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BEEF Leadership Summit

Webinar Series

Sustainability: Animal Agriculture's Path to Climate Neutrality and Feeding the World

Beef's Path to Climate Neutrality

Frank Mitloehner, Ph.D.
Professor & Air Quality Specialist
Department of Animal Science
fmmitloehner@ucdavis.edu

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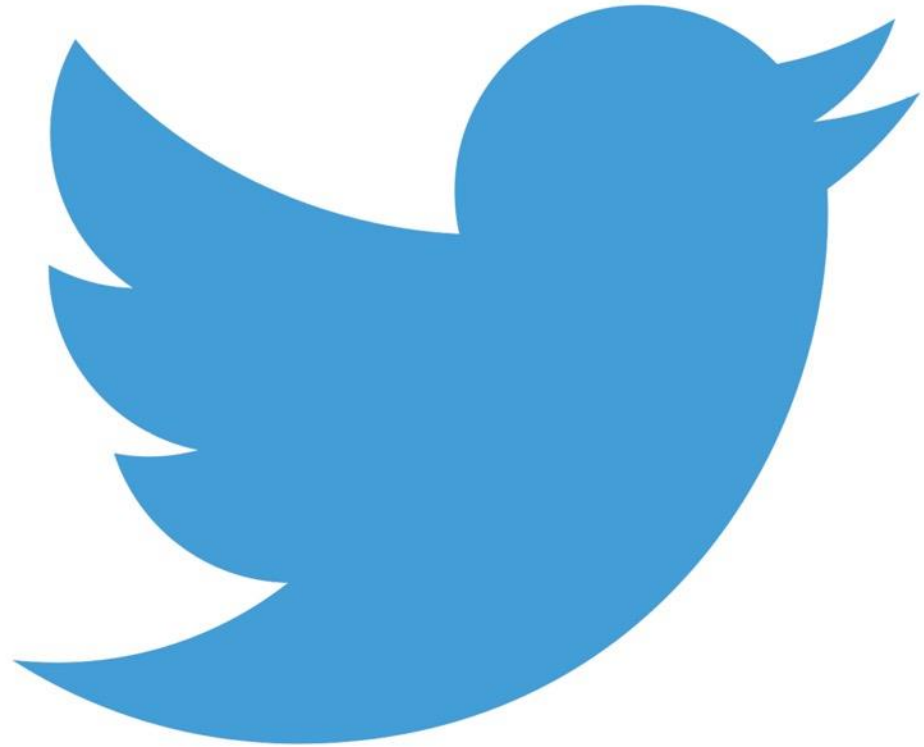

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RETHINKING METHANE

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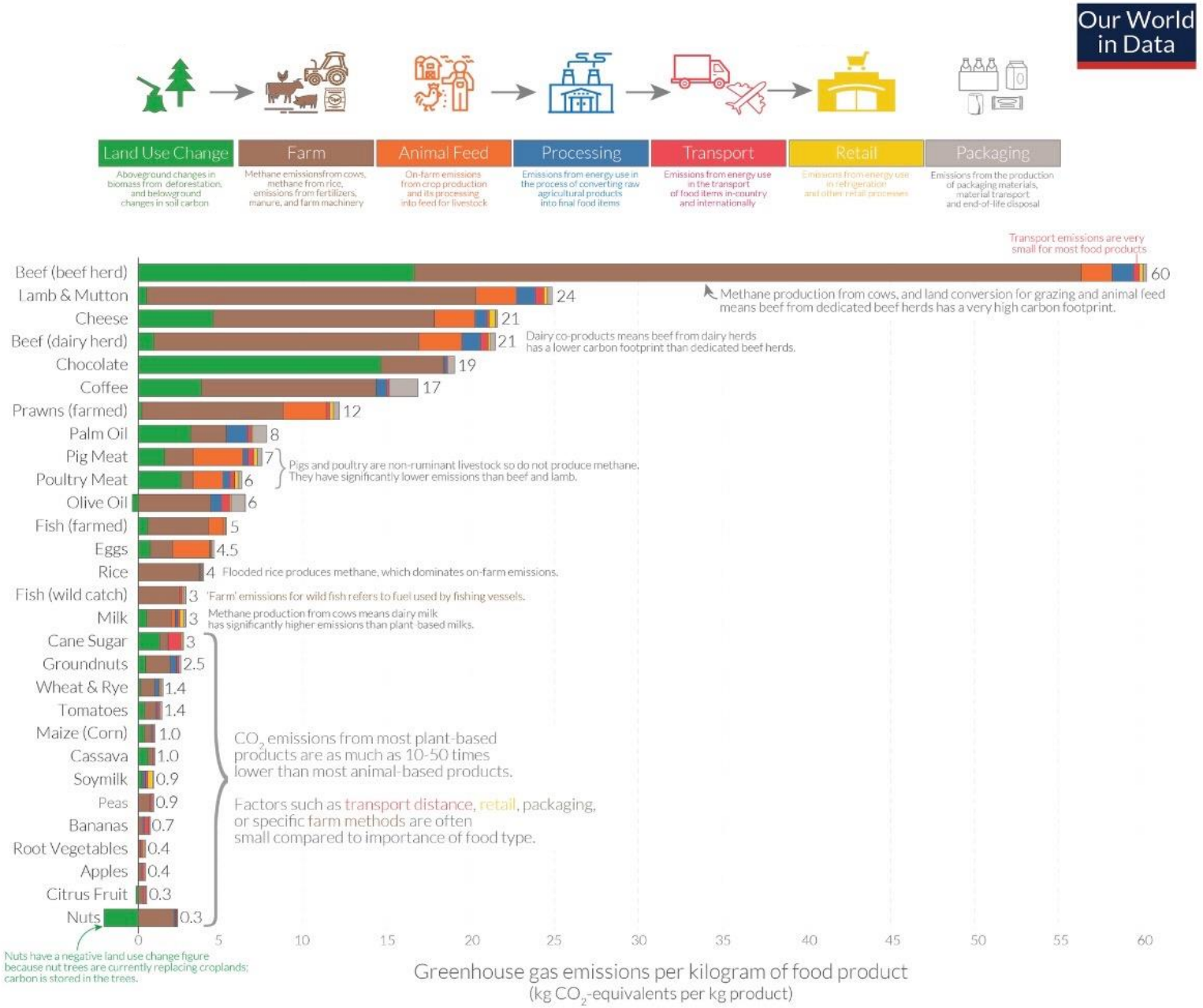
Greenhouse gas emissions across the food supply chain



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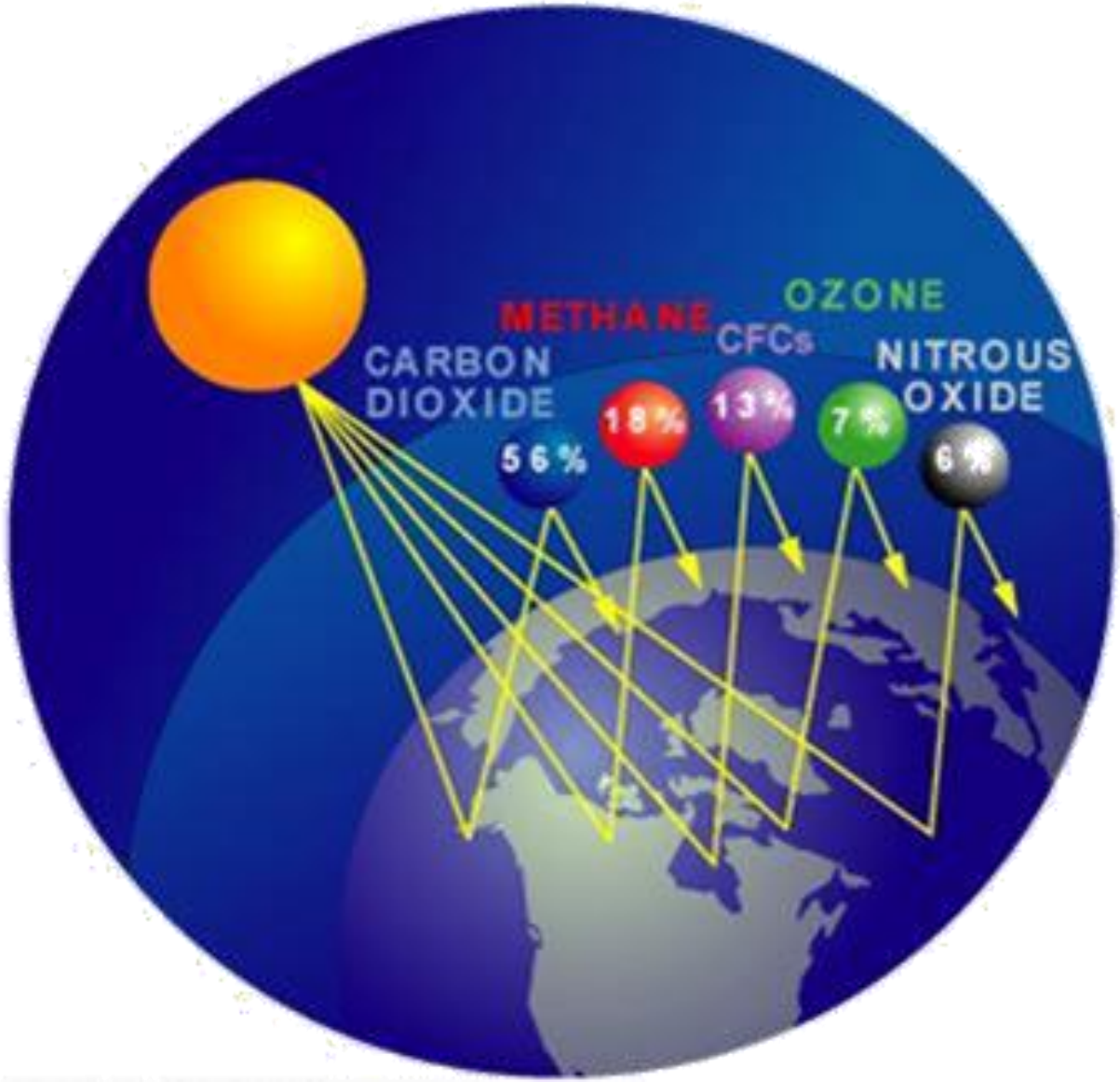

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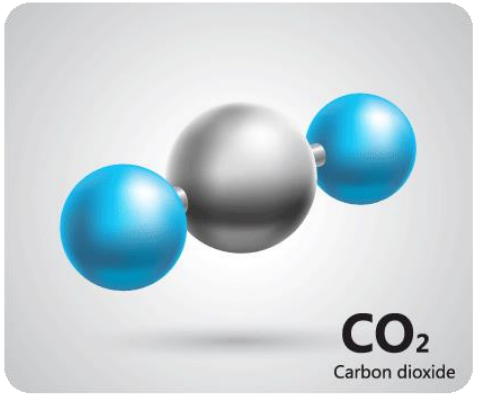

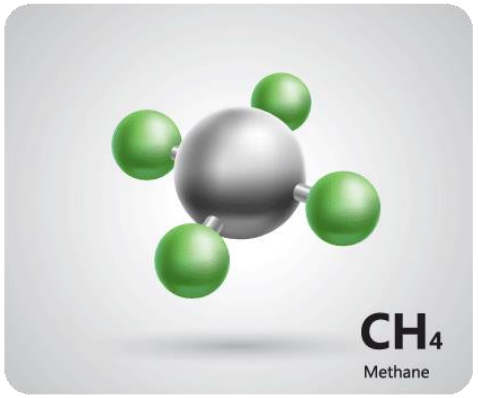

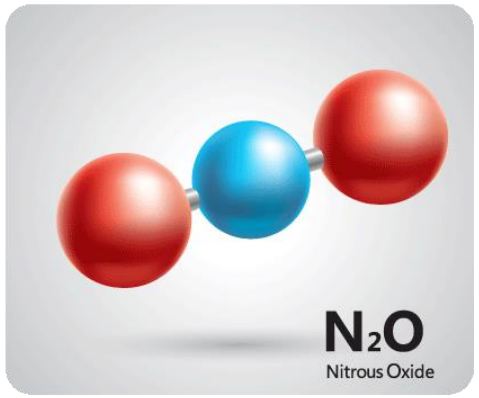

Global Warming Potential (GWP_{100}) of Main Greenhouse Gases

Carbon Dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous Oxide (N_2O)	265

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GLOBAL METHANE BUDGET

Global Carbon Project

TOTAL EMISSIONS

558
(540-568)

CH_4 ATMOSPHERIC GROWTH RATE
10
(9.4-10.6)

TOTAL SINKS

548
(529-555)

105
(77-133)

188
(115-243)

34
(15-53)

167
(127-202)

64
(21-132)

515
(510-583)

33
(28-38)

