

Green Paper or environmental death warrant? Why any self-respecting Emissions Trading Scheme will include agricultural methane; and how it could work.

By Nichola Donovan, September 2008

Author's preliminary note

The author recognises that it is harder for an individual to comprehend the logic of arguments about agricultural methane if he/she has a personal interest in eating red meat and dairy products. As animals, we act to promote our (perceived) self interests, unless we choose to allow longer-term self, or non-self, interests – better known as 'morality' – to intervene. Therefore, the author (who is, herself, an 'aspiring' semi-vegan) asks non-vegan readers to consider this paper from outside their usual red meat and dairy consuming paradigm; lest the human impulse of self-justification be tempted to override logic. For red meat-eating, dairy-consuming politicians to succumb to the rationality of including agricultural methane in the ETS; it is likely that they will need to confront the grim reality of global warming, with honesty and imagination – something few of us dare to do.

Introduction

There are several prerequisites for the continuance of life on Earth, many of which are beyond human control – the avoidance of large meteors, for instance. So it is serendipitous that the most urgent prerequisite: the abatement of accelerated global warming (caused by human-related activity)¹; happens, for a time, to be within human control. Yet this truly unique opportunity will be squandered by the Australian and other world governments, unless a serious rethink on agricultural methane is immediately undertaken.

Recently, over 1,700 eminent scientific and economic experts urged the U.S. Government to ensure that their greenhouse gas emissions are reduced by 15 to 20 per cent (from 2000 levels) during the next 12 years, and by 80 per cent during the next 40 years; in order to have 'a reasonable chance of limiting warming to 2°C'.² Meanwhile, scientists from the Intergovernmental Panel on Climate Change (IPCC) predict that the forthcoming rise in global temperatures of between 1.5 and 2.5°C will have devastating effects on several world regions and populations: creating mass humanitarian crises³ which will, in turn, impact on other nations through the mass movement of 'climate refugees'. Should the global temperature rise exceed 2.5°C, as is probable given current political inertia; the consequences will be catastrophic at all levels.⁴

Right now, it is critical that planned reductions in carbon dioxide (CO₂) emissions be accompanied by large reductions in methane (CH₄), since methane is around 72 times more potent than carbon dioxide in heating the Earth's atmosphere in the short-term (that is: over 20 years).⁵ Since it is likely that the 'tipping' point for

¹ IPCC, 2007: *Summary for Policymakers*. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (April 2007) [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Sourced online: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-spm.pdf>

At 10: 'Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.'

² Campbell, David et al (a total of 1,733 Ph.D. or doctoral candidate professionals) 'US Scientists and Economists call for swift and deep cuts in Greenhouse Gas Emissions' (May 2008) sourced online:

http://www.ucsusa.org/assets/documents/global_warming/Scientist_Economists_Call_to_Action_fnl.pdf

³ Op cit IPCC, 2007: *Summary for Policymakers* 11-18

⁴ Ibid 10: 'For increases in global average temperature exceeding 1.5-2.5°C and in concomitant atmospheric carbon dioxide concentrations, there are projected to be major changes in ecosystem structure and function, species' ecological interactions, and species' geographical ranges, with predominantly negative consequences for biodiversity, and ecosystem goods and services e.g., water and food supply.'

⁵ Op cit IPCC, 2007: *Summary for Policymakers* at p.212 – Figure 2.14.

Also in: Russell, G.; Singer, P.; and Brook, B. 'Submission to the Garnaut Review ETS discussion paper' (2008) p.5. Available online: [http://www.garnautreview.org.au/CA25734E0016A131/WebObj/D0846772ETSSubmission-GeoffRussell-ProfPeterSinger-ProfBarryBrook/\\$File/D08%2046772%20ETS%20Submission%20-%20Geoff](http://www.garnautreview.org.au/CA25734E0016A131/WebObj/D0846772ETSSubmission-GeoffRussell-ProfPeterSinger-ProfBarryBrook/$File/D08%2046772%20ETS%20Submission%20-%20Geoff)

global warming – beyond which it will no longer be possible for humans to control the degree of warming – will occur some time within the next decade⁶; the importance of reducing methane emissions during this period (alongside similar reductions in carbon dioxide) cannot be overstated. Also, unlike the methods by which most carbon dioxide is produced, which usually co-generate sulphate aerosols (which have a cooling effect on the Earth's atmosphere); the activities which generate methane provide no such mitigation – they 'produce only warming'.⁷

