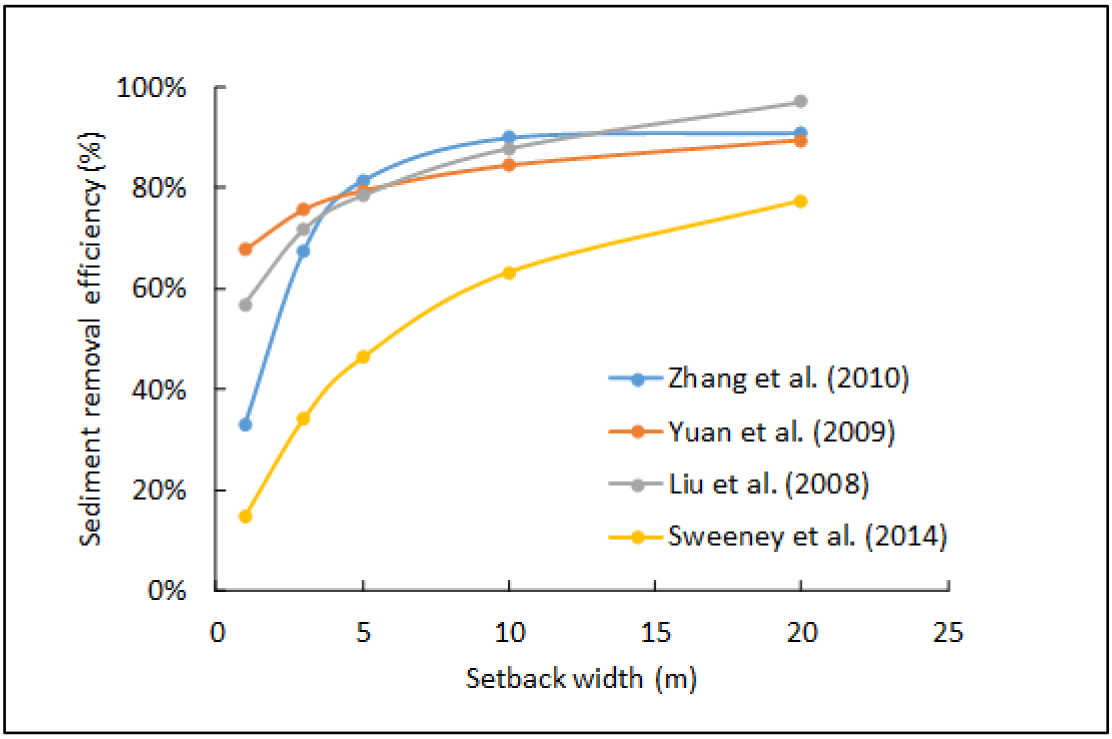


Figure 5 – Sediment Removal in relation to stream buffer width (taken from MfE, 2020)[8]

Farm Environmental Management Plans (FEMP)

65 Fonterra is the largest provider of FEMPs in New Zealand; having produced approximately 5300 plans to date. In Southland and South Otago, 650 FEMPs have been produced by Fonterra in collaboration with farmers. Fonterra started providing FEMPs to farmers in 2017 and has continued to refine both the content of the plans and how they are delivered to ensure they are fit for purpose, meet regulatory and Fonterra requirements, and also meet the needs of farmers.

66 I have been involved with development and delivery of FEMPs over those 5 years and can draw on that experience to comment on how to make sure FEMPs are relevant to farmers and how the actions and recommendations in FEMPs can bring about meaningful improvements in water quality.

[8] MfE (Ministry for the Environment). (2020). *Regulatory Impact Analysis: Action for healthy waterways Part II: Detailed analysis.*https://www.mfe.govt.nz/regulatory-impact-statements/action-for-healthy-waterways-part-1

67 The regulatory requirements of a Southland FEMP are detailed in Appendix N of the pSWLP. Under the decision's version of the pSWLP there are no requirements for plans to be certified or audited, nor are there any specific requirements for actions to target improvement of water quality within a catchment.

68 I support the proposal for strengthened FEMPs, as set out in the Planners JWS. Specifically, I support the requirement for FEMPs to be certified and audited by a suitably qualified person (as aligning with the requirements of Appendix N) and to have clear and achievable actions to respond to the values that need to be improved (i.e. aquatic ecosystem health or human health).

69 At least 650 FEMPs have already been delivered by the dairy interest groups in Southland. These will need to be upgraded and subsequently certified to meet the requirements set out in the changes proposed to Appendix N (as set out in the Planners JWS). In my opinion, farms with an existing FEMP will need a 12-month period to allow those existing plans to be updated and subsequently certified. This will reduce the risk of existing and future FEMP providers not being able to meet farmer demand.

70 I support farms requiring a certified FEMP that is regularly reviewed under an audit process to ensure actions are being achieved within agreed timeframes. In my opinion, this process would result in identifiable actions being taken on farm to achieve GFP in all catchments identified as needing improvement ahead of the 2023 plan change to implement the NPS-FM.

Achieving Farmer Engagement with FEMPs

71 When determining what needs to be included in a FEMP it is important to not only consider the desired water quality objectives and outcomes, but also how applicable and relatable the plan is to the end user. FEMP's will be most effective when they achieve farmer buy in, rather than conditions or standards being imposed via regulation. In my experience, where voluntary farmer buy in occurs, actions will often be completed ahead of any regulatory timeframes and go beyond minimum requirements.

72 Large amounts of additional educational or explanatory information in a FEMP often detracts from its readability and disengages the end user. As an example, ki uta ki tai and hauora are important philosophies that farmers and the communities of Southland will need further educated on to gain a clear understanding of what is trying to be

achieved. This will come in different forms, but I don't believe a FEMP report is the appropriate medium for this or will be successful in articulating these key philosophies.

73 FEMPs should be kept as succinct as possible, highlighting the objectives, key issues, and most importantly have practical actions that make a difference to water quality and progress the journey towards hauora. The FEMP objectives ultimately link back to higher level planning documents and the key philosophies they contain, i.e. hauora. This avoids the need to over complicate FEMPs and obscure their main purpose, which is identifying and delivering actions on the ground to improve water quality.

74 Generally, most farmer interest lies in the FEMP actions, therefore ensuring FEMP actions are clear and farmers understand the link between the action and water quality outcomes is critical to getting farmer buy in and engagement with the plan. For many farmers, photographs and maps are more engaging than large amounts of written text and will assist in plan engagement.

75 In all cases, regular follow-up is required to ensure the FEMP remains a living document. Ideally this should occur separate to the formal audit process and be proactively driven by the FEMP user or prompted by the plan certifier/developer. This ensures actions are regularly being updated, new technologies are being incorporated, and catchment level plans and objectives are being reflected in individual FEMPs.

FEMPs – Improvements in Water Quality

76 There was agreement by all experts that were present in the Farm Systems JWS that Appendix N of the pSWLP would be effective at achieving water quality improvements in phosphorus, sediment and microbial pathogens. On this basis, I do not intend to discuss in any detail how FEMPs can improve water quality for these contaminants, but refer instead to the signed Farm Systems JWS of the 22nd November and 6th December 2021.

77 The participants of the Farm Systems JWS had differing opinions around the effectiveness of FEMPs (when produced in accordance with Appendix N), in improving water quality with regards to nitrogen. In my opinion, there are measures in place in Appendix N (as revised and attached to the Planning JWS dated 10th December 2021) via provisions 5(c) and 6(a) and (b) to specifically deal with nutrient (including nitrogen) losses and their reduction. This could be made explicit by specifically referencing nitrogen loss as a contaminant loss that needs to be avoided or minimised under provision 5(c).

How nitrogen is managed by FEMPs

78 Nitrogen is introduced to a farm system in three ways, by fertiliser, imported feed/supplements or atmospheric fixation. Before any significant losses of nitrogen to water occur, nitrogen inputs need to be converted into nitrate by bacteria in the soil. Nitrogen in the form of nitrate is easily leached to water but is also an important input for terrestrial plant growth.

79 In conditions where soil moisture is at or below field capacity, little drainage will occur and therefore nitrate remains in the soil and available for use by plants. As soils become wetter in late autumn / early winter, excess nitrate can be flushed out of the soil into underlying groundwater, overland flow paths or into subsurface drains.

80 It is difficult to filter nitrate as it is soluble in water and needs to infiltrate into the plant root zone of the soil for it to be removed by plants. Alternatively, it can be converted into other forms of nitrogen such as nitrogen gas and nitrous oxide. These conversion processes, referred to as denitrification, occur when there is a source of carbon and anaerobic conditions (i.e a waterlogged soil).

81 There are two primary methods where a FEMP can assist in reducing nitrogen losses to water, these are by:

- Reducing the amount of excess nitrogen in the soil
- Removing nitrogen from any overland flow or subsurface drainage water before it enters a surface waterbody.

82 The initial focus of actions in a FEMP should be on reducing the amount of excess (unused) nitrogen in a farming system. These actions are most effective from a cost and contaminant loss reduction perspective.

