From:	Jennifer Leslie
To:	Charlotte Wright; Plan Hearings
Cc:	Bianca Sullivan
Subject:	RE: PC7 OTOP DairyNZ Evidence
Date:	Friday, 17 July 2020 3:59:43 pm
Attachments:	PC7 OTOP DairyNZ Economic Evidence Jennifer Leslie 17July .pdf

Please find the attached updated evidence for DairyNZ:

Economic evidence of Jennifer Leslie

From: Charlotte Wright <Charlotte.Wright@dairynz.co.nz>
Sent: Thursday, 16 July 2020 8:29 pm
To: planhearings@ecan.govt.nz
Cc: Bianca Sullivan <bianca@enviser.co.nz>; Jennifer Leslie <Jennifer.Leslie@dairynz.co.nz>
Subject: PC7 OTOP DairyNZ Evidence

Good evening

Please find attached for DairyNZ:

-
Planning evidence of Bianca Sullivan
Economic evidence of Jennifer Leslie

Charlotte Wright
Senior Policy Advisor
Environmental Change Team

Te tuku I tetahi anamata pai ake, mo nga kaipamu
Delivering a better future for farmers

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Work days/hours:
Monday, Tuesday, Wednesday
Thursday, Friday: 10-2

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of Part B of proposed Plan Change 7 of the Canterbury Land and Water Regional Plan
AND	
IN THE MATTER	of the submissions and further submissions by DairyNZ

STATEMENT OF EVIDENCE OF Jennifer Leslie
FOR DAIRYNZ LIMITED
17 JULY 2020

Cnr Ruakura Road & SH 26
Newstead
Hamilton 3286

1 Qualifications, experience, and background

1.1 My full name is Jennifer Elizabeth Leslie. I am currently employed as an Economist – Policy at DairyNZ Limited (DairyNZ). I joined the organization in 2019, following working as a consulting economist and technical writer. Before moving to New Zealand, I worked as a research assistant and lecturer at the University of Guelph in the Food, Agricultural and Resource Economics Department in Canada.

1.2 I am an expert in input/output models, at both the national and regional scale, I have built two input/output models, at both the national and regional scale. I have a research background in the economic modelling of nutrient management from agricultural non-point sources. In the fulfilment of my Master of Science, my thesis studied farmer nutrient management decisions within a catchment in Southern Ontario, Canada. I have also contributed to the Southland Economic Project, providing technical advice for the economic modelling commissioned by Environment Southland.

1.3 I have the following qualifications: Bachelor of Science in Agriculture: Honours Agricultural Science from the University of Guelph, Canada, and a Master of Science: Food, Agricultural and Resource Economics from the University of Guelph, Canada.

2 Code of Conduct

2.1 While this is a Council Hearing, I acknowledge that I have read and agree to comply with the Environment Court's Code of Conduct for Expert Witnesses, contained the Environment Court Practice Note 2014. My qualifications as an expert are set out above. I confirm that the issues addressed in this statement of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I might express during this process.

3 Scope and Structure of Evidence

3.1 My evidence focuses on several areas with regards to Proposed Plan Change 7 (*PPC7*):

3.2 The dairy sector is a key component of the Orari-Temuka-Opihi-Pareora (OTOP) sub-region, regional and national economy.

3.3 *PPC7* will have a negative impact on individual dairy farm profitability.

3.4 A staged approach in the implementation of *PPC7* will likely decrease the impact on dairy farm profitability.

3.5 The change to on farm profitability from *PPC7* will affect individual dairy farm viability and solvency.

3.6 The underlying economic analysis used to inform *PPC7* is incomplete and likely does not accurately capture the full economic effects of *PPC7*.

4 The dairy sector is a key component of the regional economy

4.1 The dairy sector is an important component of the New Zealand economy. It is often the nation's largest exporter by value, though this varies depending on product prices. The sector provides around a third of the value of all national merchandise exports, generating annual export revenue of around $19.6 billion (MPI, 2019). The national significance of the sector is reinforced by its economic resilience in the face of the Global Financial Crisis in 2008 and the COVID-19 pandemic in 2020.

4.2 Dairying employed around 38,700 people in 2017, with around 70% of these jobs being on farms and the remainder in the processing sector (NZIER, 2018). The dairy sector provided around $2.5b in wages in

2017, with around 80% of these being provided in rural areas (NZIER, 2018).

