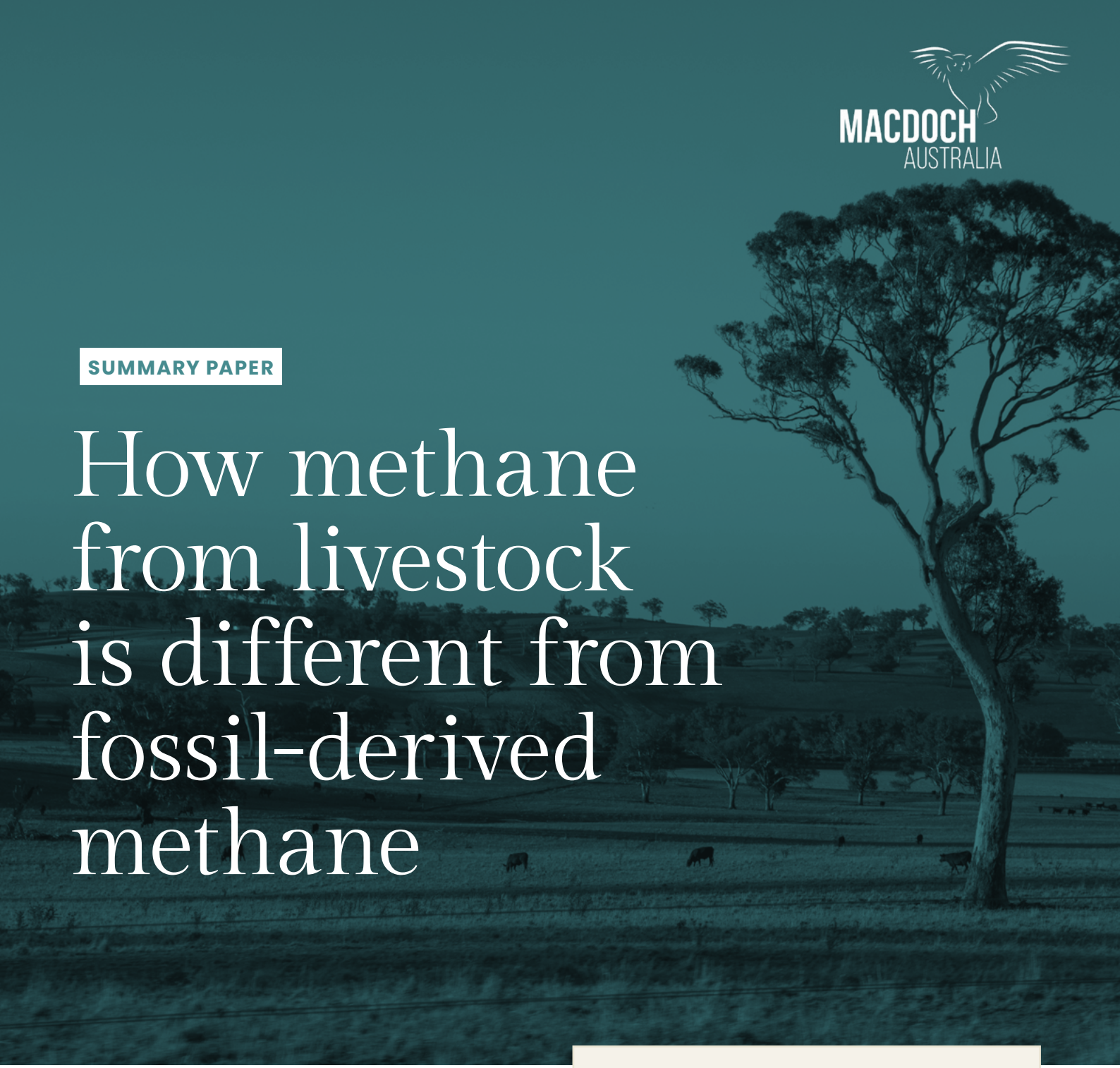


MACDOCH AUSTRALIA

SUMMARY PAPER

How methane from livestock is different from fossil-derived methane

Methane is a potent greenhouse gas, with a much stronger climate warming effect than carbon dioxide (28-fold stronger over 100 years).

While it is agreed that curbing all methane emissions should be a priority, a distinction should still be made between ancient fossil methane emissions and modern biogenic methane emissions.

Fossil-derived methane emitted by burning fossil fuels (mining, natural gas etc.) is from ancient stores, which *adds net carbon* to the atmosphere's carbon burden.

Methane emitted by livestock is a biogenic methane formed from *recent biological recycling* through photosynthesis.

KEY POINTS:

Livestock methane emissions are fundamentally different to fossil-derived methane emissions in respect to their originations, atmospheric behaviours and mitigation solutions.

Carbon atoms entering the atmosphere from *recent* biological processes are essentially recycled carbon atoms, operating in a type of "closed-loop" biological carbon cycle.

