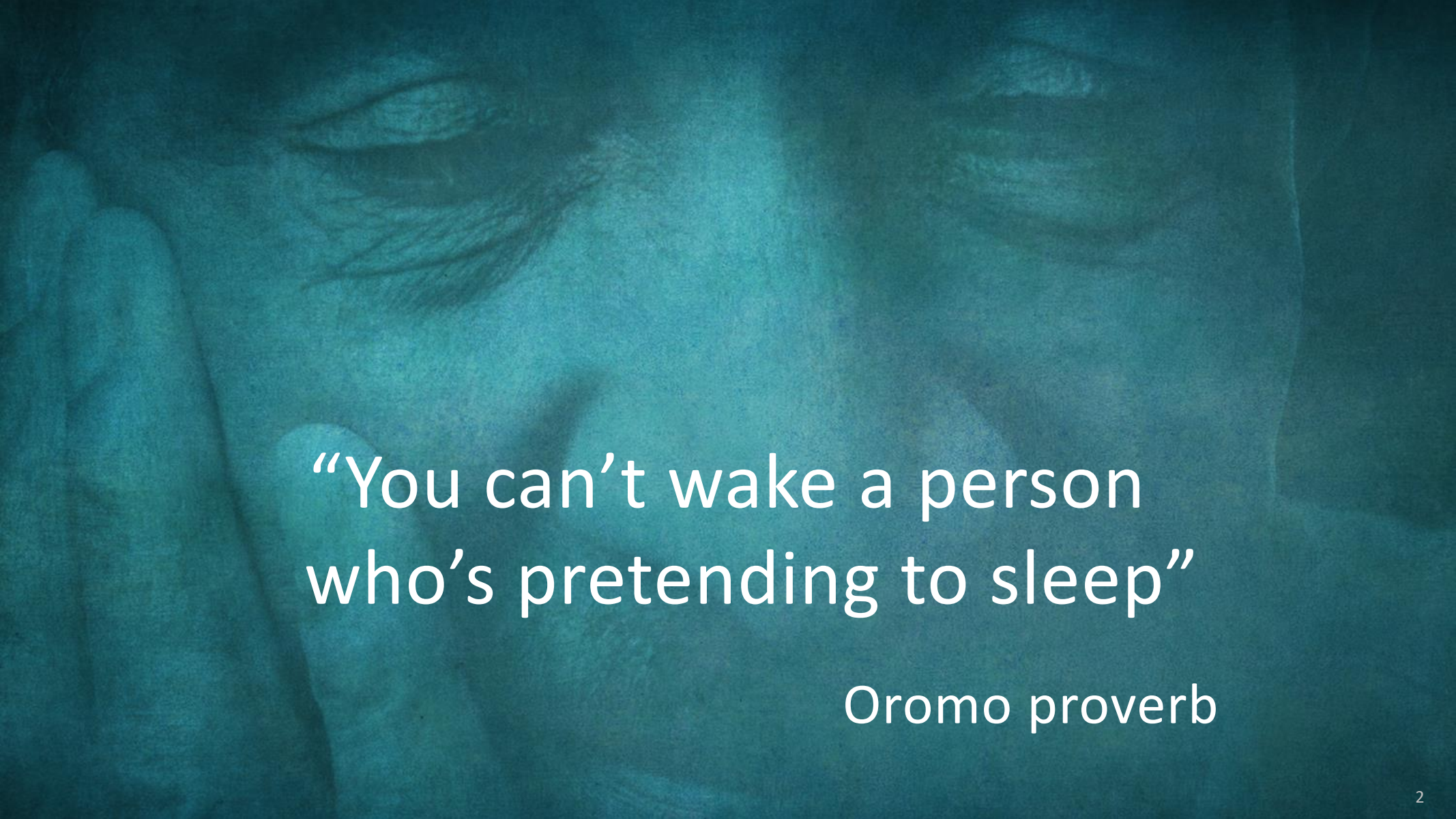
The Carbon Footprint of Meat
Challenges & **Solutions**