4.3 These economic benefits of dairy production flow onto other sectors of the economy. Dairy farmers are the largest purchasers of agricultural support services, basic wholesale materials, and veterinary services in New Zealand. Further, dairy-processing companies are the largest consumers of polymer and rubber products, as well as rail transport.

4.4 The benefits of dairy production for other sectors in the economy are highly favourable for regional development, particularly in areas where other sources of revenue and jobs can be limited (NZIER, 2018).

4.5 Dairy farming is a particularly important part of the Canterbury economy. Canterbury contains around 11% of the nation's herds, 16% of the national dairy area, and produces around 400,000 tonnes of milk solids annually, which is around 22% of the national milk supply. It is New Zealand's most profitable dairy region, and also its most productive per hectare (DairyNZ, 2020).

4.6 The Canterbury dairy sector contributes around $1.5 billion to regional GDP per annum, around 80% of this on-farm and around 20% in the processing sector (NZIER, 2018). This is around 4% of regional GDP in Canterbury and places the dairy sector as the third most-important sector in terms of generating economic growth in the region.

4.7 The dairy sector employed 7,740 workers in Canterbury in 2018-19. The on-farm sector accounted for 70% of these jobs, with dairy processing providing the rest.

4.8 The OTOP sub-region includes the Timaru District and part of the Mackenzie District. Dairy employment growth in the Timaru district was 6% from 2000-17, whereas total employment growth was 2% over the same time period (NZIER, 2018). This rate is around three

times the national rate of employment growth. In the Timaru district, direct employment within the dairy sector is significant; in 2019 dairy cattle farming was the third largest employer (3.1% of total jobs) and cheese and other dairy product manufacturing was the sixth largest employer (2.9% of total jobs) (Infometrics, 2020). In the Mackenzie district, dairy employment growth was 22% from 2000-2017, and total employment growth was 2% for the same period (NZIER, 2018). This high growth rate is due to the very low base level of dairy employment in 2000, as of the 2018-19 season there were 18 herds in the district (LIC & DairyNZ, 2019). At the regional scale, dairy production also supports 1,372 jobs in other sectors—such as agricultural equipment and support services—each year in Canterbury (NZIER, 2018).

4.9 Prime minister Jacinda Ardern highlighted the importance of the primary sector to the economy through the initial Covid-19 response, and its significance moving forward toward economic recovery as a nation (NZ Herald 2020; Stuff 2020). Prime minister Ardern announced a plan to grow primary sector exports by $44 billion (NZD) in the next decade. Further emphasising the importance of maintaining the economic health and business viability of the dairy sector at a national, regional and district scale.

5 Proposed Plan Change 7 will have a negative impact on individual dairy farm profitability

5.1 Harris (2019) assesses the economic impacts of nutrient mitigations and changes in flow regimes outlined under *PPC7*. This modelling indicates how the application of nutrient mitigations to achieve nutrient reductions will reduce operating profit on dairy farms. This economic assessment provides an incomplete assessment of the

economic impact because of several factors which are discussed in the following section.

5.2 Its aggregate approach ignores the diverse effects that the policy will have on individual and heterogeneous farm units.

5.3 Figure 1 shows the original unchanged abatement curves, from Good Management Practice (GMP) to the proposed 10% and 20% nitrogen reductions, supplied by DairyNZ (2018) and used by Harris (2019) (Figure 1, Harris 2019). Creating an average abatement curve from this sample of case studies farms as the foundation of an economic assessment appears to be reasonable. However, on closer inspection of the base data, captured in Figure 2, we can observe the high level of heterogeneity among the case study farms. Figure 2 shows the reductions in nitrogen required, and the associated change in operating profit, first to reach GMP and then the further 10% and 20% as outlined in *PPC7*. With one farm seeing a 0% change in operating profit to meet the 20% reduction beyond GMP, and another seeing a -38% change in operating profit to meet the same 20% reduction beyond GMP. Working at the average or aggregate level fails to account for farm heterogeneity. In addition, the abatement curve used by Harris (2019) is combination of the DairyNZ (2018) data, based on Farmax and Overseer, and input from the Farmer Reference Group, sitting outside the farm system modelling conducted by DairyNZ.