Sink from chemical reactions in the atmosphere

Sink in soils

Fossil fuel production and use

Agriculture and waste

Biomass burning

Wetlands

Other natural emissions

Geological, lakes, termites, oceans, permafrost

EMISSIONS BY SOURCE

In million-tons of CH_4 per year (Tg CH_4 / yr), average 2003-2012

Anthropogenic fluxes

Natural fluxes

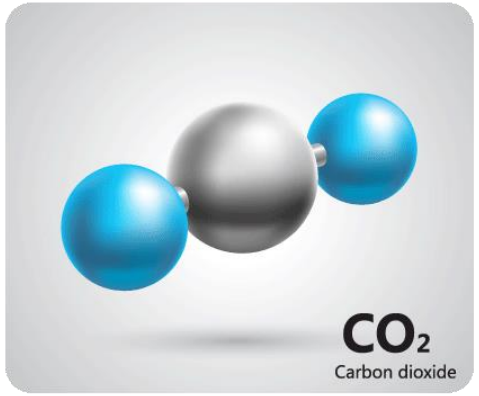
Natural and anthropogenic

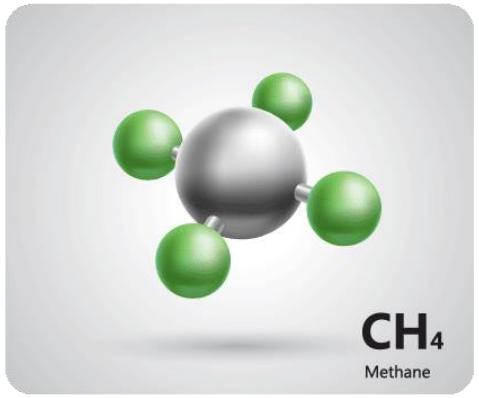
GLOBAL CARBON PROJECT

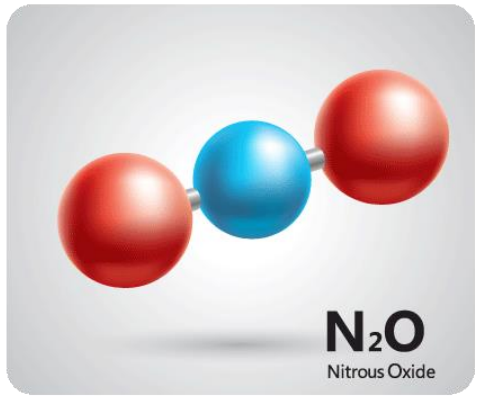
FONDATION BNP PARIBAS

Half-Life of Main Greenhouse Gases in Years

Carbon Dioxide (CO_2)	1,000
Methane (CH_4)	10
Nitrous Oxide (N_2O)	110







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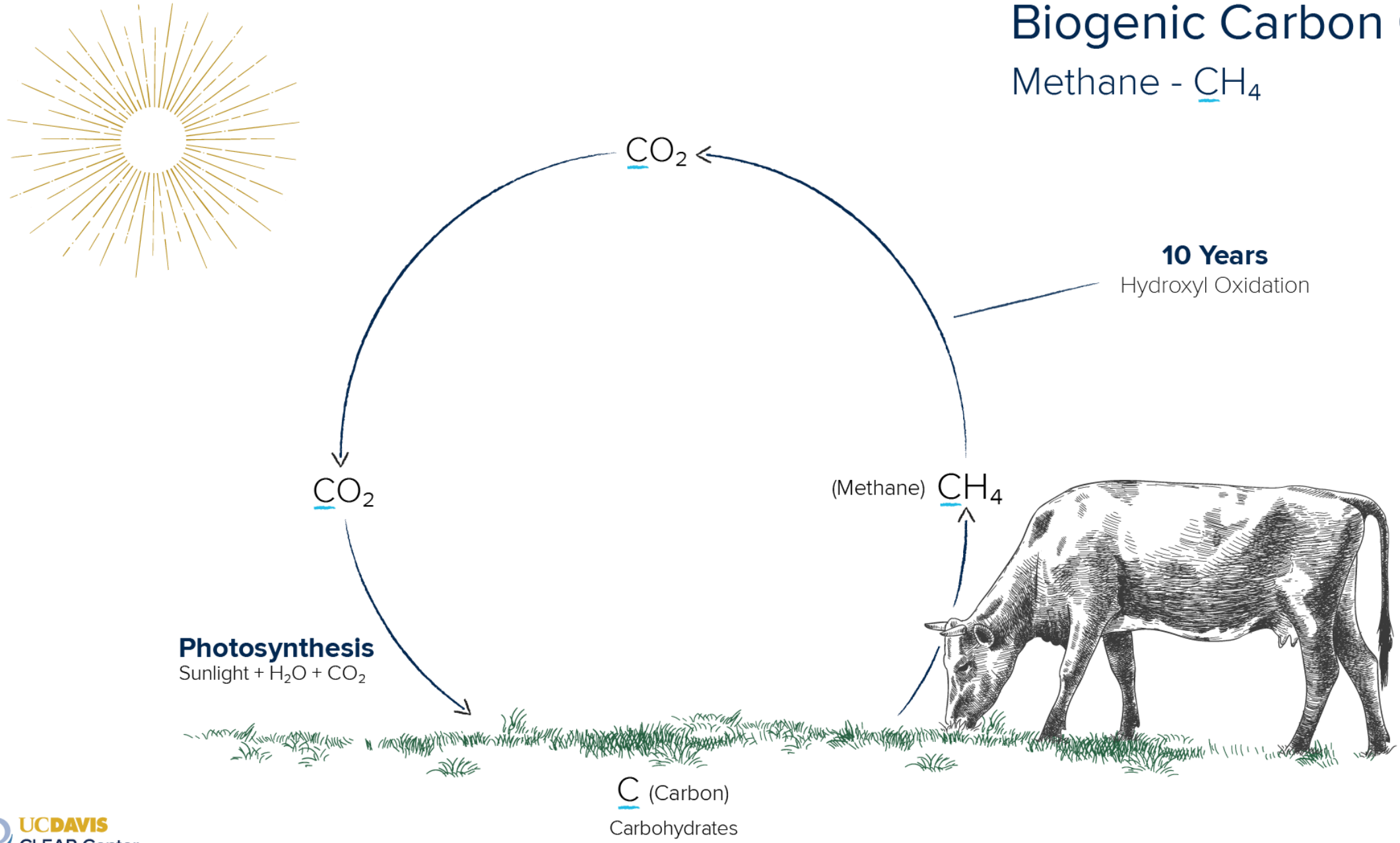
Biogenic Carbon Cycle

Methane - CH_4



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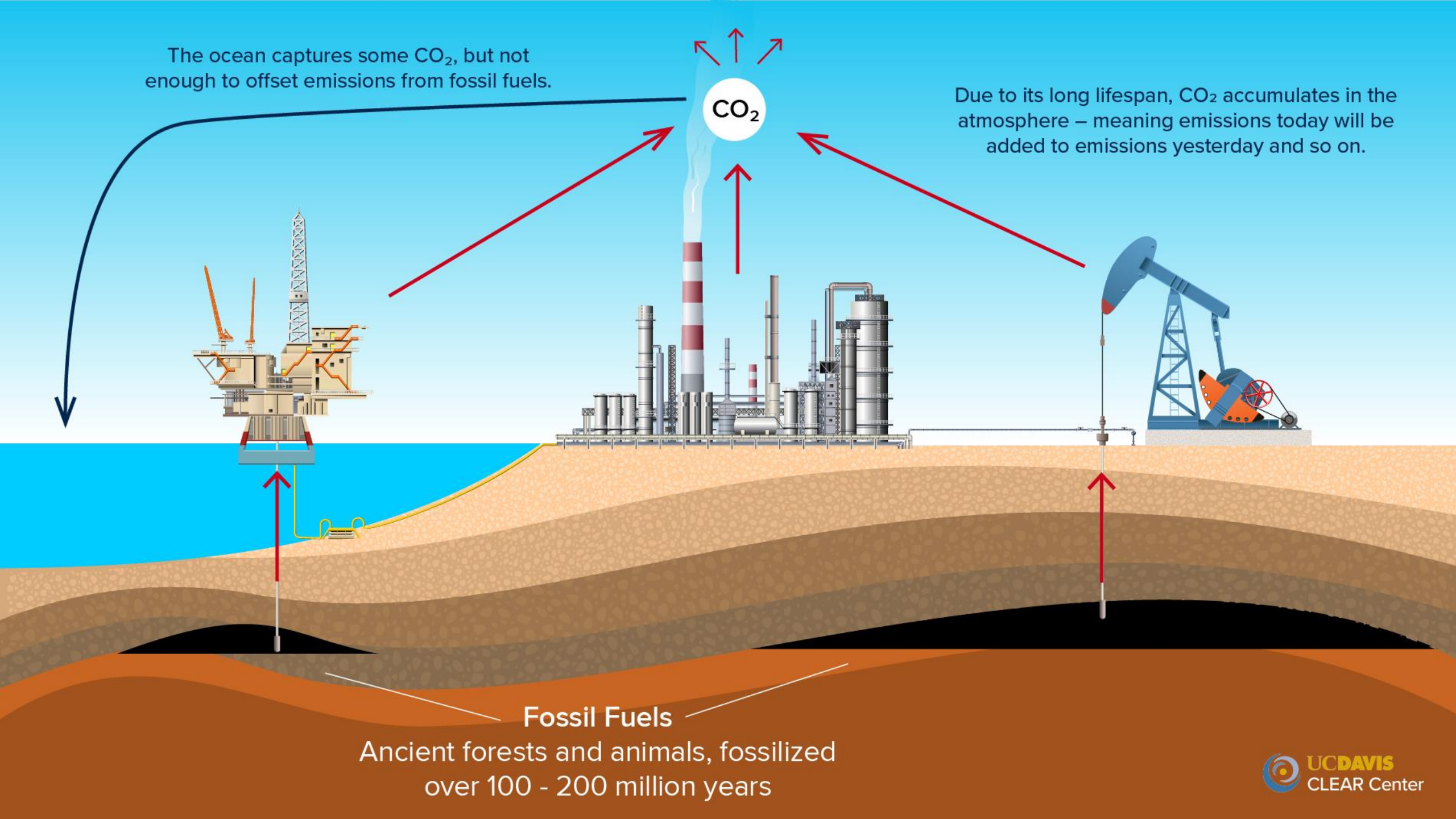
The ocean captures some CO_2, but not enough to offset emissions from fossil fuels.
CO_2
Due to its long lifespan, CO_2 accumulates in the atmosphere – meaning emissions today will be added to emissions yesterday and so on.
Fossil Fuels
Ancient forests and animals, fossilized over 100 - 200 million years
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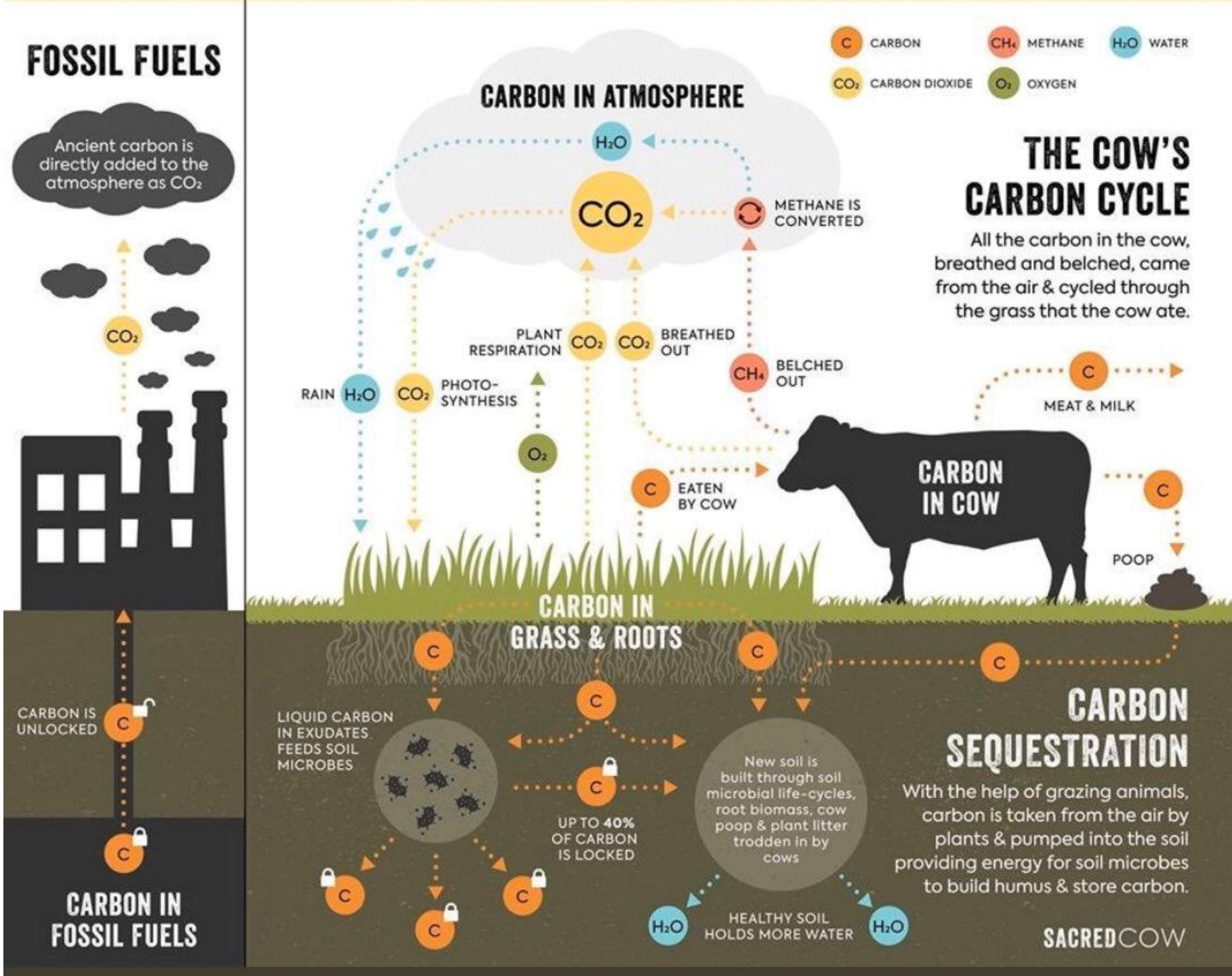
Fossil vs. Biogenic Carbon



Via:
@sustainabledish
sacredcow.info

GWP* - A new way to characterize short-lived greenhouse gases

- GWP* is a new metric out of the University of Oxford that assesses how an emission of a short-lived greenhouse gas affects temperature.
- GWP100 overestimates methane's warming impact of constant herds by a factor of 4, and overlooks it's ability to induce cooling when CH_4 emissions are reduced.
- GWP* not only accounts for methane's short lifespan, but also its atmospheric removal.

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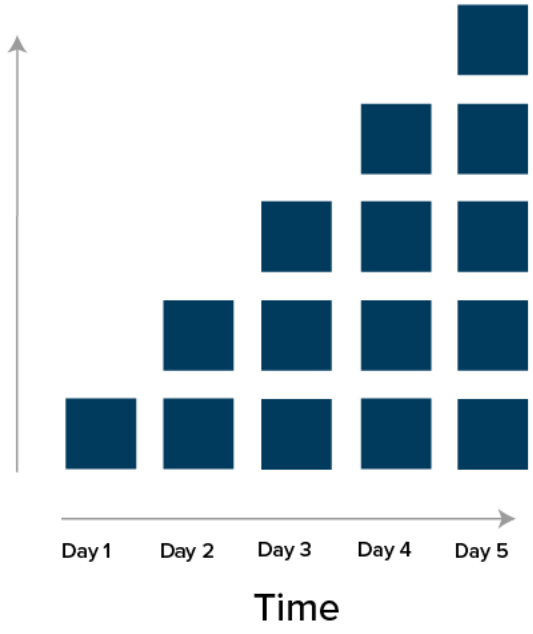
= Pulse of CO_2

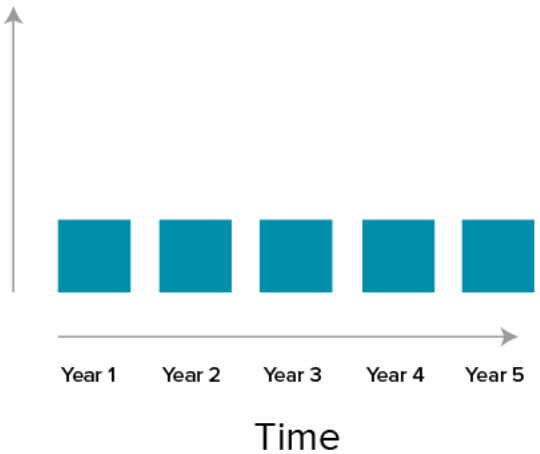
Stock Gas
Carbon dioxide (CO_2)



Stock gases will accumulate over time, because they stay in the environment.

= Pulse of CH_4

Flow Gas
Methane (CH_4)



Flow gases will stay stagnant, as they are destroyed at the same rate of emission.

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Based on research by Myles R. Allen, Keith P. Shine, Jan S. Fuglestvedt, Richard J. Millar, Michelle Cain, David J. Frame & Adrian H. Macey.
Read more here: https://rdcu.be/b1t7S

Why methane should be treated differently compared to long-lived greenhouse gases

June 12, 2018 12.59am EDT

Livestock is a significant source of methane, a potent but short-lived greenhouse gas. from www.shutterstock.com, CC BY-SA

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New research provides a way out of a longstanding quandary in climate policy: how best to account for the warming effects of greenhouse gases that have different atmospheric lifetimes.

Carbon dioxide is a long-lived greenhouse gas, whereas methane is comparatively short-lived. Long-lived "stock pollutants" remain in the atmosphere for centuries, increasing in concentration as long as their emissions continue and causing more and more warming. Short-lived "flow pollutants" disappear much more rapidly. As long as their emissions remain constant, their concentration and warming effect remain roughly constant as well.

Our research demonstrates a better way to reflect how different greenhouse gases affect global temperatures over time.

Cost of pollution

The difference between stock and flow pollutants is shown in the figure below. Flow pollutant emissions, for example of methane, do not persist. Emissions in period one, and the same emissions in period two, lead to a constant (or roughly constant) amount of the pollutant in the atmosphere (or river, lake, or sea).

With stock pollutants, such as carbon dioxide, concentrations of the pollutant accumulate as emissions continue.

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https://theconversation.com/why-methane-should-be-treated-differently-compared-to-long-lived-greenhouse-gases-97845

CarbonBrief
CLEAR ON CLIMATE

Cattle round-up before shipping on a West Texas ranch. Credit: Luc Novovitch / Alamy Stock Photo.

