Offsetting livestock methane emissions using forestry

There are many ways to carve up policy responses to different greenhouse gases. The gases all have different sources, warming potentials and atmospheric lifetimes. New Zealand has been right to treat relatively short-lived biogenic methane differently from long-lived carbon dioxide from the combustion of fossil fuels.

For centuries to come, past fossil carbon dioxide emissions will continue to keep the planet warmer than it would otherwise have been. We will have to live with that warming. The only way to reduce future additional warming from carbon dioxide is to stop burning fossil fuels.

By contrast, because the atmospheric lifetime of methane is relatively short, most of the warming from methane emitted before 2020 will be gone by 2050. But, as long as there are still herds of livestock burping methane, some level of warming will continue to be sustained into the future.

While New Zealand's climate mitigation targets recognise this split, there is an inconsistency in having a net target for long-lived greenhouse gases and a gross target for biogenic methane. Why should carbon dioxide emitters in the fossil fuel-based economy have access to New Zealand's limited supply of forestry offsets to assist them in meeting their emissions reduction target, but not emitters of livestock methane in the land-based economy?

Carbon dioxide stays in the atmosphere for centuries to millennia, so offsetting requires every tonne of carbon emitted to be stored in trees indefinitely. If emissions continue into the future, additional trees will need to be planted. In other words, offsetting fossil fuel emissions requires the planting of *more land in trees every year and ensuring that that stock of standing carbon is maintained, effectively, forever*. Ensuring the permanence of that forest cover will require ongoing maintenance including the management of risks from disease, fire and extreme weather events. The land is effectively locked up in perpetuity.

Forests remove carbon dioxide from the atmosphere, not methane. But forest offsetting works by creating a cooling effect to compensate for warming from emissions occurring elsewhere, so in theory it should be possible to use forestry to offset the warming from any greenhouse gas.

How would a warming approach to methane work?

Fortunately, we do not need to eliminate methane emissions to stop additional warming. If methane emissions were sustained at 2016 levels, after ten years methane concentrations in the atmosphere would stabilise. However, due to the atmospheric physics and chemistry of methane, it will take more than a century for *the warming* from those ongoing emissions to finally stabilise. That means, by the year 2050, holding New Zealand's livestock methane steady at 2016 levels would cause *additional warming* of 10-20% above current levels. In other words, "no additional warming" requires emission reductions of 10-22% below 2016 levels by 2050, and 20-27% by 2100 (see figure 1 below). Any target below those levels would help reduce our contribution to global warming.

The Parliamentary Commissioner for the Environment commissioned research on how offsetting the warming caused by biogenic methane with trees might be transparently and rigorously accounted for. The shorter lifetime of methane in the atmosphere means that offsetting works very differently to fossil fuel emissions. The research found that the full impact of a steady, ongoing flow of methane on warming could be offset by a one-off planting of plantation forestry. In other words, if methane emissions were to be reduced in future – for example, from successful methane-reducing technologies or from changes in stocking rates – some of the land could be freed up for other uses. Offsetting methane emissions through afforestation need not permanently remove future land use options.

The afforestation required (in commercial pine) to permanently offset the warming from different animals in our national herd is displayed in an infographic below (figure 2). Planting around 770,000 hectares of new commercial pine forest by 2050 would have a similar effect on warming as reducing gross methane emissions by 10%.

From a policy perspective, this opens the possibility for farmers to meet their emissions reductions through efficiency improvements, new technology, or offsetting. Having a separate Emissions Trading Scheme for methane makes sense for reducing an ongoing stream of emissions rather than getting emissions to zero as we must do with carbon dioxide. It would ensure that whatever level of methane emissions we aim to stay within would be allocated to the most efficient producers.

