



Reimagining Protein

The Good Food Institute

Tessa Hale, Director of Corporate Engagement

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Agenda



Introduction to GFI



Our challenge



Environmental impacts of conventional animal agriculture



Benefits of alternative proteins

The Good Food Institute

GFI is a 501(c)(3) nonprofit developing the roadmap for a sustainable, secure, and just protein supply. We focus on three key areas of work:



Science and Technology

Advancing foundational, open-access research in alternative proteins and creating a thriving research and training ecosystem around these game-changing fields.



Corporate Engagement

Partnering with companies and investors across the globe to drive investment, accelerate innovation, and scale the supply chain—all faster than market forces alone would allow.



Policy

Advocating for fair policy and public research funding for alternative proteins.



GFI officially earned Candid's 2022 Platinum Seal of Transparency - obtained by less than 1% of nonprofits - reflecting our commitment to maximum impact, efficiency, and inclusion.

We work as a force multiplier, bringing the expertise of our departments to the rest of the world.



United States
Brazil
India

Europe
Asia Pacific
Israel

180+ staff in 6 regions

The Alternative protein landscape

Plant-based



Photo courtesy of Beyond Meat

Fermentation



Photo courtesy of Atlas Food Co.

Cultivated

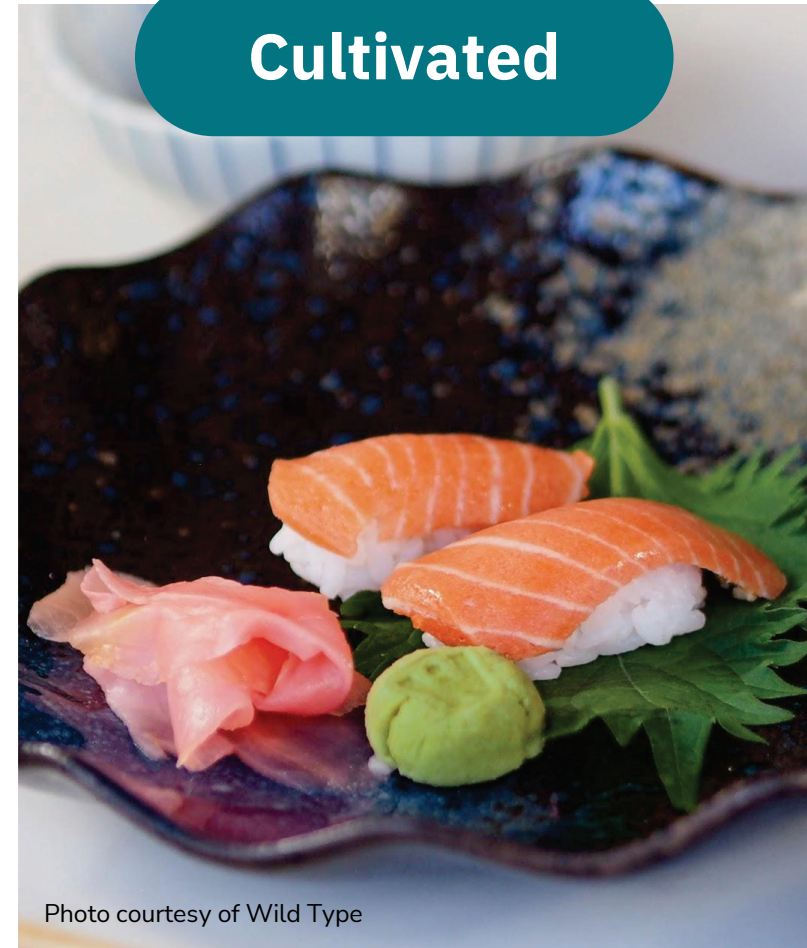


Photo courtesy of Wild Type



Our major challenge

How will we feed 10 billion people by 2050?

Sustainably



Industrialized animal agriculture is in the top **2-3 most significant contributors** to the world's most pressing environmental issues such as water use, air pollution, and loss of biodiversity.



Animal ag is responsible for **14.5% of greenhouse gas emissions** as measured in CO₂-eq.

Source: United Nations, [Livestock's Long Shadow](#) (report)

Efficiently



It takes **nine calories** of food fed to a chicken to produce **one calorie** of meat.



75% of agricultural land is used for raising and feeding livestock yet only provides **1/3** of the global protein supply.

Sources: World Resources Institute (calorie formula);
UN FAO (land use)

