Vegan Sustainability Magazine

A Compassionate Revolution

Home

Our Ethos

Current and Past Contributors

Topics

Submit an Article

Creative Commons License

Current Issue

Subscribe

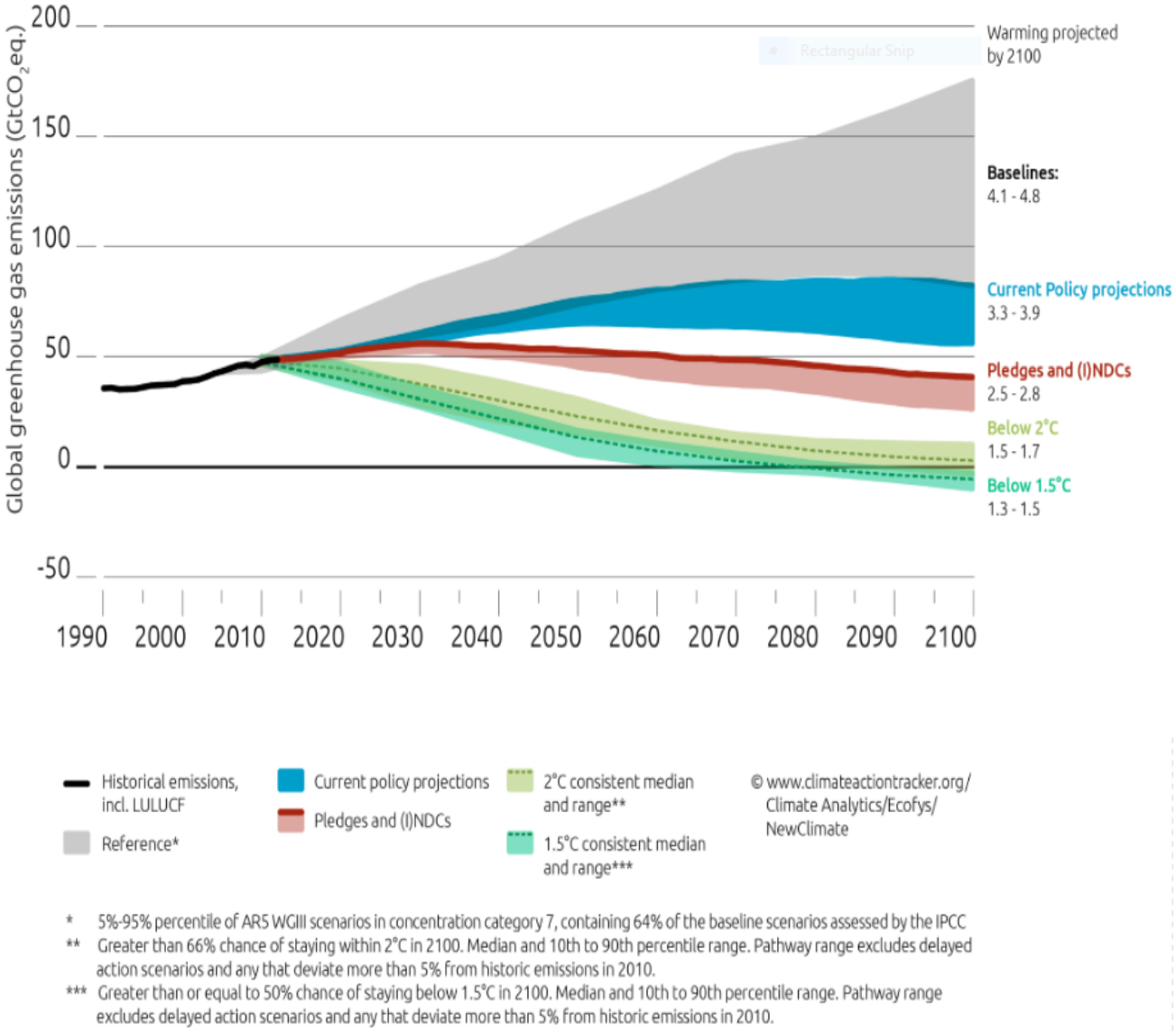
Back issues

Research and Reports

Links

Submissions

Contact Us

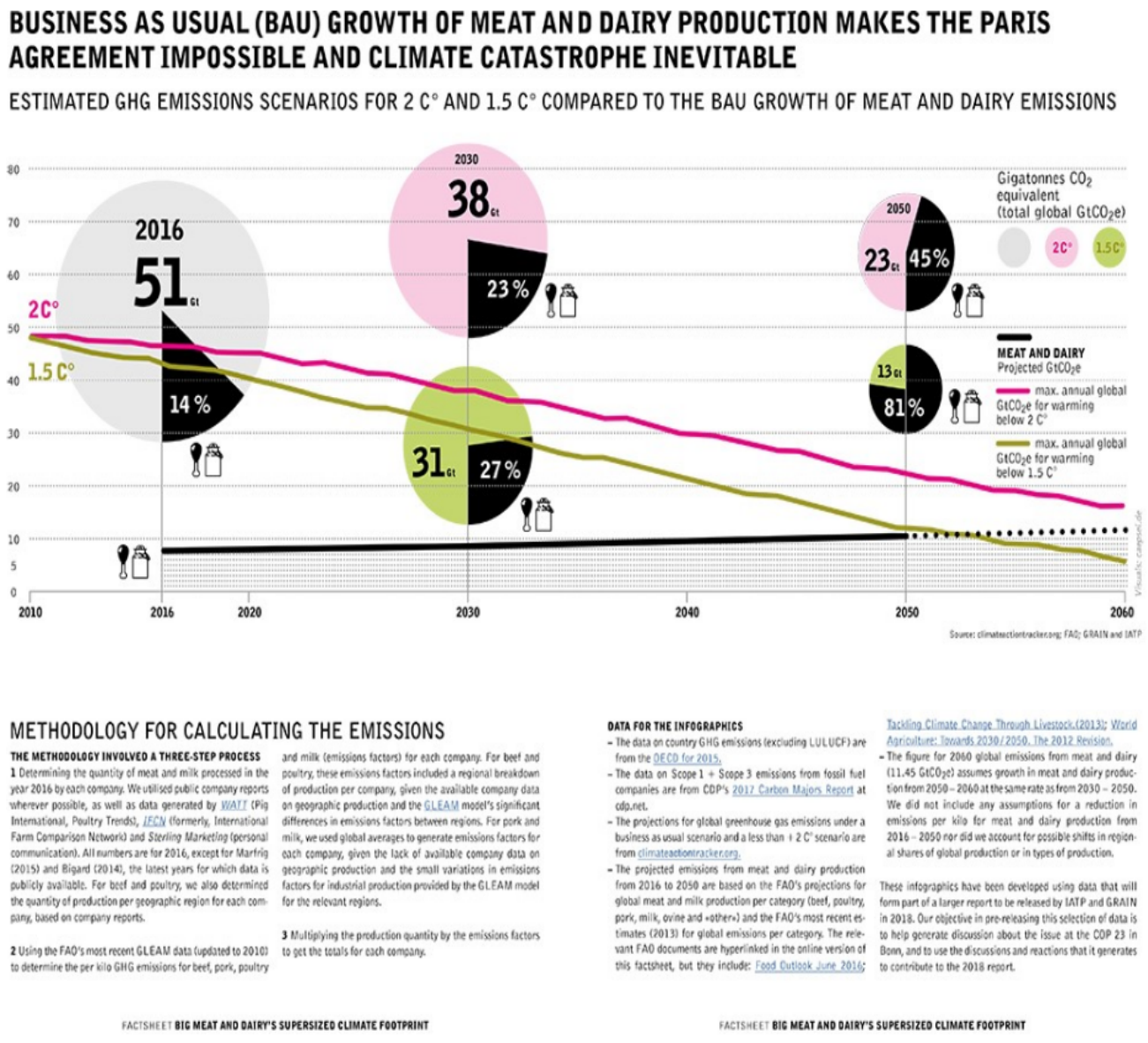


Intended Nationally Determined Contributions (INDCs) is a term used under the United Nations Framework Convention on Climate Change (UNFCCC) for reductions in greenhouse gas emissions published in the lead up to the 2015 United Nations Climate Change Conference held in Paris, in Dec 2015. Under the Paris Agreement, the INDC will become the Nationally Determined Contribution (NDC) when a country ratifies the agreement. The NDC will then be the first greenhouse gas targets that apply equally to both developed and developing countries. (Source wikipedia)

Unfortunately there remains a substantial gap between what governments have promised to do and the total level of actions they have undertaken to date. Both the current policy and pledge trajectories lie well above emissions pathways consistent with the Paris Agreement long-term temperature goal. However fortunately, as shown by the IPCC AR5, substantially more action, sufficient to hold warming below 2°C (and to below 1.5°C by 2100) with likely probability is technically and economically feasible. According to the IPCC, the costs of reducing emissions to limit warming to below 2°C are modest, **even before** taking into account co-benefits such as increased energy-

security and health improvements due to reduced air pollution. (Or from plant based diets). Annualised reductions of consumption growth are estimated at around 0.06 per cent over the century, relative to a baseline of 1.6 to 3% growth per year.

A recent Report from GRAIN, the Heinrich Boll Foundation and the Institute for Agriculture and Trade Policy Europe, Big Meat and Dairy's Supersized Climate Footprint, calculated that Business As Usual Meat and Dairy production will make meeting Paris Climate Goals impossible.