Yet, for reasons not fully discernible, the Australian Government, and its chief advisors on global warming, have thus far chosen to exclude agricultural methane from their proposed 'Carbon Pollution Reduction Scheme' (better known as the 'Emissions Trading Scheme' or 'ETS'). In its recent *Green Paper* on the proposed ETS, the Government states that it is 'disposed to include agriculture emissions in the scheme by 2015 and to make a final decision on this in 2013'.⁸ While the Government and its chief economic advisor on the ETS, Professor Ross Garnaut, concur in excusing agricultural methane from inclusion in the ETS for (at least) five years after the scheme's proposed commencement; their reasons for doing so are somewhat mysterious. Although they allude to the cost of including agricultural emissions in the ETS as being one major inhibitor; the more likely reasons that both the Government and Professor Garnaut have chosen to exclude methane from the proposed ETS are: a fundamental lack of scientific understanding as to its importance; and a lack of political will to challenge the livestock and dairy industries and to re-educate the average, red-meat-eating Aussie.

In the context of broader legal and scientific discussion, this paper attempts to offer a simple explanation of the science connecting anthropogenic methane production with global warming, to demonstrate its importance in any ETS. It then analyses several arguments for and against inclusion of agricultural methane in Australia's ETS; before touching on the incidental advantages of agricultural methane reduction. Finally, this paper attempts to frame a practical proposal for including agricultural methane in the ETS, should our Government have the courage and foresight to do so.

Why all the fuss about methane?

Methane is a relatively short-lived greenhouse gas⁹, derived from anthropogenic (human-made) and natural sources. Natural sources of methane include: wetlands; oceans; forests; bushfires; termites and geological sources. According to the latest comprehensive study, however, it is anthropogenic sources of methane that

[%20Russell%20-%20Prof%20Peter%20Singer%20-%20Prof%20Barry%20Brook.pdf](#)

⁶Hansen, J.E. et al 'Dangerous human-made interference with climate: a GISS modelE study' (May 2007) 7 (9)

Atmospheric Chemistry and Physics 2287-2312 Sourced online: <http://www.atmos-chem-phys.net/7/issue9.html>

⁷ As the director of NASA's Goddard Institute for Space Studies, James (Jim) Hansen, puts it: 'The distinction between CO₂ and the trace gases is important, because the same activities that produce most of the CO₂, burning of fossil fuels and land conversion, also produce aerosols. The net climate forcing by aerosols, direct plus indirect, is almost certainly one of cooling which would tend to at least partially obscure globally warming due to increasing CO₂. Thus I suggest that the sharp global warming trend that began in the 1960s was primarily a consequence of the activities producing the trace gases, mainly CFCs and methane (CH₄), as these gases produce only warming.'

Hansen J.E. 'The sun's role in long-term climate change' (November 2000) 94 *Space Science Reviews* 349–356

⁸Australian Government Department of Climate Change *Carbon Pollution Reduction Scheme: Green Paper* (July 2008) para 2.19. Sourced online: <http://www.climatechange.gov.au/greenpaper/index.html>

⁹ Opcit, Russell; Singer & Brook 'Submission to the Garnaut Review' at pp 3-4: '[Carbon dioxide] has a very long atmospheric lifetime. About 25% of every tonne emitted will still be in the atmosphere 500 years later. Methane, on the other hand, has a very short atmospheric lifetime. About 66% of every tonne emitted is gone in 10 years and 90% is gone by 20. Some of the CO₂ now in our atmosphere was put there during the burning of trees during deforestation 500 years ago, but almost none of the methane is older than 20 years.'

account for around 72 per cent of total global production.¹⁰ In Australia, methane is predominantly produced through a process of enteric fermentation¹¹ in ruminant¹² livestock. This process, alone, accounted for 2.974 mega tonnes (Mt) of methane produced in Australia in 2005.¹³ Taking into account the methane generated by prescribed burning of tropical savanna and grasslands – principally for pasture management (0.289 Mt); and the methane generated by management of livestock manure (0.094 Mt – including pig, chicken and other animal manure); Australia's total estimated methane attributable to the farming of cows and sheep during 2005 was around 3.1 Mt – that's almost 58 per cent of our total anthropogenic methane emissions (5.377 Mt).¹⁴ Other anthropogenic sources of methane in Australia that generate significant volumes are the energy industry (1.307 Mt or 24 per cent, including fugitive emissions from the extraction of coal, oil and gas); and landfill/waste treatment (0.783 Mt or 15 per cent).¹⁵ Less significant contributors to Australia's anthropogenic methane volume include deforestation (0.086 Mt or less than 2 per cent in 2005) and rice cultivation (0.01 Mt or 0.19 per cent).¹⁶