Safely



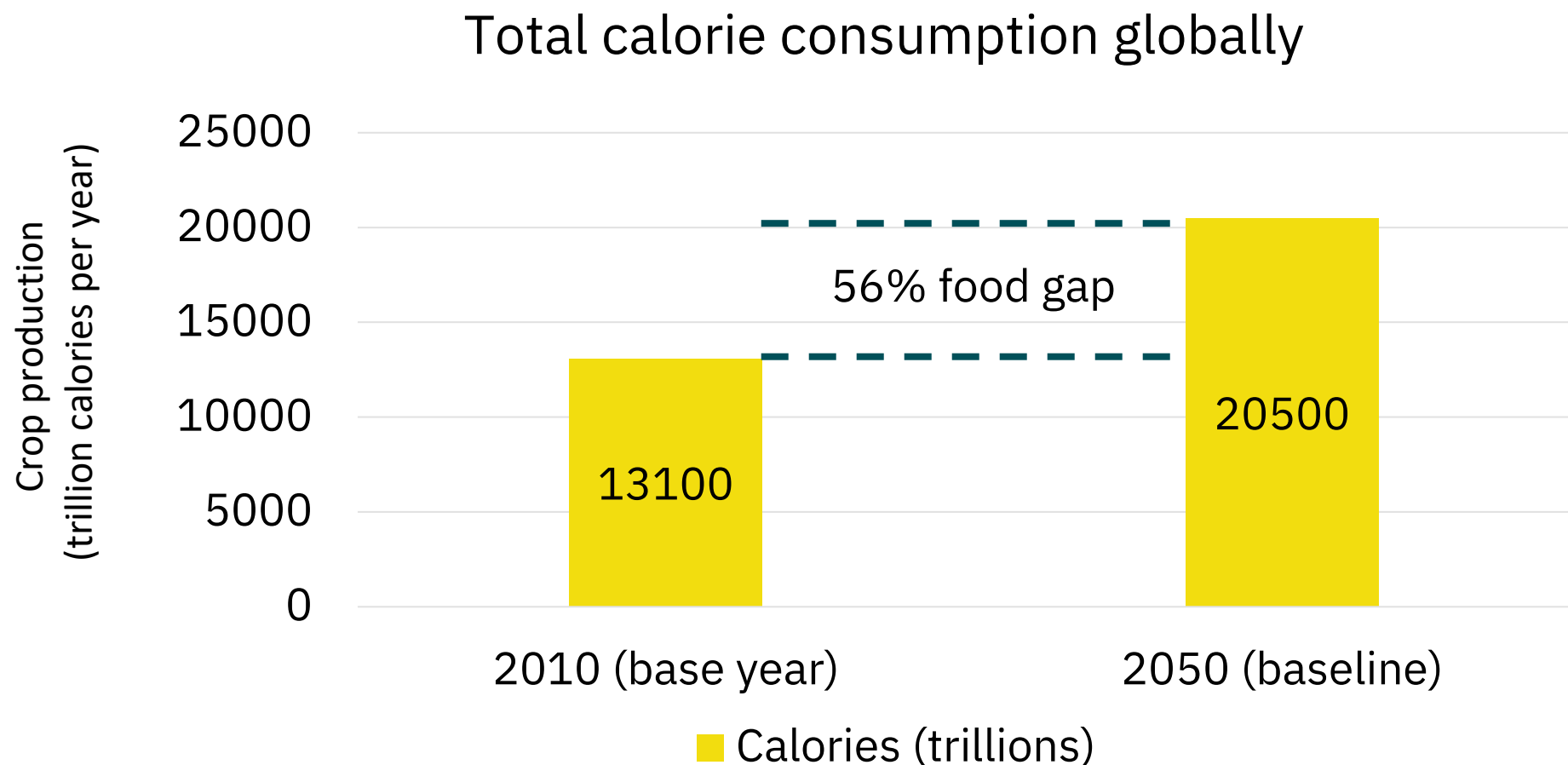
Animals in the United States **consume more than 2x** as many medically important antibiotics as humans do.



Based on current trends, medical experts expect **10 million annual deaths** from antimicrobial resistance (AMR) in 2050, a 14-fold increase over current deaths.

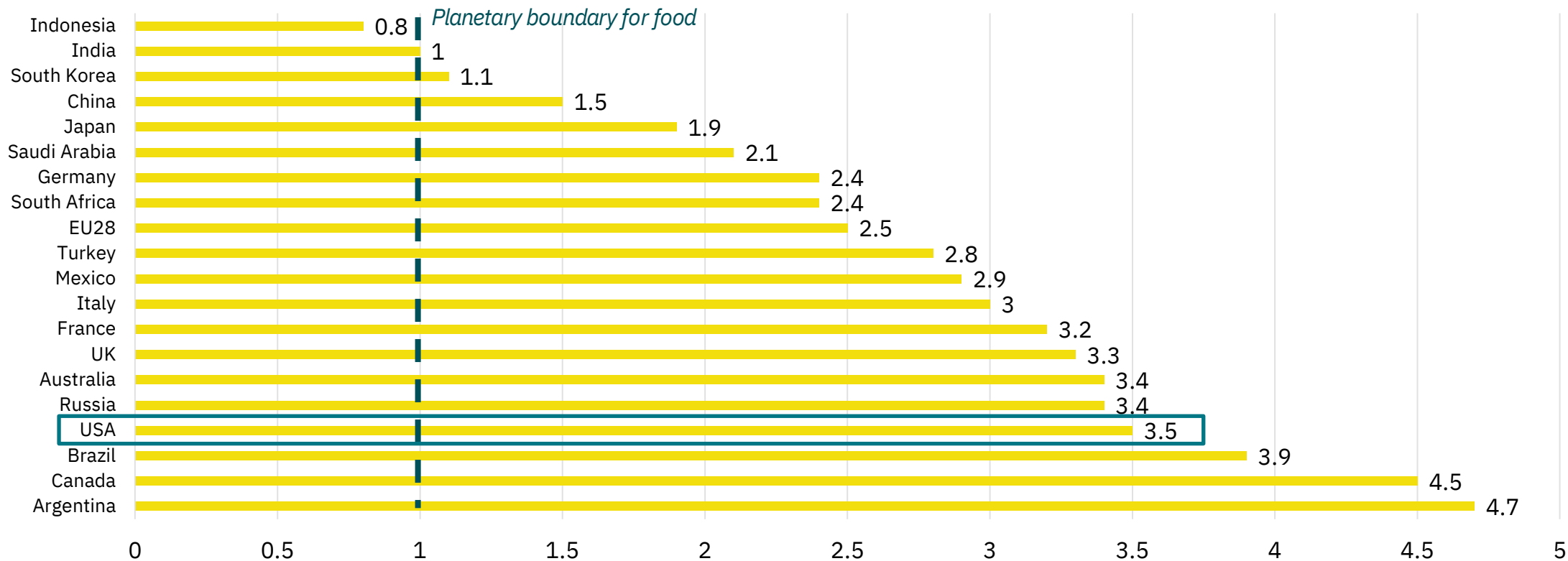
Sources: FDA (animal-consumed antibiotics); IMS Health (human-consumed antibiotics); United Nations IAGC (AMR)

The world will have to close a 56% food production gap by 2050.



The world will not be able to produce sufficient food to meet national dietary guidelines.

