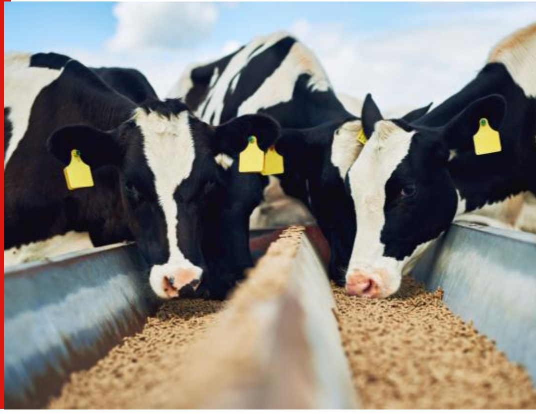
WESTPAC AGRICULTURE CLIMATE CHANGE ASSESSMENT

Southland Dairy GHG Transition Options

December 2022



Summary

The physical risks of climate change will become increasingly apparent in coming years with more extreme weather events like droughts and severe storms, as well as rising sea levels in some parts of New Zealand. Regions across the country will experience these physical risks differently and with varying impacts. Transition risks, from things like regulation and changing customer preferences as a society moves to address climate change, will also have a widespread effect on farmers nationwide.

New Zealand has made international climate change commitments. These commitments have a direct effect on the agricultural sector, with the specific goal of reducing greenhouse gas (GHG) emissions. The three main greenhouse gases these commitments are focussed on are methane (CH4); carbon dioxide (CO2); and nitrous oxide (N2O).

The key drivers of on-farm biological GHG emissions are:

- Amount of dry matter eaten (methane)
- Amount of protein in the diet (nitrous oxide)
- Amount of nitrogen fertiliser used (nitrous oxide and carbon dioxide).

The Government announced plans in October 2022 for pricing agricultural emissions, following the Primary Sector Climate Action Partnership / He Waka Eke Noa recommendations made in May. This programme has been established to meet the Government's emissions reduction targets of net zero emissions for long lived greenhouse gasses by 2050. This will see the agricultural sector paying an emissions levy by 2025.

Transition risk: Risks incurred while in the process of changing practices as part of collective efforts to address climate change, predominantly through the reduction of greenhouse gas emissions.

Upstream transition risks: Risks emerging from government and sector climate policy regulations.

Downstream transition risks: Market-based effects beyond the farm gate such as changing consumer preferences.

Changing consumer food considerations/preferences

Case study

To demonstrate the implications of transition risks on both profitability and GHG emissions, Lincoln University modelled a range of emission reduction strategies for an average dairy farm in Southland. The primary focus was to understand options available to reduce emissions, while also understanding the likely financial impact to the business from the changes.

The scenarios modelled were as follows:

- Reduce stocking rate by 10%, and improve per cow productivity
- Reduce stocking rate by 15%, and improve per cow productivity
- No nitrogen fertiliser applied, resulting in cow numbers reduced by 10%
- Reducing nitrogen fertiliser use by 50%, reduce stocking rate by 10%
- No supplementary feed purchased, resulting in cow numbers reduced by 15%
- Reduce supplementary feed by 50%, reduce stocking rate by 9%
- Planting 5ha of farm in native trees at a cost of $25,000/ha

Two key assumptions made in this assessment were above average farm management and a 'normal' climatic season. Additionally, these scenarios are modelled, and have not been assessed in real life whole farm research trials.

Table 1: Southland Dairy GHG Scenario Summary Results

Scenario		Cows	Cows/ha	kg MS Total	kg MS/ha	kg MS/ cow	Operating Profit ($/ha)	% Difference	GHG (T CO2e/ha)	% Difference
1	**Base farm**	602	2.6	251,608	1,133	433	$3,091		10.2	
2	**Reduce SR 10%, improve per cow**	542	2.4	250,045	1,126	478	$3,358	8.60%	9.68	-3.30%
3	**Reduce SR 15%, improve per cow**	512	2.2	248,169	1,118	501	$3,476	12.50%	9.67	-5.20%
4	**No N Fertiliser**	542	2.4	226,547	1,020	433	$2,833	-8.30%	8.45	-17.20%
5	**1/2 N reduce SR 10%**	542	2.4	238,462	1,074	456	$3,091	0.00%	9.12	-10.60%
6	**No supplementary feed**	512	2.2	215,059	969	434	$2,859	-7.50%	8.71	-14.60%
7	**1/2 Supplementary feed, reduce SR 9%**	548	2.4	229,186	1,032	434	$2,870	-7.10%	9.27	-9.10%
8	**5ha native forestry**	590	2.6	246,786	1,112	434	$2,961	-4.20%	9.85	-3.40%