METHODOLOGY FOR CALCULATING THE EMISSIONS

THE METHODOLOGY INVOLVED A THREE-STEP PROCESS

1 Determining the quantity of meat and milk processed in the year 2016 by each company. We utilised public company reports wherever possible, as well as data generated by *WATT* (Pig International, Poultry Trends), *IFCN* (formerly, International Farm Comparison Network) and *Sterling Marketing* (personal communication). All numbers are for 2016, except for Marfrig (2015) and Bigard (2014), the latest years for which data is publicly available. For beef and poultry, we also determined the quantity of production per geographic region for each company, based on company reports.

2 Using the FAO's most recent GLEAM data (updated to 2010) to determine the per kilo GHG emissions for beef, pork, poultry and milk (emissions factors) for each company. For beef and poultry, these emissions factors included a regional breakdown of production per company, given the available company data on geographic production and the GLEAM model's significant differences in emissions factors between regions. For pork and milk, we used global averages to generate emissions factors for each company, given the lack of available company data on geographic production and the small variations in emissions factors for industrial production provided by the GLEAM model for the relevant regions.

3 Multiplying the production quantity by the emissions factors to get the totals for each company.

DATA FOR THE INFOGRAPHICS

- The data on country GHG emissions (excluding LULUCF) are from the OECD for 2015.
- The data on Scope 1 + Scope 3 emissions from fossil fuel companies are from CDP's 2017 Carbon Majors Report at cdp.net.
- The projections for global greenhouse gas emissions under a business as usual scenario and a less than + 2 C° scenario are from climateactiontracker.org.
- The projected emissions from meat and dairy production from 2016 to 2050 are based on the FAO's projections for global meat and milk production per category (beef, poultry, pork, milk, ovine and «other») and the FAO's most recent estimates (2013) for global emissions per category. The relevant FAO documents are hyperlinked in the online version of this factsheet, but they include: Food Outlook June 2016; Tackling Climate Change Through Livestock.(2013); World Agriculture: Towards 2030/2050. The 2012 Revision.
- The figure for 2060 global emissions from meat and dairy (11.45 $GtCO_2e$) assumes growth in meat and dairy production from 2050 – 2060 at the same rate as from 2030 – 2050. We did not include any assumptions for a reduction in emissions per kilo for meat and dairy production from 2016 – 2050 nor did we account for possible shifts in regional shares of global production or in types of production.

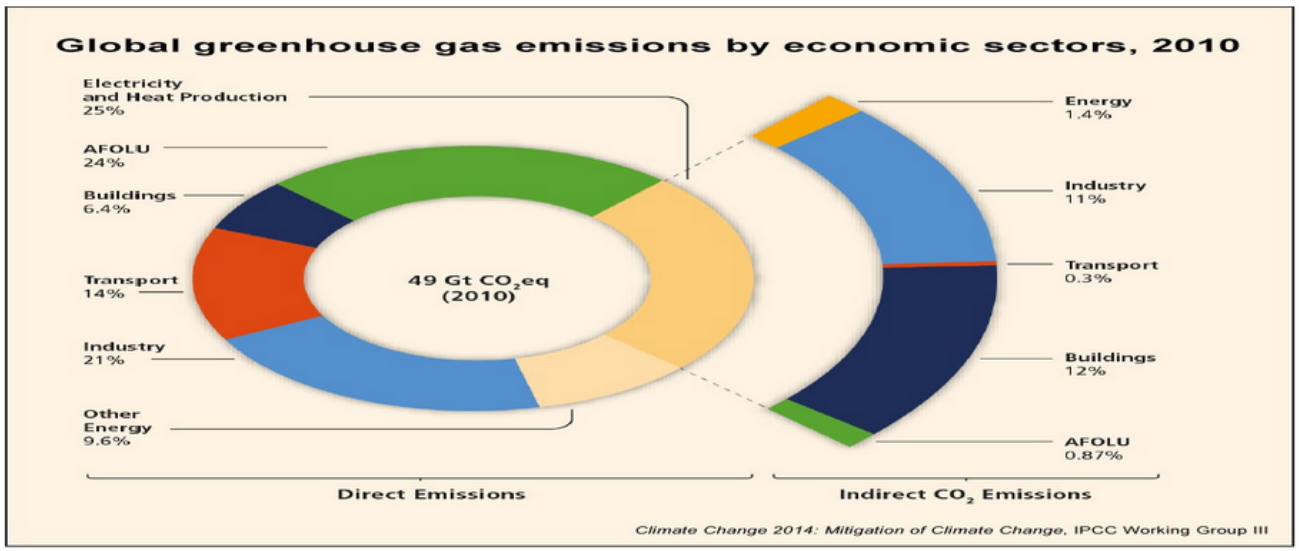
These infographics have been developed using data that will form part of a larger report to be released by IATP and GRAIN in 2018. Our objective in pre-releasing this selection of data is to help generate discussion about the issue at the COP 23 in Bonn, and to use the discussions and reactions that it generates to contribute to the 2018 report.

FACTSHEET BIG MEAT AND DAIRY'S SUPERSIZED CLIMATE FOOTPRINT

Causes of Climate Change by Sector

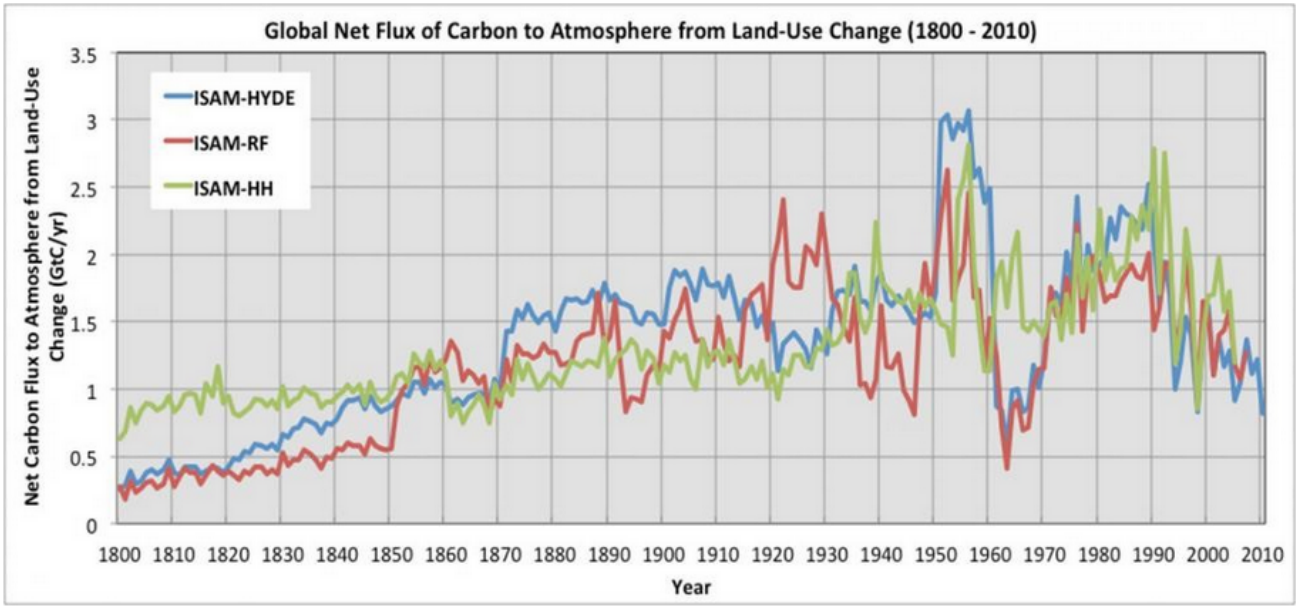
According to the IPCC Agriculture, Forestry, and Other Land Use Changes (AFOLU) are responsible for 24% of annual green house gas (GHG) emissions. It's important to note that this is only the GHG emissions happening right now and so does not take into

account past emissions from previous land use changes caused by the expansion of agriculture.



Source: IPCC (2014).

Foley et Al estimated that agriculture was responsible for 30-35% of GHG primarily due to tropical deforestation. A 2009 analysis by the World Watch Institute (WWI) outlined how current estimates of the impact of agriculture may be an underestimate and suggests that agriculture could be responsible for 51% of GHG emissions primarily due to deforestation and using a twenty year time horizon (see GWP below). This was not a peer reviewed research paper and while some of its findings have not been supported by other researchers it raises significant questions. For example, nearly all the conversation about climate change focuses on current emissions which does not accurately identify the huge contribution of animal agricultural land use changes (deforestation of 20 million km2, draining of wetlands and destruction of peatlands). These models also do not include the CO2 emissions of animal respiration, which is also significant because farm animal biomass is now about five times the biomass of all land based wild animals. This is why a vegan agricultural system and reafforestation are key climate change solutions. Below is an estimate of historical land use change emissions.