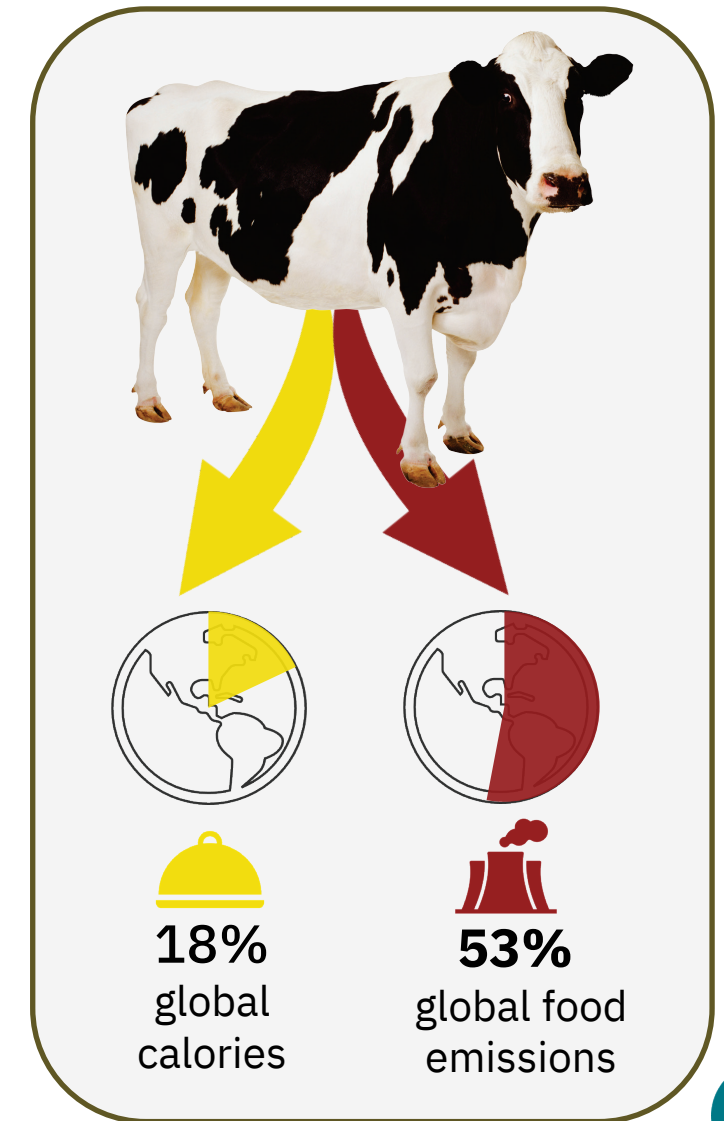
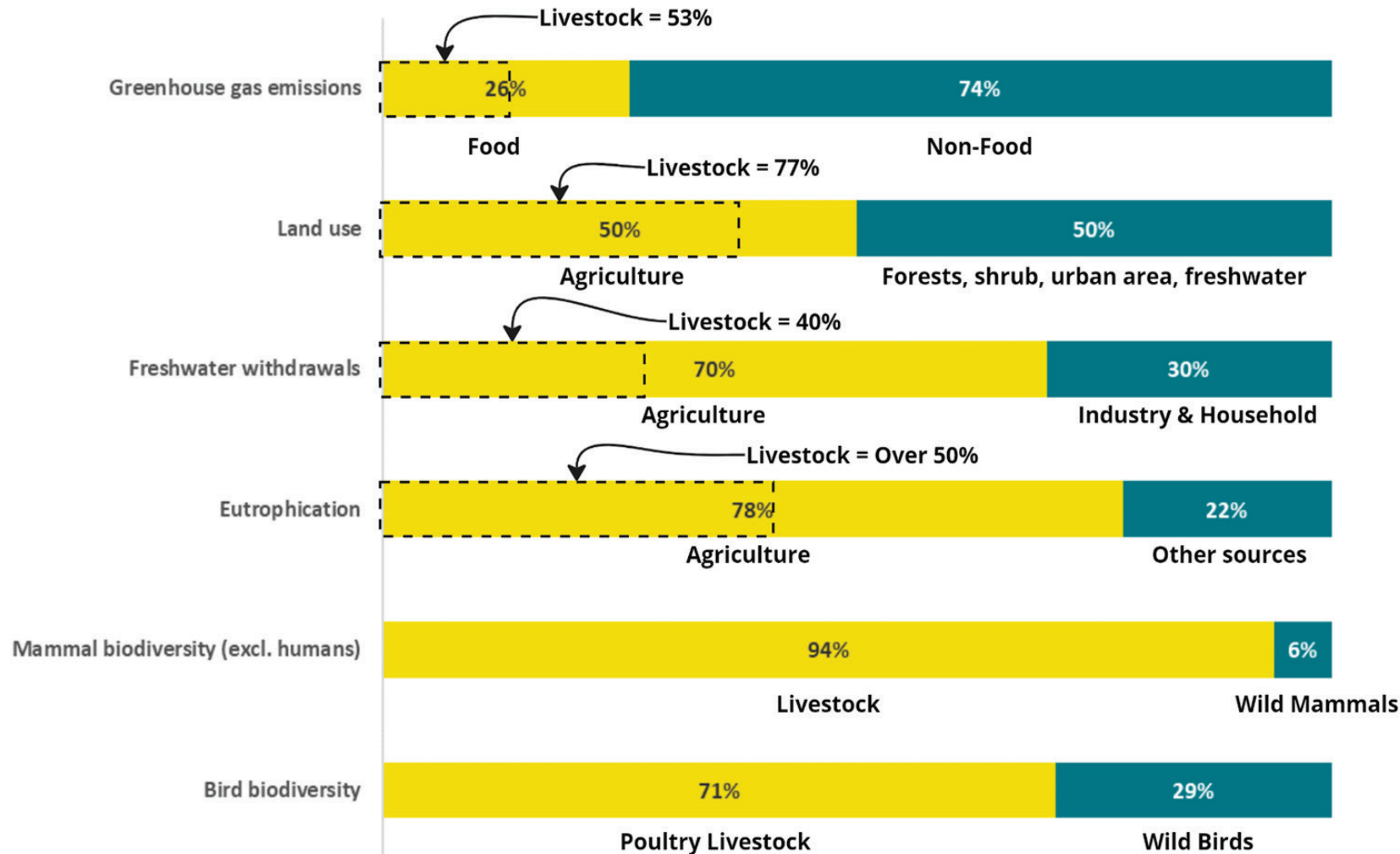
The number of earths needed to provide sufficient food if all countries globally adopted the national food-based dietary guidelines used by the countries listed