Note: SR = Stocking Rate

Key findings

The 'reduce stocking rate and improve cow performance' scenarios both show a material improvement in farm profitability and reduction in GHG emissions. Reducing cow numbers reduced dry matter consumption overall, as the maintenance feed requirements for the missing cows resulted in a greater overall effect than the increase in dry matter consumption for the increase in cow performance. However, in these two scenarios, improvements in farm management is critical to improving per cow performance. Farmers need time to fully develop the skills and knowledge and farm changes required to improve per cow productivity; by improving pasture management, better genetic selection, and farm infrastructure improvements.

All scenarios resulted in the reduction of GHG emissions, yet most come at the expense of operating profit. These findings are consistent with other dairy farm GHG reduction trials completed in other parts of New Zealand.

The effect of the emissions reductions was priced at different carbon prices and different levels of free allocation and the effect on operating profit calculated (not shown here). At a lower carbon price and 95% free allocation (as the likely scenario in the short term), the effect of pricing emissions had a modest effect on operating profit. At higher carbon prices the effects are more pronounced, as expected. Until the final structure of the pricing of agricultural emissions program is confirmed in early 2023, the exact on-farm costs are not yet known. However, from 2025 the agriculture sector will have an emissions pricing programme; therefore, it's important to understand options available to influence on farm emissions.

The results presented above are specific to the Southland region. The extent to which agricultural producers will be able to reduce overall emissions or emissions intensity from their operations will vary depending on the specific characteristics of their systems. Considerable regional differences exist in emissions reduction options, which may mean region-specific mitigation options develop and evolve over time.

The research demonstrates the 2030 methane reduction targets of -10% can be achieved by implementing changes in farm systems, stock types, management of nitrogen fertiliser and supplementary feed. While reduction in stocking rates is a component of reducing GHG emissions, it must be accompanied by an improvement in per animal productivity in order to minimise the impact on farm profitability.

Risk from failure to decarbonise

If the agricultural sector is unable to reduce GHG emissions, downstream risks come in three main forms:

- **Market Trends**
  International consumers are increasingly aware of the impacts of food production on the natural environment, including GHG emissions, particularly for meat and dairy products. This increased awareness could lead to decreased sales volumes for food producers in favour of those perceived to be more environmentally friendly. Consumers are also incorporating increasing components of alternative diets evidenced by increased consumption of alternative protein and milk products.
- **Trade Access**
  New Zealand may be vulnerable to decreased competitive advantage based on the respective policy of competing producer countries. Given shifts in international climate policy, countries that import New Zealand's products may apply trade restrictions to products with relatively higher GHG emissions profiles, thereby creating risk for those producers who are unable to reduce their emissions.

These risks will become more evident if New Zealand fails to implement and reduce emissions from agricultural products.

- **Farm carbon efficiency vs farm profitability**
  We expect the proposed pricing of agricultural emissions will drive the sector to become more carbon efficient. Businesses that don't adapt to this new and evolving market may see operating costs increase which reduces profitability vs the market.

Actions for transition risks

Some of the adaption options for transitions risks are outlined below:

Feed management	- Improved efficiency of bought-in supplementary feed. - Using lower emissions supplementary fee,d such as maize.
Pasture, Crop and Soil Management	- Improve nitrogen fertiliser management. - Improving soil fertility and pH. - Improving irrigation management and water use efficiency. - Diversity in pasture swards to utilize water and nutrients efficiently. - Management of peat soils to minimize carbon loss.
Stock Management	- Seeking options to improve per animal productivity which may see slightly lower stocking rates. - Selective breeding practices such as low methane genetics or higher livestock production performance. - Adjusting finishing intensity.
Technology Investment	- Incorporating methane reduction technology that is available. - Using precision fertiliser application technology. - Using nitrogen fertiliser with urease inhibitors (eg.N-Protect and Sustain). - Improve energy efficiency on-farm and considering options for renewable energy.
Sequestration	- Planting ineffective or low producing areas in on-farm forestry. - Considering wetland construction or restoration as these are efficient carbon sinks. - Diversification with conversion of some land use from pastoral to horticulture/arable.

The journey to a lower emissions future will likely prove challenging for the industry; however the agricultural sector has proven time and again it can adapt and evolve to respond to new problems. Those who can improve productivity and lower emissions simultaneously will be able to take advantage of opportunities presented by the incoming carbon market along with seeing an improvement in overall farm efficiency.

For further information

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