# Pathways to climate neutral red meat production

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# Disclosure

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# Paris Agreement

## Article 2

*Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change*

i.e. the goal can broadly be described as
climate stabilization

# Different goals for different gases

"Stabilizing the climate will require strong, rapid, and sustained reductions in greenhouse gas emissions, and reaching **net zero CO2** emissions.

**Limiting** other greenhouse gases and air pollutants, especially **methane**, could have benefits both for health and the climate," said Zhai.

IPCC Newspost, 9 Aug, 2021

https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/

# GWP100 – no scientific argument

The GWP has become the default metric for transferring emissions of different gases to a common scale; often called '$CO_2$ equivalent emissions' (e.g., Shine, 2009). It has usually been integrated over 20, 100 or 500 years consistent with Houghton et al. (1990). Note, however that Houghton et al. presented these time horizons as 'candidates for discussion [that] should not be considered as having any special significance'. The GWP for a time horizon of 100 years was later adopted as a metric to implement the multi-gas approach embedded in the United Nations Framework Convention on Climate Change (UNFCCC) and made operational in the 1997 Kyoto Protocol. The choice of time horizon has a strong effect on the GWP values — and thus also on the calculated contributions of $CO_2$ equivalent emissions by component, sector or nation. There is no scientific argument for selecting 100 years compared with other choices (Fuglestvedt et al., 2003; Shine, 2009). The choice of time horizon is a value judgement because it depends

IPCC 5AR Ch 8, p. 711

# IPCC AR6 Terminology

**Carbon neutrality** Condition in which anthropogenic $CO_2$ emissions associated with a subject are balanced by anthropogenic $CO_2$ removals. The subject can be an entity such as a country, an organisation, a district or a commodity, or an activity such as a service and an event. Carbon neutrality is often assessed over the life cycle including indirect ("scope 3") emissions, but can also be limited to the emissions and removals, over a specified period, for which the subject has direct control, as determined by the relevant scheme.

**Greenhouse gas neutrality** Condition in which metric-weighted anthropogenic greenhouse gas (GHG) emissions associated with a subject are balanced by metric-weighted anthropogenic GHG removals. The subject can be an entity such as a country, an organisation, a district or a commodity, or an activity such as a service and an event. GHG neutrality is often assessed over the life cycle including indirect ("scope 3") emissions, but can also be limited to the emissions and removals, over a specified period, for which the subject has direct control, as determined by the relevant scheme. The quantification of GHG emissions and removals depends on the GHG emission metric chosen to compare emissions and removals of different gases, as well as the time horizon chosen for that metric.