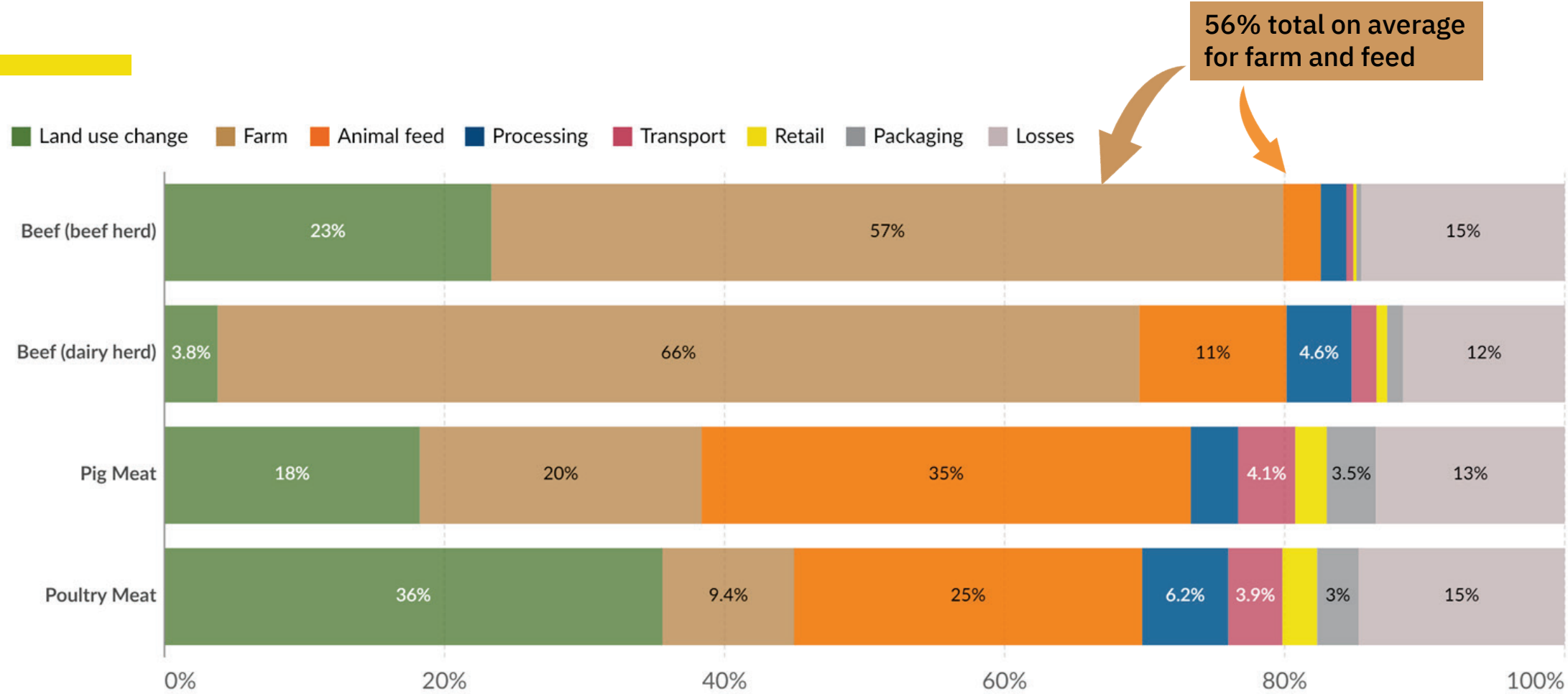


Environmental impacts of conventional animal agriculture

The outsized environmental impact of livestock in our food system



Emission sources within the supply chain

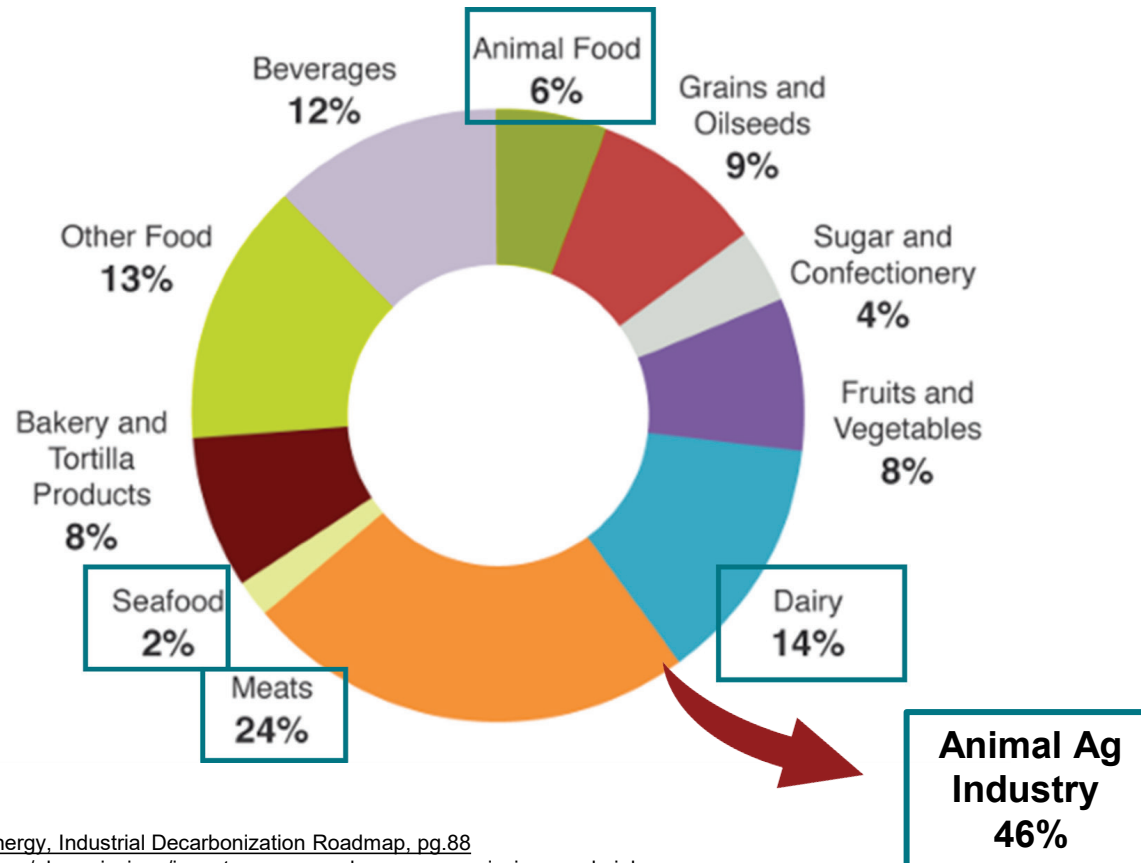


Source: Joseph Poore and Thomas Nemecek (2018).