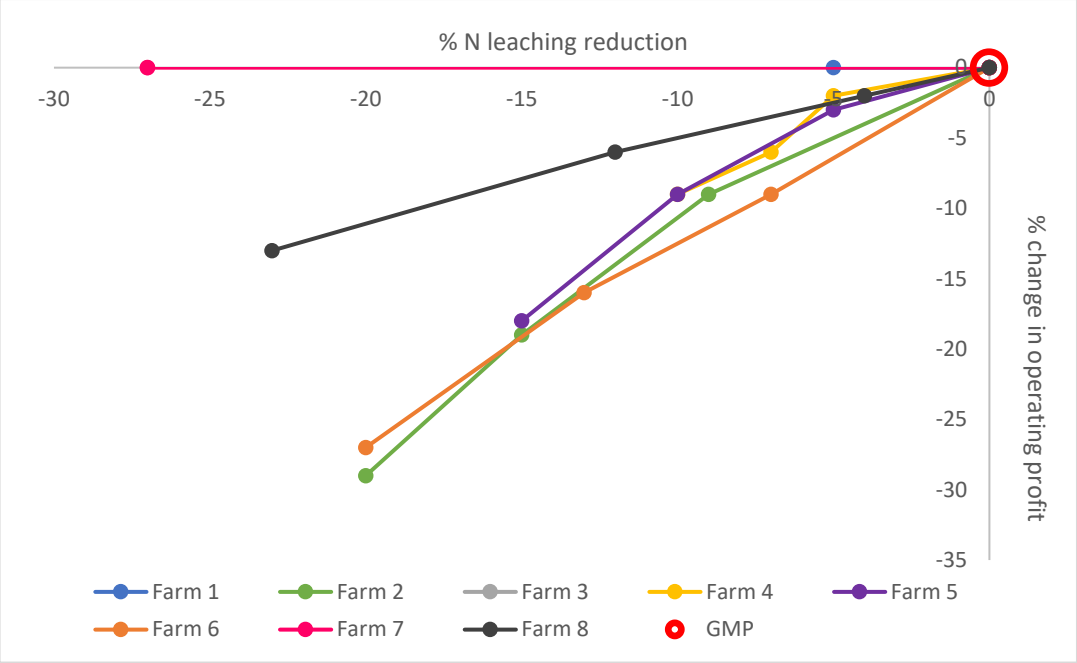

Figure 1: Abatement curve for case study farms starting at GMP (red circle) and 10%, 20% and 30% reductions beyond GMP (DairyNZ 2018).