GUEST POSTS 7 June 2018 10:08

Guest post: A new way to assess 'global warming potential' of short-lived pollutants

DR MICHELLE CAIN
06.07.18

GUEST POSTS Guest post: A new way to assess 'global warming potential' of short-lived pollutants

Dr Michelle Cain in a science and policy research associate on the Oxford Martin School's

https://www.carbonbrief.org/guest-post-a-new-way-to-assess-global-warming-potential-of-short-lived-pollutants

npj | Climate and Atmospheric Science www.nature.com/npjclimatsci

ARTICLE OPEN

Improved calculation of warming-equivalent emissions for short-lived climate pollutants

Michelle Cain[1,2], John Lynch[3], Myles R. Allen[1,3], Jan S. Fuglestvedt[4], David J. Frame[5] and Adrian H Macey[6,7]

Anthropogenic global warming at a given time is largely determined by the cumulative total emissions (or stock) of long-lived climate pollutants (LLCPs), predominantly carbon dioxide (CO_2), and the emission rates (or flow) of short-lived climate pollutants (SLCPs) immediately prior to that time. Under the United Nations Framework Convention on Climate Change (UNFCCC), reporting of greenhouse gas emissions has been standardised in terms of CO_2-equivalent (CO_2-e) emissions using Global Warming Potentials (GWP) over 100-years, but the conventional usage of GWP does not adequately capture the different behaviours of LLCPs and SLCPs, or their impact on global mean surface temperature. An alternative usage of GWP, denoted GWP*, overcomes this problem by equating an increase in the emission rate of an SLCP with a one-off "pulse" emission of CO_2. We show that this approach, while an improvement on the conventional usage, slightly underestimates the impact of recent increases in SLCP emissions on current rates of warming because the climate does not respond instantaneously to radiative forcing. We resolve this with a modification of the GWP* definition, which incorporates a term for each of the short-timescale and long-timescale climate responses to changes in radiative forcing. The amended version allows "CO_2-warming-equivalent" (CO_2-we) emissions to be calculated directly from reported emissions. Thus SLCPs can be incorporated directly into carbon budgets consistent with long-term temperature goals, because every unit of CO_2-we emitted generates approximately the same amount of warming, whether it is emitted as a SLCP or a LLCP. This is not the case for conventionally derived CO_2-e.

npj Climate and Atmospheric Science (2019)2:29 ; https://doi.org/10.1038/s41612-019-0086-4

INTRODUCTION

Comprehensive climate policies must appraise a range of greenhouse gases and aerosols, which can differ significantly in their radiative efficiencies and atmospheric lifespans, and hence the nature of their climate impacts.[1] To reflect this, different climate pollutants are often expressed using a common emission metric. Emissions reporting under the United Nations Framework Convention on Climate Change (UNFCCC) now requires the use of 100-year Global Warming Potential (GWP_{100}) to account for all gases as carbon dioxide equivalent (CO_2-e) quantities. Despite its prevalence in the UNFCCC and national climate policies, GWP has received criticism,[2–4] not least that it cannot be used to appraise temperature-related goals,[5] and other equivalence metrics have been proposed.[6–9] Indeed, Shine[9] notes that strong caveats were in place when GWP was introduced in the Intergovernmental Panel on Climate Change's First Assessment Report[10]: "It must be stressed that there is no universally accepted methodology for combining all the relevant factors into a single [metric]… A simple approach [i.e., the GWP] has been adopted here to illustrate the difficulties inherent in the concept." Working Group 1 of the Fifth Assessment Report, AR5, did not recommend any metric and emphasised that the choice of metric depends on the specific goal of the climate policy. In AR4, however, the GWPs were the recommended metric to compare the effects of long-lived greenhouse gases,[11] and AR5 values of GWP_{100} have now been adopted for emissions reporting (see the textual proposal from 12 December 2018 on the transparency framework for action and support referred to in Article 13 of the Paris Agreement: https://unfccc.int/process/bodies/subsidiary-bodies/ad-hoc-working-group-on-the-paris-agreement-apa/information-on-apa-agenda-item-5).

The temperature response to emissions is ambiguous under GWP[1,12,13] and this ambiguity is particularly relevant in the context of the Paris Agreement, given its stated aim of 'holding the increase in the global average temperature well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C.' Beyond the reference to a balance of emissions by sources and removals by sinks well before the end of the century, neither the means by which this is to be achieved nor the metrics used to assess progress are explicitly stated.[14] Tanaka and O'Neill[15] demonstrate that net-zero aggregate CO_2-e emissions based on GWP_{100} (which is often assumed to be the definition of the balance of sources and sinks described in the Paris Agreement) are not essential to limit warming to 1.5 °C. Wigley[16] posits that the balance of sources and sinks in Article 4.1 of the Paris Agreement is scientifically inconsistent with the temperature goals in Article 2.1. These papers show how moving from the temperature goals articulated in the Paris Agreement to emissions targets and profiles is not something that is currently well-handled by conventional carbon accounting; they also show that the area

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https://www.nature.com/articles/s41612-019-0086-4.pdf

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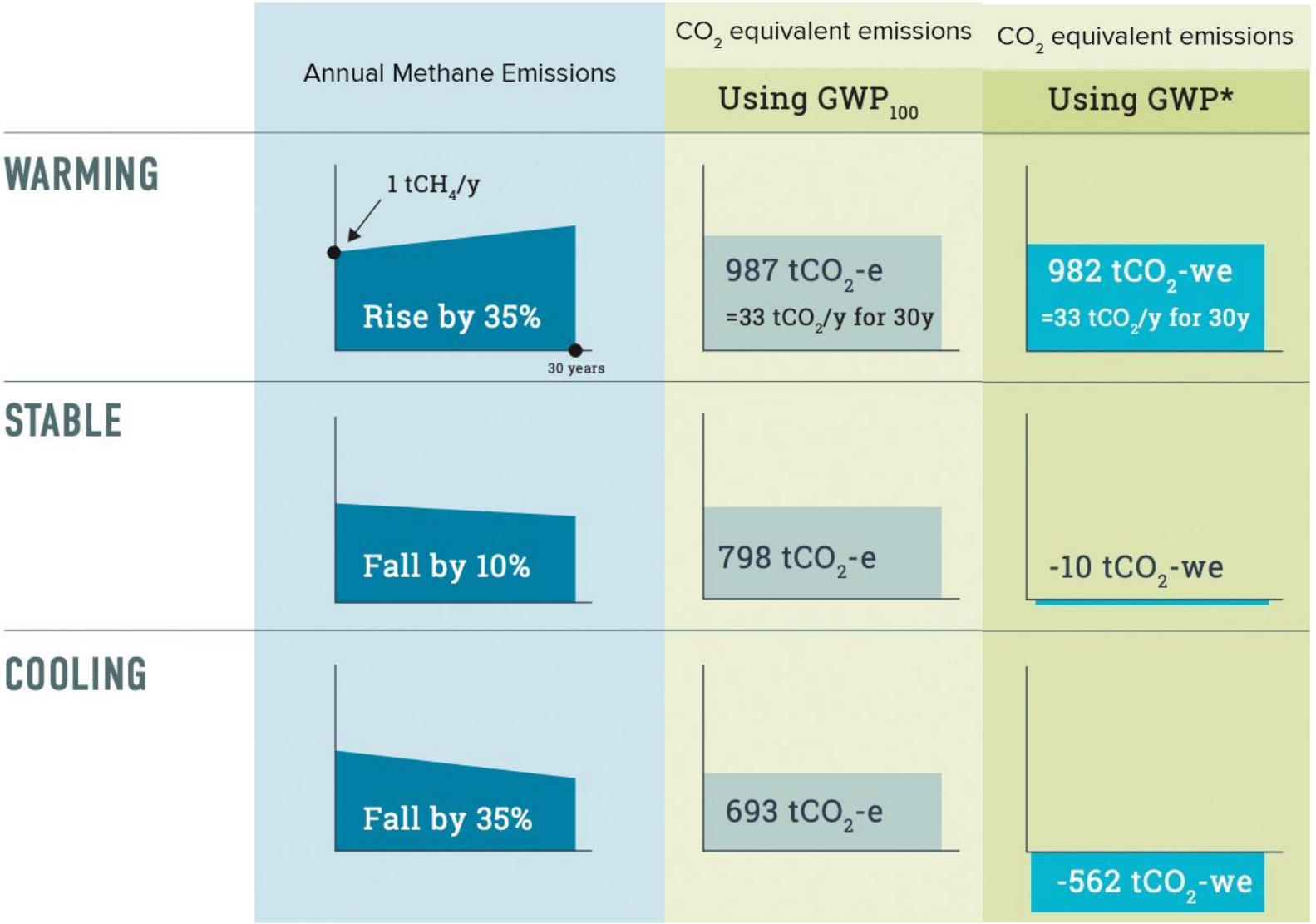

Cain, M., Allen, M. & Lynch, J. *Oxford Martin Programme on Climate Pollutants* (2019). Read more at: https://www.oxfordmartin.ox.ac.uk/downloads/academic/201908_ClimatePollutants.pdf.

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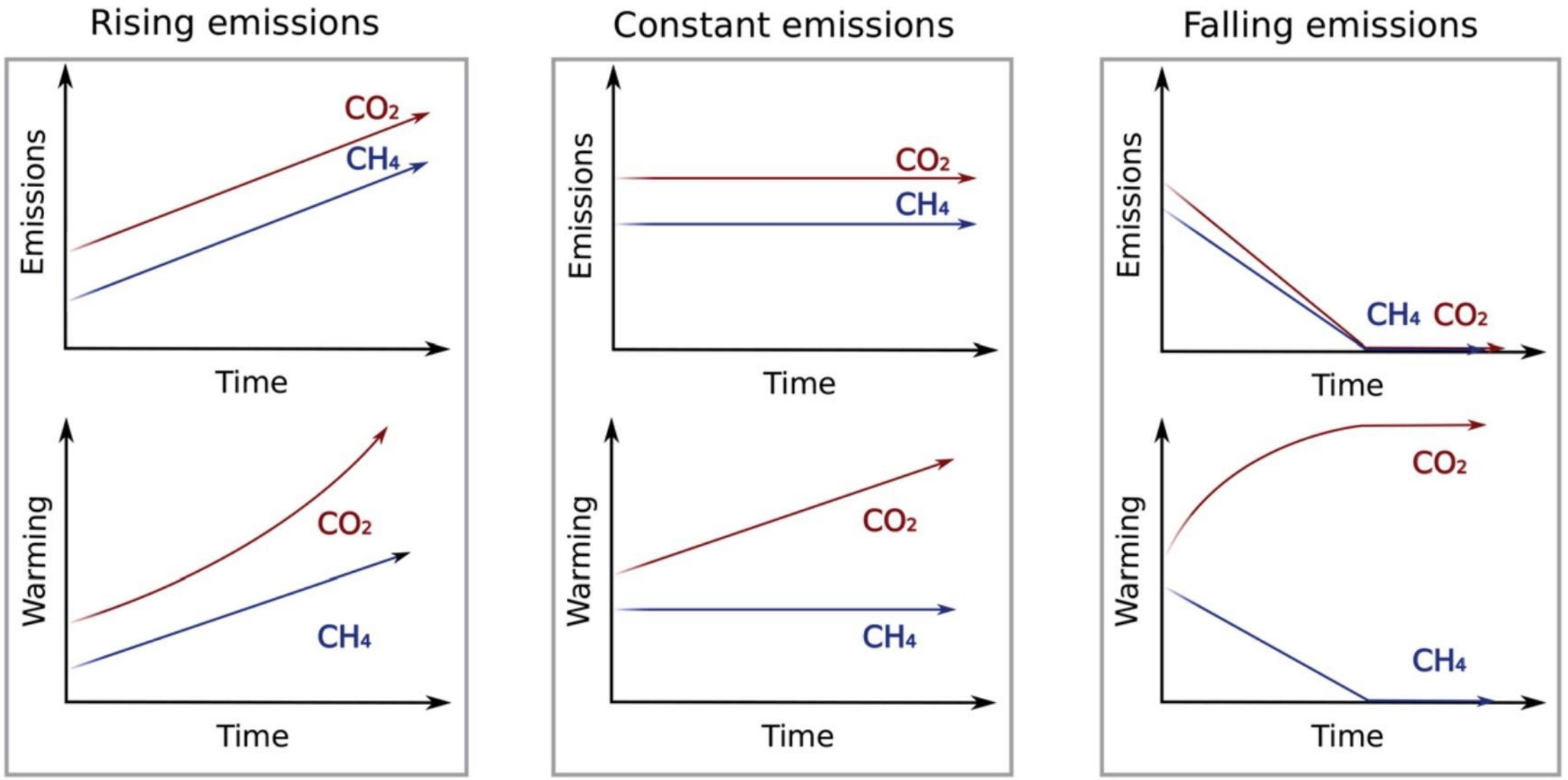

Oxford Martin, Climate Metrics for Ruminant Livestock, July 2018,
https://www.oxfordmartin.ox.ac.uk/downloads/reports/Climate-metrics-for-ruminant-livestock.pdf%C2%A0

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Since 2015 California dairies have reduced greenhouse gases by **2.2 million metric tons.**

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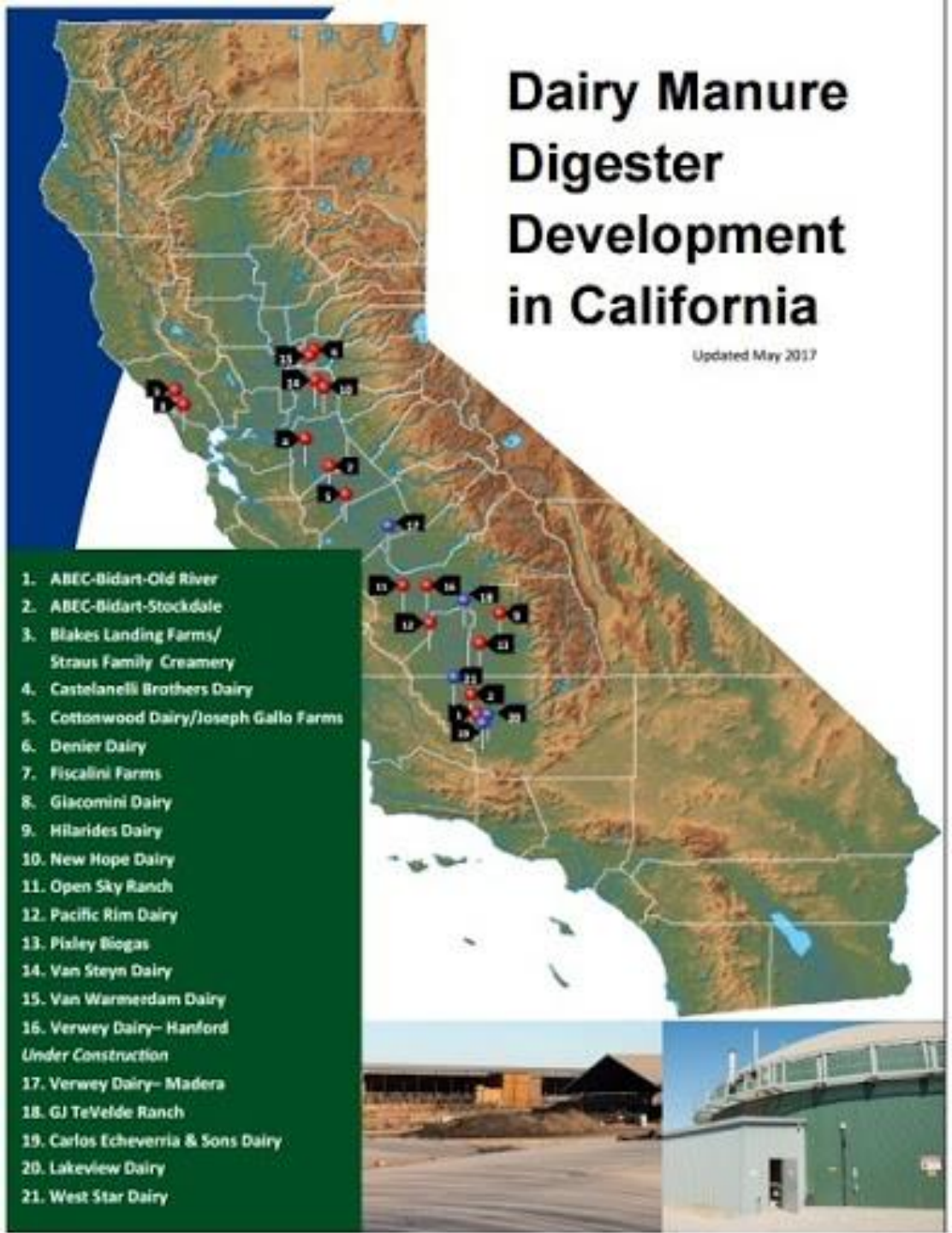

That's a **25 percent** reduction in GHG emissions.