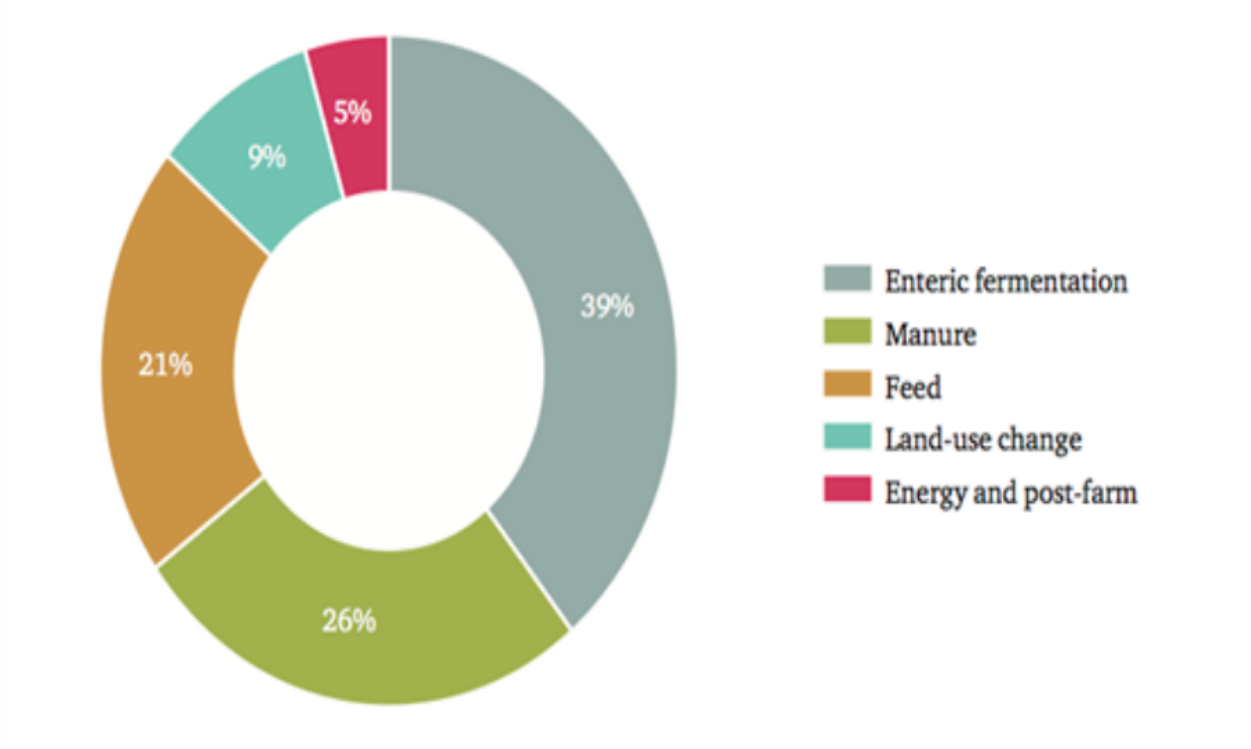


Globally agriculture contributes to GHG increases in a number of ways:

- » CO2 releases linked to deforestation;
- » CO2 releases linked to overgrazing and loss of soils' organic matter;
- » CO2 releases linked to other land use changes such as draining wetlands and destruction of peatlands;
- » Methane releases from rice cultivation using flood irrigation;
- » Methane releases from enteric fermentation in ruminants (cattle and sheep) and manure storage;
- » Nitrous oxide releases from fertilizer production and application.

These agricultural processes comprise 50% of methane emissions, roughly 80% of nitrous oxide emissions, and virtually all carbon dioxide emissions tied to land use changes.

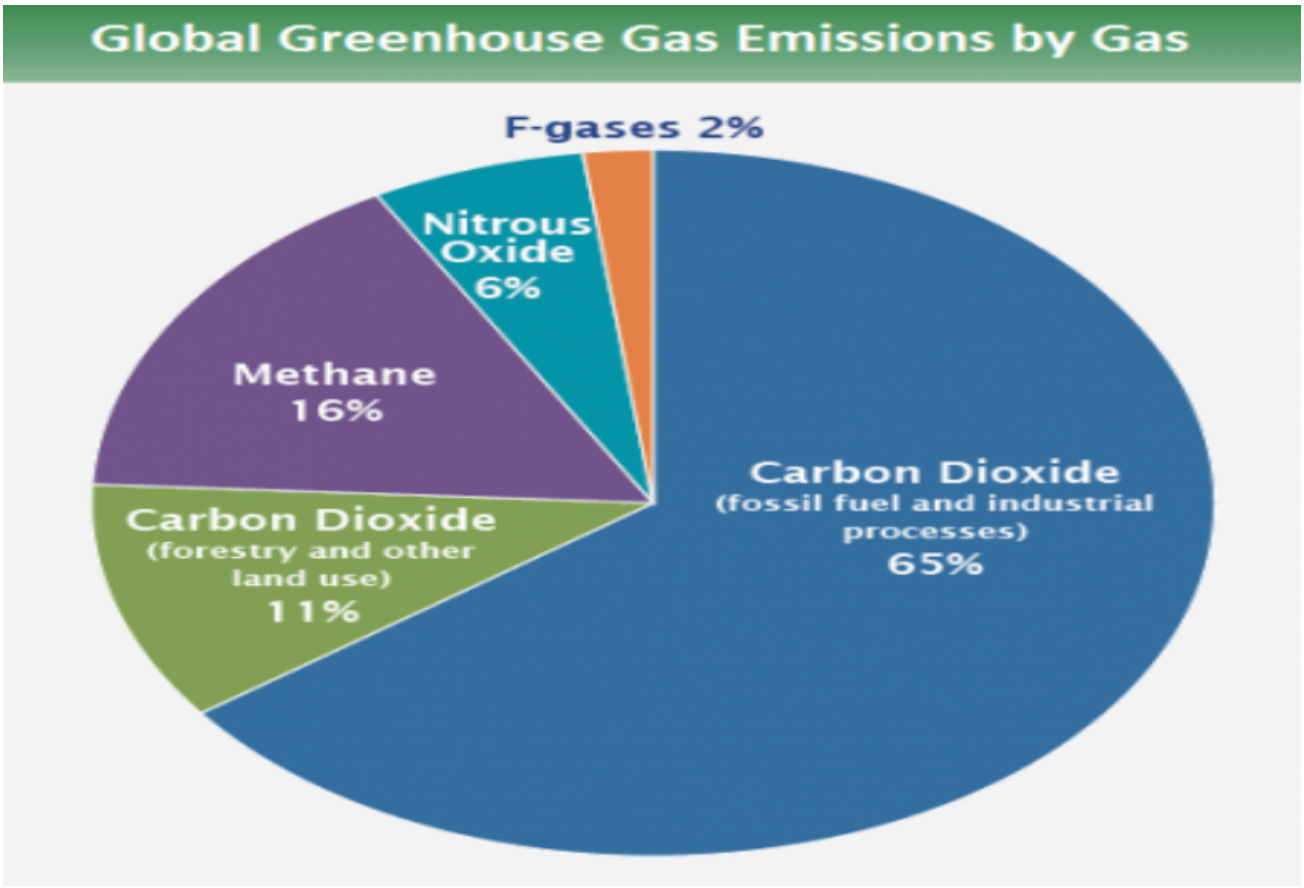
Livestock is responsible for 14.5% of current GHG emissions.



Breakdown of Current Livestock Emissions. Chatham House.

Causes of Climate Change by Greenhouse Gas

A range of different gases contribute to current greenhouse gas emissions. The main GHG contributions come from carbon dioxide from burning fossil fuels, methane from human and natural sources and carbon dioxide from on-going land use changes.



Source: IPCC (2014).

Global Warming Potential

The capacity of different greenhouse gases to trap heat in the atmosphere is described in terms of their global warming potential (GWP), which compares the warming potential of different gases to that of CO2 (which has a GWP of 1). "In the IPCC AR5, methane has a lifetime of 12.4 years and with climate-carbon feedbacks a global warming potential of 86 over 20 years and 34 over 100 years in response to emissions. **Model choices such as the time horizon can greatly affect the numerical values obtained for carbon dioxide equivalents.** The change in time horizon from 20 to 100 years as selected by the IPCC in their mathematical model, decreases the GWP for methane by a factor of approximately 2.5." If we chose a 20 year time horizon this would change the influence of methane in GHG emissions from 16% (see below diagram) to 40%. **As a result of methane's short half-life, a significant reduction in livestock raised worldwide would reduce GHGs relatively quickly and at a fraction of the cost compared with measures involving renewable energy and energy efficiency investments.**