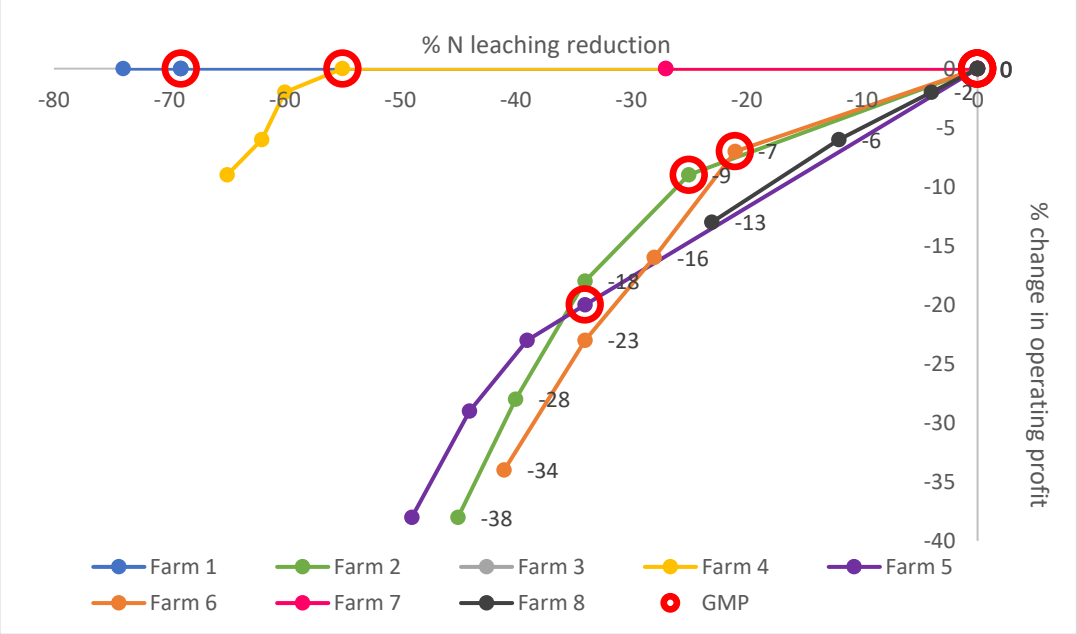

Figure 2: Abatement curve for case study farms from current state to achieve GMP (red circle) and 10%, 20% and 30% reductions beyond GMP (DairyNZ 2018).

5.4 The mitigations considered in the construction of the abatement curve to achieve GMP and then 10%, 20% and 30% reductions beyond GMP for the case studies are listed below:

i. Irrigation management – target 80% efficiency.
ii. Consider culling early, 90% of the known culls gone by April.
iii. If a stand-off structure already exists, increase its utilisation particularly in winter and autumn.
iv. Substitute high protein feed like brewers grain with low protein feed like barley grain (provided there is infrastructure to accommodate the new feed).
v. Nitrogen fertiliser management – focus on timing and application rate.
vi. Reduce the cropping area and import feed to compensate for reduced crop area or reduce stocking rate to match feed supply to demand.
vii. Effluent management – if increasing effluent application area, ensure it is only onto suitable soils and consider topography. Also consider spreading solids to non-effluent block.
viii. De-intensification - scale down operations by reducing nitrogen fertiliser application first targeting applications in the shoulders (autumn and winter) then reduce stocking rate to match feed supply and demand.
ix. Consider further capital investment, such as building a feed pad.

5.5 Environment mitigations, such as those proposed under *PPC7* are not the only factors affecting dairy farm operating profit. I have conducted additional modelling that captures the impact of a decrease in the milk price, as forecast for the upcoming season, in combination with the proposed nitrogen leaching reductions in *PPC7*. Rabobank has forecast a decrease in the farmgate milk price to NZD $5.60 per kilogram of milksolids ($5.60 / kg MS) for the upcoming season (Rabobank, 2020). There is a relationship between milk price, operating expenses and operating profit, and farmers adjust their

expenses given a change in price they receive. To balance this analysis, I used the projected decrease in milk price to model a decrease in operating expenses, as farmers expense decisions vary with the milk price. Using a linear relationship (R^2 value of 0.60) to evaluate Canterbury Region data from the DairyNZ Economic Survey[1] (Figure 3) a $5.60 / kg MS will result in an operating expense of $4.77 / kg MS, and an operating profit of $1.27 / kg MS (after accounting for other sources of income including livestock sales).