It would also mean that the land-based sector of the economy wouldn't be losing land permanently to offset emissions from fossil fuel users. Operationalising this approach would require removing the right for fossil fuel emitters to offset their emissions through forestry. This could be achieved progressively and without affecting existing property rights. The effect would be to increase the New Zealand Emissions Trading Scheme price and allow the government to auction more emission permits, generating revenue that could be used, for example, to retire erosion prone land in native trees. It would also enable the Government to honour commitments not to further restrict the land use opportunities of low value land returned to or retained by iwi Māori in areas such as the East Coast where tree planting on vulnerable land is essential.

References:

https://pce.parliament.nz/media/03bpa3sn/how-much-forestry-would-be-needed-to-offset-warming-from-agricultural-methane.pdf

https://pce.parliament.nz/media/cdfhd4mr/a-note-on-new-zealands-methane-emissions-from-livestock.pdf

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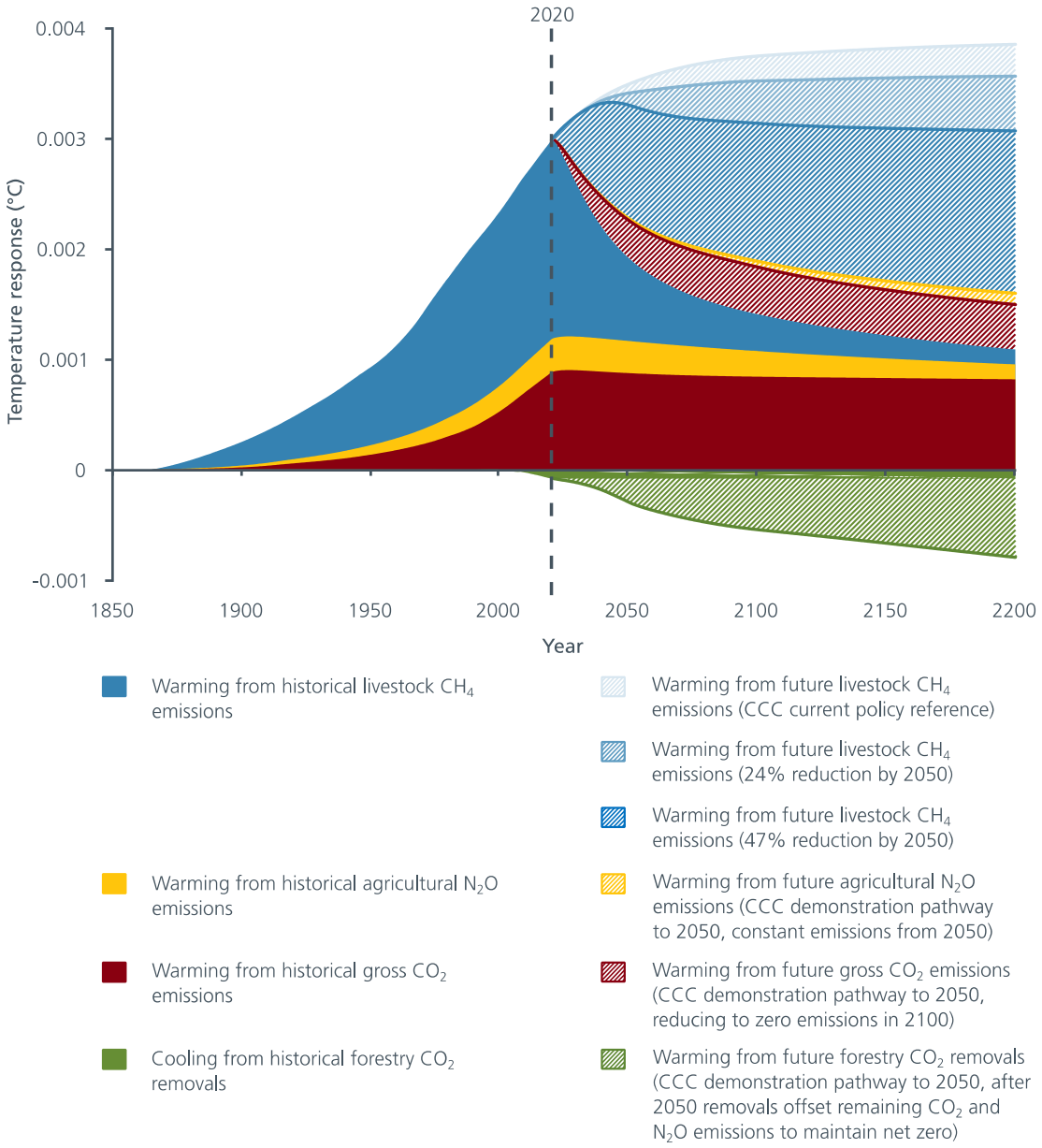