83 In recent years Fonterra has been developing a suite of tools and FEMP actions to reduce the amount of excess nitrogen in the soil. There are 6 key management areas that will impact on the risk of nitrogen loss on a dairy farm. These are reported to Fonterra farmers on an annual basis (Farm Insights Report) and discussed in Fonterra FEMPs (where relevant). An example Farm Insights Report is attached in Appendix 1.

84 The six management areas are:

1. Stock Management

85 A high stocking rate is a key driver for increased nitrogen leaching. Excess nitrogen ingested by animals (i.e. the fraction not converted into milk or meat), increases urinary nitrogen concentrations which is deposited back to the soil via urine patches. The amount of nitrogen in a urine patch far exceeds plant requirements and the excess is therefore susceptible to leaching from mid to late autumn when drainage occurs. Stock management also looks at the amount of dry matter eaten by cows (the higher the amount of dry matter eaten the higher the amount of nitrogen ingested by the animal), wintering practices and whether replacement animals are grazed on farm.

2. Nitrogen Fertiliser

86 This is a major area of focus in Fonterra FEMPs and the annual Farm Insights Report provided to farmers. On many farms, significant improvements are possible in terms of the efficient use of nitrogen.

87 Nitrogen surplus is the measure of the amount of nitrogen brought into a farm system that does not leave the farm as product. Nitrogen surplus is therefore the amount of nitrogen remaining within the soil that is available to be leached. Increasing the conversion efficiency at which imported nitrogen fertiliser is converted into product will reduce the surplus available for loss (assuming other factors remain constant).

88 Recently, benchmarking has been added to Fonterra's annual Farm Insights Report and discussed in our FEMPs. Additionally, a portion of a farms milk payment is linked to achieving a 'purchased nitrogen' surplus that is at or lower than the 75th percentile for Fonterra farms nationally. Benchmarking indicates how efficient a farm is at using imported nitrogen compared to other farms in the region that are producing similar amounts of milk. These additional tools and incentives have resulted in an increased farmer awareness of their nitrogen use due to the costs associated with inefficient nitrogen use. There has been a significant increase in requests to Fonterra's Sustainability Advisers from farmers this season asking for assistance in fully understanding their nitrogen surplus and how they can reduce it to be more in line with their peers and meet the new milk price incentive payment[9].

[9] Payment of 7c on all milk supplied if farm dairy records are submitted, animal welfare plan in place, DairyNZ workplace 360 assessment completed and three out of four key environmental practices being achieved (purchased nitrogen surplus is at or lower than the national 75th percentile, farm is participating in a product stewardship scheme for on-farm plastics and agri-chemicals, no discharge of dairy shed effluent to water and 80% farm grown feed across the season) . Payment of additional 3c based on milk quality excellence.

89 Where farms have a high nitrogen surplus, a Fonterra FEMP will comment on why this may be high and identify strategies to use nitrogen fertiliser more tactically. For example, the FEMP may advise that nitrogen fertiliser should only be applied when required rather than on a regular basis after each paddock is grazed. If there is less excess nitrogen in a farming system, then less nitrogen is available to be lost to water.

90 In addition to nitrogen surplus, analysis is also made of the total amount of nitrogen fertiliser used, the conversion of nitrogen fertiliser into milk (or meat), when applications of nitrogen fertiliser occur (i.e. do they occur in high risk months such as June and July) and whether a feed budget is used to help plan the strategic use of fertiliser rather than using a routine or blanket nitrogen use strategy.

3. Imported Supplementary Feed

91 The greater the amount of imported feed the more nitrogen enters a farm system. In addition to the total amount of feed imported, the nitrogen content of feed is looked at. Feeding supplements with high protein (nitrogen) increases the nitrogen concentration in animal urine. Fonterra's Farm Insights Reports identify where high levels of feed are being imported and the nitrogen content of those feeds. Fonterra is currently developing FEMP actions that will address feed efficiency and whether lower nitrogen feeds could be used.

4. Irrigation

92 Irrigation will increase the risk of nitrogen loss by inducing drainage events (and therefore nitrogen loss) if over irrigating is occurring. FEMP actions focus on investigating more efficient forms of irrigation where this is not being used and insuring irrigation scheduling is being undertaken accurately, using soil moisture monitoring to avoid over watering and drainage events occurring.

5. Effluent

93 The risk of nitrogen loss is increased if effluent is applied at a high depth and/or during conditions that result in the soil being unsuitable for effluent applications. Losses can also be reduced by utilising low rate effluent irrigation and having a suitably sized effluent area.

94 Fonterra FEMPs have actions to ensure effluent irrigation systems are tested on a regular basis so operators know the application rates they are applying and that their system is operating correctly. Where required, actions will also be included to expand

effluent areas, enlarge effluent storage facilities, and move to low rate irrigation. These actions all reduce the risk of excess nitrogen in the soil and subsequent leaching of nitrogen to water.

6. Cropping and Cultivation

95 Cropping and cultivation can impact on nitrogen leaching due to the release of mineral nitrogen after cultivation. The release of mineral nitrogen, when not fully taken up by a crop can lead to leaching. In the short term the establishment method can be significant, as cultivation can leave the land fallow for a longer period than no-till establishment. Full cultivation also stimulates faster soil organic matter decomposition and mineral nitrogen release than no-till establishment. Fonterra FEMPs have actions to utilise no or minimal till methods of crop and pasture establishment where this is possible.

Removing nitrate from overland flow or subsurface drainage water before it enters a surface waterbody

96 In addition to the six management areas above, nitrogen can be removed from overland flow by slowing the flow of water and infiltrating it back into the soil where it can be used by plants. Alternatively, both overland flow and sub surface drainage water can be passed through a human made medium (i.e. water logged bark chip) that results in denitrification occurring, or the change in the form of nitrogen from nitrate into nitrogen gas and nitrous oxide.

97 Where there is an elevated risk of nitrate loss via subsurface drainage, Fonterra FEMPs have recommendations to investigate treatment options, such as small wetlands or wood chip nitrate filters. Where the elevated risk is from overland flow paths, time bound actions are included in the FEMP to extend riparian buffer zones where these flow paths enter waterbodies. Options are given for planting these areas in native grasses and shrubs to assist with nitrate uptake or as a first step simply leaving them in rank grass. It is intended that future FEMP follow up visits will have more of a focus on assisting farmers in implementing these 'edge of field' treatment options.

98 Fonterra FEMPs have a significant focus on reducing nitrogen losses from dairy farms with several tools and resources developed and being developed to assist farmers in this. In my opinion, implementing actions within FEMPs that directly relate to reducing excess nitrogen in the soil and removing nitrate from overland flow and sub surface

drainage will reduce the amount of nitrate being lost from a farming system, which will improve water quality.

Extent of nitrogen reductions that may be expected

99 In 2014, Snelder and Legard[10] conducted and published an "Assessment of Farm Mitigation Options and Land Use Change on Catchment Nutrient Contaminant Loads" for the Southland Region. The assessment looked at reductions in nitrogen and phosphorus that would occur if various mitigations were carried out. These mitigations included improved farm dairy effluent management, improved productivity per animal, grass buffer strips and improved nutrient management. Depending on the catchment and what package of mitigations were used, agricultural nitrogen loads were modelled to reduce by between 18 and 37%, as shown in Table 1.

Catchment	M1			M2			M3		
	Nitrogen	Phosphorus	Overall[1]	N	P	Overall[1]	N	P	Overall[1]
Bluff_Harbour	22	25	11	22	14	11	32	57	17
Haldane_Estuary	32	0	19	32	0	19	37	80	22
Jacobs_River_Estuary	18	31	16	19	34	17	30	39	27
Lake_Brunton	25	0	25	25	0	25	28	38	28
New_River_Estuary	18	31	16	19	35	17	30	42	27
Toetoes_Harbour	24	19	22	24	21	23	33	55	31
Waiau_River	25	11	14	25	10	14	29	39	16
Waikawa_Harbour	29	9	23	28	6	23	33	52	27

Table 1 – Reductions in the agricultural source loads (% of current load) for nitrogen and phosphorus in each catchment under the three levels of mitigations and assuming all farm types adopt mitigations. – Taken from Snelder and Legard 2014.

100 The report highlighted that the reductions could be eroded due to ongoing conversions of sheep and beef to dairy farms and intensification of existing dairy farms, based on the work of Monaghan and De Klein (2014)[11]. This study drew its findings from a period of rapid expansion and intensification of the dairy industry in New Zealand (2001 – 2009). Intensification between 2001 and 2009, of the dairy farms that were part of Monaghan and De Klein's research, resulted in more milk production per cow and per

[10] Snelder, T., Legard, G. (2014). *Assessment of Farm Mitigation Options and Land Use Change on Catchment Nutrient Contaminant Loads in the Southland Region*. Aqualinc Research Ltd. Report No C13055/04.