OurWorldInData.org/environmental-impacts-of-food • CC BY

GHG emissions from the animal industry in the US

Food and beverage manufacturing subsectors' value added to the industry in 2019.



**314 MMT
CO₂e/year**

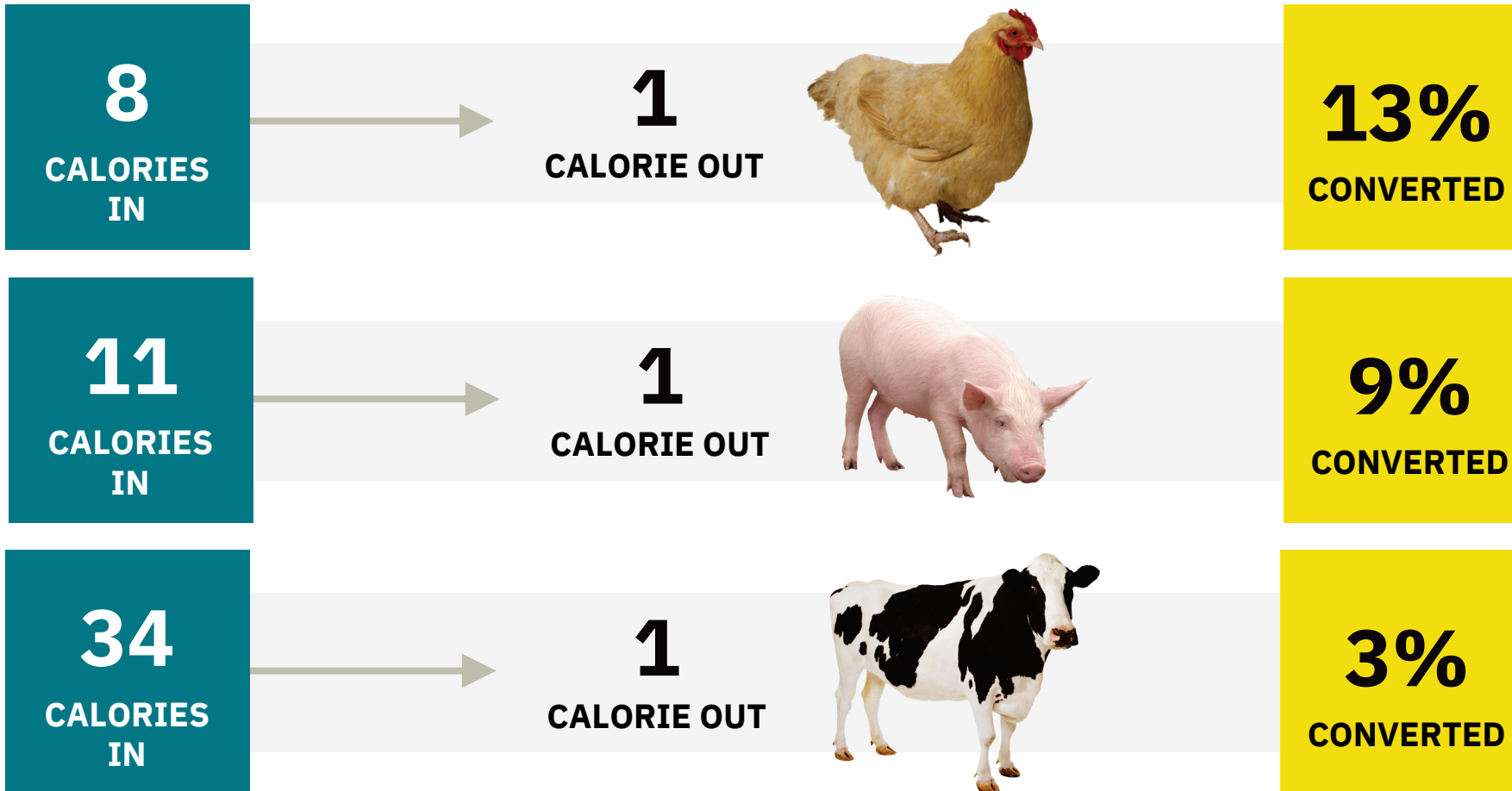
US animal products industry +
livestock agricultural
emissions

=

**CO₂e to power to all US
homes**



Producing protein via animals is inefficient



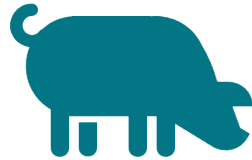
Cycling calories through animals in this way is equivalent to **87-97% food waste** in production.

Animal agriculture is a leading cause of global deforestation.



5 million

hectares (12M acres)
in global annual net
deforestation



>75%

is driven by agriculture—
clearing forests to grow
crops, raise livestock and
produce products such as
paper.



Consumption patterns in
Canada, France, Germany,
Italy, Japan, the UK and the
US drive an average loss of **4
trees per person per year**
(totaling 3 billion trees per
year).