The fact that during the first 20 years after its release, methane is 72 times more potent than carbon dioxide in causing atmospheric temperatures to rise by 'radiative forcing' – a measure of the degree to which a gas makes it easier for energy to arrive at the planet's surface, and/or harder for it to leave¹⁷ – is not in scientific dispute. The multiple of 72 for calculating the equivalent radiative forcing of methane to carbon dioxide, over 20 years, is clearly stated by the IPCC in its 4th Assessment Report.¹⁸ Yet it may come as some surprise to learn that by applying the factor of 72 to Australia's 2005 *Greenhouse Gas Inventory*, it is possible to demonstrate that agricultural methane outstripped Australia's total emissions from electricity generation in

¹⁰Chen, Y-H. and Prinn, R.G. 'Estimation of atmospheric methane emission between 1996-2001 using a 3-D global chemical transport model' (2006) 111 *Journal of Geophysical Research*, D10307, doi:10.1029/2005JD006058. Figures as quoted in Forster, P., V. Ramaswamy, P. Artaxo, T. Bernsten, R. Betts, D.W. Fahey, J. Haywood, J. Lean, D.C. Lowe, G. Myhre, J. Nganga, R. Prinn, G. Raga, M. Schulz and R. Van Dorland, 2007: *Changes in Atmospheric Constituents and in Radiative Forcing*. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Chapter 7, Table 7.6 on p.542
Sourced online: <http://www.ipcc.ch/ipccreports/assessments-reports.htm>

¹¹Garnaut, R. *Garnaut Climate Change Review: Draft Report* (June 2008). Sourced online: [http://www.garnautreview.org.au/CA25734E0016A131/WebObj/GarnautClimateChangeReview-FULLDraftReport,4July2008/\\$File/Garnaut%20Climate%20Change%20Review%20-%20FULL%20Draft%20Report,%204%20July%202008.pdf](http://www.garnautreview.org.au/CA25734E0016A131/WebObj/GarnautClimateChangeReview-FULLDraftReport,4July2008/$File/Garnaut%20Climate%20Change%20Review%20-%20FULL%20Draft%20Report,%204%20July%202008.pdf)

In Glossary at p.527: 'enteric fermentation Part of the digestive process of ruminant animals, such as cows and sheep, that results in the release of methane emissions.'

¹² 'Ruminants' are mammals of the suborder Ruminantia, characteristically having a stomach divided into four compartments and chewing a 'cud' consisting of regurgitated, partially digested food. They include: cattle, sheep, goats, deer and giraffe.

¹³ Australian Government Department of the Environment and Water Resources Australian Greenhouse Office *National Greenhouse Gas Inventory 2005* (March 2007) 21

Sourced online: <http://www.greenhouse.gov.au/inventory/2005/pubs/inventory2005.pdf>

Note: 1 gigagram (Gg) divided by 1000 = 1 mega tonne (Mt)

¹⁴ Ibid

¹⁵ Ibid

¹⁶ Ibid

¹⁷ Op cit Russell; Singer & Brook 'Submission to the Garnaut Review' p.3

Also: Op cit, Forster, P. et al 2007: *Changes in Atmospheric Constituents and in Radiative Forcing*, Working Group I Report, Sourced online: <http://www.ipcc.ch/ipccreports/assessments-reports.htm>

At pp.131 and 136: 'Radiative forcing (RF)1 is a concept used for quantitative comparisons of the strength of different human and natural agents in causing climate change... [It] is a measure of how the energy balance of the Earth-atmosphere system is influenced when factors that affect climate are altered. The word radiative arises because these factors change the balance between incoming solar radiation and outgoing infrared radiation within the Earth's atmosphere. This radiative balance controls the Earth's surface temperature. The term forcing is used to indicate that Earth's radiative balance is being pushed away from its normal state.'

¹⁸ Ibid, Forster, P. et al 2007: *Changes in Atmospheric Constituents and in Radiative Forcing*, Working Group I Report, Chapter 2, p.212 – Figure 2.14

terms of its effect on global warming up to 2025¹⁹. Similarly, total carbon dioxide emissions from Australian transport in 2005 (including road, rail, sea and air) amounted to 80.4 Mt; so agricultural methane will cause around 2.8 times as much global warming, over a 20 year period. Over a hundred year period, the IPCC has stated that the relevant multiple to equate methane with carbon dioxide in terms of its net radiative forcing, is 25 (formerly they used a factor of 21).²⁰ Thus the carbon dioxide emissions from electricity generation and transport in Australia will have a greater impact on global warming than agricultural methane, in the longer-term.²¹ That's why a multi-gas ETS is essential, with carbon dioxide reductions being (at least) equally as important as methane, for the life of our planet.