[11] Monaghan, R.M., De Klein, C.A.M. (2014). *Integration of measures to mitigate reactive nitrogen losses to the environment from grazed pastoral dairy systems*. Journal of Agricultural Science, doi:10.1017/S0021859613000956.

hectare. This increase was mainly driven by increases in purchased feed (5% per annum on average) and nitrogen fertilisers (4% per annum on average).

101 I am unaware of any new conversions in Southland since the start of the 2018 dairy season and in my opinion, the large annual increases in purchased feed and nitrogen fertilisers seen between 2001 and 2009 (and the subsequent year on year increases in modelled nitrogen leaching) are not occurring today and are unlikely to occur in the future.

102 This is supported by statistics[12] on urea (main form of nitrogen fertiliser used on dairy farms) use in the Southland region between 2002 and 2019, which has been a key farm input used to intensify dairy farms. Between 2002 and 2017 urea usage increased by 16% per annum on average compared to a less than 1% increase per annum on average between 2017 and 2019. This highlights how farm inputs and potential nitrogen losses were increasing between 2001 and 2009 versus the much smaller increases in inputs that are occurring today.

103 There are several other reasons why, in my opinion, the drivers and incentives for increased nitrogen losses associated with intensification have changed in recent years and why significant intensification of dairy farms is unlikely to occur in the foreseeable future, these are outlined below:

<u>1. Environmental Regulations</u>

104 Between 2001 and 2009 Southland had no significant environmental regulations in place restricting or requiring the monitoring of farm inputs, land area or cow numbers. Through the NES-F there are several new regulations that restrict the intensification of dairy farms, these include a cap on the use of nitrogen fertilisers, restrictions on intensive winter grazing, restrictions on land use change to dairy support land and restrictions on the irrigation of dairy farms. In addition to the NES-F the pSWLP proposes additional restrictions on winter grazing, prevents increases in dairy land and cow numbers that increase nitrogen losses and introduces FEMPs that will have a key focus of reducing nitrogen losses. In addition to water quality regulations, regulations to reduce greenhouse gas emissions from agricultural land will also limit the ability to significantly intensify dairy farms and will impact the profitability of any intensification that does occur.

[12] Statistics New Zealand and Ministry for Primary Industries Agricultural Production Survey (2002-2019). Fertilisers, nitrogen and phosphorus, applied, 2002-2019 dataset.

2. Profitability Focus

105 Traditionally many dairy farms were focused on production gains, especially when input costs were relatively low and production increases generally brought about increases in profitability. As the price of inputs such as imported feeds and more recently nitrogen fertilisers have increased (the price of urea has increased by 160% between February 2021 and February 2022) more farmers are focusing on producing additional milk out of their existing farm inputs rather than simply increasing inputs and corresponding business costs. This change has also been driven by a similar change in focus from industry bodies such as Dairy NZ and milk processors (Fonterra).

3. Environmental Awareness

106 Historically there was little awareness on the environmental impacts of using imported feed and fertiliser to increase milk production. Nitrogen fertiliser was applied liberally as and when farmers required it, even if it was at times when pasture response rates were low and there was an increased risk of leaching. Due to the relatively low cost of nitrogen fertiliser comparative to the benefit obtained, in some cases, this still made economic sense.

107 Throughout the last decade, on the back of several large research programmes e.g. forages for reduced nitrate leaching, there has been a significant increase in awareness amongst dairy farmers on how the efficient use of inputs, such as fertiliser, can reduce a farms environmental footprint. This has been led by industry programmes such as Fonterra's Nitrogen Programme and an increased awareness of water quality issues surrounding dairy farming from local communities and central government. These have led most dairy farmers to carefully consider the timings and application rates of fertiliser applications and how changes to imported feed and cow numbers impact their overall nitrogen losses.

4. Industry Programmes and Incentives.

108 Fonterra's nitrogen programme has been in operation since the 2012/13 dairy season and initially used Overseer to report an estimated nitrogen leaching to water and nitrogen use efficiency value to all Fonterra farmers. In the 2018/19 season Fonterra introduced the nitrogen risk scorecard and purchased nitrogen surplus metric to focus farmer action on specific practices that contribute to nitrogen loss risk. This programme has successfully raised farmer awareness of the environmental risks of nitrogen. As outlined in paragraphs 85-95 of my evidence, nitrogen risk scorecard information is

used within Fonterra FEMPs to help formulate farmer actions to reduce nitrogen loss. Purchased nitrogen surplus targets have also been introduced as part of a new milk price incentive[4].

Extent of nitrogen reductions that may be expected – further research

109 In addition to the 2014 work by Snelder and Legard[13], McDowell, et al (2021)[14] sort to quantify the reductions in nitrogen, phosphorus and sediment losses that could be achieved by 2035 if certain mitigations were implemented. The study firstly looked at the reduction in contaminant losses that could have been achieved by 2015 if all the good farming practices/mitigations that were available and well-established at that time (2015) were fully implemented by all farmers (rather than just being partly implemented by some farmers). Secondly, the study investigated the reductions in contaminant losses that could be achieved if all the good farming practices/mitigations that were under development in 2015, and those good farming practices/mitigations that have been developed since, were implemented by 2035.

110 The study found that if the well-established mitigations that were available in 2015 had been fully implemented by all farms at that time, losses of nitrogen could have been decreased by 16% compared to the estimated actual losses for 2015[15] (where well-established actions were only partially implemented). If all the well-established GFP/mitigations available in 2015 and the developing mitigations were fully implemented by 2035 potential nitrogen losses may decrease by 34% compared to the estimated actual 2015 losses.

111 The mitigations that McDowell, et al (2021) consider for the reduction in nitrogen on dairy farms are shown in Table 2, along with my comments on whether I would expect to see actions/recommendations associated with these mitigations in a dairy farm FEMP.

2015 Mitigation Suite	**Action/Recommendation included in FEMP where required**

[13] Snelder, T., Legard, G. (2014). *Assessment of Farm Mitigation Options and Land Use Change on Catchment Nutrient Contaminant Loads in the Southland Region*. Aqualinc Research Ltd. Report No C13055/04.
[14] McDowell, R.W., Monaghan, R.M., Smith, C., Manderson, A., Basher, L., Burger, D.F., Laurenson, S., Pletnyakov, P., Spiekermann, R., Depree, C. (2021). *Quantifying contaminant losses to water from pastoral land uses in New Zealand III. What could be achieved by 2035?* New Zealand Journal of Agricultural Research, 64:3, 390-410, DOI:10.1080/00288233.2020.1844763
[15] Nitrogen losses were estimated to have increased by 25% between 1995 and 2015.

Judicious scheduling of N fertiliser to avoid risk months	Yes
Reducing excessive inputs of N fertiliser	Yes
Enlarged areas receiving Farm Dairy Effluent	Yes
Targeted fertiliser returns to areas treated with farm dairy effluent	Yes
Deferred and/or low rate effluent irrigation	Yes
Wintering in a barn or on a standoff pad	No
Reducing over-watering and flood irrigation by-wash (irrigated farms)	Yes
Stream Fencing to exclude stock	Yes
Developing Mitigation Suite	**Action/Recommendation included in FEMP where required**
On-off grazing in autumn/winter	No
Edge of field attenuation	Yes[16]
Controlled Drainage	Yes[7]
Constructed Wetlands	Yes[7]
Decreasing N inputs by half	No[17]
Catch Crops	Yes
Nitrification Inhibitors	No

Table 2 – Nitrogen loss mitigations studied by McDowell et al (2021) for dairy farms and their inclusion in FEMPs.

How other contaminants are managed by FEMP's

[16] Emerging FEMP recommendation to investigate these concepts in identified locations.
[17] FEMP actions would be included to reduce nitrogen inputs where necessary but not by half on all farms.

112 As referenced in paragraph 76 of my evidence, there was agreement by all experts that were present in the Farm Systems conferencing that Appendix N of the pSWLP would be effective at achieving water quality improvements in phosphorus, sediment and microbial pathogens.

113 There are a range of actions included in Fonterra FEMP's that achieve this. A small sample of these actions are:

- Reducing phosphorus losses by maintaining soil Olsen P levels within the optimum range (20-30);
- Reducing all contaminant losses by managing CSAs, including temporary fencing CSAs when they are wet and stock are present, extending riparian margins where critical source areas enter surface water bodies and permanently fencing and planting particularly wet/low productive critical source areas;
- Reducing all contaminant losses and improving biodiversity by identifying areas to undertake riparian planting that will have a benefit to water quality;
- Reducing sediment losses by requiring lanes to be well maintained and where lanes run adjacent to a waterway that they are sloped away from the waterway and a larger riparian buffer is in place; and
- Providing recommendations and advice on emerging edge of field technologies such as sediment traps, small constructed wetlands, peak run-off control structures and bio-filters to reduce sediment, phosphorus and nitrate losses.

114 As well as the sample of actions outlined above, several of the actions that are outlined for managing nitrogen will also assist in reducing other contaminants.