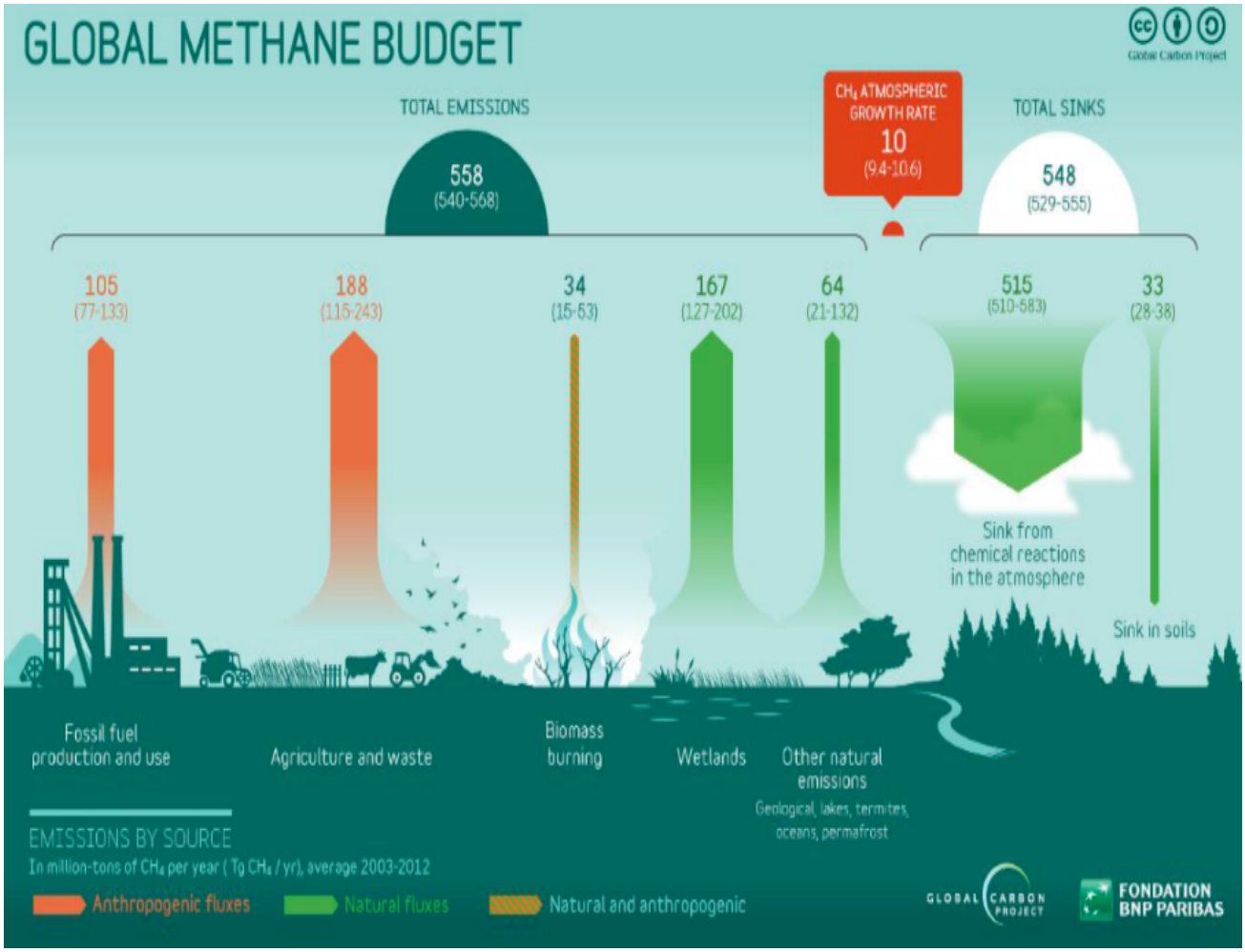
A recent Research Paper by Andy Reisinger and Andy Clark of the New Zealand Agricultural Greenhouse Gas Research Centre, explores the question, How much do direct livestock emissions actually contribute to global warming? They employed "a simple carbon cycle-climate model, historical estimates and future projections of

livestock emissions to infer the fraction of actual warming that is attributable to direct livestock non-CO2 emissions now and in future, and to CO2 from pasture conversions, without relying on GWPs."

What they found was that "direct livestock non-CO2 emissions caused about 19% of the total modelled warming of 0.81°C from all anthropogenic sources in 2010. CO2 from pasture conversions contributed at least another 0.03°C, bringing the warming directly attributable to livestock to 23% of the total warming in 2010."

They conclude that "Our estimates demonstrate that expanding the mitigation potential and **realizing substantial reductions of direct livestock non-CO2 emissions through demand and supply side measures** can make an important contribution to achieve the stringent mitigation goals set out in the Paris Agreement, including by increasing the carbon budget consistent with the 1.5°C goal."

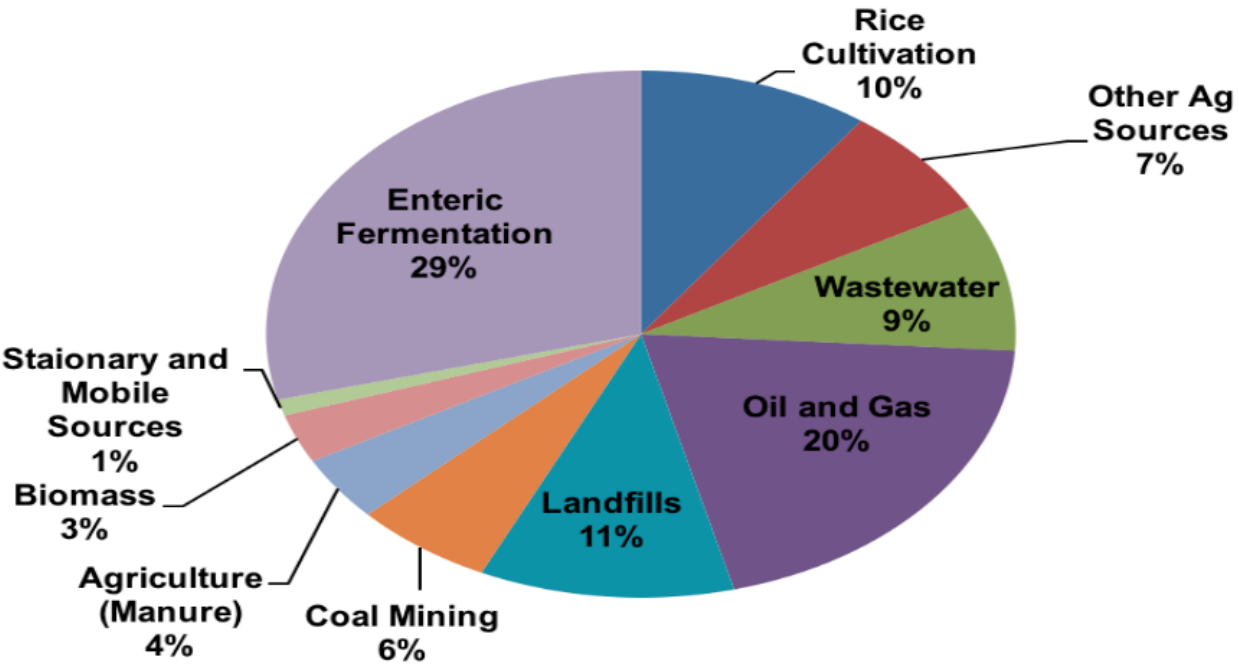
Sources of Methane contributing to Climate Change



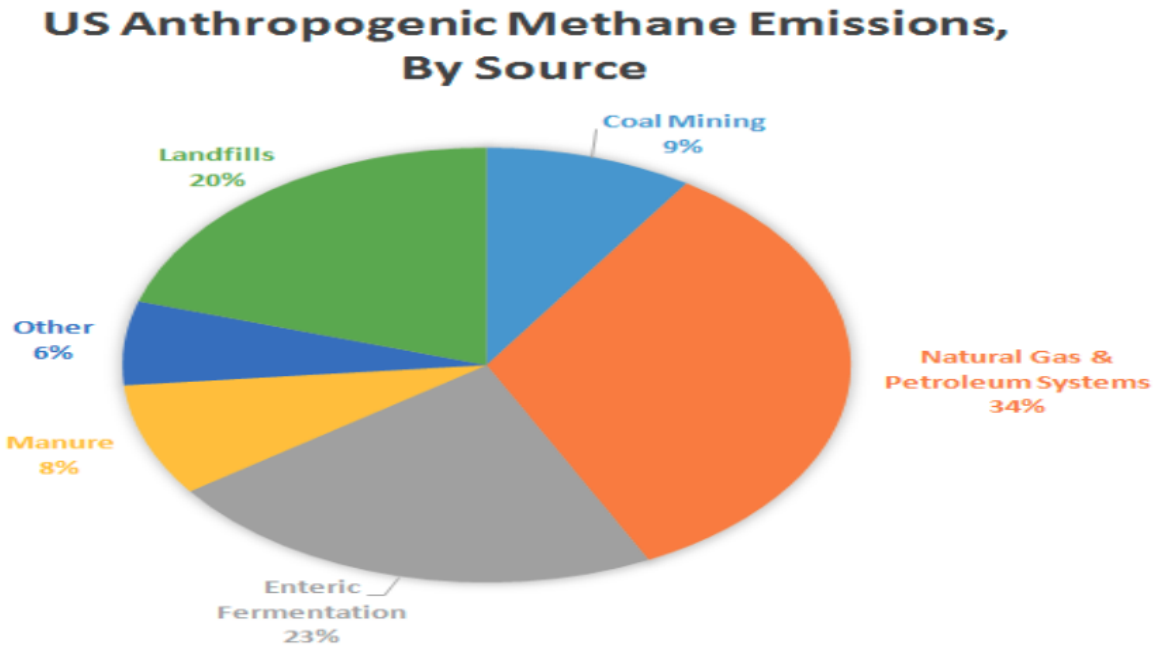
Source: Methane Emissions From Blind Spot to Spotlight, The Oxford Institute for Energy Studies, July 2017

The above diagram shows that anthropogenic sources generate 56% of current methane emissions (Wikipedia estimates 61%).

Below is a breakdown of the global anthropogenic sources of methane. Animal agriculture is responsible for approx. 33% of current anthropogenic methane emissions.