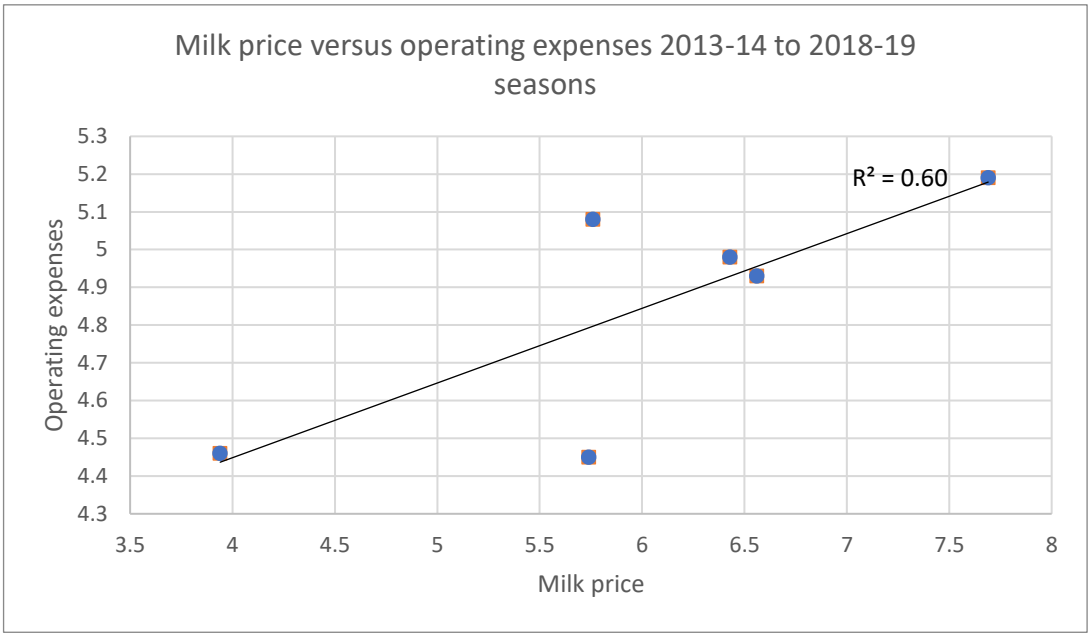

Figure 3: Milk price versus operating profit[2]

5.6 This operating profit of $1.27 / kg MS is more than 30% less than the 2018-19 operating profit in the Canterbury Region ($1.90/ kg MS) (DairyNZ, 2020). Accounting for the change in milk price, simultaneously with the projected change in operating profits as modelled by the Harris (2019) economic assessment of the N

[1] DairyNZ Economic Surveys included: DairyNZ Economic Survey (2018-19); DairyNZ Economic Survey (2017-18); DairyNZ Economic Survey (2016-17); DairyNZ Economic Survey (2015-16); DairyNZ Economic Survey (2014-15); DairyNZ Economic Survey (2013-14) and sampled the regional owner-operator financial data, focusing on the Canterbury Region.
[2] DairyNZ Economic Surveys included: DairyNZ Economic Survey (2018-19); DairyNZ Economic Survey (2017-18); DairyNZ Economic Survey (2016-17); DairyNZ Economic Survey (2015-16); DairyNZ Economic Survey (2014-15); DairyNZ Economic Survey (2013-14) and sampled the regional owner-operator financial data, focusing on the Canterbury Region.

reductions on Dairy farms (Table 7, Harris, 2019), the range of impact on operating profit, compared to the 2019 baseline becomes:

Reduction in N beyond GMP	**Change in operating profit with respect to the 2018-19 milk price in the Canterbury Region ($1.90/ kg MS)**		
	Low	*Medium*	High
10%	-27%[3] ($1.38/ kg MS)[4]	-34% ($1.24/ kg MS)	-40% ($1.14/ kg MS)
20%	-35% ($1.23/ kg MS)	-39% ($1.16/ kg MS)	-47% ($1.02/ kg MS)

5.7 The example discussed in the previous two paragraphs is meant to illustrate that the changes in operating profit associated with meeting the proposed nutrient reductions do not occur in isolation, and are additive to the volatility in operating profit faced by dairy farmers. In addition, the effects of the nutrient reductions proposed under *PPC7* on operating profits discussed in this section do not jointly consider the effects of the proposed minimum flow requirements under *PPC7*. Harris (2019) evaluates the economic effects of the proposed nutrient reductions and changes to the flow regime independently, rather than simultaneously in an integrated model, likely resulting in an underestimation of the economic impacts of the *PPC7* for those farms affected by both increased minimum flows and nutrient reductions.

5.8 As a result of above-mentioned limitations, I believe the economic assessment provided by Harris (2019) provides an incomplete assessment of the economic impacts of *PPC7* on dairy farms in the OTOP sub-region.

[3] The change in operating profit with respect to the operating profit in the Canterbury Region for the 2018-19 season.
[4] The operating profit calculated with the forecast Rabobank milk price ($5.60 / kg MS) combined with the modelled change in operating profit as calculated by Harris (2019).

6 Proposed Plan Change 7 will affect dairy farm debt and viability

6.1 The use of debt to expand businesses and sectors is a common practice. In a healthy business environment debt to asset ratios (DAR) fall over time due to a combination of capital gains and debt payment. However, high DAR indicate an issue with business viability and farm solvency. The average DAR in the Canterbury Region increased from 49.3%in the 2017-18 season (DairyNZ, 2019) to 57.8% in the 2018-19 season (DairyNZ, 2020). Farm solvency can be discussed based on general criteria used by the Reserve Bank of New Zealand to define a non-performing loan (NPL) (Dunstan et al., 2015), where a NPL captures insolvent farms that cannot adequately service debt across time. The criteria of a NPL are defined as follows:

a. the farm has a loan-to-value[5] ratio greater than 90%;
b. cash flow in the current season is negative; and
c. cash flow would still be negative even under an assumed 'status quo', or medium-term, milk payout.

