Which emissions scenarios are best for kiwi farmers?

New Zealand farmers have more at stake than most kiwis when it comes to how agriculture is included in global climate change policy. Researchers at Motu Economic and Public Policy Research found that what is good for New Zealand is not always good for our farmers. Motu is a not-for-profit, non-partisan research institute.

"In NZ, 48% of greenhouse gas emissions are from agriculture: methane (30%) and nitrous oxide (18%). This is a very high proportion compared with the rest of the developed world," said Suzi Kerr.

"In the lead up to the upcoming Paris talks on national emissions targets, it is worthwhile for New Zealand to push for effective global mitigation for agriculture. This will lower the global costs of limiting warming to 2 degrees and lower the costs to New Zealand. It will also raise commodity prices for dairy and meat, which provides benefits for our farmers, though not enough to make farmers want global regulation if they would face the full emissions price." said Dr Kerr.

Recent modelling by Stroombergen and Reisinger explored the impact of three different global policy scenarios on New Zealand as a whole:

- All in this together – where all emissions (including agriculture) face the same price,
- Agricultural conundrum – all emissions are priced except those from agriculture, but countries are still accountable for those emissions,
- Agriculture out – all emission are priced, except those from agriculture and countries are not accountable for those emissions.

Relative to a world with no climate policy, meeting a 2 degree target without mitigating agricultural emissions (*Agricultural Conundrum* and *Agriculture Out)* would raise livestock commodity prices by around 14% in 2020 because less agricultural land would be available globally. Agriculture would compete for land with the forests which are needed to store carbon. Including agricultural emissions in global climate policy (*All in this Together*) cuts the global CO_2 price in half. It also raises livestock commodity prices (dairy and meat) by an additional 4% in 2020.

Motu has extended this analysis to explore the impacts on New Zealand farmers assuming they face either 10% or 100% of the emissions price in the first two scenarios but no emissions price in the third.

Across the scenarios that meet the global target, New Zealand benefits most in the *All in this Together* scenario as do New Zealand farmers under the previously proposed emissions trading

scheme (ETS) rules – with farmers initially facing only 10% of the emissions price. However, despite the higher livestock commodity prices in *All in this Together*, New Zealand farmers slightly prefer *Agriculture Out* if they face a 100% emission liability. Livestock commodity prices do not rise enough to match the higher costs with an emission liability and farmers do not benefit much from the lower CO2 price. The worst outcome for both New Zealand and New Zealand farmers is if we are responsible for agricultural emissions but other countries do not act to mitigate them.

The way methane is measured is also important. The most commonly discussed metrics are Global Warming Potential (GWP) and Global Temperature Change Potential (GTP).

GWP with a time horizon of 100 years has been adopted as the standard climate change metric under the UNFCCC. GWP now assigns methane a value of 28 times CO_2 whereas GTP assigns methane a value of just 7 times CO_2 for the same 100-year time horizon. This has little effect on New Zealand's preferences but a large effect on what scenario farmers will prefer.