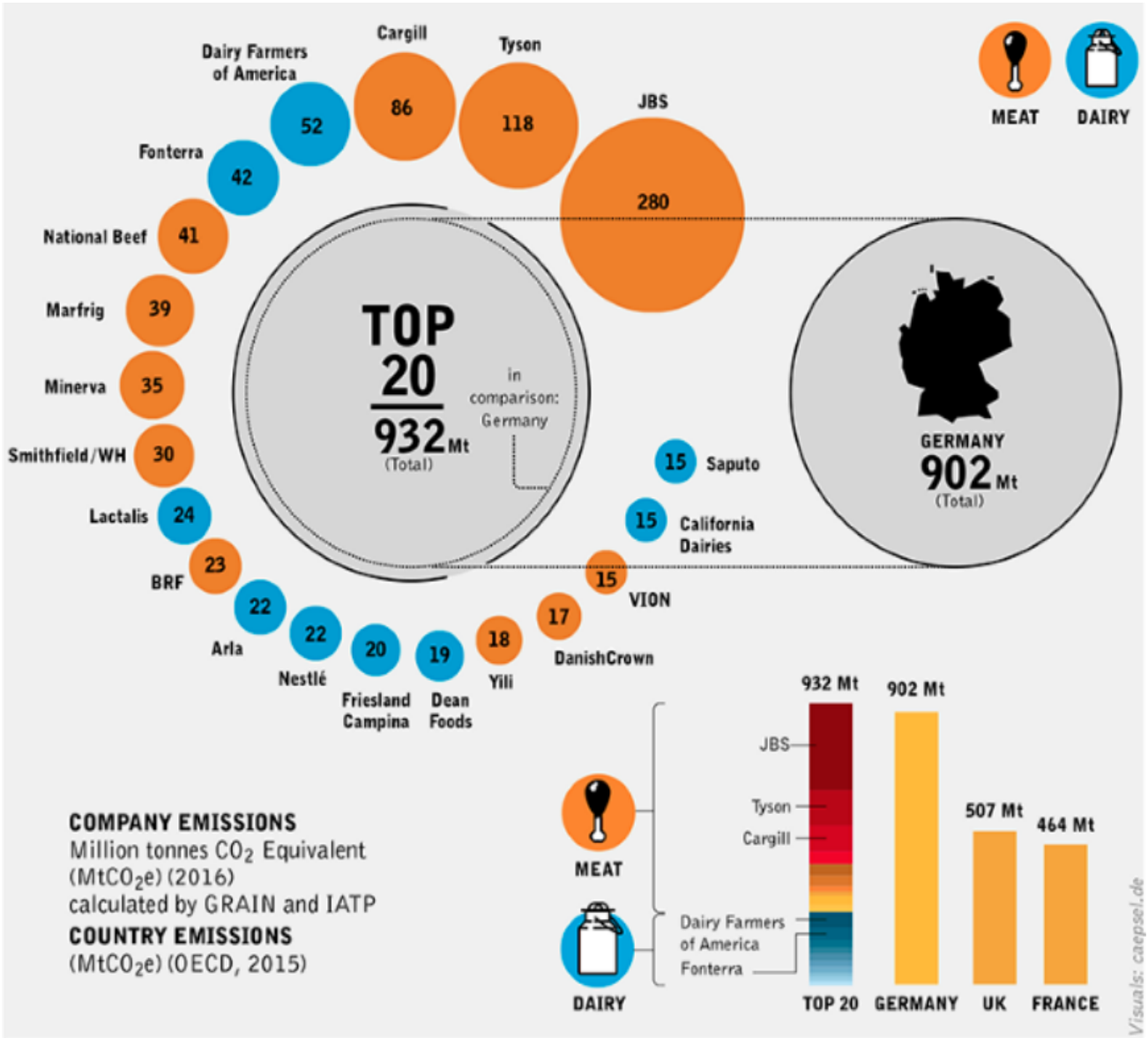


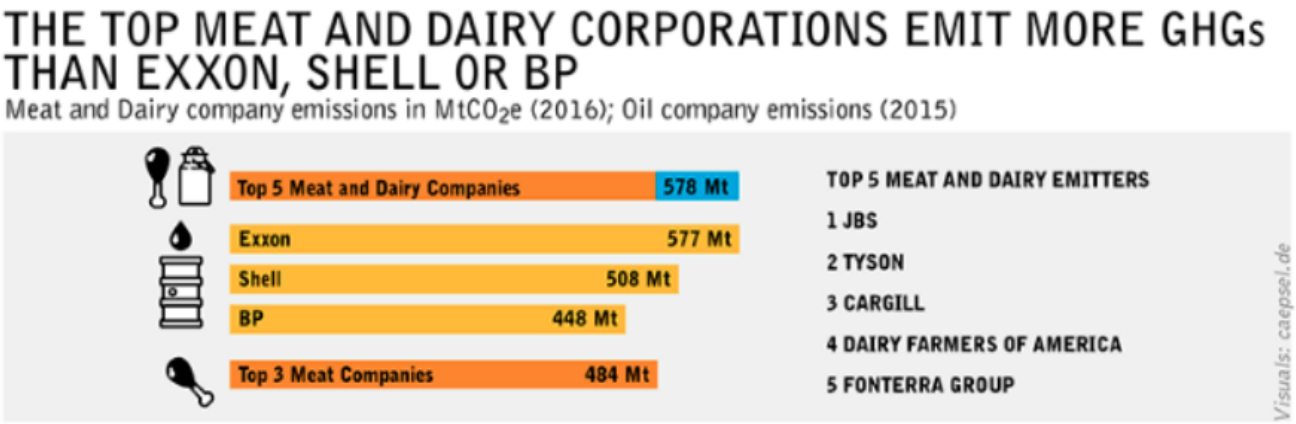
The specific mix of anthropogenic sources of methane varies from country to country depending on the economy, fossil fuel resources, land use and agriculture practices. Below is the US EPA breakdown of US anthropogenic sources of methane for 2016 where animal agriculture contributes 31% of methane emissions.



A recent Report produced by GRAIN (mentioned above) calculated that the top 20 meat and dairy companies emit more GHG than Germany. The top five meat and dairy

companies emit more than Exxon or Shell or BP.





A selection of Research Papers supporting a transtion to a plant based agricultural system as a cost effective Climate Change Mitigation Strategy.

The following is a summary of the main conclusions from a selection of relatively recent research papers looking at the impacts of animal agriculture on things like health, climate change, health care costs, etc. and measuring the potential climate change benefits of changing to a vegan or plant based agricultural system.

1. Analysis and valuation of the health and climate change co-benefits of dietary change, Marco Springman, PNAS, 2015.

(Click here for full research paper)

This widely reported research paper concluded that "A global switch to diets that rely less on meat and more on fruit and vegetables could save up to **8 million lives** (and countless lives of other species) by 2050, reduce greenhouse gas emissions by two thirds, and lead to healthcare-related savings and avoided climate damages of $1.5 trillion (US)."

2. The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health, A Systematic Review, Aleksandrowicz et al, Public Library of Science Journal, November, 2016

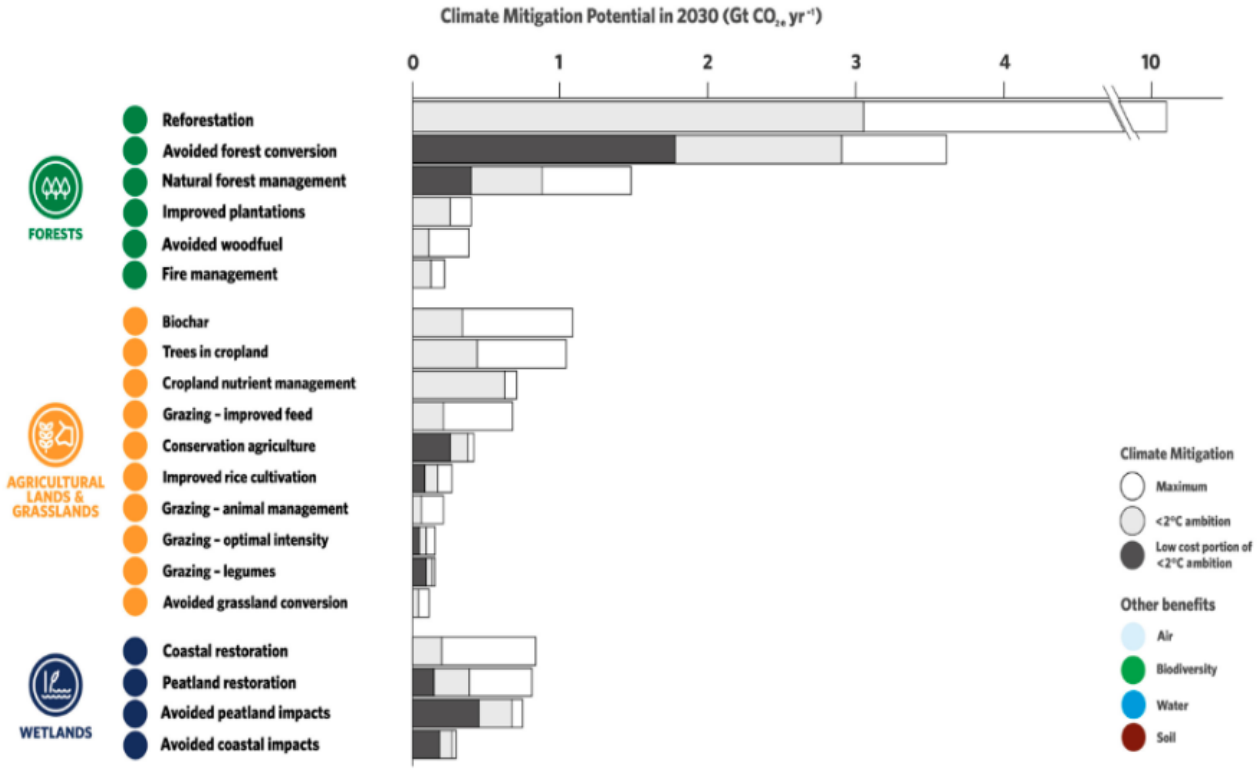
(Click here for full research paper)

