# Calculator has gas solution

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A NEW calculator shows that with only small changes to management, cattle producers can completely offset the global warming effect of methane from their animals.

The man behind the calculator, author and founder of the carbon grazing principle, Alan Lauder, has worked with some of Australia's leading scientists to tackle the issue of livestock emissions and offsets from a practical and previously unconsidered approach.

In very simple terms the calculator takes into account the amount of methane that livestock emit in real time and then assesses how much carbon dioxide needs to be brought down from the atmosphere to offset the warming effect of those livestock (see 'how it works').

A calculation for 10 cattle running on 100 ha, demonstrated in the accompanying graphic, shows that the landholder would have to increase total soil carbon by just 0.5 percent to completely offset the warming effect of the methane emitted by those livestock.

This is because the slight increases made to soil carbon levels – which effectively pulls carbon dioxide out of the atmosphere – completely offsets the warming effect of the methane emitted by cattle and which still resides in the atmosphere.

When producers responded with the appropriate changes to management, the outcome would be the same for the atmosphere as if their livestock did even not exist, Mr Lauder said.

The calculator helped the livestock industry to nullify claims that meat production was always a major cause of warming through greenhouse gas emissions.

"This approach provides society with the outcomes it seeks, while at the same time allowing the grazing industry to get on with the job of producing food," Mr Lauder said.

The offset calculator is based on the same "radiative efficiency" figures that are relied upon by the IPCC to advise international governments.

It is still in a conceptual stage but Mr Lauder said it had been shown to a number of Australia's leading climate scientists and mathematicians who described it as a unique approach to the solution.

A key difference in Mr Lauder's approach lay in his treatment of the contrasting life cycles of the two main global warming gases, methane and carbon dioxide.

As methane enters the atmosphere, it is broken down into carbon dioxide and water vapour by OH molecules.

Because methane has a short atmospheric lifetime, the warming effect of the emissions into the atmosphere will reach equilibrium if the source is in a steady state.

## How it works

The offset calculator calculates the volume of carbon dioxide that needs to be removed from the atmosphere, in order to reduce radiative forcing (warming effect) by an equivalent amount to what the equilibrium mass of methane was producing.

"Provided the right amount of carbon dioxide is brought down to the landscape permanently, then this has the same effect as removing all the ruminant animals from the landscape in both the short and long term," Mr Lauder said.

After the volume of carbon dioxide that has to be removed from the atmosphere has been calculated, the next step is to decide what sink is going to be used to store the carbon from this carbon dioxide. It could be either the soil, trees or shrubs.

The calculator then shows what needs to be done to completely offset the warming effect of a given number of animals.

"It is then a case of adding in the emissions of your animals using the best available estimates that current science can provide.

"It goes right back to the basics and relies on the science of radiative forcing allocated to carbon dioxide and methane," Mr Lauder said.

"The temperature of this earth, and related energy flows, is determined by both the concentration and mix of the greenhouse gases.

"Each gas contributes to the total radiative forcing effect in the atmosphere. The calculator looks at how much carbon dioxide has to be removed from the atmosphere, to completely offset the radiative forcing effect (warming effect) of the equilibrium mass of methane produced by ruminant animals."

The global warming potential (GWP) figures on methane produced for governments change according to the time frame being considered, whereas Mr Lauder's approach is focused on the present.

The perturbation lifetime of methane can differ distinctly from the global atmospheric lifetime.

Methane as it applies to ruminant animals in Australia is in a steady state so needs to be accounted for differently. A new emissions source produces a different atmospheric outcome to a steady-state source.

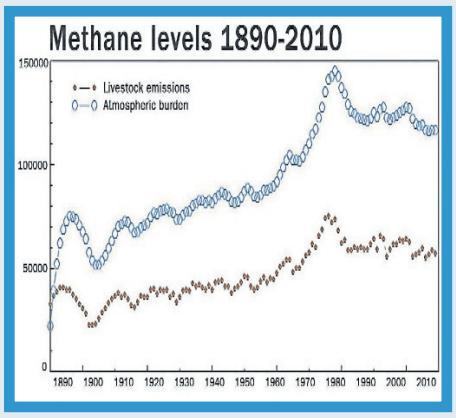
"All else being equal, new sources change the lifetime of existing methane emissions as a result of increasing the concentration of methane in the atmosphere.

"Not only is a new source of methane adding to radiative forcing through increasing atmospheric concentration, it is also adding to the radiative forcing of methane being produced by stable state sources."

As a first stage model the calculator currently relies on a constant number of animals releasing constant emissions each year.

This provides the figure of the equilibrium amount of methane residing full time in the atmosphere, due to a constant number of animals in a paddock.

"This is a very relevant approach, given that the emissions from ruminant animals in Australia peaked in the 1970s and have since declined a little (see graph)," Mr Lauder said.