Curbing methane emissions is seen as a practical, technically achievable strategy.

Key distinctions between livestock methane and fossil-derived methane

Fossil-derived methane

Carbon atoms entering the atmosphere from burning or venting fossil fuels have not featured in the world's active carbon cycle for millions of years. As such, they represent "new" carbon added to a system that was, until recently, in equilibrium.[1]

Fossil methane emissions return geological carbon to the atmosphere that has been stored underground for aeons.

Examples include coalmining, natural gas leakage, and methanol production from natural gas.

The combustion of fossil fuel frees this carbon at a much greater rate than it can be removed, resulting in "net additional carbon" added to the atmosphere.

Burning ancient fossil fuels is increasing the total amount of carbon in today's atmosphere.

Livestock methane

Carbon atoms entering the atmosphere from recent biological processes such as livestock grazing (biogenic carbon) are essentially recycled carbon atoms.

Methane emitted by livestock starts out as atmospheric carbon dioxide, which is then captured by plants through photosynthesis.

Livestock consume the plants and convert carbon contained in plant carbohydrates (e.g. cellulose, starch) into methane, which is then exhaled or belched into the atmosphere.

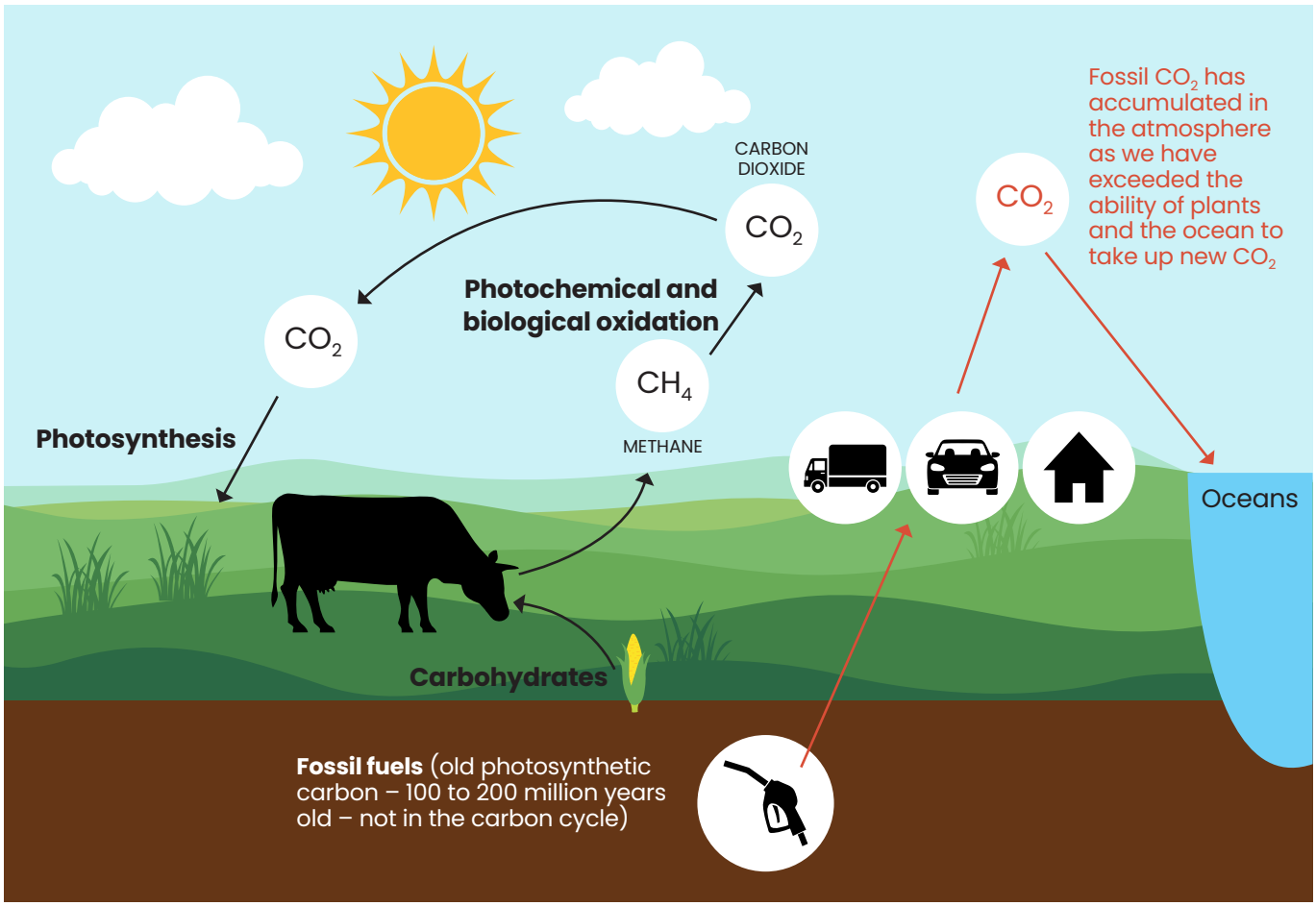
It therefore does not represent *new* carbon being added to atmospheric carbon levels.