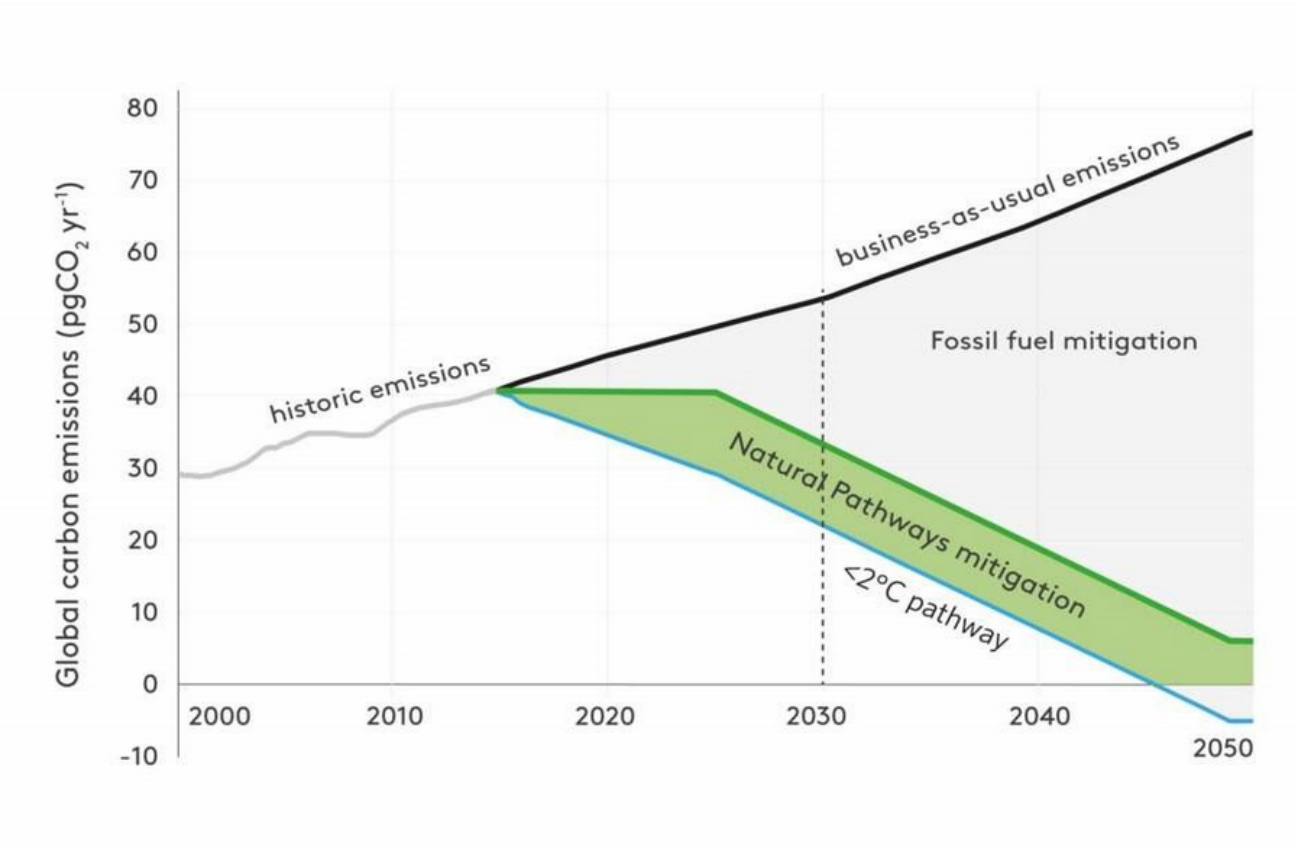
This paper found “14 common sustainable dietary patterns across reviewed studies, with reductions as high as 70–80% of GHG emissions and land use, and 50% of water use (with medians of about 20–30% for these indicators across all studies) possible by adopting sustainable dietary patterns. Reductions in environmental footprints were generally **proportional to the magnitude of animal-based food restriction.**“

3. Natural Climate Solutions, Proceedings of the National Academy of Sciences, September 2017. (The paper did not assume adoption of a vegan diet but did assume that agricultural areas that were established on previously forested areas would be reforested and people would eat less meat.)

(Click here for full research paper)

Natural climate solutions (NCS) can provide 37% of cost-effective CO2 mitigation needed through 2030 for a more than 66% chance of holding warming to below 2 °C. One-third of this cost-effective NCS mitigation can be delivered at or below 10 USD per MgCO2. Most NCS actions—if effectively implemented—also offer water filtration, flood buffering, soil health, biodiversity habitat, and enhanced climate resilience…..Forest pathways (reforestation and avoiding deforestation) offer over two thirds of cost-effective NCS mitigation needed to hold warming to below 2 °C and about half of low-cost mitigation opportunities. Reforestation is the largest natural pathway and deserves more attention to identify low-cost mitigation opportunities. Reforestation may involve trade-offs with alternative land uses, can incur high costs of establishment, and is more expensive than Avoided Forest Conversion.

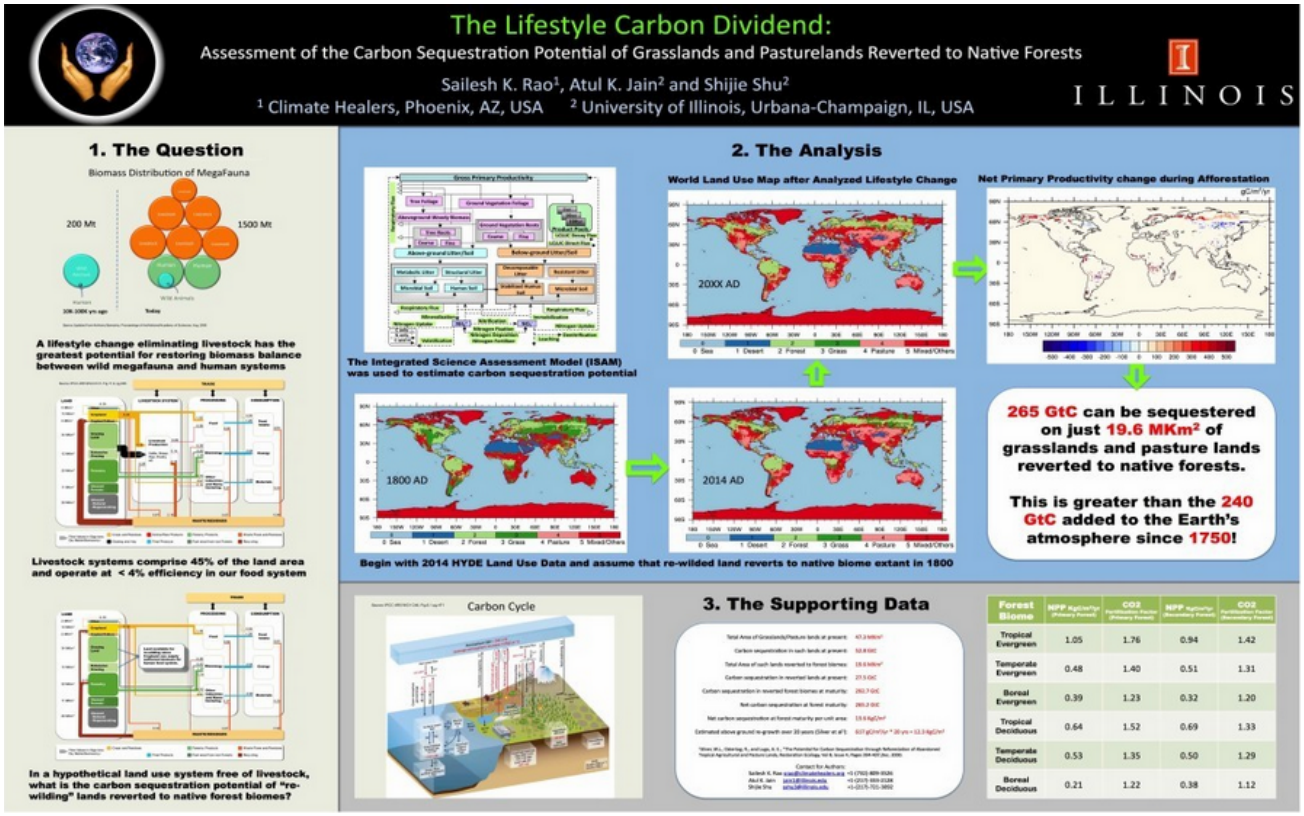




4. The Lifestyle Carbon Dividend, Assessment of the Carbon Sequestration Potential of Grasslands and Pasturelands Reverted to Native Forests, GC13E: Livestock, Land Use and the

