FOCUS ON WARMING, NOT JUST EMISSIONS

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In Chapter 7 of AR6, the IPCC's 2021 report into the physical basis of climate change, a small explosion occurs. On page 123, the report states that, 'Expressing methane emissions as CO_2 equivalent emissions using *GWP-100 overstates the effect of constant methane emissions* on global surface temperature *by a factor of 3-4 [...] while understating the effect of any new methane emission source by a factor of 4-5'*.

This is revolutionary. And it matters so enormously because when we accurately understand the impact of methane emissions from ruminants, our land use options change. At a stroke the argument for land sparing, and the inevitable intensification of livestock agriculture that this leads to, is weakened. Immediately, the radical benefit of agroecological and regenerative agriculture becomes clear.

If we are to use land to address the multiple crises we face in nature, while producing enough high quality nutrition for all of the people on this planet, then accuracy is essential when assessing the global warming impact of agriculture.

The science referred to in AR6 is the product of research by Professor Myles Allen at the Oxford Martin School with Michelle Cain, Dave Frame, John Lynch, and Raymond Pierrehumbert. Professor Allen was a lead author on the IPCC's Special Report: Global Warming of 1.5 Degrees.

It shows categorically that methane from stable or slightly dwindling populations of cattle and sheep are not causing additional global warming. Although ruminant livestock produce methane almost constantly, the focus on their emissions is misleading – *it's the warming impact of those emissions that actually matters*. Far from being unsustainable as some people have argued (e.g. Poore and Nemecek), grass-based, low input cattle and sheep systems, such as agroecological systems, can become rapidly warming neutral, and they can help to restore biodiversity and soil health.

The Oxford Martin team has published several papers that explain both the science, and the use of a revised metric, GWP*, to measure the global warming potential of methane (Oxford Martin School, Climate metrics under ambitious mitigation). In a 2020 piece for Environmental Research Letters, John Lynch et al explain that: 'CO2-equivalents have become a near-universal means of reporting greenhouse gas emissions, and in many cases are used to directly infer their climate impacts or role in mitigation strategies—even if such an expansive application was never intended. Given this, it is important to have a means of deriving CO2-equivalents that provides a reliable link between reported emissions and their warming impacts. As demonstrated, in many cases

conventional use of GWP100 does not achieve this, while GWP* does.'

GWP* accurately characterises the warming impact of methane for the first time. While carbon dioxide (CO_2) and nitrous oxide (N_2O) are active in our atmosphere for many generations, methane is broken down in about a decade. This means that the methane emissions of a herd of 100 cows today are simply replacing the emissions that were first produced when that herd was established by a previous generation of farmers. There was an initial pulse of warming when the herd was established, but there is no on-going warming from that herd.

As an example, under GWP*, total UK agricultural emissions fell from 45.6 million tonnes of CO_2 equivalent ($MtCO_2e$) in 2016 to just 9.5 $MtCO_2e$*. Of these emissions, warming from CO_2 and N_2O are the same as previously reported (5.6 + 14.3 = 19.9 $MtCO_2e$), but methane is recalculated as -10.6 $MtCO_2e$*. That's a negative value because methane levels have fallen since the base year of 1996, the reference point for comparing 2016 emissions. (It should be noted that ruminant populations have also fallen in the USA and the European Union.)

Lynch et al continue: 'Using GWP100 to direct climate change mitigation strategy could be unfair, inefficient, and dangerous. Unfair, as it does not provide a clear link between emissions and climate change contribution, and could lead to an expectation that some actors (long-term methane emitters) have to undo their past warming, while others (CO_2 emitters) merely have to limit further temperature increases. Inefficient, as it would overstate the level of action needed to offset long-term sustained methane emissions, while simultaneously undervaluing the potential short-term benefits of reducing these methane emissions. Dangerous, as it can greatly understate the impacts of increasing methane emissions, and obscure the fundamental need for net-zero CO_2 emissions as soon as possible, regardless of what mitigations are made to shorter-lived climate pollutants.'

The science shows that enteric methane emissions must still fall – but to continue having a neutral impact, they only need to fall by 10 per cent by 2050. Stuart Roberts, deputy president of the UK National Farmers' Union, put it simply when he wrote in Countryside Online, 'If we continue gradually declining methane emissions it would make no further contribution to global warming.'

The use of GWP* also shows the danger of increasing ruminant numbers – while a continued shift towards more highly-stocked indoor ruminant systems would contribute additional CO_2 and N_2O emissions, for example from new building requirements, monoculture feed production, feed distribution, and slurry management.

By contrast, outdoor agroecological systems can produce significantly smaller CO_2 and N_2O footprints. By mainstreaming agroecology we would see first a national and global redistribution of ruminant livestock (as rotation is restored as a staple component for all farm systems) and a natural reduction in numbers (as farm business decisions become land-, rather than volume-oriented).

Lynch et al conclude, 'There is an additional danger, which is to the perceived environmental integrity of climate policy. *Basing climate policies and emission trading systems on a metric that demonstrably fails to reflect the impact of different emissions on global temperature, while at the same time claiming these are designed to deliver a long-term temperature goal, risks undermining confidence in the entire strategy.* GWP* provides a straightforward means of dealing with these issues, calculating genuinely warming-equivalent emissions using information that is already being reported in the UNFCCC system.'

Soil regeneration and ruminant agriculture

In the UK, farmers own and manage more than 70 per cent of the land. Unfortunately, many of them

feel marginalised and threatened by the exaggerated focus on ruminant methane in causing global warming. This mis-characterisation runs the risk of alienating precisely the constituency we must inspire in the race to mitigate and adapt to climate change, to restore biodiversity, and increase our nutritional and soil security.

The Oxford Martin science shows us that cattle and sheep are not the enemy. GWP* is already being used by some farmers to footprint the warming impact of their farm businesses. The metric can be used to accurately inform farm business plans, and indicates the value of mitigating climate change by growing trees, hedges, and establishing ponds and diverse species-rich grasslands. These interventions should be integrated within whole farm systems to offer the greatest benefit, so that in addition to sequestering carbon they help to restore biodiversity, improve soil health, and restore and manage water flows. Renewable energy generation can be used to mitigate emissions even further. Additional flora for climate mitigation will also create the potential for greatly improved animal health and welfare, with more shelter from extreme weather, more nutritional diversity in the sward, and better natural management of pests and diseases.

For clarity, GWP* is not a prescription for business as usual. As the population grows, humanity must also reduce its per capita meat and dairy consumption. But for enteric methane to continue having a neutral impact, emissions need only fall by 10 per cent by 2050.

Cattle and sheep have been part of the European landscape for generations and this research shows that they can be for many years to come. For this, we need a new consensus to emerge – one that focusses on warming from emissions rather than on the emissions themselves – and which mobilises more farmers to produce nutritious, affordable, quality food, while sequestering carbon, restoring nature, and helping to establish rural economic resilience.