115 Overall, there is a body of evidence that supports my opinion that mitigations in FEMPs will bring about improvements in water quality, specifically reductions in nitrogen, if appropriate actions are contained within a FEMP and those actions are undertaken.

116 Appendix N (as revised and attached to the Planning JWS dated 10th December 2021) has the required provisions via 5(c) and 6(a) and (b) to ensure appropriate actions are included in FEMPs to bring about improvement in waterbodies identified as requiring improvement as well as a robust audit process to ensure actions are completed. This gives confidence that the actions that will result in improvements in water quality,

including nitrogen, prior to the 2023 notification of plan change Tuatahi, will be implemented.

Physiographic Zones

117 Physiographics are a helpful tool in determining the risk individual contaminants pose to water quality in a particular location and the pathway those contaminants are likely to take to reach water. Unlike Overseer, physiographics look at the processes that occur beyond the plant root zone to determine what impact a particular contaminant may have on water quality within a particular setting.

118 Physiographics combine landscape attributes, such as soil type and topography, with the key processes affecting water quality in surface and shallow groundwater. The data sets used in the modelling are generally the best available but still have inherent inaccuracies when using the information at a farm scale.

119 An example of a landscape attribute that can impact the accuracy of physiographics at a farm scale is soil type. Soil mapping was undertaken for the Southland region by Topoclimate South (concluded in 2001) with maps and soil information made publicly available on most of the 170 soil types found in Southland. The maps produced were at a 1:50,000 scale. Despite being an excellent resource, at a farm level there are inaccuracies in terms of the boundaries between different soils (soils generally graduate from one soil type to another rather than there being an exact boundary) and in some cases the type of soils within a paddock or farm. As a result of this and inaccuracies in other data sources there will be inaccuracies in the physiographic maps when using them at a farm scale.

120 Physiographics are an important tool but need to be sense checked on the ground to ensure the underlying assumptions are correct. For these reasons, physiographics are currently well suited for use within the FEMP process and for providing guidance on land use, but not suited to use within inflexible rules that restrict land uses, for example restrictions on land that can be used for intensive winter grazing.

121 Physiographics have been further developed since 2016 as part of the Our Land and Water National Science Challenge and have now been applied nationally. As a result of this work, some of the physiographic zones have been further refined and improved.

This information can all be accessed via the recently launched Landscape DNA website[18].

122 As an example, under the 2016 physiographic maps the Central Plains Physiographic Zone, which is characterised by clay-rich soils that shrink and crack when dry and swell when wet, covers a relatively small area of Southland (~18,000ha). In the more recent physiographic work, soils with these properties cover a much larger portion of Southland as can be seen by comparing Figure 8 and the dark red areas in Figure 9. This highlights the importance of land managers utilising the most up to date physiographic information when making decisions on appropriate mitigations for their properties.

123 To achieve the best water quality outcomes, it is critical the pSWLP does not restrict physiographics to the use of maps developed in 2016, which have now been further refined, as this could result in perverse outcomes from using inaccurate or outdated information.

Figure 8 – 2016 Central Plains Physiographic Zone (Soils with high risk of bypass flow due Shrink/Swell Properties)

[18] Landscape DNA <https://landscapedna.org>

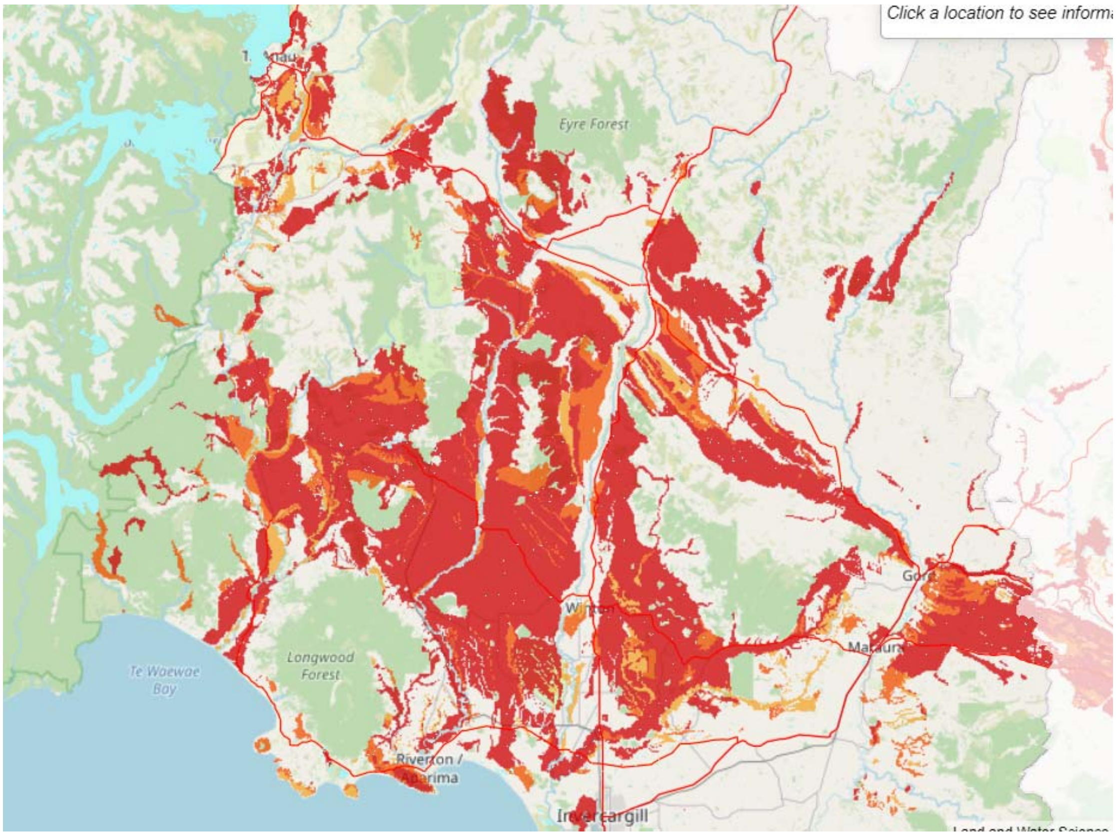


Figure 9 – 2021 Soils with high risk of bypass flow due to Shrink/Swell Properties (Dark Red)

Intensive Winter Grazing on Pasture

124 The evidence of Ms Dalley provides a comprehensive overview of the various ways stock are grazed on pasture between the 1st May and the 30th September and the difficulties posed with using exposure of soil and/or pugging of soil as a way of determining whether grazing on pasture falls within the definition of intensive winter grazing.

125 I support the use of a robust FEMP process as an alternative to changing the definition of intensive winter grazing or including a new rule to regulate high risk winter grazing on pasture. Using the FEMP process means different pasture-based wintering systems can be assessed in the context of an individual farm and its natural capital. Mitigations can then be implemented that appropriately deal with the risk associated with the pasture grazing activity being carried out rather than 'across the board' requirements that may or may not be appropriate.

126 This approach is consistent with the NES-F which provides for the use of certified freshwater farm plans as an alternative pathway for managing the risk associated with intensive winter grazing in general.

Cain Duncan

04 February 2022

Appendix 1 – Sample Farm Insights Report

Supply Number: SAMPLE

Farm Insights Report

2020/2021

The Co-operative Difference

- Environment
- Milk
- Animals

Introduction

This report uses the information that you provide in your Farm Dairy Records, together with milk quality and production data that the Co-op holds, to provide useful insights into what is happening on your dairy farm. The metrics included in this report highlight risks and opportunities that may exist in your farming system, helping you to improve your efficiency and reduce your impact.

The Co-operative Difference Achievements

The Co-operative Difference is the framework to ensure that on-farm practices support the achievement of our strategy. The Co-operative Difference metrics show how your farm tracked if the achievements had been in place for the 2020/2021 season to give you an indication of achievement.

Purchased Nitrogen Surplus

Purchased Nitrogen Surplus is at or lower than 137 kgN/ha (75th percentile for Fonterra farms nationally)

2020/2021 season:

124 kgN/ha

Farm Grown Feed

Your herd's diet needs to be made up of at least 80% farm grown feed

2020/2021 season:

90%

Milk Quality Excellence

If Te Pūtake is achieved, to reach Te Puku you need a minimum of 30 days of Milk Quality Excellence to receive 3c per kgMS on all 'Excellence' milk

2020/2021 season:

262 days

To achieve Te Tihi you must achieve an excellence rating on at least 90% of the days that you supplied milk

2020/2021 season:

90%

For more information on The Co-operative Difference please go to **www.fonterra.com/makethedifference**

Your Farm's Key Information

	2018/2019	2019/2020	2020/2021
Dairy farm effective area	356.3 ha	355.8 ha	355.8 ha
Peak cows (maximum cow numbers)	1,030 cows	1,050 cows	1,050 cows
Stocking rate (milking cows)	2.9 cows/ha	3.0 cows/ha	3.0 cows/ha
Production (milk solids produced)	534,137 kgMS	543,683 kgMS	520,764 kgMS
Production per cow	519 kgMS/cow	518 kgMS/cow	496 kgMS/cow
Production per hectare	1,499 kgMS/ha	1,528 kgMS/ha	1,464 kgMS/ha
Nitrogen fertiliser applied per hectare	195 kgN/ha	195 kgN/ha	165 kgN/ha
Imported supplementary feed fed	1,671 t	1,468 t	972 t
Imported supplementary feed fed per cow	1.6 t/cow	1.4 t/cow	0.9 t/cow
Average somatic cell count	135,094 cells/ml	129,533 cells/ml	124,067 cells/ml
Greenhouse Gas Emissions per hectare	-	12,419 $kgCO_2e/ha$	12,811 $kgCO_2e/ha$

Previous seasons data will be shown where data is available and farm ownership hasn't changed.