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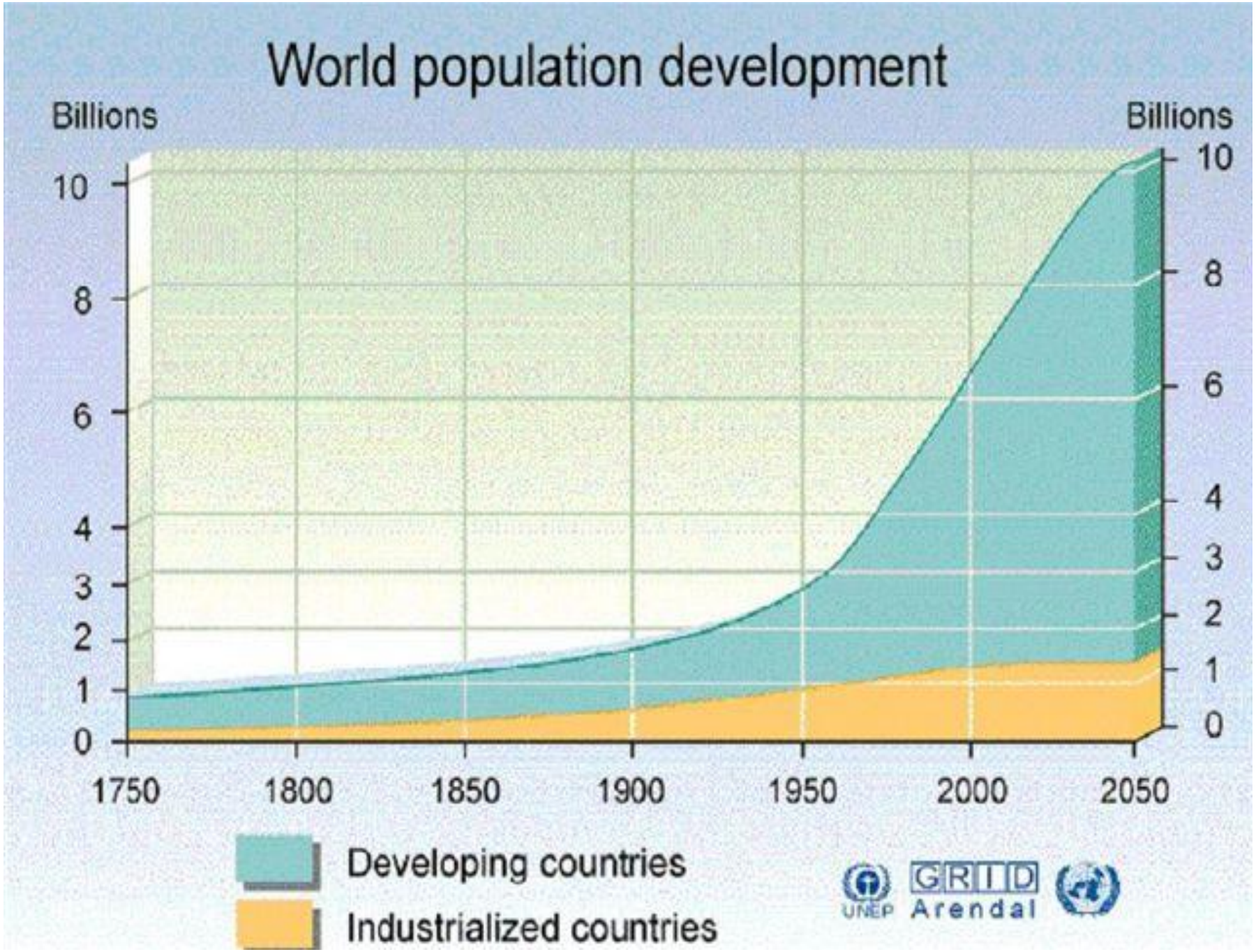

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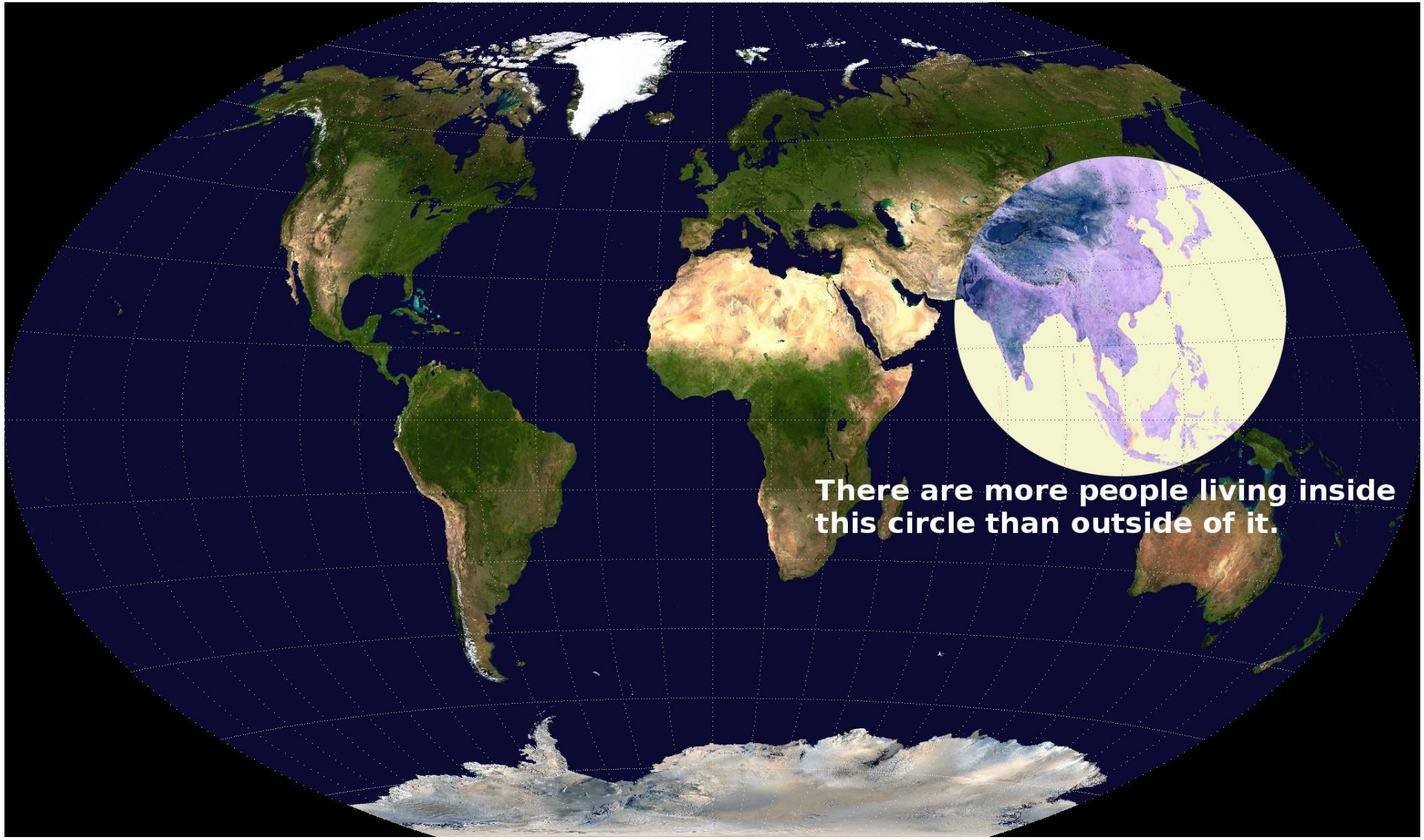

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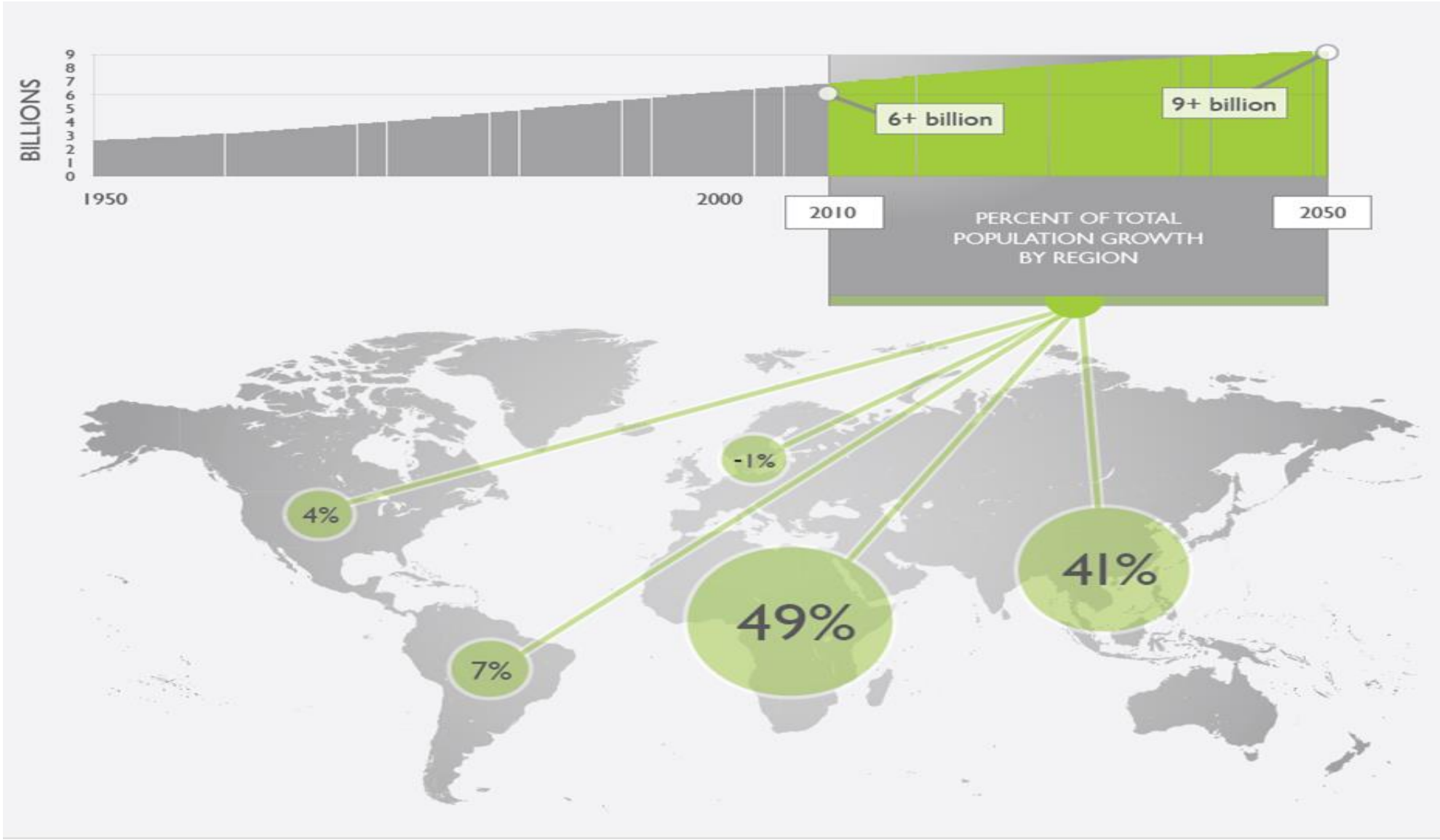

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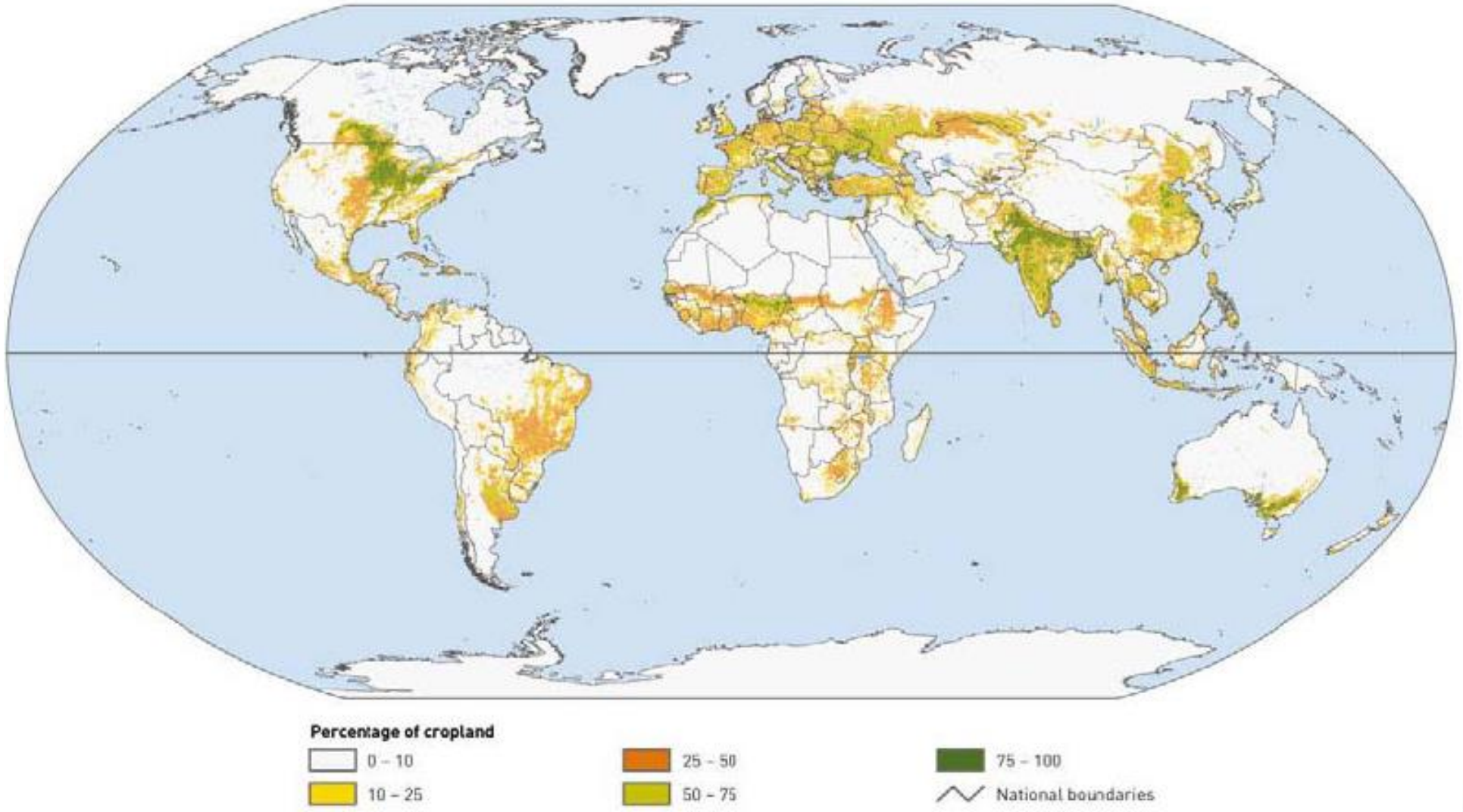
Distribution of cropland



Source: FAO, 2006f.

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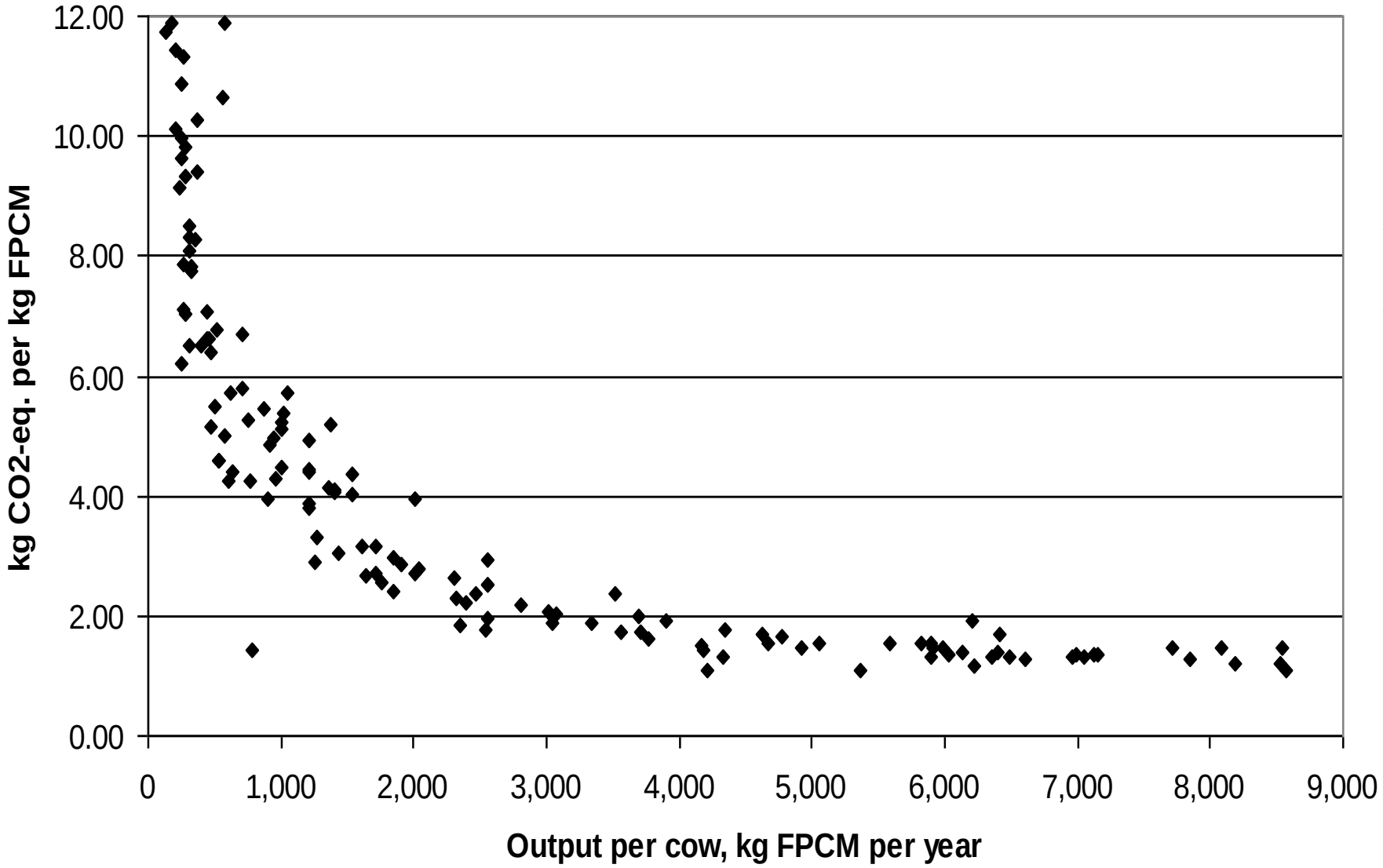
FAO (2006)