6.2 MPI (2019) reports that 24% of dairy farms in New Zealand have a DAR greater than 70%, and the Economic Survey (DairyNZ 2020) reports that 6% of dairy farms in New Zealand have a DAR greater than 90%. Nationally, the DAR for dairy farms increased from 50.7% in the 2017-18 season to 53.4% in the 2018-19 season (DairyNZ 2020). As a region, Canterbury DAR is greater than the national average, sitting at 57.8%, sitting 4.4% higher than the national average (DairyNZ 2020). The distribution of DAR in the Canterbury Region is shown in Figure 4. The high DAR in the Canterbury Region increases the risk of NPLs overtime.

[5] Where the DairyNZ DAR is calculated using current and term liabilities and assets at the close of the specified milking season, the loan-to-value ratio (LVR), as defined by the Reserve Bank, focuses on the size of the loan with respect to the value of the mortgaged property. In addition, the Reserve Bank defines an investment property with a LVR of more than 70% as being a high-LVR (Reserve Bank 2020).

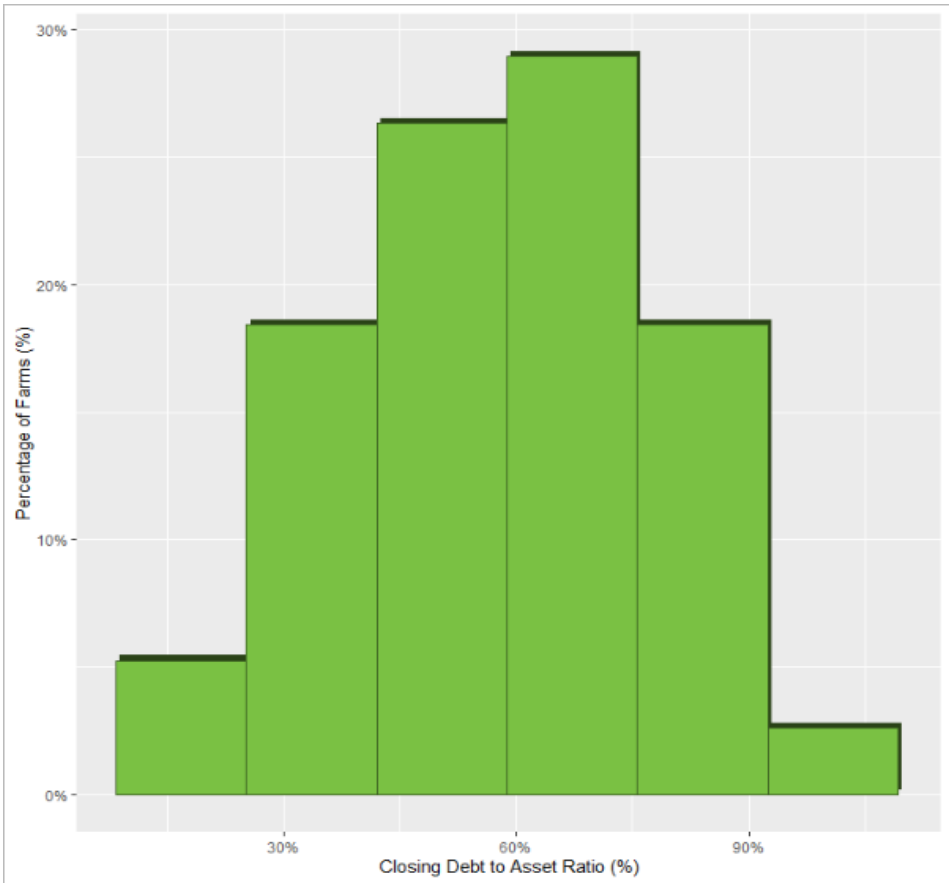

Figure 4: Debt to asset ratio (DAR) distribution of dairy farms in the Canterbury Region for the 2018-19 season.