Environment

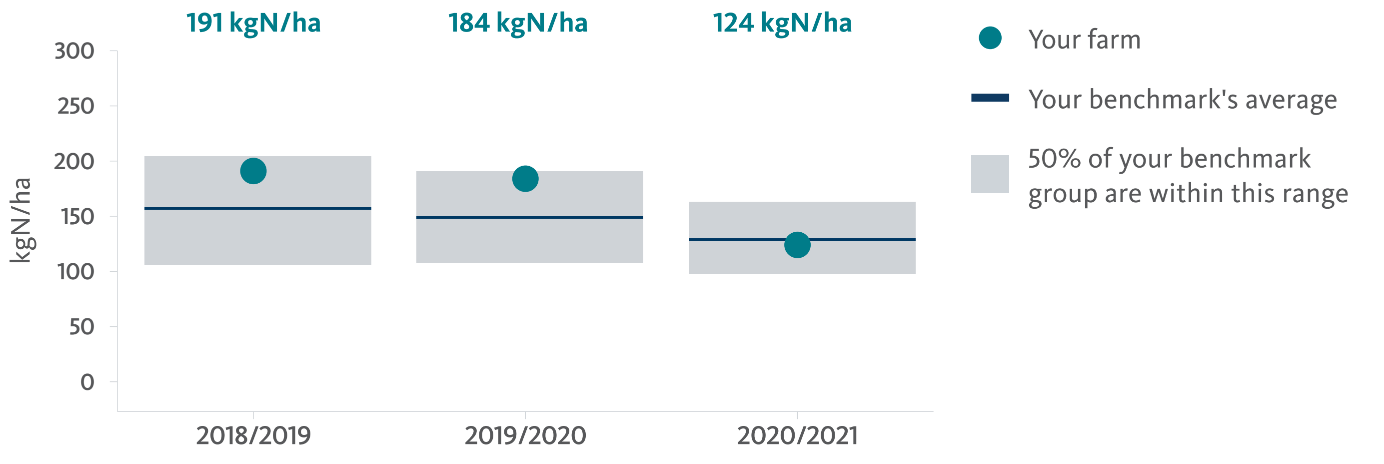
Your farm's environmental insights are broken down into Purchased Nitrogen Surplus, Nitrogen Risk Scorecard and Greenhouse Gas Emissions.

Your Farm's Purchased Nitrogen Surplus

Purchased Nitrogen Surplus is the difference between the nitrogen inputs (fertiliser and imported feeds) and the nitrogen outputs (milk, meat, crop or supplementary feeds). A high number means more nitrogen is at risk of being lost from your farm to the receiving environment.

Nitrogen Fertiliser	+	Imported Feed	−	Exported Product	=	Purchased Nitrogen Surplus
165 kgN/ha		60 kgN/ha		101 kgN/ha		124 kgN/ha

Your Farm's Purchased Nitrogen Surplus Per Hectare



Your farm is benchmarked against other farms in the Canterbury region with production **between 1401-1700 kgMS/ha.**

Your Farm's Nitrogen Risk Scorecard

Stock Management	VERY HIGH
Nitrogen Fertiliser	HIGH
Imported Feed	LOW
Cropping & Cultivation	HIGH
Effluent Management	VERY LOW
Irrigation	VERY LOW

Your Farm's Nitrogen Risks Broken Down

Stock Management

VERY HIGH

Stocking Rate

The higher the stocking rate (peak), the greater the nitrogen loss

Total	**27.5 su/ha**
Milking herd (3.0 cows/ha)	23.6 su/ha
Replacement/other animals	3.9 su/ha

Dry Matter Eaten

The more dry matter eaten per hectare, the more nitrogen ingested by the animal and returned to pasture as dung and urine

Total	**17.3 tDM/ha**
Grown on this farm	
Pasture & crops	14.1 tDM/ha
Imported to this farm	
Pasture & crops *	1.4 tDM/ha
All other feeds	1.8 tDM/ha

Wintering Off/Culling

Reducing the number of animals on farm (from peak numbers) by culling and/or wintering off (May-Aug) will reduce the nitrogen loss risk on your dairy farm effective area

37% off platform

Winter Practices

Reducing the amount of time cows spend on pasture and/or crops over winter will reduce the nitrogen loss risk

Off pasture facility	0%
On pasture	**93%**
Break fed fodder crop	**7%**

Nitrogen Fertiliser

HIGH

Nitrogen Fertiliser Applications

The more nitrogen fertiliser applied, the higher the nitrogen loss risk

165 kgN/ha

Nitrogen Use Efficiency of Fertiliser

The greater the conversion efficiency, the lower the nitrogen surplus available to be lost

9 kgMS/kgN

Timing of Application

Fertiliser applied during the winter months can increase the chance of nitrogen being lost

Sep - Apr

Jul - Aug

May - Jun

Highest Application Rate

Lower application rates reduce the nitrogen loss risk

Below 25 kgN/ha

Above 25 kgN/ha

Feed Budget

Using a feed budget or wedge to help plan strategic fertiliser applications is a good farming practice

No feed budget used

Feed budget used

Imported Feed

LOW

Nitrogen Imported From Feed

The greater the amount of imported feed, the more nitrogen that enters the system

60 kgN/ha

Nitrogen Content

The greater the average nitrogen content, the higher the amount of nitrogen that enters the system

Average N content of 2.19%

Nitrogen Use Efficiency of Imported Supplements

The greater the conversion efficiency, the lower the nitrogen surplus available to be lost

25 kgMS/kgN

Energy model calculations based upon the DairyBase model developed by DairyNZ.

** Includes feed fed to stock grazed off the dairy farm effective area*

Key driver of Nitrogen loss risk (flag: Stocking Rate; Nitrogen Fertiliser Applications; Nitrogen Imported From Feed)

Your Farm's Nitrogen Risks Broken Down Continued...

Cropping & Cultivation

HIGH

Conventional

This is the greatest risk method for sowing a crop and the risk increases as the cultivated area increases

6% of farm cultivated annually

Minimum Tillage

This is a lower risk activity than conventional cultivation, however the risk increases with the total area cultivated

Not Applicable

Direct Drill

This is a lower risk activity than both full cultivation and minimum tillage for establishing a crop

Not Applicable

Season of Harvest/Grazing

Crops harvested/grazed during winter pose a higher risk to nitrogen leaching

Summer harvest

Winter harvest

Timing of Fertiliser Application

There is greater risk if fertiliser is applied to crops during high risk months of May, June, July and August

No fertiliser applied during winter

Fertiliser applied during winter

Effluent Management

VERY LOW

Effluent Discharge Method

Discharging treated effluent to land is the lowest risk

Irrigate to pasture

Irrigate to pasture (low storage)

Discharge to water

Discharge to water and pasture

Effluent Irrigation Area

An undersized effluent area can result in the average amount of nitrogen per hectare applied exceeding local rules and regulations

22ha/100 cows (incl. feed pad)

Application Depth

Low rates will ensure greater flexibility of management with more irrigation days available and increase the chance of the plant utilising the nutrients within the effluent rather than it being lost

> 12mm application depth

Irrigation

VERY LOW

Irrigation Method

Irrigation generally increases the nitrogen loss risk due to the potential for over irrigating to induce drainage events. Some systems are inherently riskier than others irrespective of management

No fresh water irrigation

Irrigation Scheduling

Deciding when to start or stop irrigation is important as poor management of an irrigation event can lead to induced drainage

Not Applicable

Irrigation Application Method

Having control over the amount and how often water is applied can greatly influence nitrogen loss risk with poor management of irrigation events leading to induced drainage

Not Applicable

Greenhouse Gas Emissions

This section describes the greenhouse gas emissions on your farm. It has been designed to give you a better understanding of what is happening on your farm in relation to agricultural sources of biological greenhouse gas emissions.