**ADDING IT UP:**

## Methane levels soar in data

### The Lauder Methane Offset Calculator

This sample calculation has relied on inputs specific to one location. Methane emissions are influenced by the size of livestock and the quality of their diet. For the relevant soil carbon figure to use, make enquiries about local soils.

| | | |
|---|---|---|
| CO2 Radiative Forcing | 0.000014000 | watts/m2/unit mass (warming effect) **IPCC AR4 report - table 2.14** |
| CH4 Radiative Forcing | 0.000370000 | watts/m2/unit mass (warming effect) **IPCC AR4 report - table 2.14** |
| CH4/CO2 forcing ratio | 26.42857143 | this means the warming effect of methane is 26.4 times greater than carbon dioxide |
| Ratio emissions/year to atmosphere "equilibrium" CH4 amount | 2.05 | **from AussieGRASS (approx)** This figure explains that there is just over 2 yrs of methane emissions residing permantly in the atmosphere (assuming steady state emissions) |
| Number of Animals in paddock | 10 | Is the number of cattle in the paddock |
| kg Methane/Animal | 100 | kg/head/year (this is how much methane each animal releases a year) |
| Paddock area | 100 | ha (10ha/beast) (this is the area the 10 head of cattle are grazing) |
| Paddock total CH4 emissions | 1000 | kg/paddock (this is the total methane emissions of the 10 head of cattle for a year) |
| Paddock CH4 emissions in atmosphere | 2050 | kg in atmosphere on average (the amount of methane permanently residing in the atmosphere from the 10 head of cattle i.e equilibrium.) Net figure: emissions minus breakdown |
| Paddock CH4 emissions in atmosphere as CO2 forcing equivs | 54178.57143 | KG CO2 equivalents (of CH4 in atmosphere, use CH4/CO2 forcing ratio) This is the amount of carbon dioxide which has the same warming effect as equilibrium methane. |
| Convert to CO2 to carbon factor | 0.272727273 | (is 12/44) This is a ratio to show how much carbon would be in the landscape after carbon dioxide is brought down from the atmosphere by photosynthesis. |
| Carbon equivalents of forcing | 14775.97403 | kg of carbon (This figure shows how much increased carbon we have to measure in the landscape, to prove that enough CO2 has been removed to offset the CH4 equilibrium. |
| Kg to tonnes | 1000 | This is just the factor for converting kg to tonnes |
| Tonnes carbon equivalent | 14.77597403 | tonnes of carbon required to offset equilibrium CH4 |
| Carbon in wood | 0.5 | wood is aprox 50% carbon when dried |
| wood equivalents | 29.55194805 | tonnes wood required to offset CH4 (just doubling the figure of carbon required) |
| Average woodland above ground | 60 | tonnes/ha (tree basal area about 10 m2/ha) This figure changes according to average rainfall |
| Ha of new forest required | 0.492532468 | Ha trees to plant to offset CH4 (half a Ha of the 100 Ha would have to be planted to trees) |
| Soil concentration (0-30cm) | 0.5 | % (average sort of rangeland value; happens to be better country capable of growing trees) |
| Soil C/Ha (0-30cm) | 30 | aprox tonnes/ha (0-30cm at about 0.5%C) grazing land (note: temp influences carbon levels) |
| Paddock soil C (0-30 cm) | 3000 | tonnes soil C to 30cm in paddock (carbon in 100 Ha before management change to offset CH4) |
| % increase in soil C mass required | 0.492532468 | (atmosphere tonnes C equiv/paddock soil C tonnes) This is % increase on 3000 tonnes |
| New soil carbon concentration required | 0.502462662 | % (new soil carbon% required to offset CH4) i.e. going from 0.5% to 0.502462662% |

Early suggestions are the carbon offset has to be increased by 25% (to cover the indirect Radiative Forcing of the equilibrium methane e.g. warming effect of water vapour & effect on ozone) If Saltbush is planted to supply protein in dry times, or for resting pastures after rain, then it could offest methane as trees do. One assessment at Deniliquin arrived at 5.5 tonnes carbon/Ha

**A TMOSPHERIC methane densities have increased from 700 parts per million (ppm) before the industrial revolution (pre-1750) to approximately 1735 ppm in 2007.**

**Researcher Alan Lauder believes this ongoing increase must be the result of sources other than livestock emissions, because livestock methane emissions in Australia peaked in the 1970's and has in fact declined a little since (see above graph).**

**The top line on the graph, which shows the atmospheric burden, quantifies the actual warming effect caused by Australian livestock over time. This atmospheric burden is what climate scientists say has to be offset by bringing down carbon dioxide from the atmosphere and storing its carbon in the soil.**

**The top line is the net mass of methane attributed to livestock.**

**The net mass is emissions less what has broken down.**

**"The reason the lines have moved further apart, is because other emissions have slowed the time it takes methane to break down.**

**"The IPCC places a different lifetime figure on methane breakdown, depending on whether it is emissions from a steady state emissions or new emissions."**

**Mr Lauder said one of the reasons that livestock copped such a bad wrap on climate change, was because methane from all sources was treated equally.**

**He said the atmosphere had always had methane entering it and it had "always worked" to break it down.**

**Indeed atmospheric methane along with other greenhouse gases, played an essential role in stopping the earth from freezing.**

**Methane only became a problem, however, when its densities exceeded the level required to keep warming in balance.**

**"What causes a lot of confusion is that people think it all has to break down, when in fact, nature only needs to get rid of enough from the past to get back to the equilibrium," Mr Lauder said.**

> "Emissions from ruminant animals in Australia peaked in the 1970s."