6.3 Harris (2019) outlines several facts with respect to farm viability: land value will fall under *PPC7* due to increased operating costs, reduced operating profit, and reduced potential for capital gain. Lower asset prices will adversely affect DARs, increasing the probability of business insolvency. These adverse shifts in the DAR therefore have the potential to become problematic before operating profit is affected by nutrient reductions. As discussed in Section 5, dairy operating profit is not affected by regulations, such as those outlined by *PPC7*, in isolation but also by milk price volatility. These factors could result in dairy farm DAR increasing to more than 90%, increasing the likelihood of NPLs and impacting farm solvency.

6.4 Historically, dairy farms in New Zealand have been allowed to operate with interest only loans, with the option to pay principal voluntarily. In New Zealand, approximately 70% of dairy farms are paying interest

only on their loans at this point in time. However, there has been a movement towards a requirement to paying principal. Potentially further impacting dairy farms operating profit, and business viability and solvency.

7 A staged transition is an important component of Proposed Plan Change 7

7.1 The importance of the dairy sector to the Canterbury region emphasises the need for careful transition and setting of nitrogen-leaching limits. It emphasises the potential for stringent nitrogen leaching limits to impose far-reaching negative economic consequences, both on the dairy sector and the broader regional economy.

7.2 The dairy sector in the OTOP sub-region is economically important (see Section 4). Also, it was established using a significant amount of debt capital (see Section 6). These factors emphasise the importance of a well-planned and executed transition.

7.3 A valuable part of *PPC7* is the proposal to implement a staged transition. This has several advantages:

i. It ensures that a strong foundation for implementation, monitoring, and enforcement is developed and applied.
ii. It takes time to design, pilot, and introduce programmes to implement environmental management.
iii. It allows time for those affected by regulation to develop skills that help with adaptation.
iv. It builds trust and engagement between regulators and farmers, laying a foundation for an effective and efficient transition.
v. It allows diversity between farms, farmers, and the risk of contaminant loss to be pragmatically considered in research, development, and extension.
vi. It increases the feasibility of implementing research outcomes associated with mitigation strategies at scale.

7.4 Abatement curves normally have the property of increasing at an increasing rate (Figure 1 & Figure 2), meaning that the first 10% nutrient reduction in *PPC7* will have less of an impact on operating profit than the second, additive 10% nutrient reduction to achieve the overall 20% nutrient reduction for dairy farms outlined in *PPC7* by 2035.

7.5 The first 10% nutrient reduction, as well as having less of an impact on operating profit, is scheduled to occur over a 10-year period, or by 2030. In contrast, the second 10% nutrient reduction, which has a greater impact on operating profit, occurs over a 5-year period, by 2035. This second phase in the nutrient reductions outline in *PPC7* is accelerated in comparison to the first, occurring in half the time, is more costly, likely will impact operating profit to a greater degree, and could flow on to impact dairy farm viability.

8 Incomplete economic analysis was used to estimate the affects of Proposed Plan Change 7

8.1 The use of input output tables from the Waimakariri District to model the economic impact of the proposed *PPC7* in OTOPs is not appropriate. While both are located in the Canterbury Region and are spatially a similar size, Waimakariri's adjacency to Christchurch, greater population (approximately 30% greater) and geographical differences have an impact on the structure of the economic transactions such that input output tables are likely incomparable between the two districts.

8.2 Input output tables are produced and updated by Stats NZ, with the next release slated for 2021. This means that the input output tables used as the foundation of the model were released in 2013. Between 2013 and the release of the Harris (2019) report outlining the regional economic modelling, GDP in the Canterbury Region grew by more than 35% (+$9,844,000) in nominal terms (StatsNZ, 2020). This level of GDP growth would indicate some changes in economic structures

and transactions. No details as to if or how the original Stats NZ input output tables were updated to conduct the analysis was provided in Harris (2019) that outlines the economic analysis conducted for Environment Canterbury.

8.3 Input output tables capture the transactions, also referred to as intersectoral flows in the literature, within a specified time period, typically one year (Miller & Blair, 2009). Such models rely on several key simplifying assumptions (McLennan, 1995; Miller and Blair, 2009):

- Prices are fixed within the time period captured in the input output table.
- There are no limits to labour or capital at the fixed prices.
- If all inputs are increased by X%, then output will increase by the same amount. (This is known as constant returns to scale.)
- One input cannot be substituted for another.
- There is no technological change or innovation.
- Each industry produces one homogeneous product.