Relationship between total greenhouse gas emissions and milk output per cow

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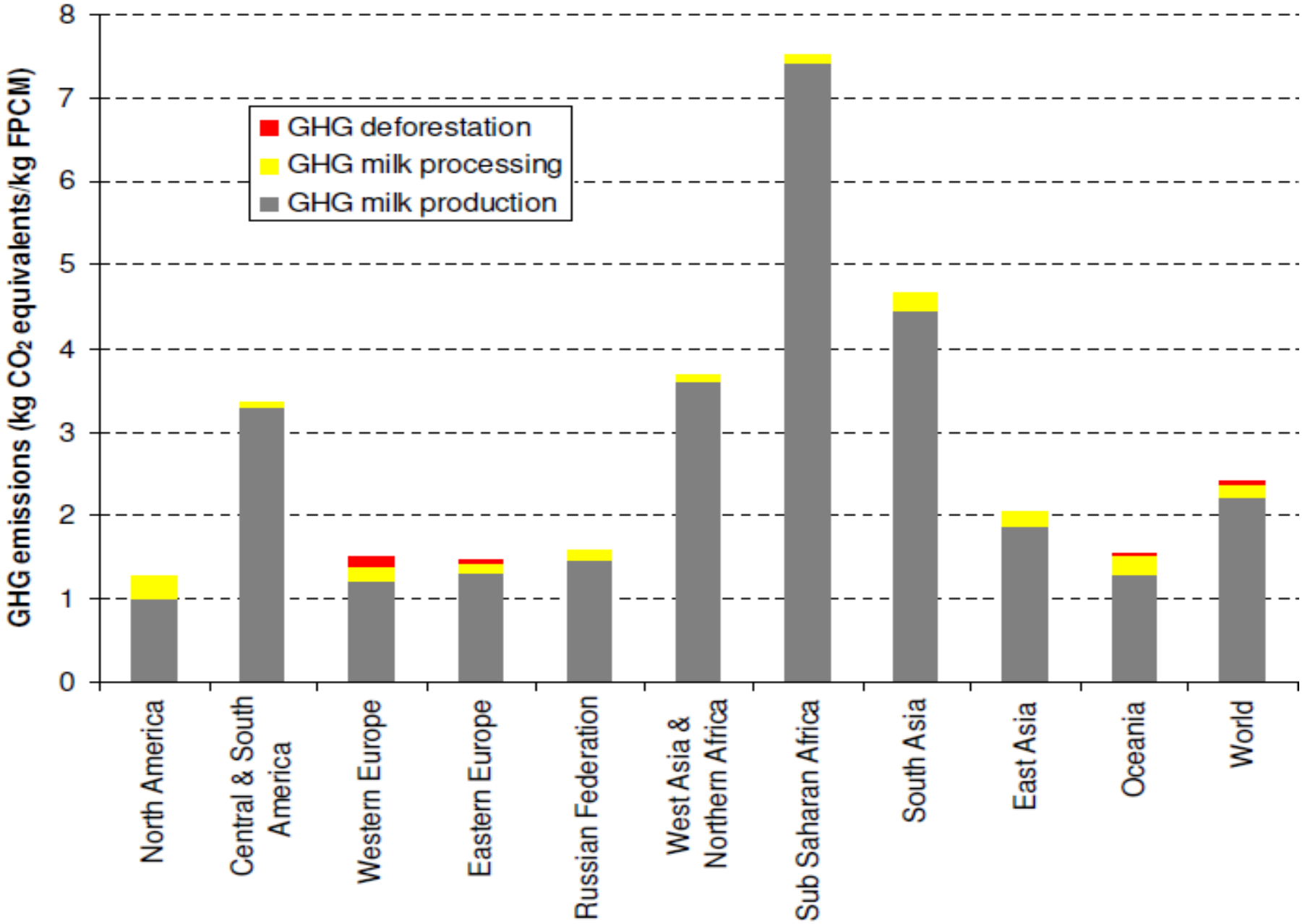
H. Steinfeld, 2015



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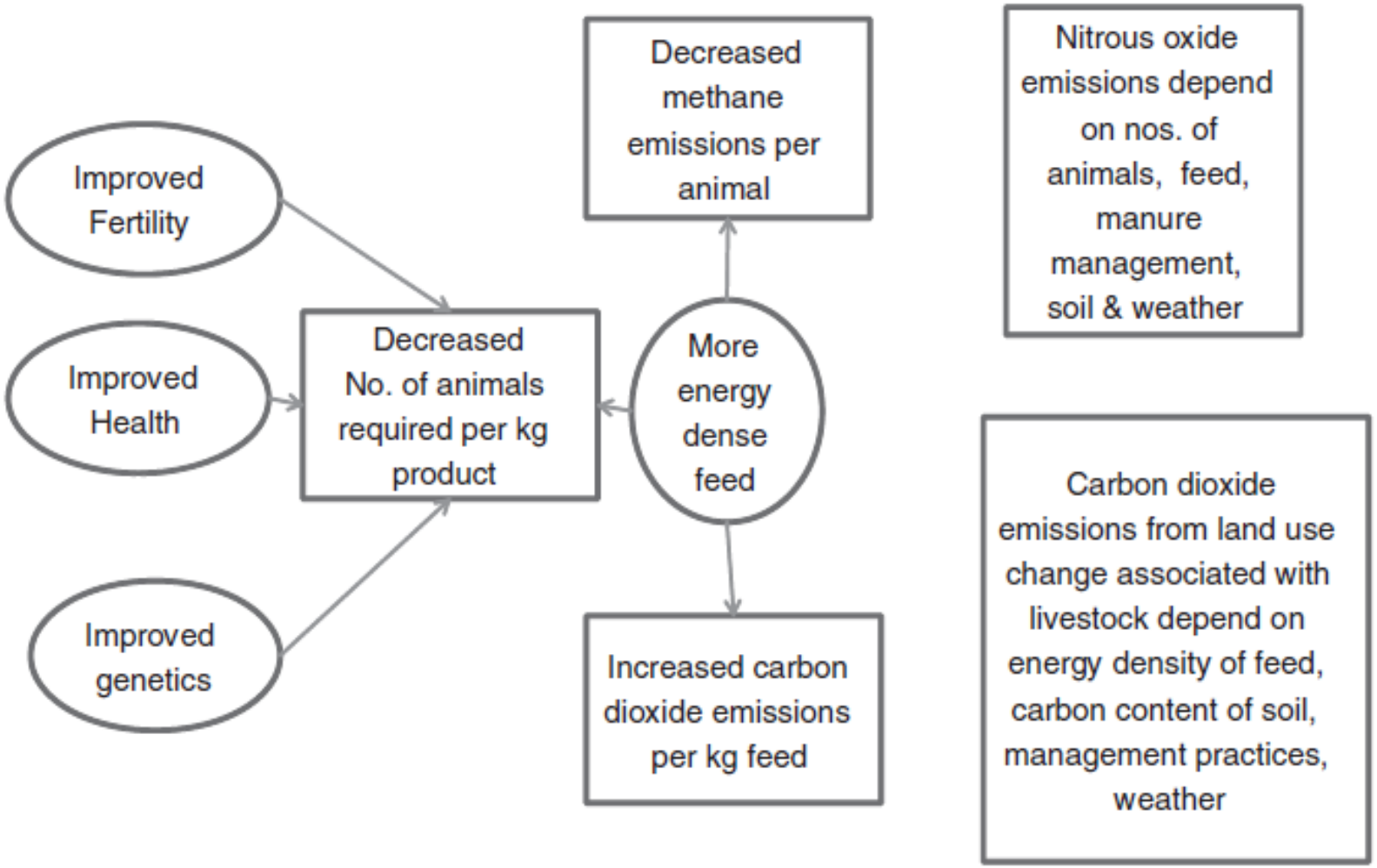
FAO (2010)

Mitigation: interventions to improve productivity



Gill et al. (2010)

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US Dairy trends

- In 1950, there were 25 million dairy cows in the US, vs 9 million today
- With 16 million fewer cows (1950 vs 2018), milk production nationally has increased 60 percent
- The carbon footprint of a glass of milk is 2/3 smaller today than it was 70 years ago

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US Beef Trends

- In 1970, the U.S. had 140 million head of beef.
- By comparison, today there are 90 million head.
- In both 1970 and 2010, 24 million tons of beef were produced.

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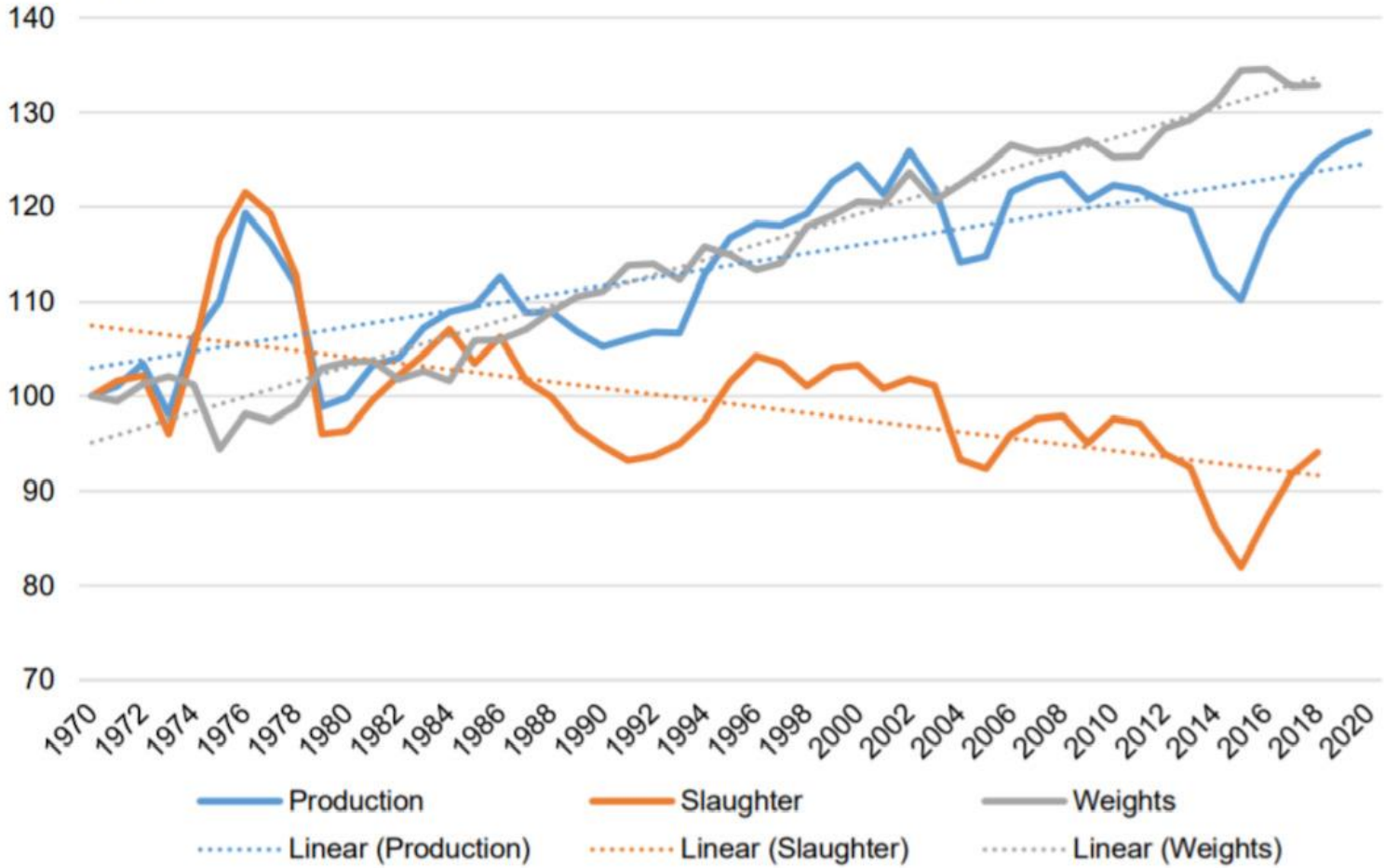
For over 50 years, cattle weights have propelled beef production as cattle slaughter decreased

Index 1970=100



Source: Calculations by USDA, Economic Research Service based on data from USDA, National Agricultural Statistics Service.

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National Geograpic

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Thank you

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Real-World Impacts of Ground Beef compared to Plant-Based Meat Alternatives

Samantha Werth, Ph.D.

Idaho Science & Technology Policy Fellow

James A. & Louise McClure Center for Public Policy Research

University of Idaho

THINKING TOWARDS THE FUTURE

- By 2050, we will need to feed nearly 10 billion people
  - Food production will need to increase by 70%
- Add to this the very present threat of climate change
  - Cattle contribute to 5.9% of global GHG emissions
- Calls for reductions in beef consumption

PLANT-BASED MEAT ALTERNATIVES

Ground Beef vs. Meat Alternatives

Ground Beef VS

Environmental Impacts

- Climate Change (CO_2)
- Land Use
- Water Use
- Energy Use

Ground Beef VS

Ground Beef vs. Meat Alternatives

Ground Beef VS 

Environmental Impacts

	Climate Change	Land Use	Water Use	Energy Use
Ground Beef VS Beyond Burger	90% fewer GHG emissions	93% less land	99% less water	46% less energy
Ground Beef VS Impossible Burger				