Your Farm's Greenhouse Gas Emissions

Greenhouse Gas Emissions Per Hectare

This number indicates the biological greenhouse gas emissions per hectare from your farm which is made up of both methane and nitrous oxide gases

12,811 $kgCO_2e/ha$

Methane

Total Methane emissions per hectare of your farm

10,399 $kgCO_2e/ha$

Nitrous Oxide

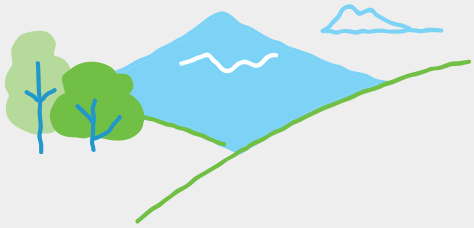
Total Nitrous Oxide emissions per hectare of your farm

2,412 $kgCO_2e/ha$

9,599 $kgCO_2e/ha$

Enteric Methane

Methane is the single biggest contributor to on-farm emissions and is produced by microbes that are naturally present in the gut of ruminants (e.g. cows, sheep) and is emitted when they burp



415 $kgCO_2e/ha$

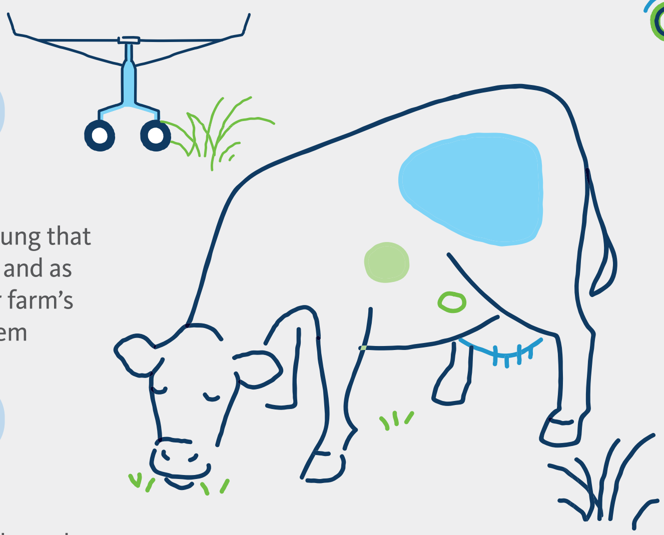
Effluent System

Methane emissions from dung that is emitted while in storage and as it is spread to land via your farm's effluent management system

385 $kgCO_2e/ha$

Dung

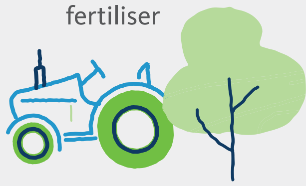
Methane emissions from dung that is deposited on to the pasture



574 $kgCO_2e/ha$

Nitrogen Fertiliser

Nitrous oxide emissions from the applications of nitrogenous fertiliser



29 $kgCO_2e/ha$

Effluent System

Nitrous oxide emissions from urine that is emitted while in storage and as it is spread to land via your farm's effluent management system

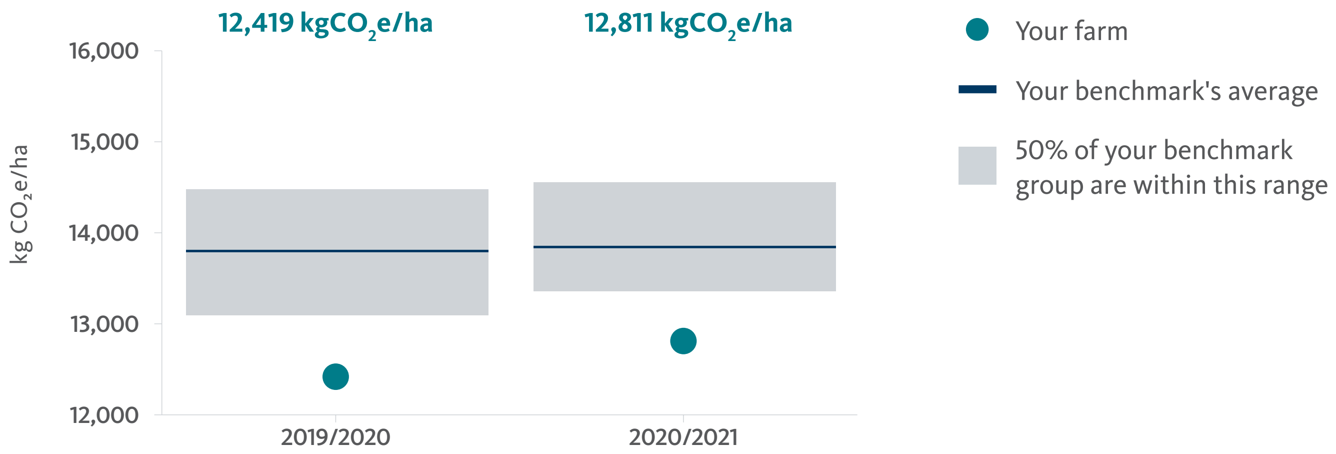
1,809 $kgCO_2e/ha$

Urine & Dung

Nitrous oxide emissions when dung and urine is deposited on to pasture

All emissions are given as a total amount of carbon dioxide equivalents (CO_2e). This is done to create a universal metric to compare greenhouse gases regardless of sectors and sources. This takes into account the different lifespans and warming potential of the different gas types.

Your Farm's Greenhouse Gas Emissions Per Hectare



Your farm is benchmarked against other farms in Canterbury with production between 1401-1700 kgMS/ha.

Your Farm's Greenhouse Gas Emissions Per Kg Milk Solids

Your farm is benchmarked against other farms in Canterbury with production between 1401-1700 kgMS/ha.

He Waka Eke Noa Partnership

Primary Sector Climate Action Partnership

Farmers, Government, and Māori working together to reduce Aotearoa New Zealand's agricultural emissions while continuing to sustainably produce quality food and fibre products for domestic and international customers. This partnership aims to equip farmers with the knowledge, tools and support they need to reduce emissions and adapt to a changing climate.

For more information

More information relating to agriculture and climate change is available on the He Waka Eka Noa and AgMatters websites.

www.hewakaekenoa.nz

www.agmatters.nz

Your Greenhouse Gas Emissions were calculated using the Agriculture Inventory Model (AIM), which was developed by Ministry for Primary Industries.

Milk

This section of the report provides you with key insights into potential savings and opportunities for your farm. These insights have been calculated using existing tools and calculators that have been tested and developed through industry research.

Somatic Cell Count

Mastitis is usually caused by bacteria, which enter through the teat canal and infect the udder. Effective mastitis prevention will ensure more milk in the vat, higher quality milk, less use of antibiotics and more time saved on farm. If your bulk somatic cell count (SCC) is greater than 100,000 cells/ml this indicates some cases of sub-clinical infection are present with the potential to impact milk production.

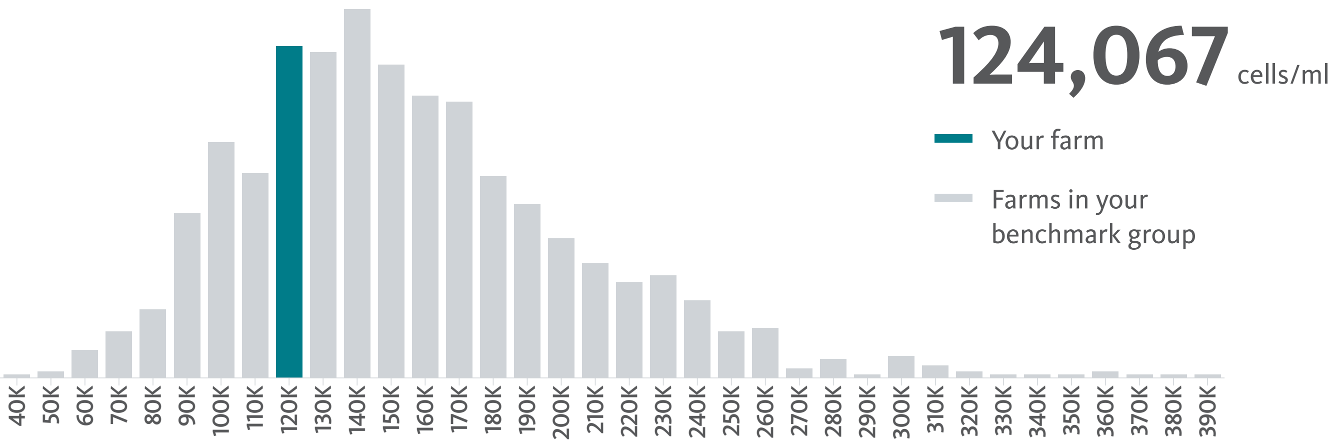
Research has shown there is a 2.1% loss in production for every doubling of somatic cell count over 100,000 cells/ml.

Potential Benefit

$25,900

By reducing your cell count to 100,000 cells/ml there is the potential to increase production on your farm that could be worth up to $25,900. This does not include the cost of treatment or culling and is based off a milk price of $7.60.