Why, then, is agricultural methane currently excluded from the proposed Emissions Trading Scheme?

Despite failing to dispute the extraordinary danger of methane emissions in the short-term (20 years), almost all scientific research continues to focus on a longer-term view of climate change (over 100 years), and to base calculations of carbon dioxide equivalencies on such a view. One possible explanation for this phenomenon is that science is, by its nature, precise. Thus, when two alternate scenarios (20 years and 100 years) present themselves, with varying scientific data; scientists seem naturally inclined to focus their work on a single scenario, to reduce confusion. Of the two alternate scenarios, the one that scientists are more likely to choose is that which conforms with pre-existing studies and reports (in this case, the 100 year model). This helps to ensure that their work is understood, and is comparable with that of their peers. So perhaps it was (in part) a kind of scientific inertia that caused the urgency of cutting methane emissions to be (more generally) ignored.

After all, it was only in its 4th Assessment Report (released in April 2007) that the IPCC advised that 72 is the revised factor by which the Global Warming Potential (GWP) of methane can be expressed relative to that of carbon dioxide, over a 20 year period. Prior to this (at Kyoto, for instance) a GWP factor of 21 was used. Hence, it is just over one year since the GWP factor of 72 – a simplified tool for calculating short-term equivalence between methane and carbon dioxide – revealed the full seriousness of the methane crisis to non-scientists. Could this be why politicians and economists have not yet shifted to a dual focus on long and short-term objectives in the struggle against global warming: they simply haven't had time to adjust to this disturbing news?

Within such a context, there would initially appear to be some excuse for Prof. Ross Garnaut's review and the Australian Government's *Green Paper* having overlooked the importance of including agricultural methane in the ETS, from the earliest possible date. However, such an excuse is diminished by the powerful submission to Garnaut's review, made in April 2008, by Mr. Geoff Russell, Prof. Peter Singer and Prof. Barry Brook.²² When Garnaut's *Draft Report* was released some two months later (June 2008)²³, apparently ignoring their submission, the authors followed up with an article published by Fairfax Newspapers on 10 July 2008, titled 'The missing link in the Garnaut report'.²⁴ This again focused on the need to include agricultural methane in any ETS, lest ominous 'tipping points' be reached in the next decade, owing to methane's radiative forcing. Just 6 days later (on 16 July 2008) the Government released its *Green Paper* advising that it is 'disposed to include agriculture emissions in the scheme by 2015 and to make a final

¹⁹3.1 Mt methane x 72 = 223.2 Mt equivalent carbon dioxide; as opposed to 194.3 Mt carbon dioxide from electricity generation

²⁰ Op cit, Forster, P. et al 2007: *Changes in Atmospheric Constituents and in Radiative Forcing*, Working Group I Report, Chapter 2, p.212 – Figure 2.14

²¹Agricultural methane of 3.1 Mt x 25 = 77.5 Mt equivalent carbon dioxide over 100 years

²² Russell, G.; Singer, P.; and Brook, B. 'Submission to the Garnaut Review ETS discussion paper' (2008) Available online: [http://www.garnautreview.org.au/CA25734E0016A131/WebObj/D0846772ETSSubmission-GeoffRussell-ProfPeterSinger-ProfBarryBrook/\\$File/D08%2046772%20ETS%20Submission%20-%20Geoff%20Russell%20-%20Prof%20Peter%20Singer%20-%20Prof%20Barry%20Brook.pdf](http://www.garnautreview.org.au/CA25734E0016A131/WebObj/D0846772ETSSubmission-GeoffRussell-ProfPeterSinger-ProfBarryBrook/$File/D08%2046772%20ETS%20Submission%20-%20Geoff%20Russell%20-%20Prof%20Peter%20Singer%20-%20Prof%20Barry%20Brook.pdf)

²³Garnaut, R. *Garnaut Climate Change Review: Draft Report* (June 2008)

²⁴Russell, G.; Singer, P.; and Brook, B. 'The missing link in the Garnaut report' *The Age* (Melbourne) 10 July 2008. Available online: <http://www.theage.com.au/opinion/the-missing-link-in-the-garnaut-report-20080709-3cjh.html>

decision on this in 2013.²⁵ While the present Government's rush to make up for vital time lost during the 'dark ages' of the previous administration, is admirable; it must be tempered by reason. The current submissions period on the *Green Paper* will not be of any use, if the Administration is already committed to pushing a half-baked and politically short-sighted ETS through the Senate (with Liberal/National Party support).