Ground Beef vs. Meat Alternatives

Ground Beef VS 

90% FEWER GHG EMISSIONS

93% LESS LAND

99% LESS WATER

46% LESS ENERGY

Environmental Impacts

Climate Change	Land Use	Water Use	Energy Use

Ground Beef VS 

92% FEWER GHG EMISSIONS

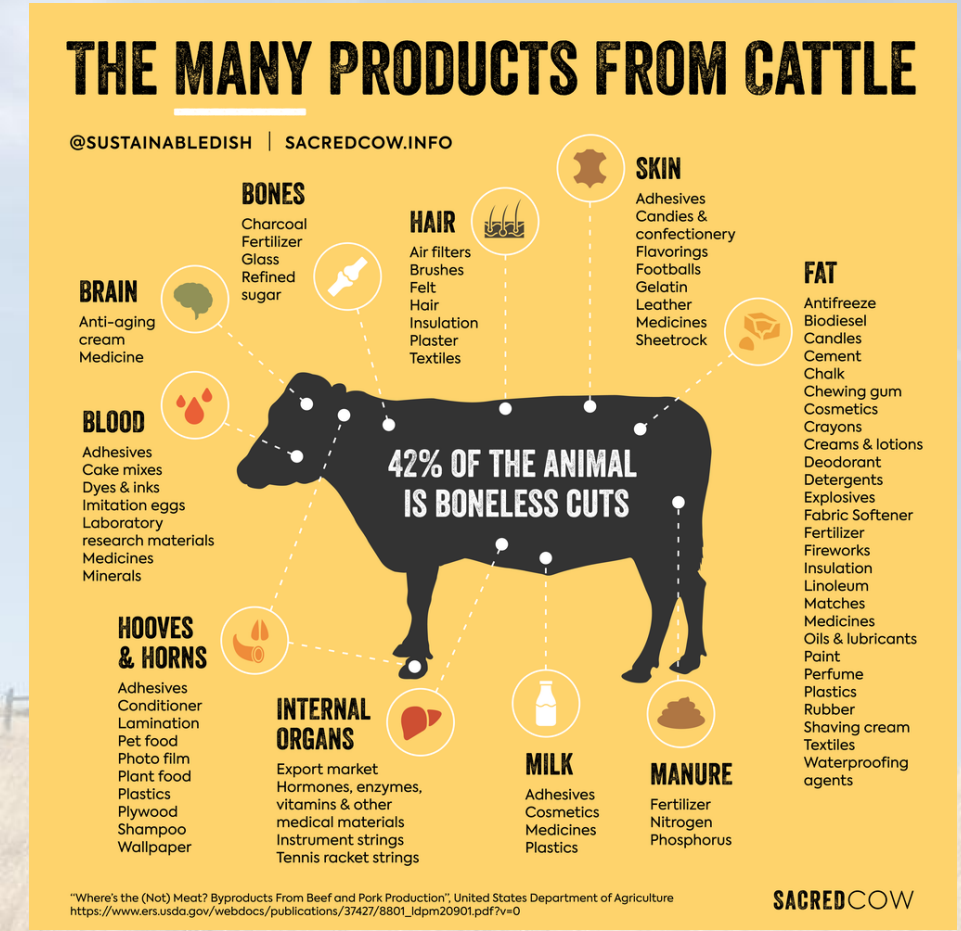
96% LESS LAND

87% LESS WATER

?? ENERGY

REAL-WORLD IMPACTS

BEYOND GROUND BEEF

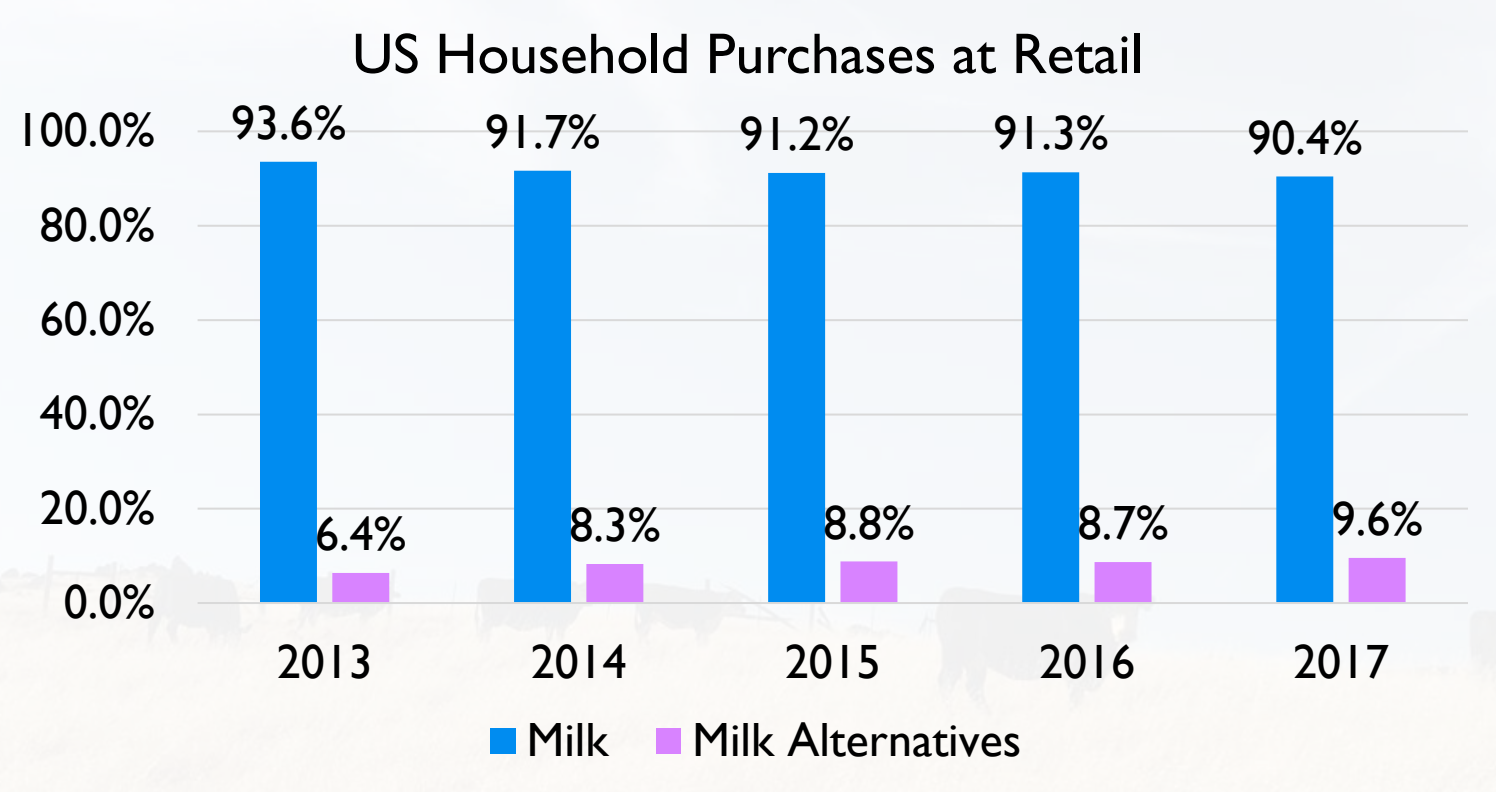


FACTORS NOT CONSIDERED

- Ground beef links to the economy
  - US cattle production is a $77 billion dollar industry
  - Supports livelihoods of many in rural communities
  - Major component of international trade

WHAT IS A REASONABLE REPLACEMENT?

- Milk vs. Milk Alternatives



Source: Stewart et al. 2020. Are Plant-Based Analogues Replacing Cow's Milk in the American Diet? Journal of Agricultural and Applied Economics. 52:562–579.

WHAT ARE THE REAL-WORLD IMPACTS?

- Two points of analysis:
  1. Economic Impacts
     - What happens in US and international economies if we reduce GB consumption by 15%?
  2. Environmental impacts
     - How does a 15% replacement of GB with Beyond or Impossible Burger impact the environment

ECONOMIC IMPACTS

TOTAL PRODUCTION

	Total Production (% change from baseline)		
Sector	US	Import regions important to US beef (IMP)	Rest of World (ROW)
Ground Beef	-9.98	-2.22	-0.05
Other Beef	0.20	0	-0.01
Cattle	-3.76	-1.11	-0.03
Grains	-0.41	-0.06	-0.03
Vegetables	0.16	0.04	-0.02
Oil seeds	0.38	-0.04	-0.07
Agricultural Products	0.50	0.08	-0.03
Leather	0.07	0.09	0
Pharmaceuticals	-0.02	0.03	0.01
Rubber	-0.04	0.04	0

LABOR

	Labor (% change from baseline)		
Sector	US	IMP	ROW
Ground Beef	-9.98	-2.22	-0.06
Other Beef	0.20	0	-0.01
Cattle	-4.10	-1.19	-0.04
Grains	-0.55	-0.10	-0.05
Vegetables	0.06	0	-0.02
Oil seeds	0.29	-0.07	-0.08
Agricultural Products	0.42	0.05	-0.04
Leather	0.06	0.09	0
Pharmaceuticals	-0.02	0.04	0.01
Rubber	-0.04	0.04	0

WORLD TRADE

- US
  - Reduced imports/exports and shifted imports to manufactured goods (MFG)
- IMP
  - Reduced exports of agricultural products and increased imports of MFG
- ROW
  - Increased exports of MFG, but reduced overall national spending

ENVIRONMENTAL IMPACTS

Sector Results

GROUND BEEF

ENVIRONMENTAL IMPACTS

Climate Change

Land Use

Water Use

Energy Use

GROUND BEEF

Sector Results

GROUND BEEF

12.9% FEWER GHG EMISSIONS

13.7% LESS LAND

7.3% LESS WATER

8.1% LESS ENERGY

ENVIRONMENTAL IMPACTS

CO_2 Climate Change

Land Use

Water Use

Energy Use

GROUND BEEF

Sector Results

GROUND BEEF

12.9% FEWER GHG EMISSIONS

13.7% LESS LAND

7.3% LESS WATER

8.1% LESS ENERGY

ENVIRONMENTAL IMPACTS

CO_2 Climate Change

Land Use

Water Use

Energy Use

GROUND BEEF

12.6% FEWER GHG EMISSIONS

8.5% LESS LAND

8.5% MORE WATER

0.5% MORE ENERGY

National Results

Environmental Impacts

Climate Change

Land Use

Water Use

Energy Use

National Results

GROUND BEEF

0.07% FEWER GHG EMISSIONS

1.5% LESS LAND

0.02% LESS WATER

0% CHANGE

ENVIRONMENTAL IMPACTS

CO_2

Climate Change

Land Use

Water Use

Energy Use

GROUND BEEF

National Results

GROUND BEEF +

0.07%	1.5%	0.02%	0%
FEWER GHG EMISSIONS	LESS LAND	LESS WATER	CHANGE

ENVIRONMENTAL IMPACTS

Climate Change	Land Use	Water Use	Energy Use

GROUND BEEF +

0.07%	0.9%	0.4%	0.02%
FEWER GHG EMISSIONS	LESS LAND	MORE WATER	MORE ENERGY

BACK TO THE REAL-WORLD

- Ground beef plays an important role in the economy
- Reductions in environmental impacts are not as substantial as previously reported
- We will need more food in the future
  - It may be necessary to consider how both ground beef and meat alternatives can be a part of a sustainable future

THANK YOU!

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: @samjwerth

Food Security and Beef's Path Forward to Feeding the World

Kim Stackhouse-Lawson, PhD

Beef Sustainability – Beef Leadership Summit Webinar

September 22, 2021

Colorado State University

AgNext

Sustainable Solutions for Animal Agriculture

Vision: Animal agriculture is a sustainable component of our global food system by providing economic, social and environmental benefits to Colorado, the Nation, and the world.

Mission: Identify and scale innovation that fosters the health of animals and ecosystems to promote profitable industries that support vibrant communities.

Phased Cluster Hires DRAFT

First Cluster Hire – Clinical Sciences and Animal Sciences already committed - 2021

- Population Health (2 position)
    - Disease Epidemiologist
- Systems Modeling (1 position)
- Feedlot Specialist (1 position)

Second Cluster Hire – 2022

- Dairy Specialist (1 position)
- Rangeland Scientist (1 position)
- Cow Calf Population Health Management Specialist (1 position)
- Animal Agriculture Law and Policy Specialist (1 position)

Third Cluster Hire – 2023

- Environmental Impact Scientist (1 position)
- Emerging Agriculture Technology Scientist (1 position)
- Grazing System Specialist (1 position)
- Nutritional Epidemiologist (1 position)
- Emerging Infectious Disease Specialist (1 position)

711 Ranch
James Henderson
CEO

Beatty Canyon Ranch
Steve Wooten
President, CEO

Beef Marketing Group
John Butler
CEO

Brackett Ranches
Kim Brackett
CEO

Five Rivers
Mike Thoren
President, CEO

Veterinary Research & Consulting, LLC
Tom Portillo
Partner

Harper Livestock
Mike Harper
President, CEO

JBS USA
Cameron Bruett
Head of Corporate Affairs and Chief Sustainability Officer

LeValley Ranches
Robbie LeValley
CFO

Kraft Family Dairies
Mary Kraft
CFO

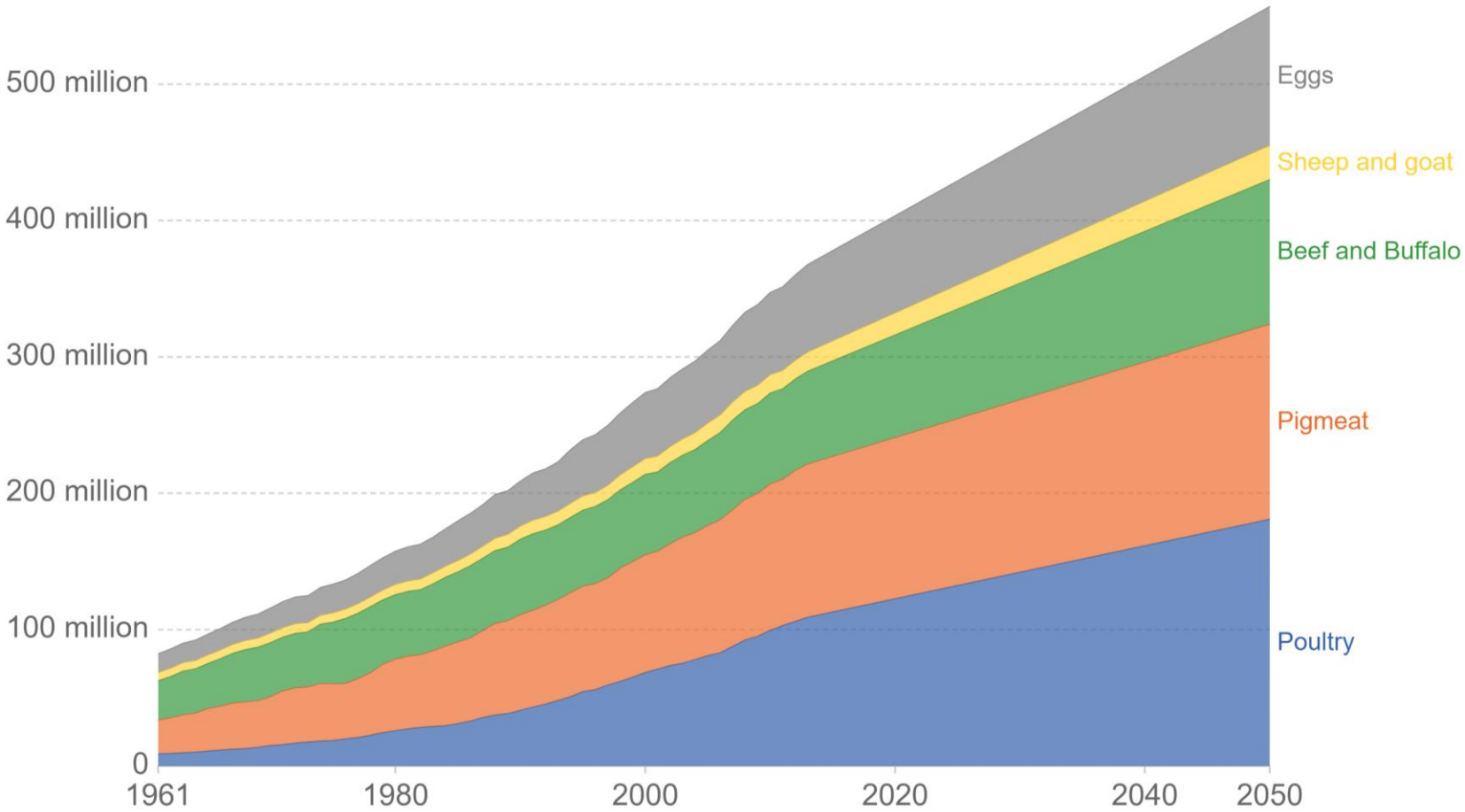
Safeway/Albertsons
Cathy East
Vice President Procurement Meat/Seafood/Deli

Veterinary Research & Consulting, LLC
Del Miles
Founder

The challenge of our time

Population Growth	Today	2030	2050	2100
	7.6B	**8.5B**	**9.7B**	**11.2B**

1B People Currently Living in Hunger and Undernourishment



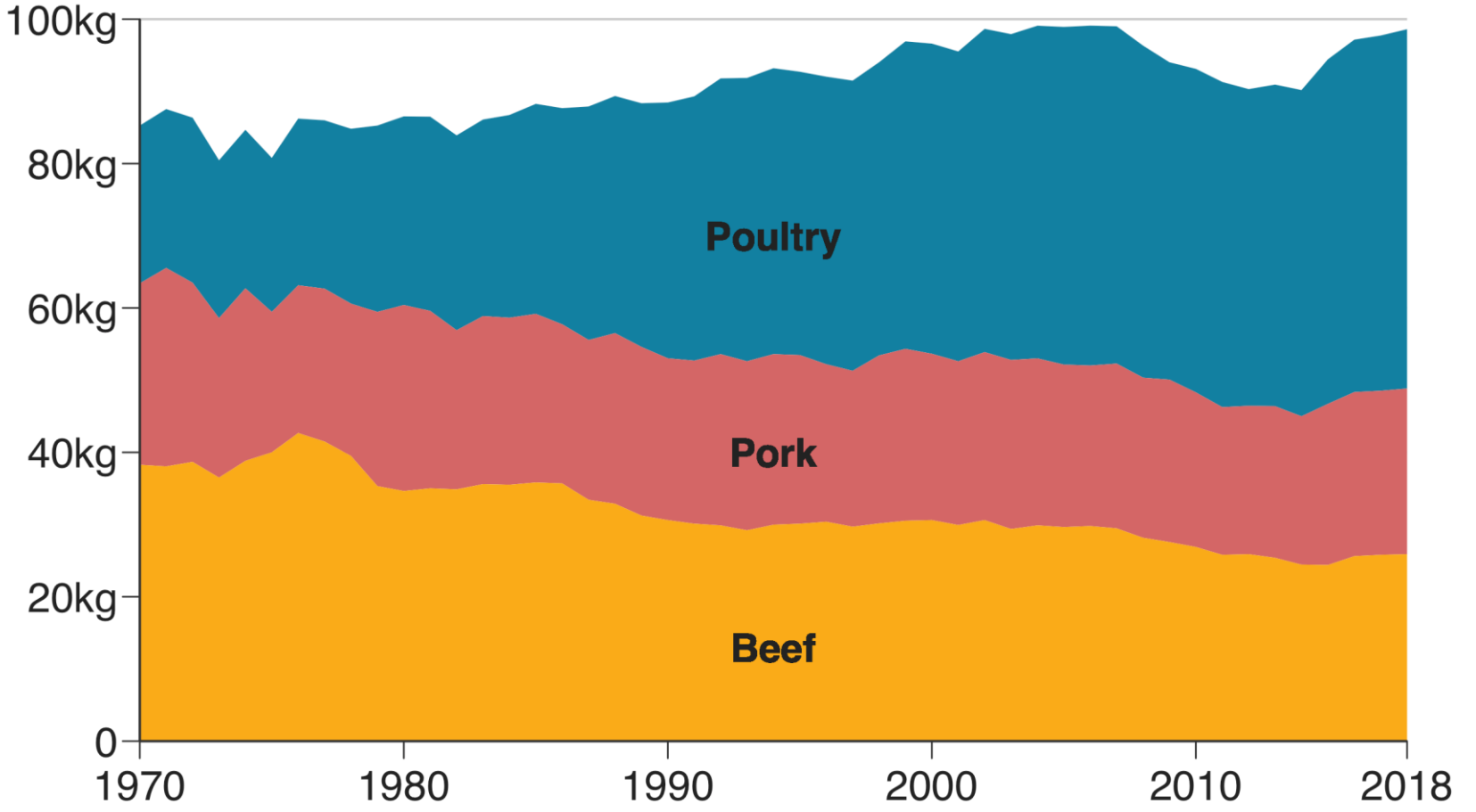
Source: UN Food and Agriculture Organization (FAO)

Global Meat Projections to 2050

UN FAO Global Meat Projections based on future population projections and expected impacts of regional and national economic growth trends on meat consumption.