8.4 The simplifying assumptions within the modelling framework bound the timeframe of usefulness of the input-output model to the short-run where price flexibility is not required (Koks & Thissen, 2016; Miernyk, 2006). In the short-run, between two to three years, it is a fair assumption that the input output tables remain relatively constant. Moving to the long-run, or a ten-year time horizon, it is no longer reasonable to assume that the input output table coefficients remain constant (Miernyk, 2006). Harris (2019) uses input output modelling to the long term (ten-year time horizon) apparently without altering input output table coefficients.

8.5 These technical modelling issues further highlight the incomplete assessment of the economic impacts of *PPC7* on dairy farms in the OTOP sub-region, the Canterbury Region and New Zealand as a whole. The incomplete nature of the assessment is especially

apparent with regard to the 2035, 20% nutrient reductions for dairy farms outlined in *PPC7* for the OTOP sub-region.

9 References

DairyNZ. (2018). Mitigation modelling for dairy farms in the Orari-Temuka-Opihi-Pareora Zone: The impact of implementing farm-system mitigations to reach nitrogen Good Management Practice (and beyond) on farm profitability. DairyNZ. Hamilton.

DairyNZ. (2019). DairyNZ economic farm survey 2017/18. DairyNZ, Hamilton.

DairyNZ. (2020). DairyNZ economic farm survey 2018/19. DairyNZ, Hamilton.

Dunstan, A., Skilling, H., Newman, M., and Mounsey, Z. (2015). *An updated assessment of dairy sector vulnerabilities*, Reserve Bank of New Zealand Bulletin 78(8), Wellington.

Harris, S. (2019). Economic assessment of the healthy catchments project proposed zone implementation programme addendum (ZIPA), LWP, Lyttelton.

Infometrics. (2020). 50 largest employing ANZSIC 7-digit industries, 2019. Timaru District and New Zealand. Available at: https://ecoprofile.infometrics.co.nz/timaru%2Bdistrict/Employment/LargestIndustries

Koks, E. E. & M. Thissen. 2016. A multiregional impact assessment model for disaster analysis. *Economic Systems Research.* Vol 28(4): pp. 429-449.

Livestock Improvement Corporation (LIC) & DairyNZ. 2019. New Zealand dairy statistics 2018-19. DNZ30-008.

McLennan, W. (1995). Information paper: Australian national accounts: introduction to input-output multipliers. *Australian Bureau of Statistics*. Catalogue No.5246.0.

Miernyk, W. H. 2006. The elements of input-output analysis. Regional Research Institute, West Virginia University.

Miller, R. E. & P. D. Blair. 2009. Input-output analysis, foundations and extensions. Second edition. *Cambridge University Press.*

Ministry of Primary Industries (MPI) (2019). Situation and outlook for primary industries December 2019. ISBN No. 978-1-99-001724-7 (online). Available at: https://www.mpi.govt.nz/dmsdocument/38930/direct

NZ Herald. 2020. Jacinda Ardern outlines plan to live NZ primary export earnings. Published 07 July 2020: https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12346105

New Zealand Institute of Economic Research (NZIER) (2018). *An analysis of the flow-on benefits of dairy's revenue generation*, NZIER, Wellington.

Rabobank. 2020. Dairy farmers advised to plan for lower milk price in upcoming dairy season – industry report. Retrieved from: https://www.rabobank.co.nz/media-releases/2020/200409-dairy-farmers-advised-to-plan-for-lower-milk-price-in-upcoming-dairy-season-industry-report/#:~:text=Rabobank%20milk%20price%20forecast,for%20the%202020%2F21%20season.

Reserve Bank. 2020. Loan-to-value ratio restrictions FAQs. Available at: https://www.rbnz.govt.nz/faqs/loan-to-value-ratio-restrictions-faqs

StatsNZ. 2020. Regional gross domestic product: Year ended March 2019. Retrieved from: https://www.stats.govt.nz/information-releases/regional-gross-domestic-product-year-ended-march-2019

Stuff. 2020. Prime minister Jacinda Ardern reveals 10 -year plan to boost primary sector by $44b. Published 07 July 2020: https://www.stuff.co.nz/business/farming/122055134/prime-minister-jacinda-ardern-reveals-10year-plan-to-boost-primary-sector-by-44b