Environment, AGU Fall Meeting, 14-18 December 2015, Sailesh K. Rao(1), Atul K. Jain(2) and Shijie Shu(2)

(Click here for full research paper)

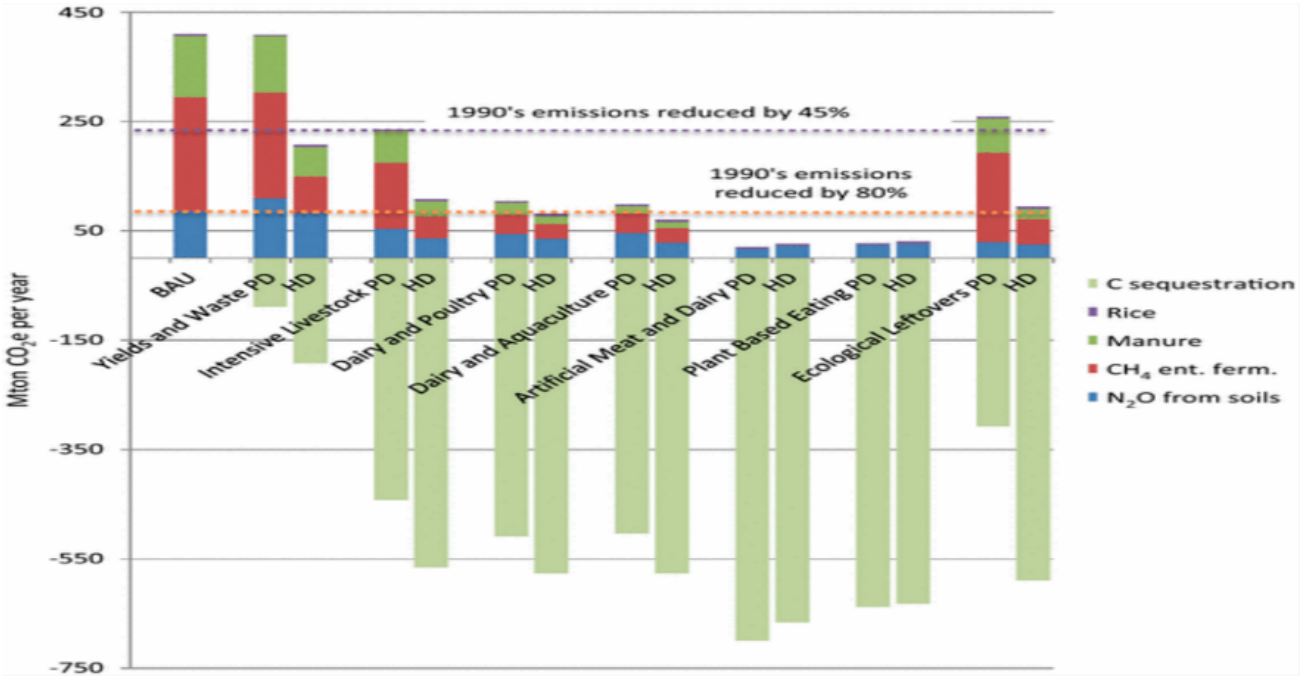


This paper calculated the carbon sequestration potential of grasslands and pasturelands that can be reverted to native forests as 265 GtC (on 19.6 MKm2 of land area), just 41% of the total area of such lands on Earth. The grasslands and pasturelands are assumed to revert back to native forest biomes that existed prior to the industrial era and these include tropical, temperate and boreal forests. The results are validated with above ground re-growth measurements. Since this carbon sequestration potential is greater than the 240 GtC that has been added to the atmosphere since the industrial era began, it shows that such global lifestyle transitions have tremendous potential to **fully reverse climate change**.

5. Protein futures for Western Europe: potential land use and climate impacts in 2050, Roos et Al, Food and Climate Research Network

(Click here for full research paper)

"The paper shows that even under extreme assumptions, some form of dietary change will be necessary to reach EU climate change targets. Results indicate that land use could be cut by 14–86 % and GHG emissions reduced by up to approximately 90 %" (with a plant based diet).



6. Livestock – Climate Change's Forgotten Sector: Global Public Opinion on Meat and Dairy Consumption, Rob Bailey et al, Dec 2014 Chatham House Report

(Click here for full research paper)

This report states that "Shifting global demand for meat and dairy produce is central to achieving climate goals. Recent analyses have shown that it is unlikely global temperature rises can be kept below two degrees Celsius without a shift in global meat and dairy consumption."

7. Grazed and confused? Ruminating on cattle, grazing systems, methane, nitrous oxide, the soil carbon sequestration question – and what it all means for greenhouse gas emissions. FCRN October 2017.

(Click here for full research paper)

This is a long detailed report comparing the climate impacts of grass fed livestock and factory farming. The report has a wide range of conclusions including: "The highly ambitious claims made about the potential for holistic grazing to mitigate climate change are wrong. The sequestration potential from grazing management is between 295–800 Mt CO2-eq/year: this offsets only 20-60% of annual average emissions from the grazing ruminant sector, and makes a negligible dent on overall livestock emissions. Expansion or intensification in the grazing sector as an approach to sequestering more carbon would lead to substantial increases in methane, nitrous oxide and land use change-induced CO2

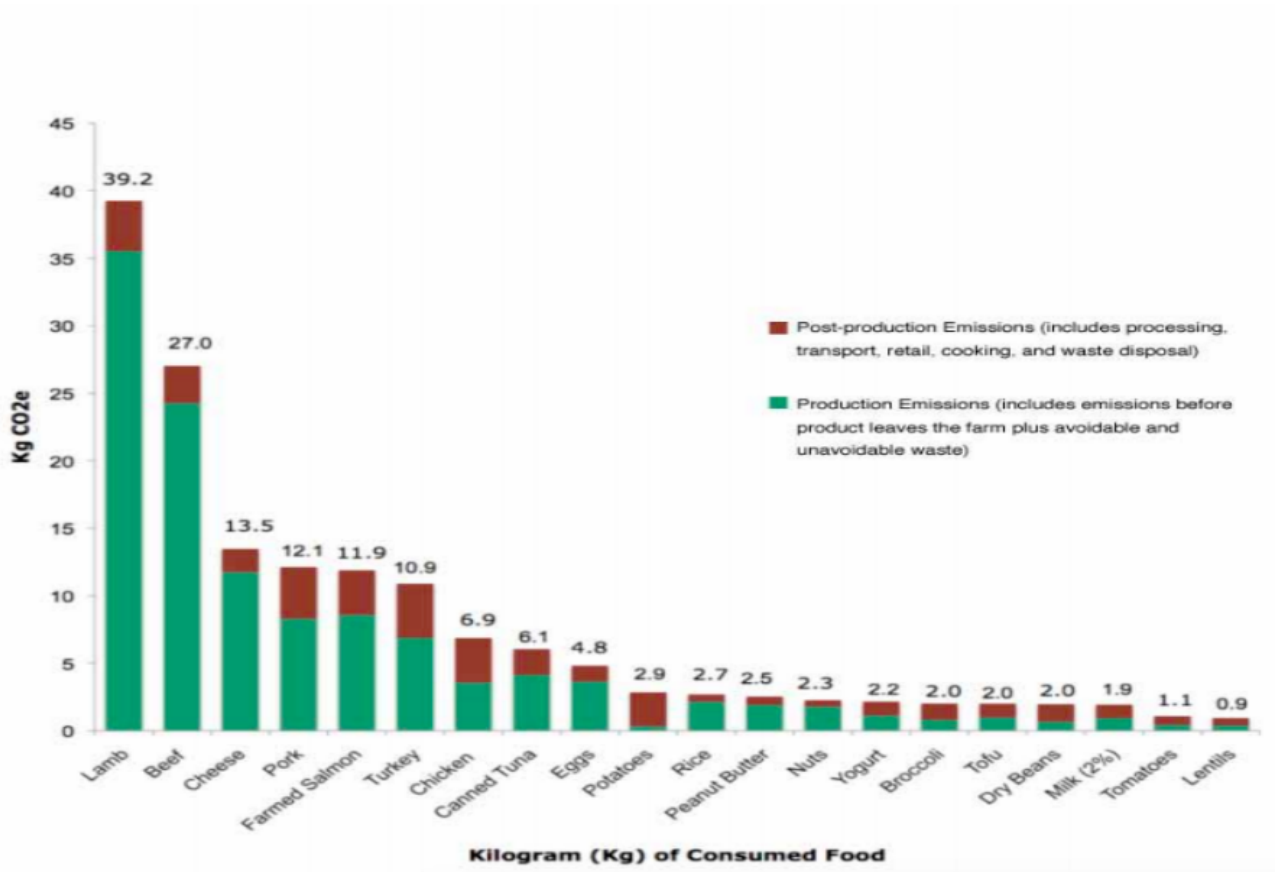
emissions. Grazing livestock – even in a best-case scenario – are net contributors to the climate problem, as are all livestock. Good grazing management cannot offset its own emissions, let alone those arising from other systems of animal production. Ultimately, if high-consuming individuals and countries want to do something positive for the climate, simply switching to grass-fed beef is not a solution. Eating less meat, of all types, is.“

8. The Environmental Working Group, a Washington, D.C.-based research and advocacy organization, and CleanMetrics Corp., a Portland, Ore.-based environmental firm, put out a 2011 report called the “Meat Eater’s Guide to climate change + health.”