Prof. Garnaut signalled his apparent misunderstanding of the radiative forcing and GWP of methane in both his review and his prior Issues Paper²⁶, by applying the factor of 25 to equate methane with carbon dioxide (over 100 years), rather than the factor of 72 (over 20 years). Admittedly, he was led into this error by the Kyoto Protocol, which adopts a similar method of equivalence. However, as Russell, Singer and Brook succinctly note, evaluating the impact of methane over 100 years is 'hardly relevant since methane doesn't last that long.'²⁷

Prof. Garnaut and the Government have each alluded to serious issues of cost and measurement, pertaining to the inclusion of agriculture (in general) within the ETS. While it is true that some variability of methane generation may be expected between individual cows and sheep, by reason of their genes, diet and general health – this minor variance cannot be regarded as significant in the overall scheme of an ETS.

Similarly, Prof. Garnaut and the Government have referred to the economic and social damage that will be inflicted on the agricultural sector, if and when agriculture is brought into the ETS. In fact, it may be indicative of the Government's principal motives for excluding agricultural methane from the proposed ETS, at present, that they already speak (with Orwellian indirectness) of compensation being paid to farmers; and suggest (rather foolishly, as discussed, below) that it may be possible to apply the cost of the scheme at a secondary production level, in a way that will impact individual farmers, less:

Given the compliance costs that would be involved if scheme obligations were to apply at farm-level, the Government seeks stakeholder views on the merits of an approach to coverage that would apply obligations generally off-farm, at some other point in the supply chain (for example, on fertiliser suppliers, abattoirs, dairies and beef exporters). The Government recognises that any approach will also need to provide appropriate incentives for on-farm abatement.²⁸

How best to implement a methane credit scheme, as part of the ETS

There are numerous ways in which agricultural methane might be included in Australia's ETS. However, the optimal model will probably be similar to the current regime of agricultural water licences, under which farmers (or non-farmers) may permanently purchase or temporarily lease water 'units' on a relatively open, free-market exchange. The principal advantage of such a system for selling methane credits, over that of water units, is that, unlike water, the number of credits issued will reflect actual animal numbers (rather than highly optimistic estimates of water flows). Also, unlike water, the methane credit will be fully transferrable, throughout Australia.

It is already possible to calculate the production of methane through *enteric fermentation* in Australia, and then to average this figure, per head across the total cattle, sheep and goat populations of Australia (making allowance for species differentials); to arrive at a value for each animal, that estimates its individual methane generation. Hence, it should be possible to require annual methane 'credits' to be purchased by livestock producers (and dairy farmers), for every head of cattle, sheep and (possibly) goat that they intend to keep, during part or all of a particular year. The additional cost of methane credits in farmers' budgets will undoubtedly reduce the overall population of livestock, as costs are passed on to secondary producers

²⁵ Op cit Australian Government Department of Climate Change *Green Paper* (July 2008) para 2.19.

²⁶ Garnaut Climate Change Review *Issues Paper 1 Climate Change: Land use - Agriculture and Forestry* (undated – released approx. December 2007) p.3. Sourced online: [http://www.garnautreview.org.au/CA25734E0016A131/WebObj/IssuesPaper1-ClimateChangeLanduse-Agricultureandforestry/\\$File/Issues%20Paper%201%20-%20Climate%20Change%20Land%20use%20-%20Agriculture%20and%20forestry.pdf](http://www.garnautreview.org.au/CA25734E0016A131/WebObj/IssuesPaper1-ClimateChangeLanduse-Agricultureandforestry/$File/Issues%20Paper%201%20-%20Climate%20Change%20Land%20use%20-%20Agriculture%20and%20forestry.pdf)

²⁷ Op cit Russell; Singer & Brook 'Submission to the Garnaut Review' p.5

²⁸ Op cit Australian Government Department of Climate Change *Green Paper* (July 2008) Para 2.19

(abattoirs and dairies) and ultimately to consumers, who respond by seeking alternate products to avoid the increased cost. Applying a diminishing cap and a temporal validity to methane credits, will also help to ensure that the number of animals alive at any one time, and thus the amount of methane being produced in a nominal period; will continue to decrease.