Further, unlike the long-lived greenhouse gas CO_2, which builds up as a centuries-long "stock" of global warming gas, methane is classed as a "pulse" greenhouse gas. It has a relatively short life and typically decays, through chemical reactions in the air, back into CO_2 and water over a period of a decade or so.

The climate warming role of livestock methane

The recent focus of climate talks and actions on methane is due to its much stronger, shorter-term climate warming effect, compared with CO_2.

In the face of increasing international urgency, governments are looking for quick and efficient wins to reduce global emissions, focusing on its three most significant sectoral sources: oil and gas production, decomposing landfill waste, and ruminant livestock.



For ruminant methane, it is important to note that emissions levels depend a lot on the type of feed the animals are eating, and the management state of the pasture, and/or feedlot, within which the animal is raised. Poor manure management in industrial-scale feedlots can emit large quantities of methane, as can overgrazed or otherwise poorly managed rangelands. In contrast, well-managed rotational grazing can promote net soil carbon storage and removal of methane by healthy soil microbes.

Mitigating methane emissions from grazing livestock

Curbing methane emissions is a practical and achievable strategy in the global solution to climate change.

Acknowledging this is spawning a major international R&D effort plus technical and practice change innovations to reduce overall methane emissions from livestock.

Key initiatives and innovations include:

1. **Feed supplements:** Feed additives that inhibit methane generation in the rumen of grazing animals are proving to be a promising solution and can be effectively used to *reduce* enteric emissions by up to 90%.[2] These include:
    - ***Asparagopsis*:** The integration of an edible seaweed species called *asparagopsis* as a feed supplement for cattle has been found to be highly effective in reducing methane-producing gut bacteria.[3] Several companies are working on the development, licensing and distribution of *asparagopsis*-derived feed supplements around the world. *FutureFeed*, a major project established by the CSIRO, has been working to commercialise *asparagopsis* and has issued licenses to three seaweed producers in Australia to supply it to the livestock market.[4]
    - **Bovaer:** A dietary supplement for cattle and other ruminants developed by global health and bioscience company Royal DSM[5]. Trials on 50 farms across 14 countries have shown Bovaer can achieve average enteric methane reductions of 30% from dairy cows and 45% from beef cattle. Bovaer is authorised in many countries including Australia. In 2022, Coles entered a partnership with Queensland's Mort & Co Grassdale Feedlot to trial Bovaer in 10,000 beef cattle, the first in Australia to test the feed supplement in a real-world, commercial feedlot. Two successful trials so far have found the product reduced methane emissions by at least 50%.[6]
    - **Rumin8**: Rumin8 is another seaweed-derived supplement that inhibits the formation of methane in the cow's rumen which can be fed at an individual animal level and scalable to a full herd. Trial work is underway at several universities in Australia including University of WA, Murdoch University, University of New England and CQU.[7]
2. **Meat and Livestock Australia's CN30 program:**

    Meat & Livestock Australia (MLA) is spearheading an R&D program focused on achieving net zero greenhouse gas (GHG) emissions in the red meat and livestock sector by 2030.[8]

    Through MLA's CN30 program, the industry is implementing various measures to identify and seize greenhouse gas mitigation opportunities.

    These include inhibiting enteric fermentation, improving agricultural soil management and enhancing manure management practices.

    Since the 2005 baseline year, the industry has achieved a 78% reduction in emissions.[9]

1 IEA Bioenergy. 2022. Fossil vs biogenic CO2 emissions.

2 BeefCentral 2022. NAPCo signs agreement to use methane-inhibitor Bovaer through supply chain.

3 Source: Glasson et. al. 2022. Benefits and risks of including the bromoform containing seaweed Asparagopsis in feed for the reduction of methane production from ruminants. Algal Research 64: 102673 (*Ref*).

4 Tydinger, H and Demeter, A. 2022. Daily supplementation with land-based cultivated Asparagopsis reduces over 90% of methane emissions from beef cattle fed a high silage diet. Volta Greentech. Project Report Ejmunds Gard, Version 1.0 – 22 June.

5 See Royal DSM backgrounder *here*..

6 BeefCentral article (*Ref*).

7 AFR report 13 Oct 2022 (*Ref*), and Rumin8 media release 10 Oct 2022 (*Ref*).

8 MLA. 2020. The Australian Red Meat Industry's Carbon Neutral by 2030 Roadmap. Nov. 2020 (*Ref*). [Note: MLA has received some criticism about its CN30 strategy because of perceptions that it is assumed to require a reduced national beef herd (eg. During Senate Estimates hearings in the Australian Parliament – *Ref*).

9 MLA. (*Ref*).