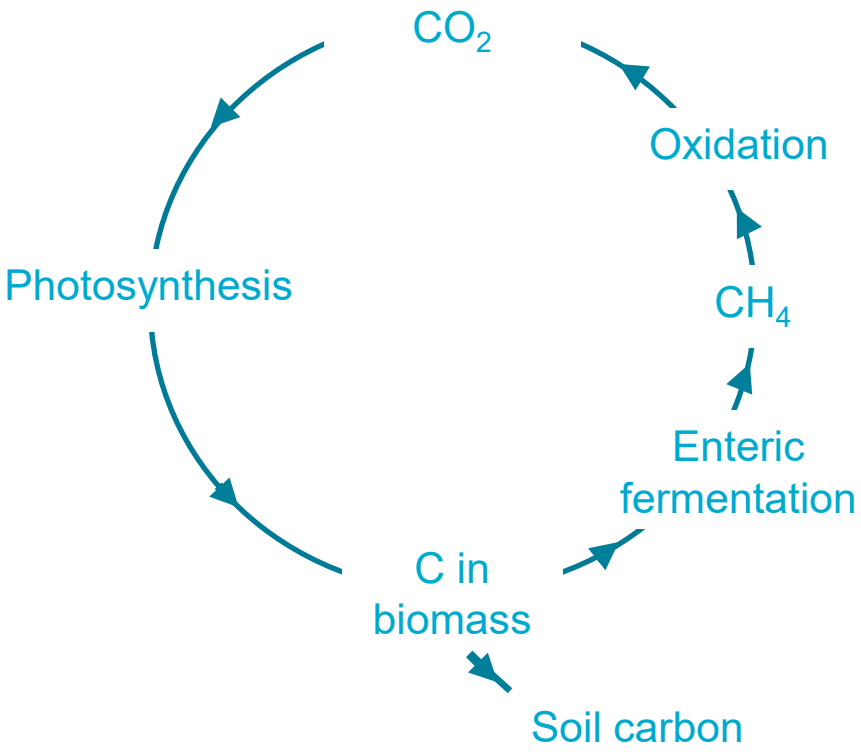
# IPCC AR6 Summary for Policymakers

- **D.1.8** Achieving global net zero CO2 emissions is a requirement for stabilizing CO2-induced global surface temperature increase, with anthropogenic CO2 emissions balanced by anthropogenic removals of CO2. This is different from achieving net zero GHG emissions, where metric-weighted anthropogenic GHG emissions equal metric-weighted anthropogenic GHG removals….
- Emissions pathways that reach and sustain net zero GHG emissions defined by the 100-year global warming potential are projected to result in a decline in surface temperature…(*high confidence*).

*Net zero CO2 is needed to stabilize climate*
*Net zero GHG is a climate cooling strategy*

*No more warming. Or no more emissions?*

# Biogenic methane:
# Part of a short-term carbon cycle



# Radiative forcing (RF) management approach

**RF footprint** – Present radiative forcing from current emissions plus the radiative forcing from historical emissions remaining in the atmosphere