Although Prof. Garnaut and the Government have attempted to assuage the inevitable concerns of farmers, by suggesting that it will be possible to apply such a methane credit scheme at the secondary production level (abattoirs and dairies), there is a simple reason why such a secondary application of the scheme would prove ineffective: abattoirs and dairies cannot monitor animal numbers from year to year. To apply a flat charge, per animal, is to fail to take account of the variance in life-time of different animals, and the consequent difference in their contribution to methane volumes depending on their individual longevities. Farmers, themselves will be best placed to undertake the necessary calculations to determine the viability of their herds and flocks, and to consider moving into other forms of agriculture (or even reforestation to attract carbon credits). Prof. Garnaut referred to the adaptation of farmers, albeit in quite a different context, when discussing their response to climate change:

The modifying impact of adaptation is exemplified by Australian agriculture. Better and earlier knowledge will allow farmers to make timely decisions on whether new money should continue to be invested in locations that seem to be severely damaged by climate change, or whether it is better to find new livelihoods in less challenging locations... Hardest of all, the most effective adaptive responses in agriculture to climate change will sometimes require fundamental changes in attitudes, policies and institutions.²⁹

Extrapolating these comments (in a way unintended) to the potential impact of a methane credit scheme: it can only be to the advantage of livestock producers for the Government to provide them with as much notice as possible, of their need to amend their farming practices; in order that they might more easily adapt. One possible solution, put forward by a Melbourne-based environmental campaigner, involves the issuance of carbon credits for reforestation and the creation of terra preta (carbon-rich soil). As he puts it:

The Australian Bureau of Agricultural and Resource Economics (ABARE) estimates that sheep and cattle grazing occurs on 60% of rangelands. Rangelands represent 80% of Australia's total land area. Therefore, nearly 50% of the entire Australian continent is used for sheep and cattle grazing...

Eliminating the need for cattle grazing and dairy herds would free up land for other uses. Quite a lot of land actually! If even a fraction of this grazing area was replanted with native forests (or softwoods if desired) or turned into terra preta (dark carbon rich soil for agriculture), then we would start to take carbon from the atmosphere and lock it up in the forests and soil. Between 3 and 5 decades of planting a quarter of one percent of the available land per year would see Australia reach carbon neutrality. Under the accounting rules of the Kyoto Protocol to the United Nations Framework Convention on Climate Change, carbon credits are worth tens of billions of dollars each year. Thus, the carbon credits we could generate by replanting or converting soil to terra preta are vastly more valuable than the current profits from our export of animal products.³⁰

While only a small proportion of 'rangeland' is likely to be suited to reforestation owing to water constraints, the 'quarter of one percent' to which Bruce Poon refers, is certainly available. Moreover, the water savings from reduced livestock are likely to be monumental – but that is a subject for another paper, as are the other benefits of reduced livestock in Australia, such as diminishing salinity, reduced soil depletion and erosion, and the overall positive effects on human health of a diet lower in red meat and dairy products.

Conclusion

Let us hope that it is now evident to the reader, that the exclusion of agricultural methane from the proposed ETS, at its commencement, is a mistake which must be remedied. We have no time to lose, since Australia must argue strongly for similar policy to be encapsulated in the revision of the Kyoto Protocol – to be discussed in Copenhagen in December this year. Leading by example is the only way forward, and future

²⁹ Op cit Garnaut Climate Change Review *Issues Paper 1*, pp.36-37

³⁰ Poon, Bruce 'Eating up the world backgrounder', Animals Working Group, Australian Greens (Vic), via email to author 16 April 2008

generations will undoubtedly thank us (rather than condemn us) if we make this collective effort. After all, the stakes have never been higher.

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Submissions

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2. Russell, G.; Singer, P.; and Brook, B. 'Submission to the Garnaut Review ETS discussion paper' (2008). Available online: [http://www.garnautreview.org.au/CA25734E0016A131/WebObj/D0846772ETSSubmission-GeoffRussell-ProfPeterSinger-ProfBarryBrook/\\$File/D08%2046772%20ETS%20Submission%20-%20Geoff%20Russell%20-%20Prof%20Peter%20Singer%20-%20Prof%20Barry%20Brook.pdf](http://www.garnautreview.org.au/CA25734E0016A131/WebObj/D0846772ETSSubmission-GeoffRussell-ProfPeterSinger-ProfBarryBrook/$File/D08%2046772%20ETS%20Submission%20-%20Geoff%20Russell%20-%20Prof%20Peter%20Singer%20-%20Prof%20Barry%20Brook.pdf)