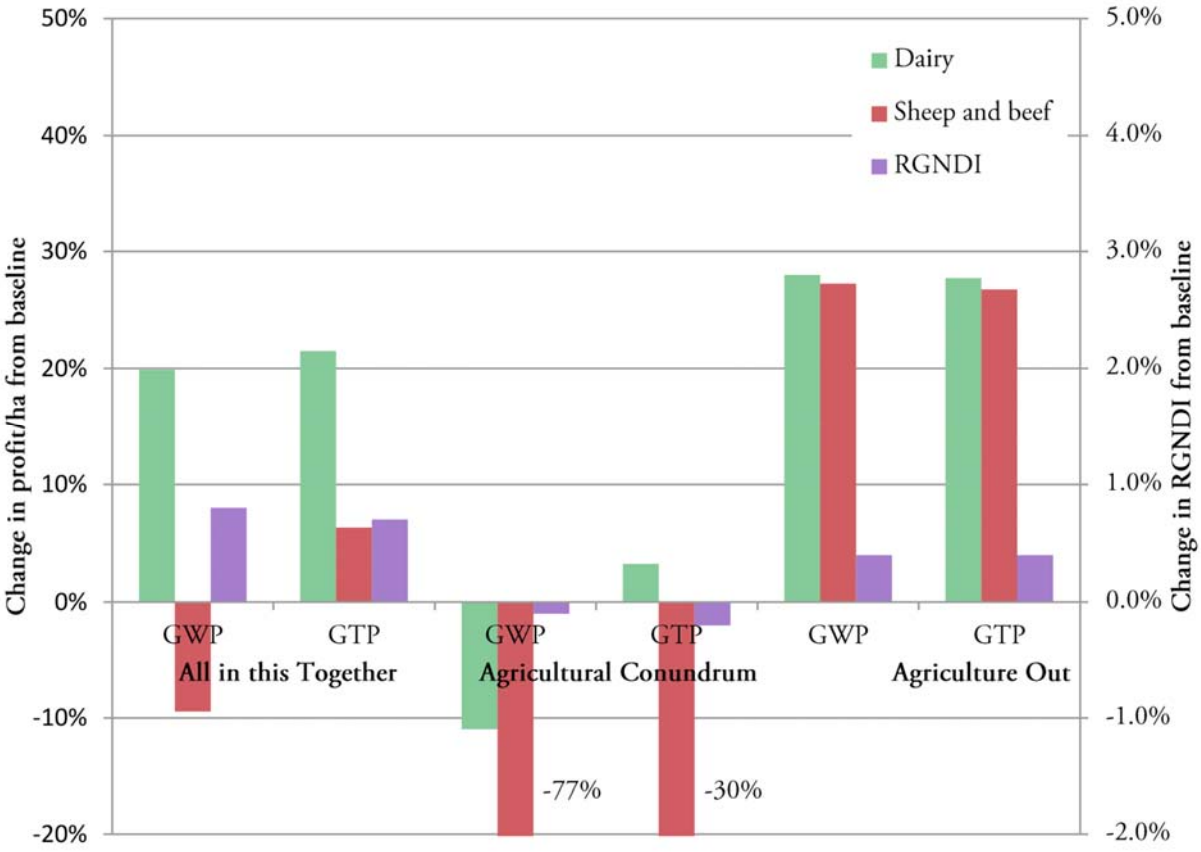

Figure 1 Change in profitability of two model farms compared with baseline in 2020 (left axis) alongside change in New Zealand's real gross net disposable income (right axis). This figure illustrates the differences between three global policy scenarios and two greenhouse gas metrics.

The GTP metric is better for NZ farmers than GWP simply because they would face a lower emissions cost. While GTP leads to higher global CO_2 prices and lower livestock prices, the fact that it puts much lower weight on methane relative to CO_2, more than offsets the differences. This contrasts with the impact on NZ's real gross national disposable income, for which GWP is always slightly preferred due to the lower global CO_2 prices. Overall though, which policy scenario the globe is in is still more important than which metric is chosen, even for farmers.

"Recent dairy prices illustrate that farmers face volatile international commodity prices – these prices do affect New Zealand as a whole but farmers bear the brunt. Similarly our modelling shows that farmers may see much larger gains or losses from international agricultural greenhouse gas policy than the country as a whole," said Dr Kerr.

"However, global climate policies on agriculture, and on forests, could lead to higher commodity prices for NZ's farmers. In the run up to COP21 in Paris, our Government will need to be mindful of these factors when negotiating an agreement, when deciding how to focus our efforts to support mitigation in developing countries, and also when deciding how large an emissions liability individual farms can bear," said Dr Kerr.

The Motu working paper Methane and Metrics: From global climate policy to the NZ farm by Motu researchers Suzi Kerr and Zack Dorner, was funded under the "Coordination and Cooperation for Effective Climate Policy Design and Implementation" programme funded by the Ministry for Primary Industries' Sustainable Land Management and Climate Change programme. All opinions, errors and omissions are the responsibility of the authors.

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An explanation of Global Warming Potential vs Global Temperature Change Potential

GWP reflects the effectiveness of different types of greenhouse gases (GHGs) at retaining heat energy in the atmosphere over a period of time. GTP, however, measures the global temperature change in an individual future year due to the emission now of a GHG, relative to CO_2.

An analogy is to think of installing insulation into one of two identical houses with identical heaters at identical settings. GWP is like measuring the difference in average amount of heat energy trapped in the two houses over 100 minutes, while GTP is like comparing the temperature difference between the two houses in 100 minutes time.

About Motu

Motu Economic and Public Policy Research is an independent economic research institute which never advocates an expressed ideology or political position. A charitable trust, Motu is founded on the belief that sound public policy depends on sound research accompanied by rigorous public debate.

Motu is the top-ranked economics organisation in New Zealand. It is in the top ten global economic think tanks, according to the Research Papers in Economics (*RePEc*) website, which ranks all economists and economic research organisations in the world based on the quantity and quality of their research publications.

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