

Greenhouse Gas Emission Reduction Case Study Kirikiri Canterbury Dairy Farm

Overview

Kirikiri is a 400ha, irrigated dairy farm in mid-Canterbury, wintering around 1,450 cows. It is an equity partnership between Craigmores Sustainable and Dion and Kristie Gordon. Since 2018 cow numbers have been reduced while per cow production has improved, driven very largely by improved management. This has resulted in a reduction in greenhouse gas emissions, both in total (9%) and biological emissions (3.5%) over the past 5 years.

Table 1 Kirikiri physical parameters 2018-2022

	2018	2020	2022	'22 vs '18
Effective Area (ha)	397.3	397.3	397.3	0
Cows wintered	1,484	1,471	1,454	-2.0%
Dry matter eaten (tonnes)	16.0	17.6	17.0	3.6%
Total kg MS	596,634	641,262	630,599	5.7%
kg/MS/cow	411	436	448	9.0%

What changes have been made?

Since 2018, the team at Kirikiri have lowered stocking rates, and increased per cow production through having a strong, knowledgeable team, better pasture utilisation, better and more consistent genetics, and having fewer poor performing cows. Fertiliser use has also been reduced (anticipating the cap on fertiliser use). The team have documented actions they are undertaking that support reduced emissions in their overall plan with Synlait.

Why were the changes made?

"In 2018 we had a higher than usual empty rate and we didn't want to buy in more animals."

This led to a reduced stocking rate (of around 2%), which worked, so they continued with it. At the same time, the team continued to develop through a strong focus by all team members on getting all of the elements of the farm system right.



GHG modelling method

The farm was modelled in Farmax for the 3 years in question, mainly to calculate the farm EBITDA for each of the years. In as much as the milk solids pay-out has increased over the period, which would mask any changes in profitability, a standardised pay-out, of \$8.00/kg MS was used – this is the 3-year average across 2019/20 – 2021/22. Farm expenditure for the farm was the actuals from the annual accounts.

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The data for the Farmax models was based on existing Overseer files. The GHG figures were taken from the Overseer files (to include non-biological emissions which are not picked up by Farmax. This information is important for the farms' sustainability reporting). Most farmers would not need to duplicate this effort.

What have been the impacts of the changes?

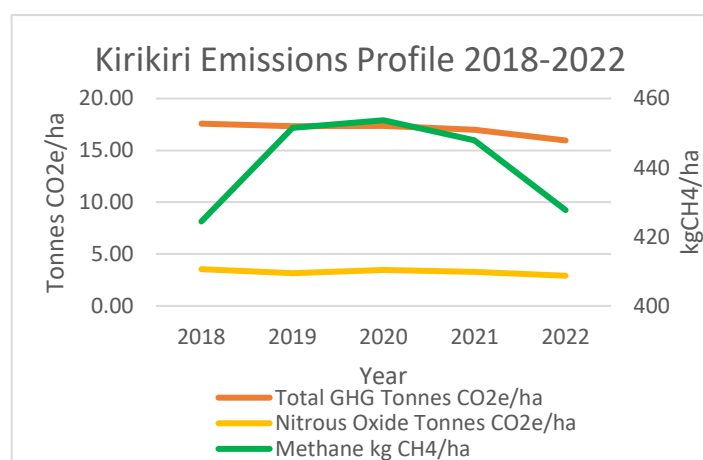


Figure 1 Kirikiri emissions profile since 2018

As shown in Figure 1 above, total emissions and nitrous oxide emissions have decreased as a result of the changes made, while methane emissions have risen slightly (albeit declined in past year). More detail on the emissions is presented in Table 2 below. This is likely due to fewer cows eating more feed now than in 2018.

Table 2 Kirikiri greenhouse gas emissions 2018 and 2022

	2018	2022	22 vs 18
Methane (Tonnes CO₂e/ha)	10.6	10.7	1%
Methane (kg CH₄/ha)	424	428	1%
Nitrous oxide (Tonnes CO₂e/ha)	3.5	2.9	-18%
Total GHG (Tonnes CO₂e/ha)*	17.6	16.0	-9%

* includes CO₂ emissions

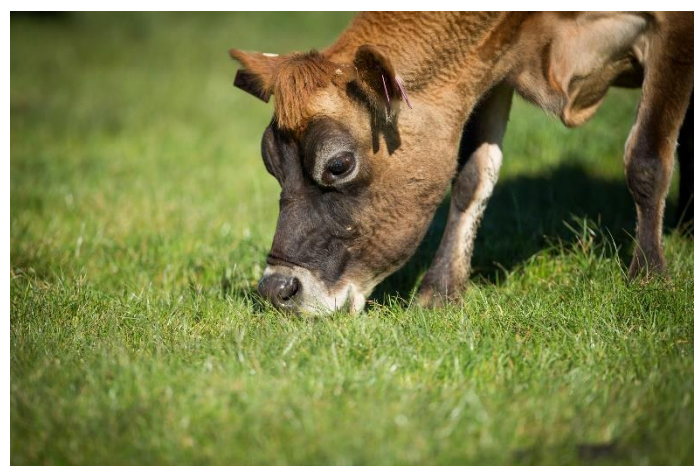
Dion and Kristie report that reducing cow numbers has helped them increase per cow production,

improved the quality of cows and in-calf rate. Milking times are now shorter which means the farm team can pay closer attention to animal health and are more focused with better attention to detail in general.

As well as reducing emissions, the changes have resulted in less nitrogen losses from the system.

What changes were made on Kirikiri that reduced emissions?

- Decreased N fertiliser from 279kgN/ha to 148kgN/ha to meet 190kgN/ha nitrogen cap – decreased nitrous oxide and carbon dioxide emissions.
- Decreased stocking rate from 3.8 peak cows/ha to 3.6 peak cows/ha – this reduction was offset by an increase in milk production/cow from 411kgMS/cow to 448kgMS/cow, 1,502kgMS/ha to 1,587kgMS/ha, and total milk production from 596,634kgMS to 630,599kgMS – increased methane and decreased nitrous oxide emissions.
- Decreased supplements fed from 1,595tDM to 1,189tDM – increased pasture intake and utilisation, less processing of supplements and decreased supplements made on farm – decreased carbon dioxide emissions.



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What process did they go through to make the changes?

Initial driver of stocking rate reduction was due to circumstances (high empty rate). The response that followed was about maximising this circumstance and so responded through feed budgeting and feed management, working with the team to ensure they could manage the feed well to drive performance. These changes were incremental over the five-year period. In addition, there was regular reviews of the system, ongoing feed budgeting, and adapting to other drivers including local freshwater regulations, and expectations from dairy company.



What other changes are planned?

Further refinement of the system is planned over the next 1-3 years including selling poor performing cows earlier, and potentially reducing stocking rate further or maintaining stocking rate but buying-in higher BW cows. Would also consider reducing stocking rate and growing own maize (rather than buying-in) if emissions levy likely to have a significant impact on profit beyond 2025.

What would drive or constrain these changes?

Profitability will drive the response. Constraints include access to capable labour, climatic challenges, regulation and the ongoing impacts of Covid-19 such as accessing labour and the flow-on effects in the supply chain.

What advice would you have for other farmers?

- Be engaged – a lot of these changes are not as hard as you think, and you're probably doing more than you realise. This means understanding what your numbers are and what they mean to your farm so you can consider what you might do about them. It is also about knowing how policy may impact you.
- Bring someone in to provide constructive advice – this will be more effective than regulation (at least regulation on its own).
- Focus on what you can do and what you can control.
- A lot of the gains are made by doing the basics better – strive for operational best practice and that benefits the broader business as well.