Figure 1: Warming from past emissions and illustrative pathways for future emissions. The solid shaded areas show the warming from past emissions – this warming is already 'locked in'. The hatched areas show the warming from future emissions that can potentially be avoided by reducing emissions. Deep, rapid and sustained reductions in gross emissions of livestock methane, fossil carbon dioxide and agricultural nitrous oxide will be needed – as well as enhanced carbon dioxide removals from forests – to minimise the warming from New Zealand's future emissions.

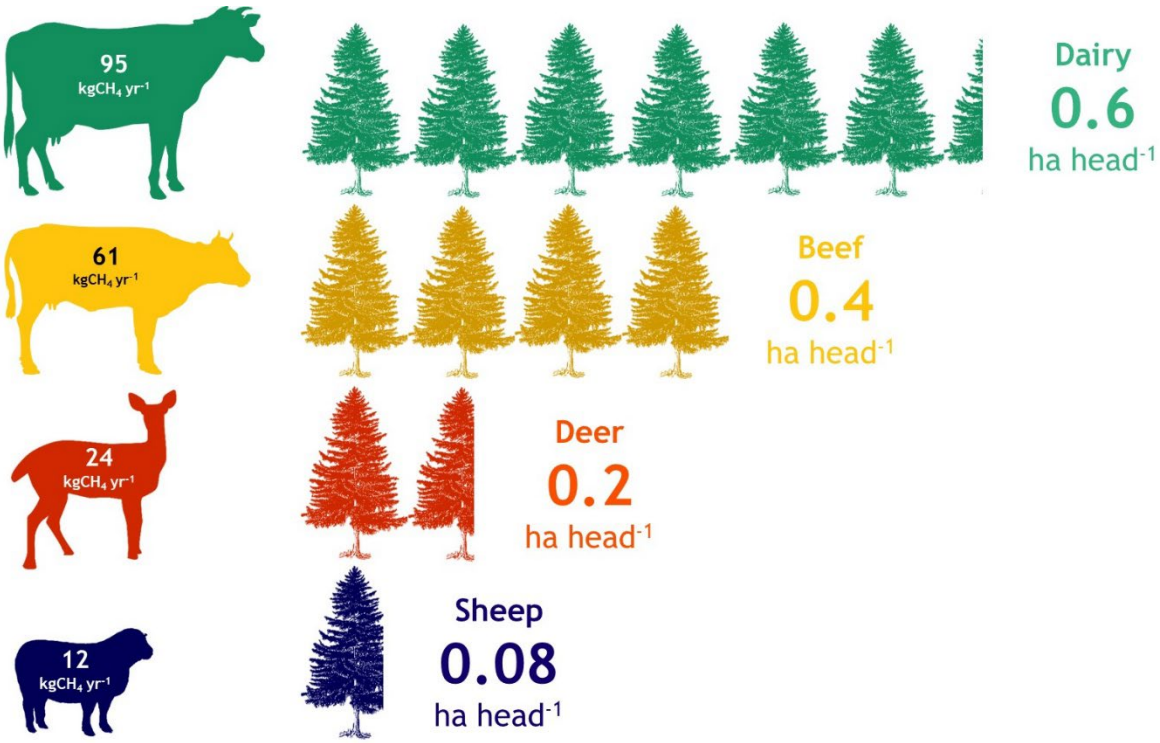

Figure 2: Area of pine plantation forest needed to offset warming from different ruminant animals.