(Click here for full research paper)

This graphic from the report shows each food broken down by greenhouse gas emissions for the United States. (For comparison, the average car today emits about 0.41 kilograms of CO2 per mile driven.) Red shows the post production emissions (transport, freezing, etc.) and green shows production emissions.

Figure 1. Full Lifecycle Assessment of Greenhouse Gas Emissions: Most Emissions from Common Proteins and Vegetables Occur During Production



The Full Report can be read at EWG and CleanMetrics.

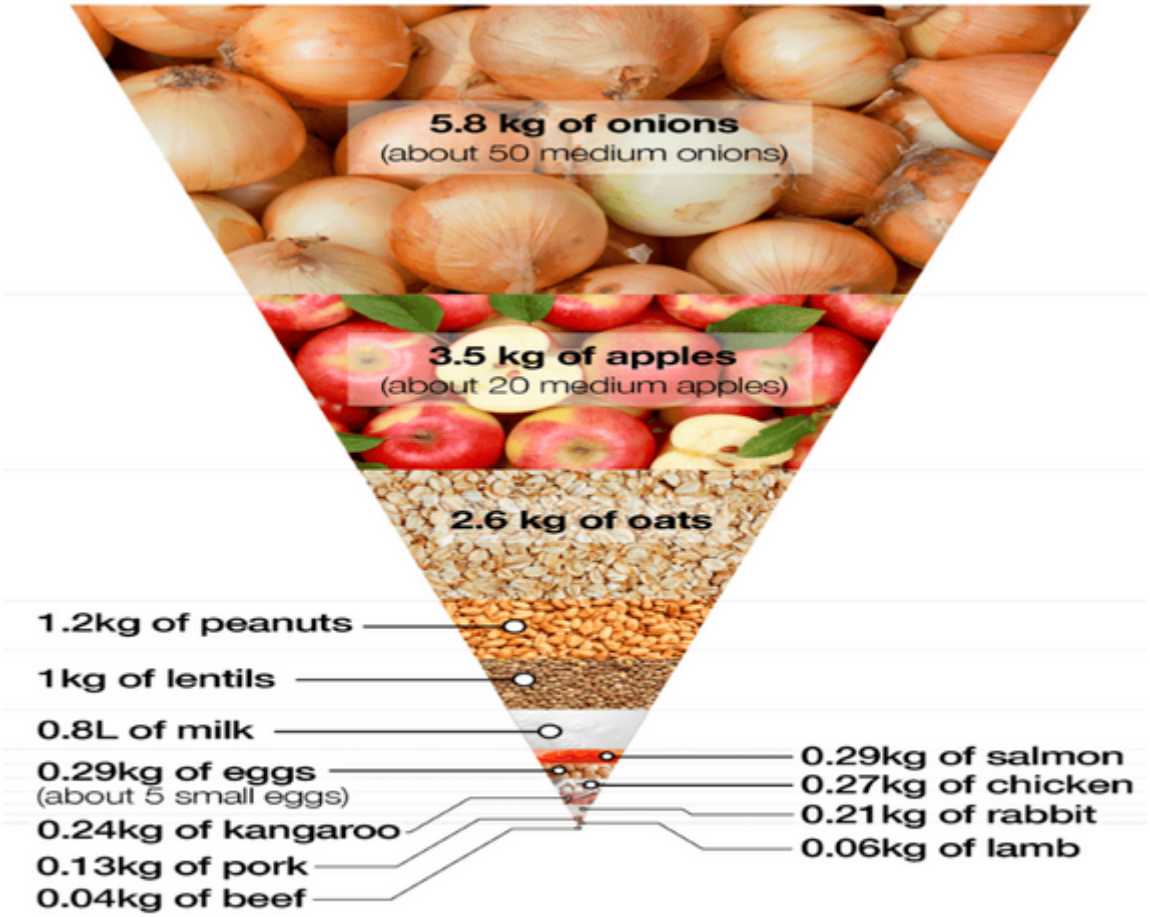
9. Systematic review of greenhouse gas emissions for different fresh food categories, Clune S, Crossin E, Verghese K, Journal of Cleaner Production (2016)

(Click here for full research paper)

This paper presents the results of a systematic literature review of greenhouse gas emissions for different food categories from life cycle assessment (LCA) studies, to enable streamline calculations that could inform dietary choice. The motivation for completing the paper was the inadequate synthesis of food greenhouse gas emissions available in the public domain. The paper reviewed 369 published studies that provided 1,718 global warming potential (GWP) values for 168 varieties of fresh produce. A meta-analysis of the LCA studies was completed for the following categories: fresh vegetables (root vegetables, brassica, leaves and stems); fresh fruits, (pepo, hesperidium, true berries, pomes, aggregates fruits and drupes); staples (grains, legumes, nuts, seeds and rice); dairy (almond/coconut milk, soy milk, dairy milk, butter and cheese); non-ruminant livestock (chicken, fish, pork); and ruminant livestock (lamb and beef). The meta-analysis indicates a clear greenhouse gas hierarchy emerging across the food categories, with grains, fruit and vegetables having the lowest impact and meat from ruminants having the highest impact. The database is provided in the Appendix as a resource for practitioners.

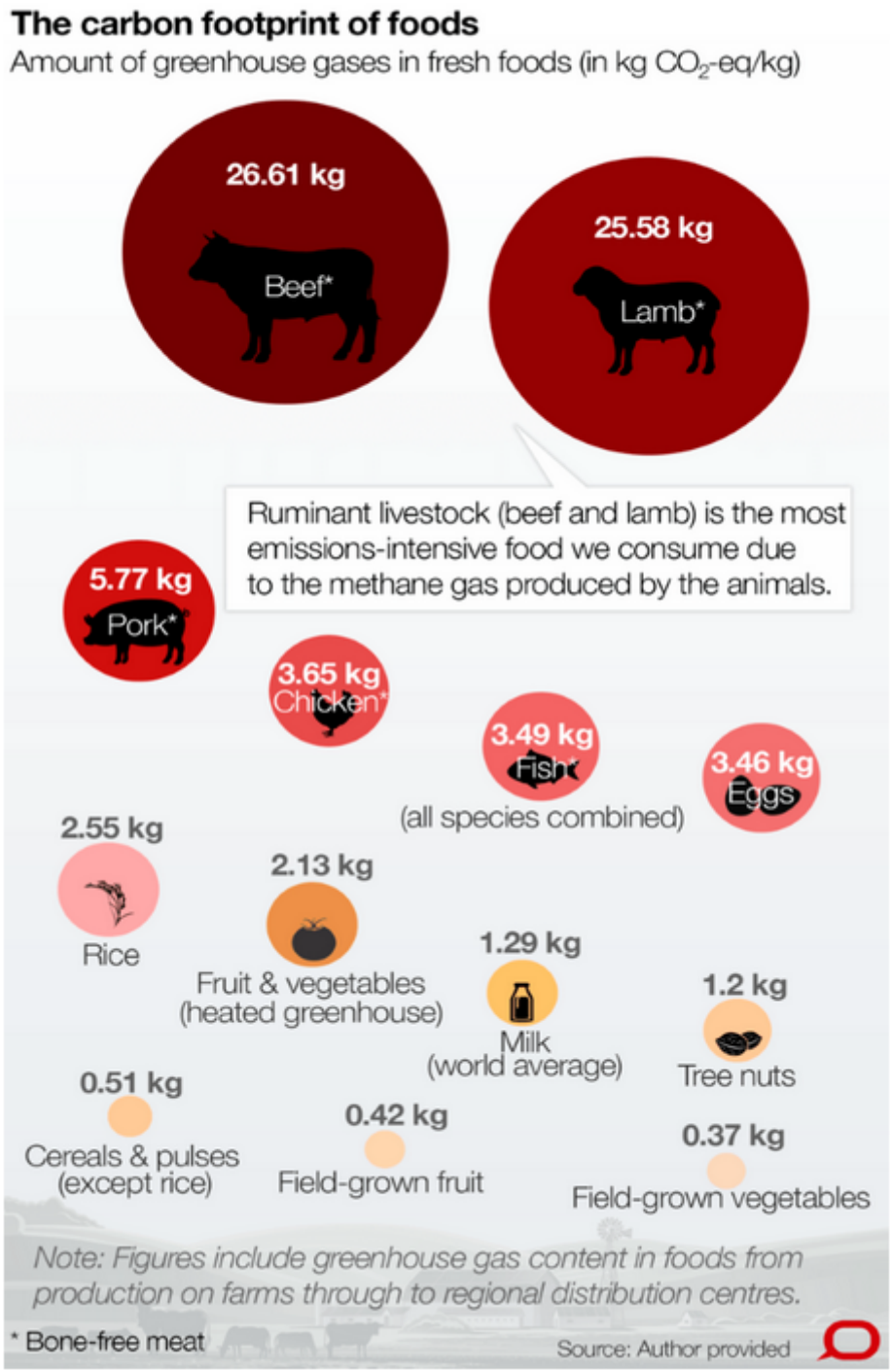
The carbon footprint food pyramid

Amount of food needed to produce 1kg of greenhouse gas



Note: Figures include greenhouse gas content in foods from production on farms through to regional distribution centres.

Source: Author provided



Leave a Reply

Your email address will not be published. Required fields are marked *

Message

Your Name

Your E-mail

Your Website

Post Comment