**Climate neutral**– Condition whereby a system is making no net contribution to increase in radiative forcing

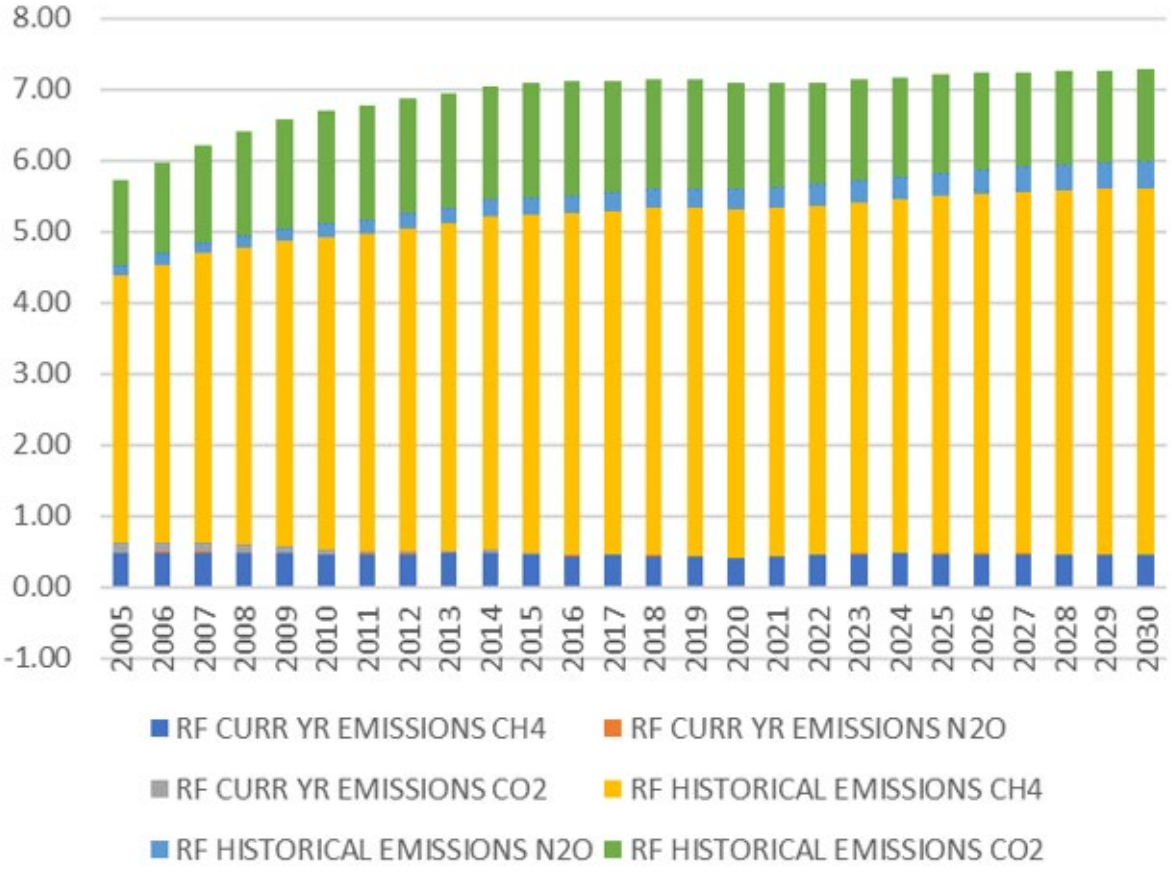
# Method

- Disaggregated timeseries 1990 to 2020
  - Cattle production (incl. feedlot finishing)
  - Sheep meat production (protein mass allocation with wool)
  - Goats
  - Domestic red meat processing
- Extrapolation to 2030
  - Business-as-usual (cattle numbers up 13%, sheep up 18%)
  - GHG mitigation and sequestration interventions
- RF footprint calculation
  - Parameters and equations from IPCC AR5
  - Units: $mW/m^2$