Meat consumption in the US

Average annual consumption per person, by type of meat



Source: United States Department for Agriculture / Our World in Data

BBC

Nearly 40%

of U.S. consumers are adding more vegan food options to the dishes they eat

Millennials & Gen Z

are eating more chicken than consumers of same age range 30 years ago.

Chicken is preferred

Price, health and sustainability attributes, including no antibiotic options.

Food Insecurity

- U.S. Department of Agriculture defines **food insecurity** as a lack of consistent access to enough food for an active, healthy life.
- Feeding America: 35 million people in the United States experienced hunger in 2019.
- This number is assumed to have increased to 42 million due to the COVID-19 pandemic.

Meat is optimal for the human diet

- Animal source foods (ASF) provide nutrients required for optimal human development, particularly in pregnant women and young children.
- Nutrients in meat could help solve the world's biggest nutrient deficiency in developing countries.
- Undernutrition causes almost half of child deaths globally and undermines the long-term health of populations.
- Meat delivers vital protein and nutrients in an efficient way.

Adesogan, et al., (2019)

Describe the biggest challenge facing the dual climate-nutrition challenge

1.3 billion people depend on livestock for their livelihoods, food security, and nutrition. Of those people, two thirds of livestock managers are women, which makes sustainable livestock production critically important for women's empowerment and job creation.

The livestock sector, on average, boosts agricultural GDP by 30 percent in low- and middle-income countries and is a critical asset for households in areas of recurrent crisis.

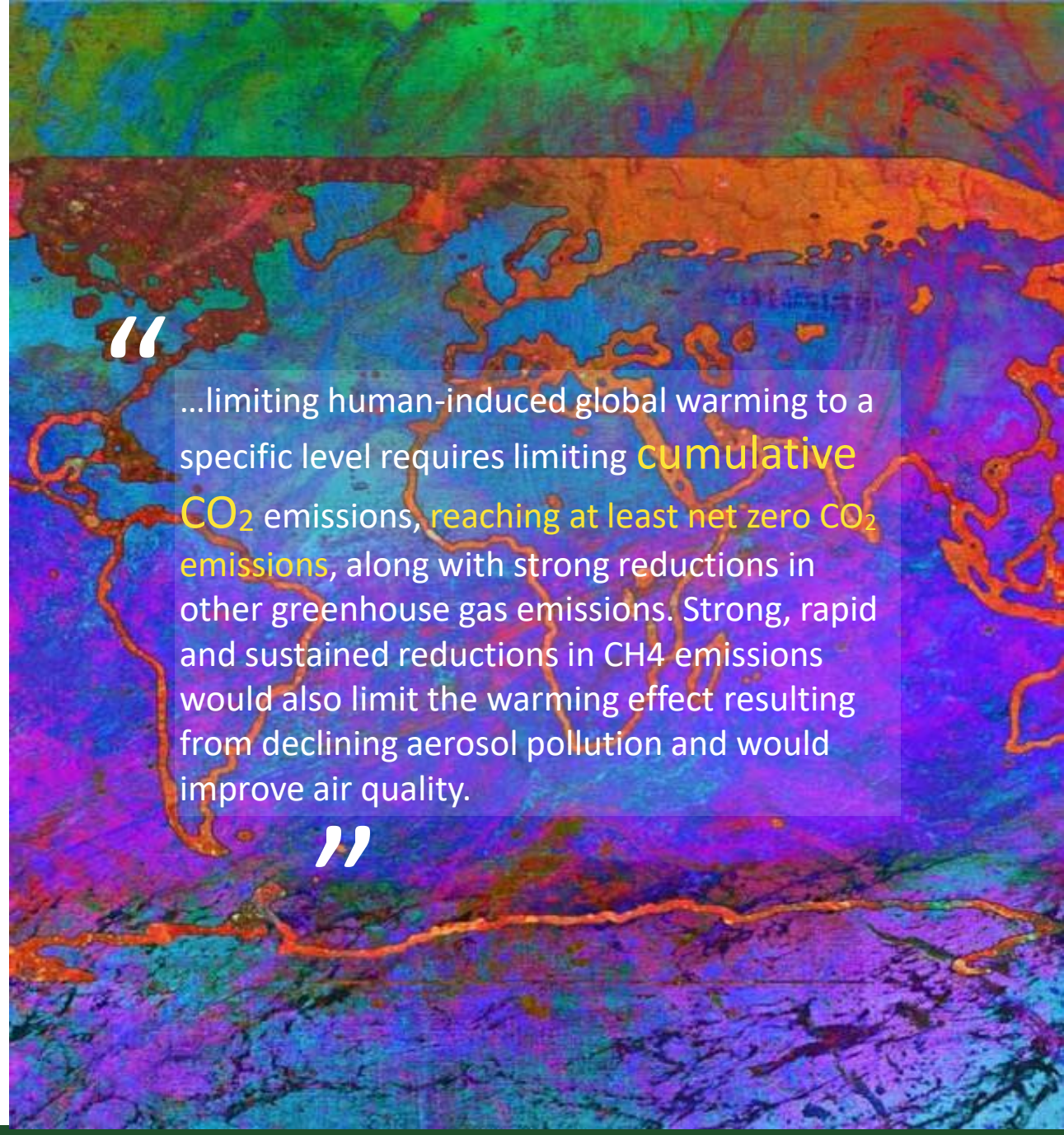
- Jim Barnhart, Assistant to the Administrator in the U.S. Agency for International Development's (USAID's) Bureau for Resilience and Food Security, as well as the Deputy Coordinator for Development for Feed the Future

Sustainable Solutions for Zero Hunger by 20303: A Vision for Agriculture for Animal Agriculture


people
profit
survivability
adaptability
eco-friendly
efficiency
viability
long
regeneration
long-term
business
stewardship
resilience
people
sustainable
health
operational
enduring
nature
impact
growth
ecological
endurance
thinking
future
environmental
social
human
needs
strategic
value
common
competitiveness
responsibility
corporate
innovation
green
creation
renewal
inclusive
planet
life
profitability
development
economic

The New IPCC AR6 Report

- Near term 1.5 to 2 °C warming unavoidable
- Many climate impacts also now irreversible
- "Net zero" goals cited by many misinterpret the IPCC.
- "Cumulative CO_2" is a very specific term
- Methane reductions are seen more as a way of offsetting reduced cooling by sulfate aerosols (fossil fuel reductions coincide with reductions in sulfate aerosols).




LIVE
Science

75%

Of millennials believe their investments can influence climate change

84%

Of millennials believe their investments can help lift people out of poverty

Source: Credit Suisse, Making an Impact: Earing Returns on Sustainable Terms

Narrative Driving The Perception

1

cows are worse than cars

2

meat and poultry destroys the planet

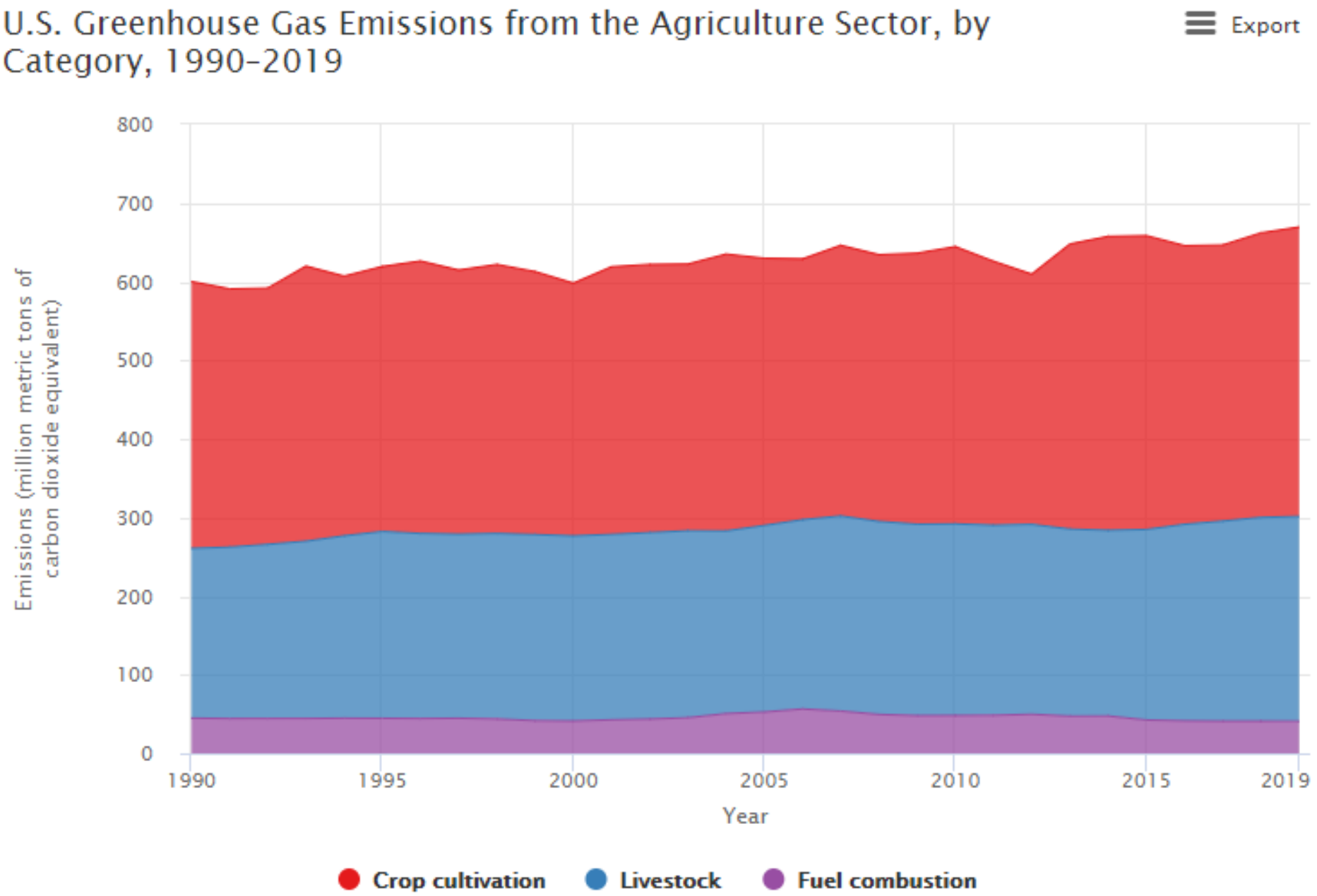
3

we should just eat what the animals eat

4

meat-free diets are the only solution

U.S. Greenhouse Gas Emissions from the Agriculture Sector, by Category, 1990–2019



Percent change:

1990–2019

Crop cultivation:

▲ 8.4%

Livestock:

▲ 20.7%

Fuel combustion:

▼ 8.9%

Total: ▲ 11.5%

Livestock is responsible for 3.8% of U.S. GHG emissions

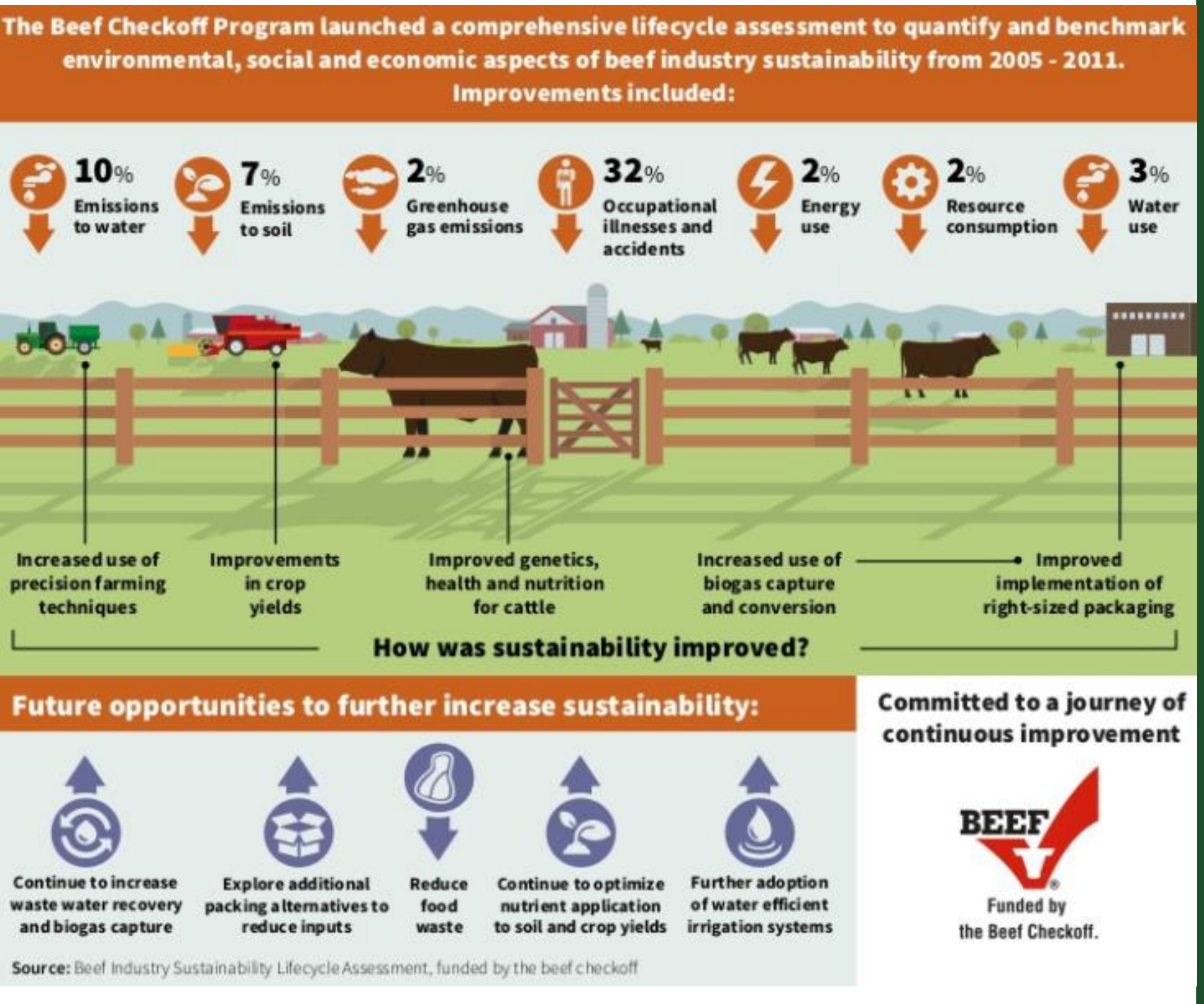
Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2019.
https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