Benefits of alternative proteins

Alternative proteins are the only food and ag climate mitigation solution that analogizes to renewable energy and electric vehicles



Alternative proteins strongly outperform conventional meat on environmental impacts

Environmental impacts compared to plant-based meat	 Plant-based meat (made with wheat protein)	 Cultivated meat (made with renewable energy)	 Conventional chicken (ambitious benchmark)	 Conventional pork (ambitious benchmark)	 Conventional beef (ambitious benchmark, from dairy cattle)
 Land use	1x	8x	23x	30x	44x
 Water use	1x	28x	23x	20x	57x
 Air pollution	1x	10x	14x	20x	67x
 Toxic chemicals	1x	6x	6x	12x	55x
 Greenhouse gas emissions (CO₂-eq)	1x	6x	7x	12x	41x

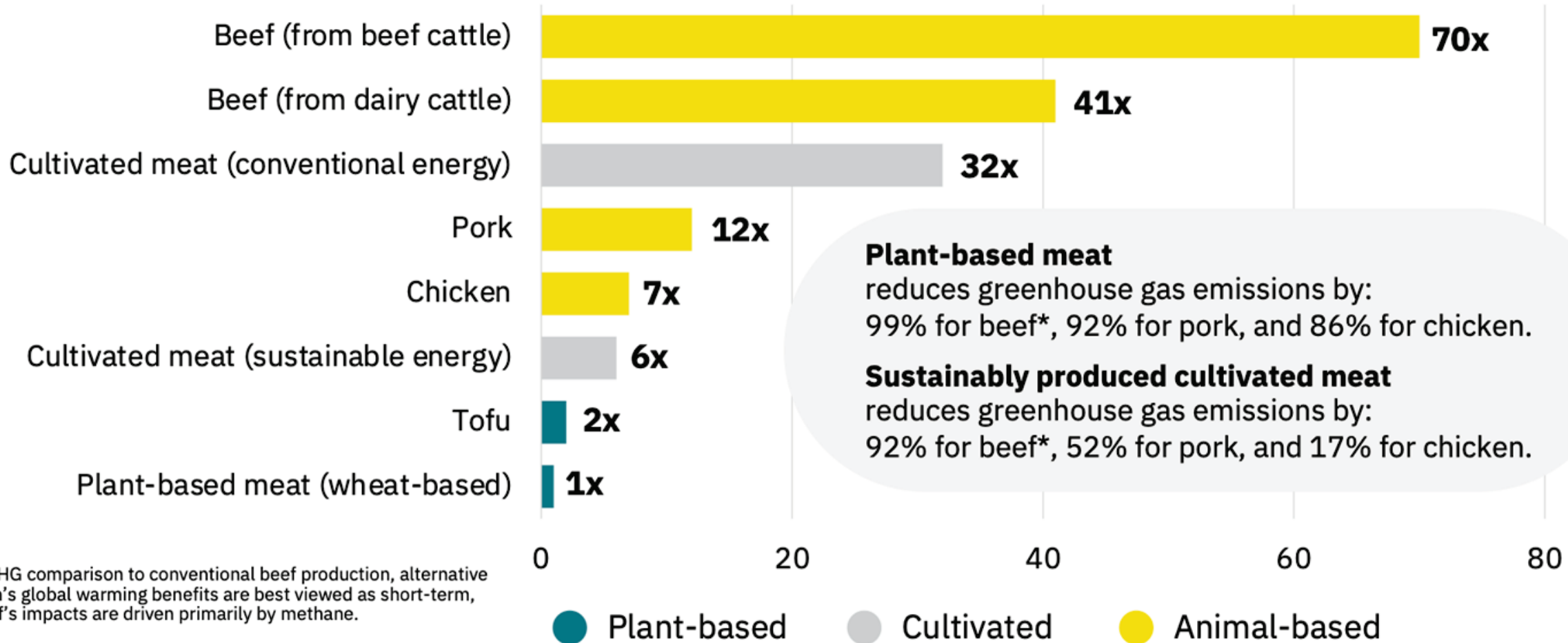
For GHG comparison to conventional beef production, cultivated meat's global warming benefits are best viewed as short-term, as beef's impacts are driven primarily by methane.

Source: GFI & CE Delft lifecycle assessment 2021. Note: The beef shown here is from dairy cattle. Beef from beef cattle is significantly more resource-intensive, with 70x as much GHG emissions compared to plant-based meat.

Global warming: lifecycle analysis



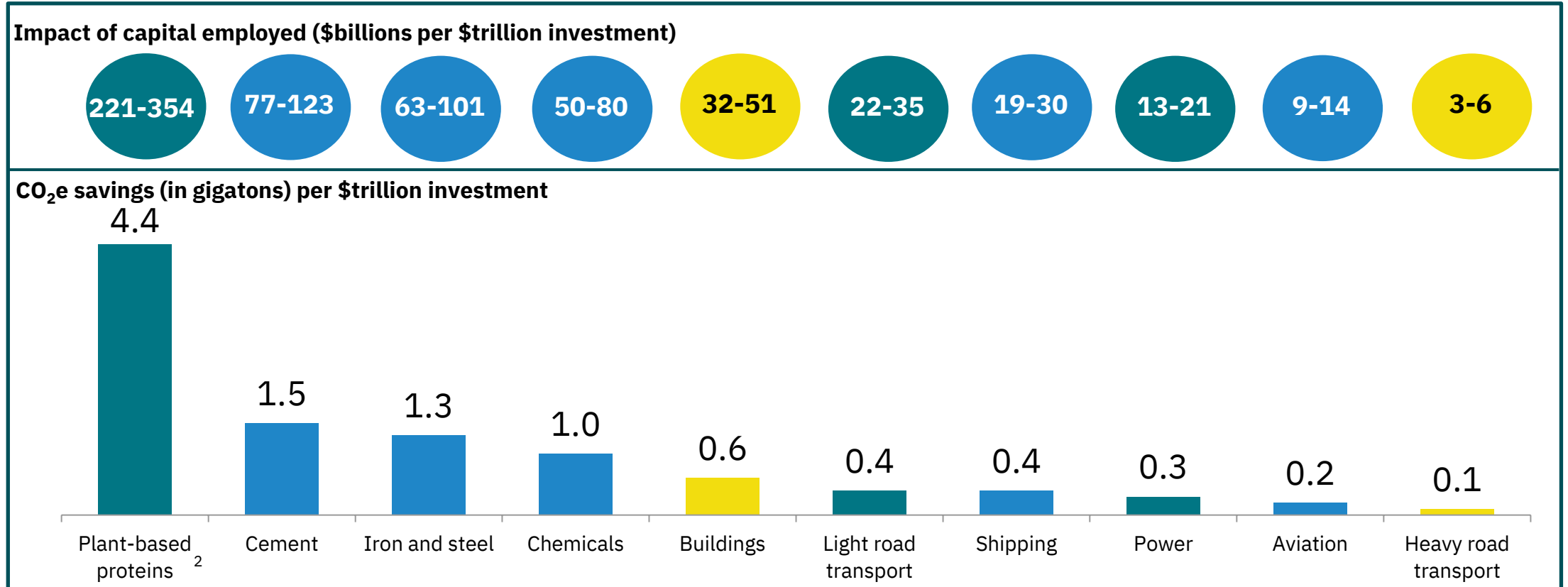
Total GHG emissions per kg relative to plant-based meat, in CO2-eq



*For GHG comparison to conventional beef production, alternative protein's global warming benefits are best viewed as short-term, as beef's impacts are driven primarily by methane.