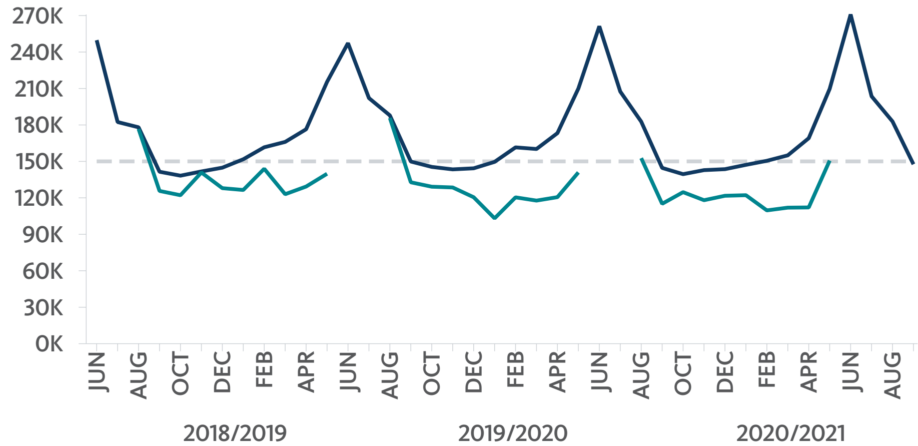
Your Farm's Annual Average Somatic Cell Count 2020/2021



Your farm is benchmarked against other farms in your region. This placed you in the top 50% of suppliers in the Canterbury Region for the 2020/2021 season.

SmartSAMM Powered by DairyNZ

Your Farm's Historical Monthly Average Somatic Cell Count



Your farm is benchmarked against other farms in your region.

- Your farm
- Farms in your benchmark group
- The Co-operative Difference Milk Quality Excellence target

Previous season's trends will be shown for up to three seasons where data is available and farm ownership hasn't changed.

Milking Efficiency

More efficient milking leads to better outcomes for people, cows and farm profitability. Simple changes that save seconds per cow can quickly add up to minutes saved per milking, and hours saved per day.

This section of the report uses milk vat monitoring data for your **month of peak production** to benchmark your milking efficiency. It uses DairyNZ research to provide an estimate of the amount of time that could be saved by changing the way your dairy is operated.

Your Farm's Peak Milk Production Data		
Shed Type	54 bail rotary	
Herd Size	1050 cows	
Peak Month	October	
Peak Volume	25347 L/day	
Milking Frequency	TAD (9.2-14.8 h interval between milkings)	
Milking*	**Times**	**Volume**
1	03:52 to 08:28	15 L/cow
2	13:02 to 16:28	9 L/cow
3	-	-
Total	**8 hours/day**	**24 L/cow**

*Milking is defined as the start of milk flow to the end of milk flow into the vat

Based On Your Information We Estimate You Could Save

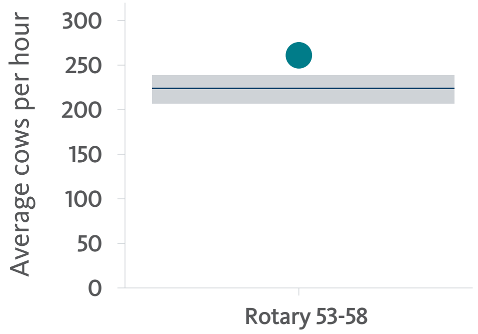
11 to 20 hours per week

This estimate is based on your farm reaching 80-100% of its potential milking efficiency using the maximum milking time (MaxT) strategy.

The insights provided in this section of the report will not be accurate if you are a split calving herd. For more detailed information please use the DairyNZ Milksmart App.

www.dairynz.co.nz/milking/milking-efficiently/milksmart-app

Average Cows Milked Per Hour During Your Peak Month

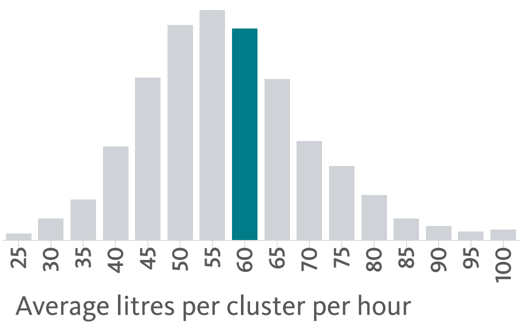


This benchmark is influenced by the number of clusters in the dairy and the herds level of production. Therefore, you are benchmarked against similar sized dairies nationally.

261 cows per hour

- Your farm
- 50% of your benchmark's group are within this range
- Your benchmark average

Average Litres Per Cluster Per Hour During Your Peak Month



This benchmark allows a fair comparison of all dairy types, sizes and production levels.

For context, if your cow's average milk flow rate is 2 L/min, then the maximum potential would be 120 L per cluster per hour (2 L/min × 60 min/hour).

58 L/cluster/hr

- Your farm
- All Fonterra farms

Animals

Heat Stress

The heat generated by rumen fermentation means that cattle are more tolerant to cold conditions than humans, but it also makes them more likely to get too hot. Cows that are too hot will seek shade, drink more, and their appetite and rumination times will reduce, depressing production. Severe heat stress can also have impacts on reproductive performance.

Previous New Zealand research (AgResearch and DairyNZ) has shown that milk production decreases relative to increasing temperature and humidity. Combining this research with actual and modeled weather data supplied by NIWA for your farm location, along with your herd size and breed, we have calculated the impact of unmitigated heat stress for your farm.

Farm Details	
Herd size:	1,050
Predominant breed:	Friesian x Jersey
Predicted production loss due to heat stress:	163 - 599 kgMS
Days above threshold:	10 - 27 days
Nearest virtual climate station:	0.62 kms

There are lots of things you can do to reduce the impact of heat stress on your cows aside from planting trees or building a shelter. Changing milking routines so cows aren't walking when it's hot, checking and upgrading water troughs so they are large enough for the herd, and installing fresh water sprinklers at the shed are all relatively straight forward ways to keep your cows cool.

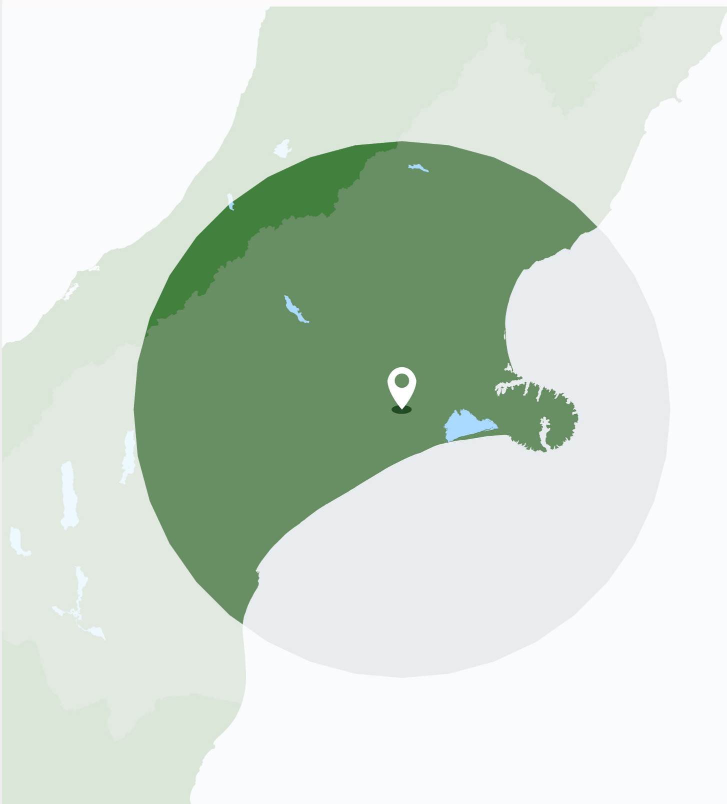
Estimated Impact of Heat Stress For Your Farm

$1,300 - $4,600 per year

Lost revenue range (predicted production loss @$7.60/kgMS) based on three most recent seasons of weather data from your nearest virtual climate station.

To find out more in depth information about the impact heat stress can have on your herd visit DairyNZ website or scan the QR code.

www.dairynz.co.nz/animal/cow-health/heat-stress



agresearch ātā mātai, mātai whetū
DairyNZ
NIWA Taihoro Nukurangi

Estimates based on a collaborative NZ Bioeconomy in the Digital Age project between AgResearch, DairyNZ, NIWA and Fonterra funded by NZ taxpayers and Milksolids levy payers through the Strategic Science Investment Fund and DairyNZ Incl. In preparing NIWA VCSN data for this insight, all reasonable skill and care was exercised and the best available data and methods were used. NIWA accepts no liability for any loss or damage (whether direct or indirect) incurred by any person through the use of or reliance on this information

Lameness

As well as being painful for affected animals, lameness can add considerable costs to a farming operation with impacts on milk production, reproduction and staff time required to treat and manage lame cows.

The cost of a case of lameness varies depending on the stage of lactation and pregnancy, but DairyNZ suggests $250 per case as a conservative starting point. Even mild cases of lameness have a cost as cows will stand to graze less, reducing milk production and potentially causing loss of body condition.