Image: agri-footprint.com

Total emissions are not the same as footprints

LCA methodology provides a much more comprehensive and complete picture of impact

Allows us to understand unintended consequences



First and largest of-its-kind, conducted by the beef check-off

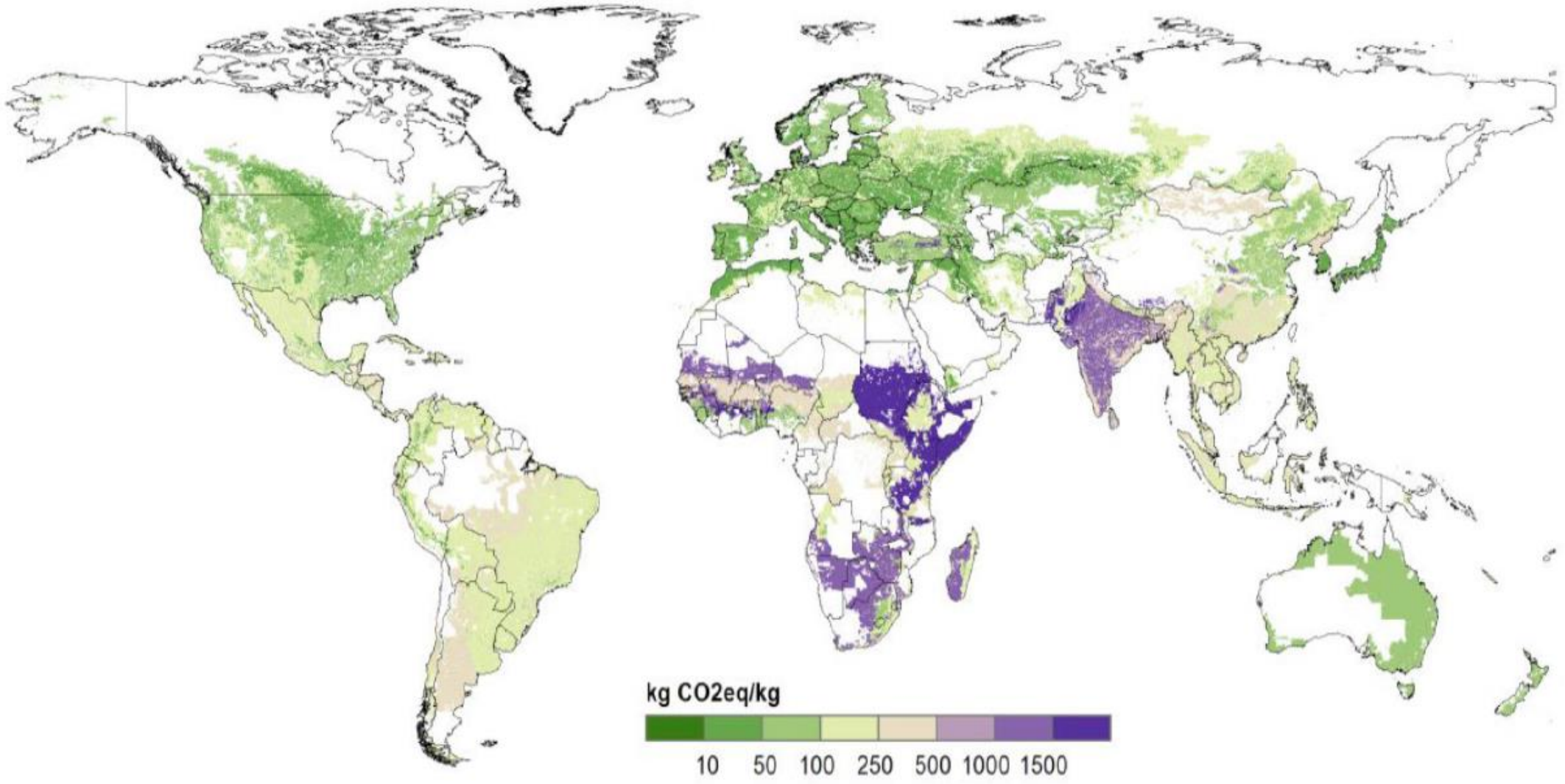
1. Validated whole systems models in beef systems: MARC and combined pre and post farm data

2. Continue to update with regional data and more detailed production data compared to NAHMS

3. Aligned to other proteins methodology

This work is important because it evaluates emissions on a product basis and allows and improvement comparison overtime

Global beef production footprints



Source: UN FAO

Livestock allow us to produce food on land unsuitable for cultivation, while enhancing ecosystems

Rangeland’s store 20% of the globes soil organic carbon

The most important thing we can do for soil organic C in rangelands is to:

1. Preserve rangelands (avoid conversion)
2. Restore cultivated and degraded lands
3. Practice adaptive livestock management
    - This does not consider benefits of other ecosystems services (wildlife habitat, water storage capacity, etc.), rural community well-being and rural economies

Source: Sanderson et. al, 2020. Cattle, conservation and carbon in the western Great Plains. Journal of Soil and Water Conservation

How Beef Production Impacts Soil C

- Cycles nutrients back to the soil
- Proper grazing management can protect and restore C on degraded land
- Inclusion on highly productive forages (legumes often included) may help improve soil C
- Inclusion of deep-rooted plants within forage mixtures may help store C deeper into the soil profile

Meat and poultry have an impact, but also provide benefits to the ecosystem and for rural communities

Feed GHG sources and sinks

- Total feed consumed to produce 1 kg CW of beef is 22 kg DM, 74% consumed in the cow-calf phase
- Total consumption consists of 82% forage, 11% grain and 7% byproduct and waste product feeds
  - *This indicates that 10–15% of the feed consumed in beef production comes from sources that might be available for human consumption.*

Feed used in animal production is not easily consumed by humans and has a different nutrient value, cattle are upcyclers

Source: Rotz et.al, 2019. Agricultural Systems 1369:1-13.

Meat-free diets are not the solution

If every American went vegan, we'd reduce U.S. greenhouse gas emissions 2.6% (which is 0.36% of global emissions)

"Overall, the removal of animals resulted in diets that are nonviable in supporting the nutritional needs of the U.S. population."

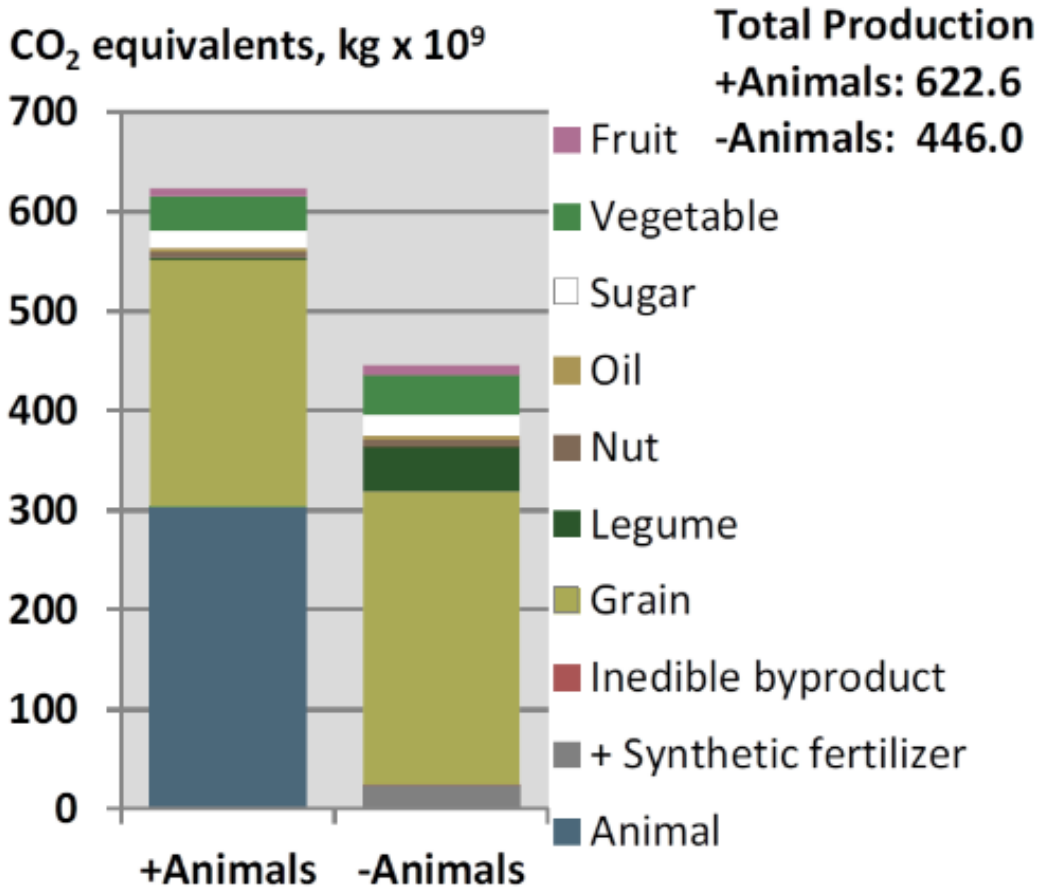
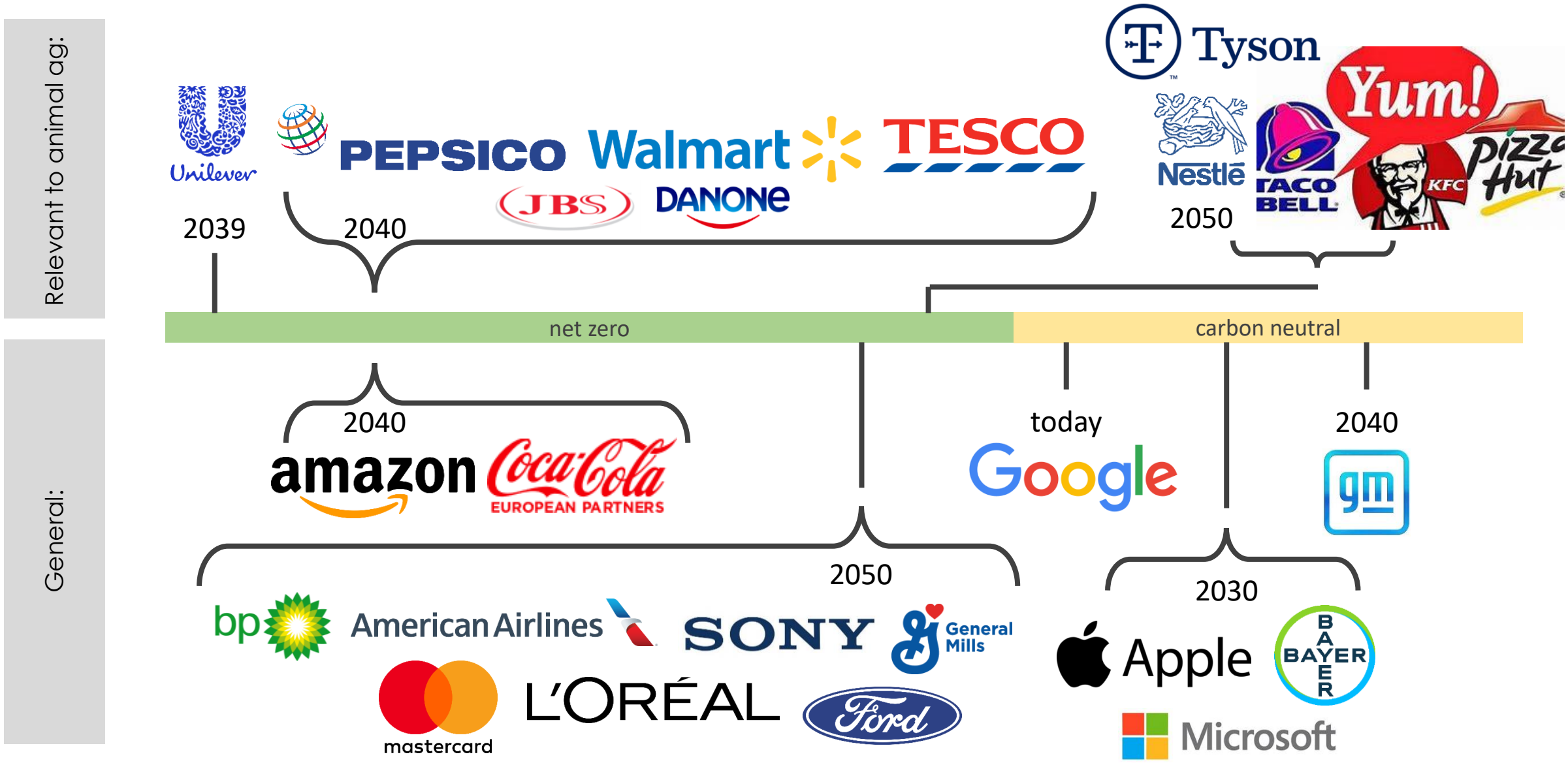


Fig. 5. GHG emissions associated with food production in a system representative of the current United States and a modeled system in which animal-derived food inputs are eliminated.

*This assumes all livestock in the U.S. would disappear

Source: White and Hall, 2017. Proc. Natl. Acad. Sci. 114: E10301–E10308

Current Company Commitments



Carbon neutral: refers to having a net-zero carbon footprint

Climate neutral: Climate neutral refers to the emission and mitigation of *all* greenhouse gases – not just carbon.

When a company commits to Net Zero, it often includes its entire value chain.

Sustainability Program Established

JBS conducts a corporate materiality assessment and baseline emission assessment in 2015.

Tyson conducts a corporate materiality assessment and baseline emission assessment in 2016.

Cargill conducts a corporate materiality assessment and baseline emission assessment in 2017.

Tyson refocused climate goals based on SBTi initiatives in 2018.

Future Goals

2025 Goals: Cargill aims to reduce scope 1 and 2 emissions by 10% against 2017 levels. Cargill also hopes to implement water stewardship at all 81 facilities. JBS aims to eliminate all amazon deforestation in their supply chain.

2030 Goals: Tyson has a goal of reducing GHG emissions 30% by 2030. Cargill has a goal of reducing GHG emissions from their global supply chains by 30% per measured ton of product. Cargill also has a goal of restoring 600 billion liters of water in priority watersheds and reduce % million kg of water pollutants. JBS plans to reach 60% renewable energy usage and reduce scope 1 and 2 emissions by 30%. JBS also has goals of reducing water use intensity by 15%. JBS also has a goal of a 30% improvement in the Global Safety Index.

Beyond 2030: Tyson has committed to achieving net zero GHG emissions by 2050. Cargill hopes to have new R&D strategies and technology by 2040 or 2050 based on research grants and studies being conducted now. JBS has committed to achieving net zero GHG emissions by 2040.

McDonalds, Target, The Nature Conservancy, Cargill

- 5-year, $8.5 million project to increase C sequestration across 100,000 acres of row crops and feed production across Nebraska
- Includes ecosystems services market consortium pilot program
- Additional $4.4 million to scale adoption of regenerative agriculture

The Nature Conservancy
Protecting nature. Preserving life.

Cargill™

target

UN SDG Commitments

SUSTAINABLE DEVELOPMENT GOALS

Company	UN Sustainable Development Goal Commitments
Tyson	
Cargill	
JBS	

In Summary

- The consumption of meat is expected to increase, globally
- The impact of beef on climate is measured and reported differently and is complex and often does not consider unintended consequences
- Sustainability (social, economic, environmental) will be an expectation moving into the future
- Corporate Food Company programs are robust
  - Significant supply-chain expectations

Thank you

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Colorado State University

Q&A


THE UNIVERSITY OF CALIFORNIA
LET THERE BE LIGHT
DAVIS
UCDAVIS
CLEAR Center


University
of Idaho


COLORADO STATE


CALIFORNIA
BEEF
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Jessica Gilreath, Ph.D.
Jen Johnson Livsey, Cattle Producer
Lamar Moore, Celebrity Chef
Nicole Rodriguez, RD, NASM-CPT

Register: https://bit.ly/3EpK7v1

Clancy Harrison, MS, RDN, FAND
Jack Bobo, Food Futurist

Register: https://bit.ly/2XlqQdh

Thank You

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