Source: GFI & CE Delft lifecycle assessment 2021.

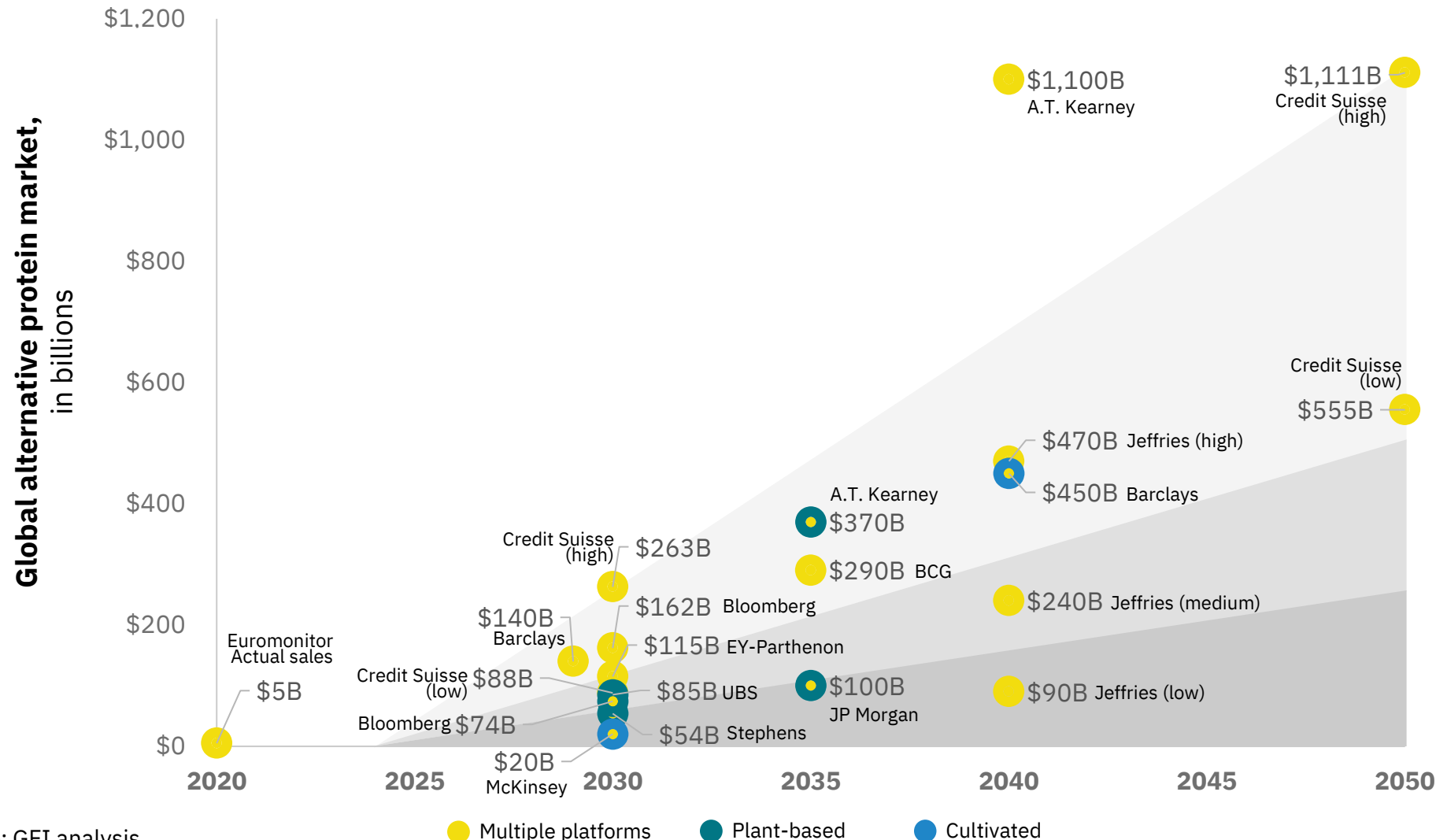
Investing in plant-based proteins has the highest CO₂e savings per dollar of any sector



- **Mostly economic:** most investments in the sector, such as replacing animal-based proteins with alternative proteins at cost parity, are economically viable
- **Mixed:** some investments in the sector, such as building automation and roof insulation, are economically viable; others in the same sector, such as moving to heat pumps in older buildings, are not
- **Mostly uneconomic:** most investments in the sector, such as introducing carbon capture and storage in cement production plants (which adds costs, but no savings), are not economically viable

Companies estimate the global alternative protein market may be as large as \$1T by 2050.

Projections of global alternative protein market size



Global alternative protein market size by 2050:

High-yield scenario:
\$500+ billion
20%+ CAGR

Medium-yield scenario:
\$250 billion to \$500 billion
~15-20% CAGR

Lower-yield scenario:
Up to \$250 billion
<15% CAGR



In the US, major meat and CPG companies are active in alternative proteins.

	CPG Companies							Meat Companies				
	PEPSICO	Nestlé	KraftHeinz	General Mills	DANONE	CONAGRA BRANDS	Kellogg's	Tyson	JBS	Cargill	Smithfield	Hormel Foods
Investment												
Acquisition												
Partnership												
Manufacturing and R&D												
				Cultivated meat	Fermentation	Plant-based						

Alternative protein companies are embracing sustainable side streams

Side streams from a range of industries are powering the next generation of alt protein companies and ingredients.