Most cases of lameness are mild and may not be identified if the cow is able to maintain her normal position when walking with the herd. Studies suggest the true prevalence of lameness may be three times higher than the number of animals treated. Taking time locomotion scoring the herd may allow you to identify lame cows early and improve their speed of recovery.

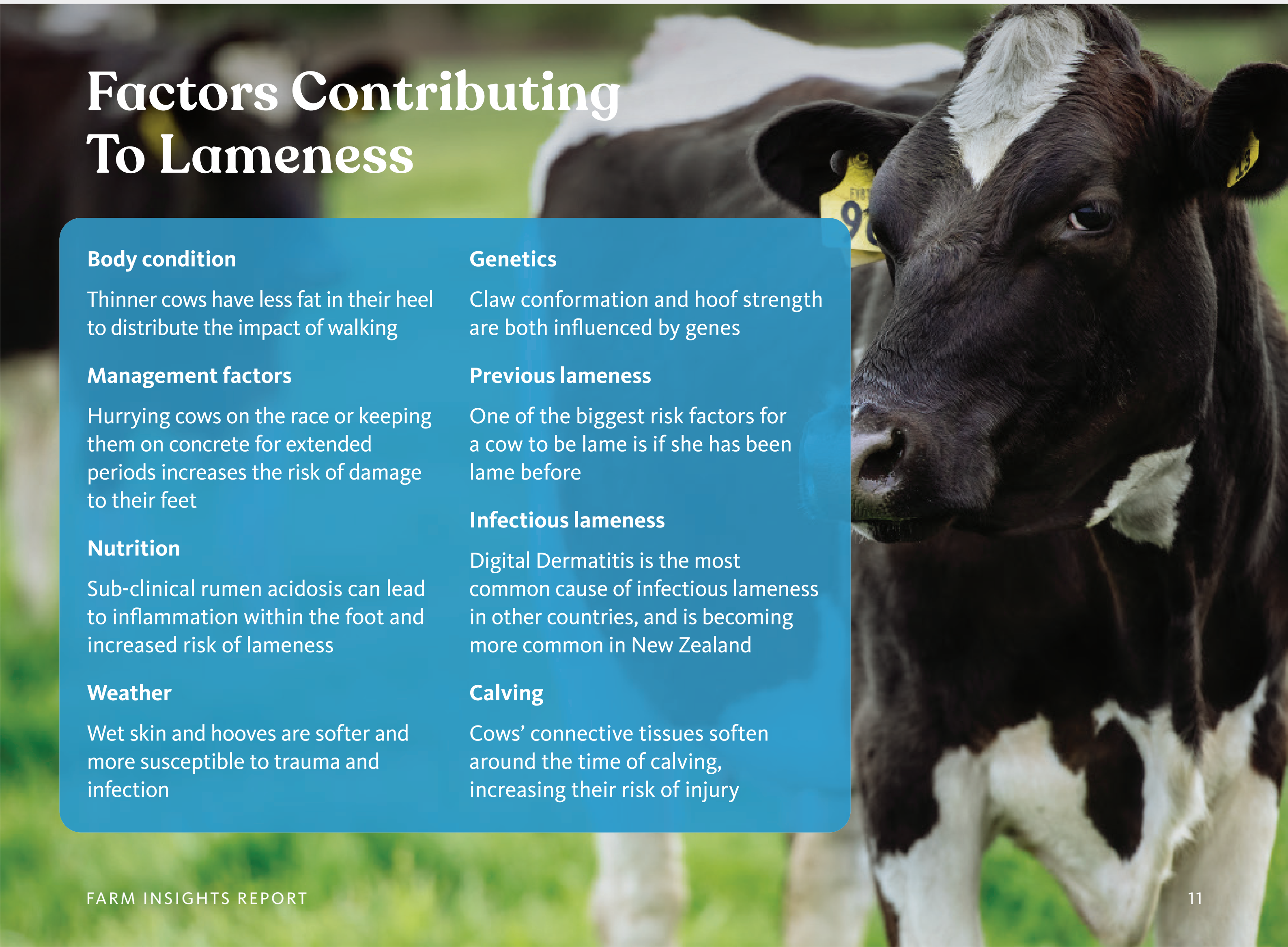
Locomotion scoring is easy to do, but it requires someone to solely focus on watching the cows walking back to the paddock. For information on how to locomotion score cows visit the DairyNZ website.

Estimated Cost of Lameness For Your Farm

$45,000

The cost calculator utilises industry research to estimate the cost of lameness through lost milk production, cost of treatment, wastage through cull cows and discarded milk, and the impact on reproductive performance.

The Lameness Cost Calculator is a valuable resource when trying to calculate the cost to your farm. Based on the conservative estimate of $250 per case and the 180 lame cows you reported in last season's Farm Dairy Records the cost of lameness on your farm is at least $45,000.



Factors Contributing To Lameness

Body condition

Thinner cows have less fat in their heel to distribute the impact of walking

Management factors

Hurrying cows on the race or keeping them on concrete for extended periods increases the risk of damage to their feet

Nutrition

Sub-clinical rumen acidosis can lead to inflammation within the foot and increased risk of lameness

Weather

Wet skin and hooves are softer and more susceptible to trauma and infection

Genetics

Claw conformation and hoof strength are both influenced by genes

Previous lameness

One of the biggest risk factors for a cow to be lame is if she has been lame before

Infectious lameness

Digital Dermatitis is the most common cause of infectious lameness in other countries, and is becoming more common in New Zealand

Calving

Cows' connective tissues soften around the time of calving, increasing their risk of injury

Mastitis

Mastitis is very painful for the affected animal. It takes time and money to treat and can have long term impacts on reproduction, somatic cell count and increases the risk of culling.

Most of the antibiotics used in the dairy industry are for the treatment of mastitis, which is both a financial cost to farmers but also contributes to the risk of developing antibiotic resistant bacteria.

Treatment costs and withheld milk are thought to cost farmers around $150 per case of clinical mastitis. DairyNZ have developed a gap calculator to help you better understand the costs of mastitis on your farm.

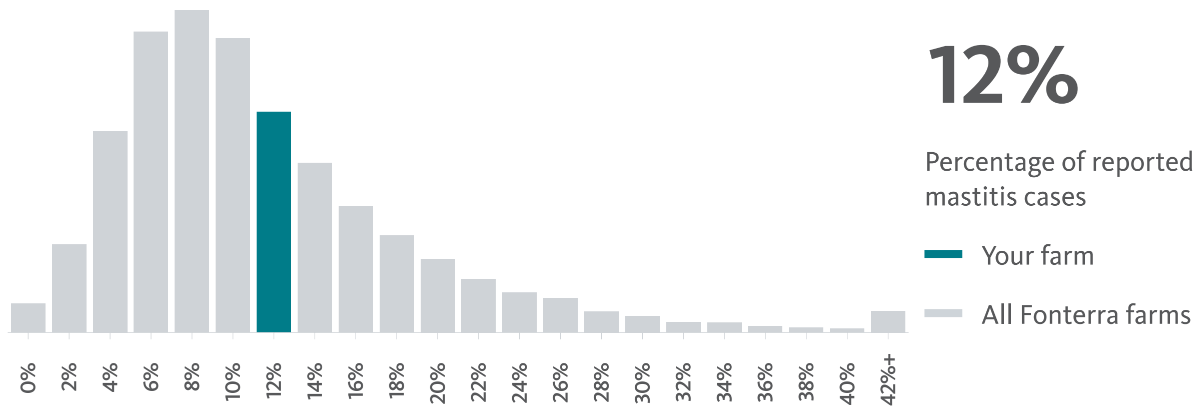
Estimated Cost of Mastitis For Your Farm

$19,200

Mastitis can have a significant effect on your herd's performance. Based on the numbers you provided Fonterra through the Farm Dairy Records the industry calculator has determined mastitis is roughly costing you $19,200.

This figure does not include potential lost milk production due to infecton impacting yield.

Your Farm's Mastitis Cases



To find out more about the impact lameness and mastitis can have on your herd, visit the DairyNZ website links below or scan the QR codes.

www.dairynz.co.nz/animal/cow-health/lameness/

www.dairynz.co.nz/animal/cow-health/mastitis/

The information and insights provided to you in this report are sourced from information that you have provided through your Farm Dairy Records, together with milk quality and production data that we hold and third party industry research. While the information and insights provided may identify risks and opportunities, such information is general information only and is not in the nature of advice. We have done our best to align historical data to the new Milk Quality Framework. We make no representations or warranties (whether express or implied) as to whether information or data provided in this report is accurate, reliable or complete. You are solely responsible for your own assessment and evaluation of the information and for the actions or decisions you take in reliance on the information or data generated. Accordingly, Fonterra shall not be liable for any loss arising from any actions or decisions taken by you in reliance on the information contained in this report.

Our Team Is Here To Help

If you would like to discuss the details of this report please contact the Service Centre on **0800 65 65 68.**