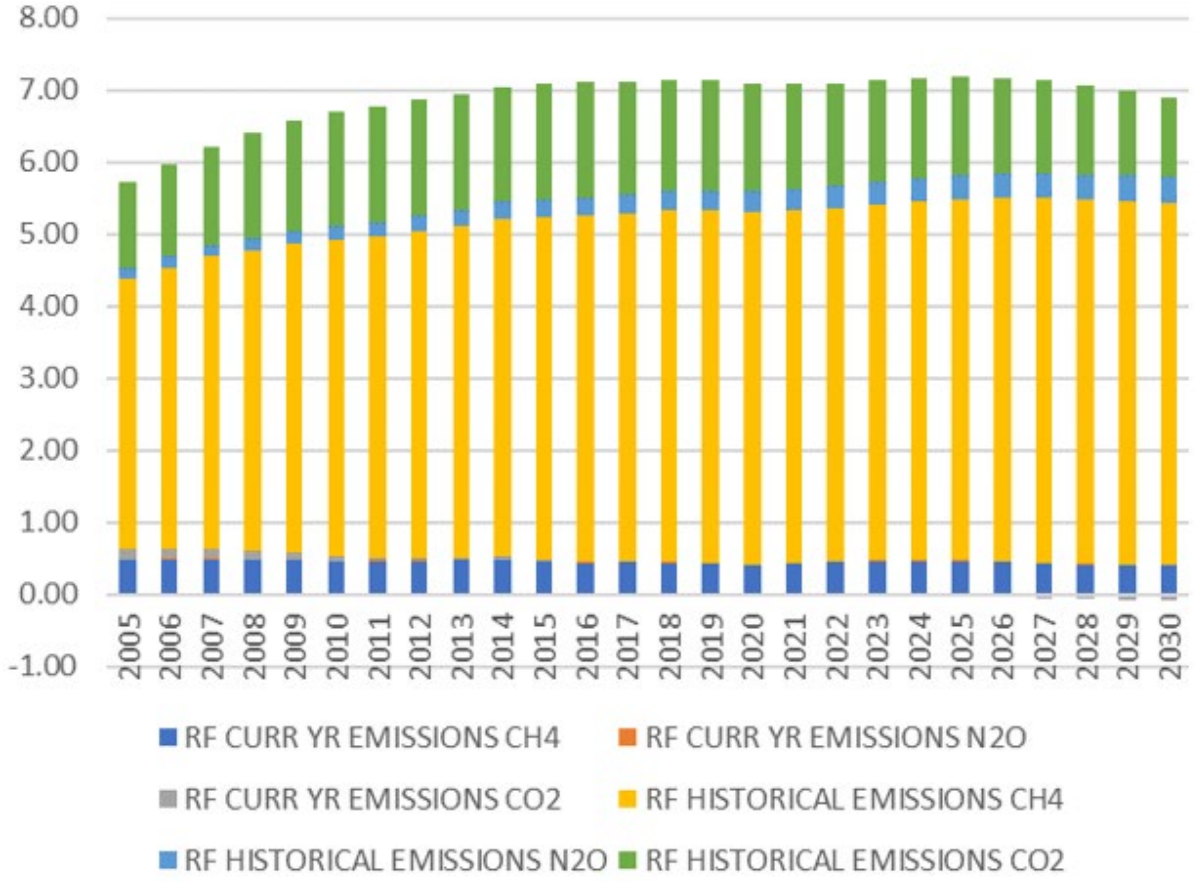
# Interventions

| Intervention | Sector | Efficacy | Adoption (initial) | Adoption (2030) |
|---|---|---|---|---|
| High impact feed additives (3-NOP, algae) | Feedlot | 49% | 2023–5% | 80% |
| High impact feed additives (3-NOP, algae) | Grazing | 11% | 2026–2% | 30% |
| Other feed additives (tannins, etc.) | Feedlot | 10% | 2023-2% | 10% |
| Other feed additives (tannins, etc.) | Beef cattle (grazing) | 5% | 0% | 0% |
| Other feed additives (tannins, etc.) | Sheep (grazing) | 1% | 2023-2% | 10% |
| Leucaena forage crop | Beef cattle (grazing) | 2% | 2023-2% | 20% |
| Desmanthus forage crop | Beef cattle (grazing) | 4% | 2023-2% | 20% |
| Breeding (lower methane emissions) | Grazing | 0.25%/y | 2023-1% | 3% |
| Trees on farm | Grazing | 25 MT/y | 2023-5% | 100% |
| Soil carbon storage | Beef cattle (grazing) | 7.8 MT/y | 2023-5% | 100% |
| Savannah burning management | Beef cattle (grazing) | 10.7 MT/y | 2023-5% | 100% |
| Herd management | Beef cattle (grazing) | 15% | 2023-5% | 80% |
| Flock management | Sheep (grazing) | 10% | 2023-5% | 50% |

# RF footprint (mW/m$^2$) - BAU



# RF footprint (mW/m$^2$) – Combined interventions



# Contribution of interventions

| Intervention | % |
|---|---|
| Trees on farm | 29.6 |
| Improved herd management | 23.7 |
| Savannah burning management | 15.6 |
| Soil carbon storage | 11.4 |
| Feed additives – beef cattle pasture | 7.4 |
| Feed additives – beef cattle feedlot | 5.3 |
| Improved flock management | 2.6 |
| Forage crops | 2.3 |
| Feed additives – sheep pasture | 2.0 |
| Breeding for lower methane | 0.1 |

# Key messages

- Australian red meat industry has contributed to global RF increase
- Since c. 2015 the industry has not contributed further
- In 2020 the RF footprint decreased (eq. $CO_2$ removal)
- With RF management, the industry can:
  - Continue to grow and contribute to food security
  - Within the constraints of climate stabilization
  - And assist other sectors to meet their climate goals
- RF footprint approach:
  - Multi-gas assessment without subjective weighting factors
  - Transparent presentation of impact over time
  - Good for performance tracking
  - Based entirely on IPCC parameters and models

# Thank you

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