There is an expanding subset of agricultural by-products being valorized.

Brewer's Spent Yeast

The logo for Planetarians, featuring an orange stylized 'P' icon followed by the word 'Planetarians' in orange.The logo for ABInBev, featuring a yellow circular icon with a stylized 'A' and the text 'ABInBev' in black.

Leftover Dates

The logo for MYCO TECHNOLOGY, featuring the word 'MYCO' in large blue letters and 'TECHNOLOGY' in smaller blue letters below it.The logo for QIA (Qatar Investment Authority), featuring a red square icon with a white grid pattern and the text 'QIA' in white, followed by 'QATAR INVESTMENT AUTHORITY' in red.

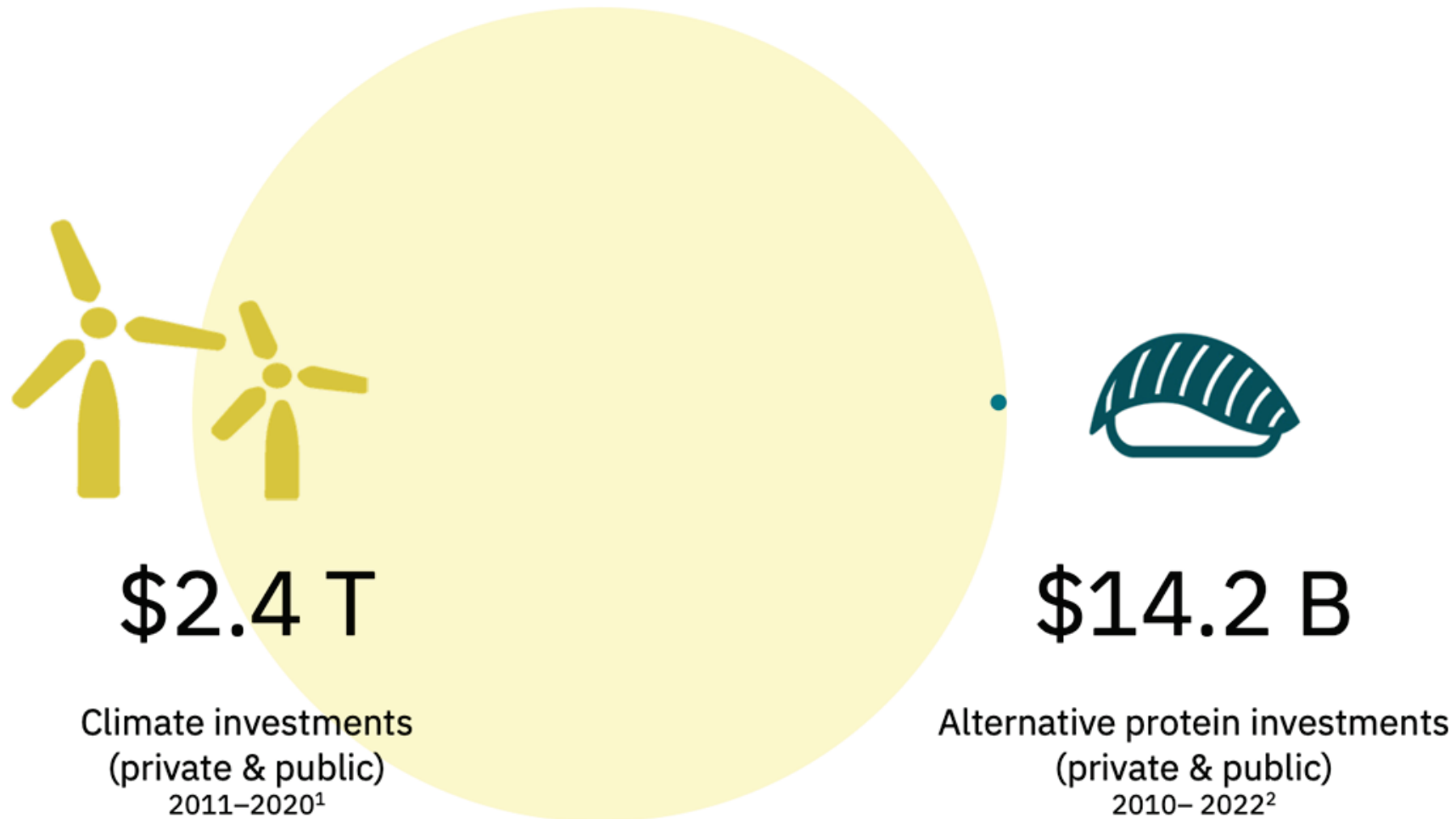
Agricultural By-Products

The logo for MOA FOODTECH, featuring the letters 'MOA' in green and 'FOODTECH' in smaller green letters below it.

Circular Biomanufacturing

The logo for ENOUGH, featuring the word 'ENOUGH' in white capital letters on a black rectangular background.The logo for Cargill, featuring a green leaf icon above the word 'Cargill' in black.

Investment in alternative proteins as a climate technology solution needs to be prioritized



¹ Source: Climate Policy Initiative (CPI), [Global Landscape of Climate Finance 2021](#).

² Source: GFI analysis of public funding and of PitchBook Data, Inc. Note: Data has not been reviewed by PitchBook analysts. Private investments includes accelerator and incubator funding, angel funding, seed funding, equity and product crowdfunding, early-stage venture capital, late-stage venture capital, private equity growth/expansion, capitalization, corporate venture, joint venture, convertible debt, and general debt completed deals.

“A report co-funded by the U.K. Foreign Commonwealth and Development Office and the ClimateWorks Foundation posits that, with modest worldwide government support of **\$10.1 billion per year**, **alternative proteins could employ between 9.5 million and 9.8 million people by 2050**, with up to **\$1.1 trillion in gross value** added to the global economy. Even in the fairly short term, agricultural research pays dividends. As U.S. Agriculture Secretary Tom Vilsack has noted, ‘Studies have shown that **every dollar invested in agricultural research creates \$20 in economic activity**.’”



Thank you!

Contact me at TessaH@gfi.org