Jason Clay, Ph.D.
SVP Markets & ED Markets Institute
WWF-US


“You can’t wake a person who’s pretending to sleep”
Oromo proverb

70% of biodiversity loss



21-37% of GHG emissions



80-85% of target catch managed at limits





MOST chemical use

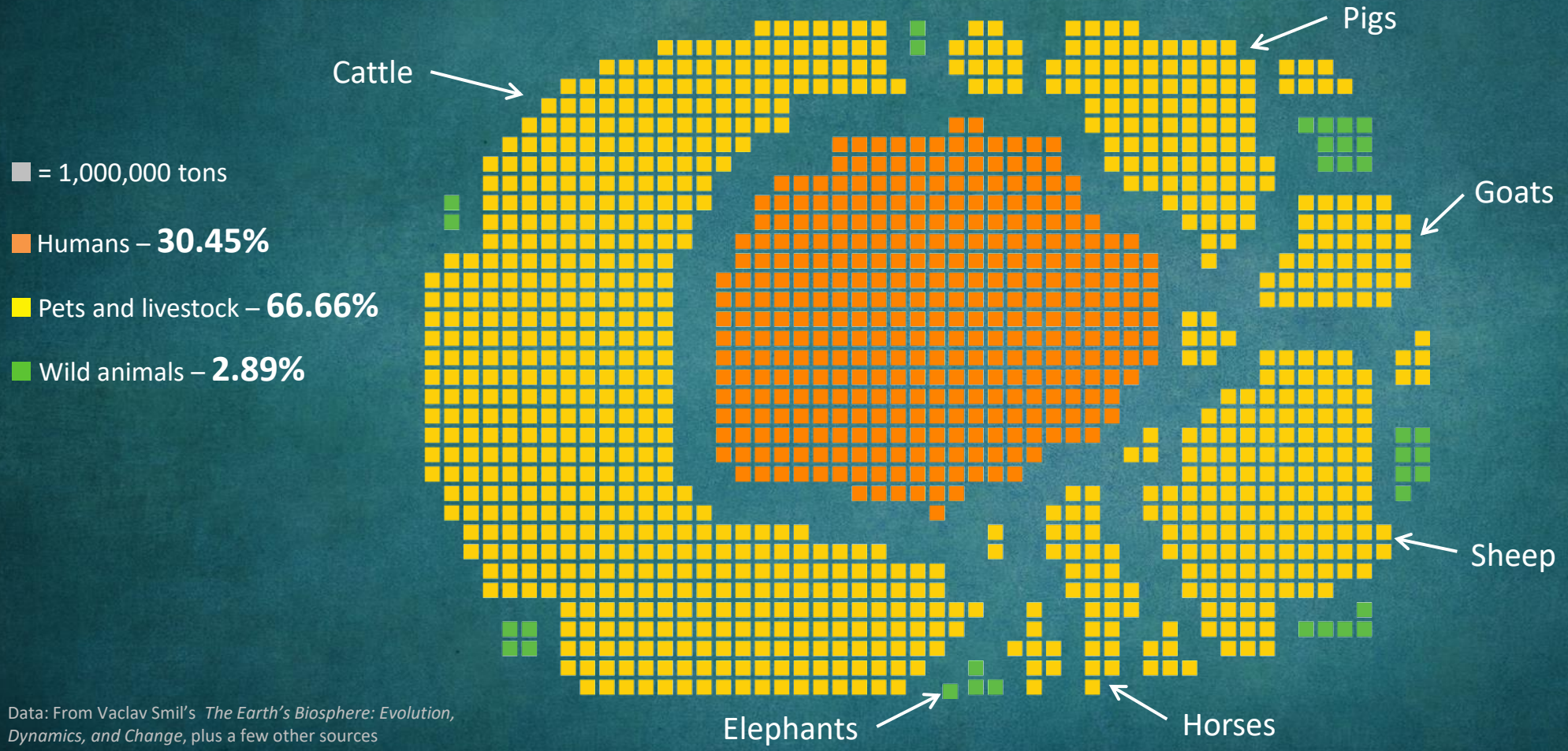


70% of freshwater use



50% of topsoil loss

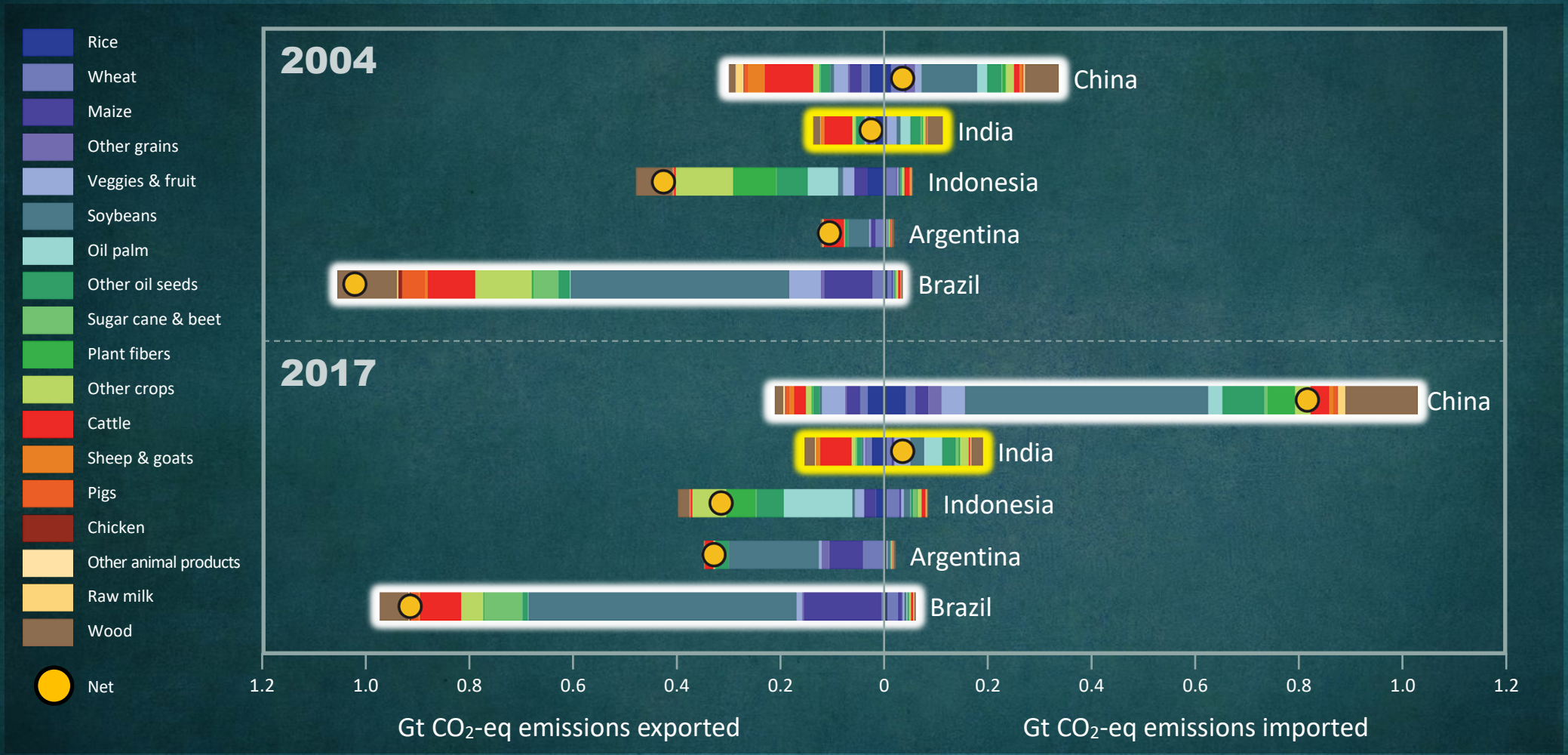
Earth’s land mammals by weight



Data: From Vaclav Smil’s *The Earth’s Biosphere: Evolution, Dynamics, and Change*, plus a few other sources

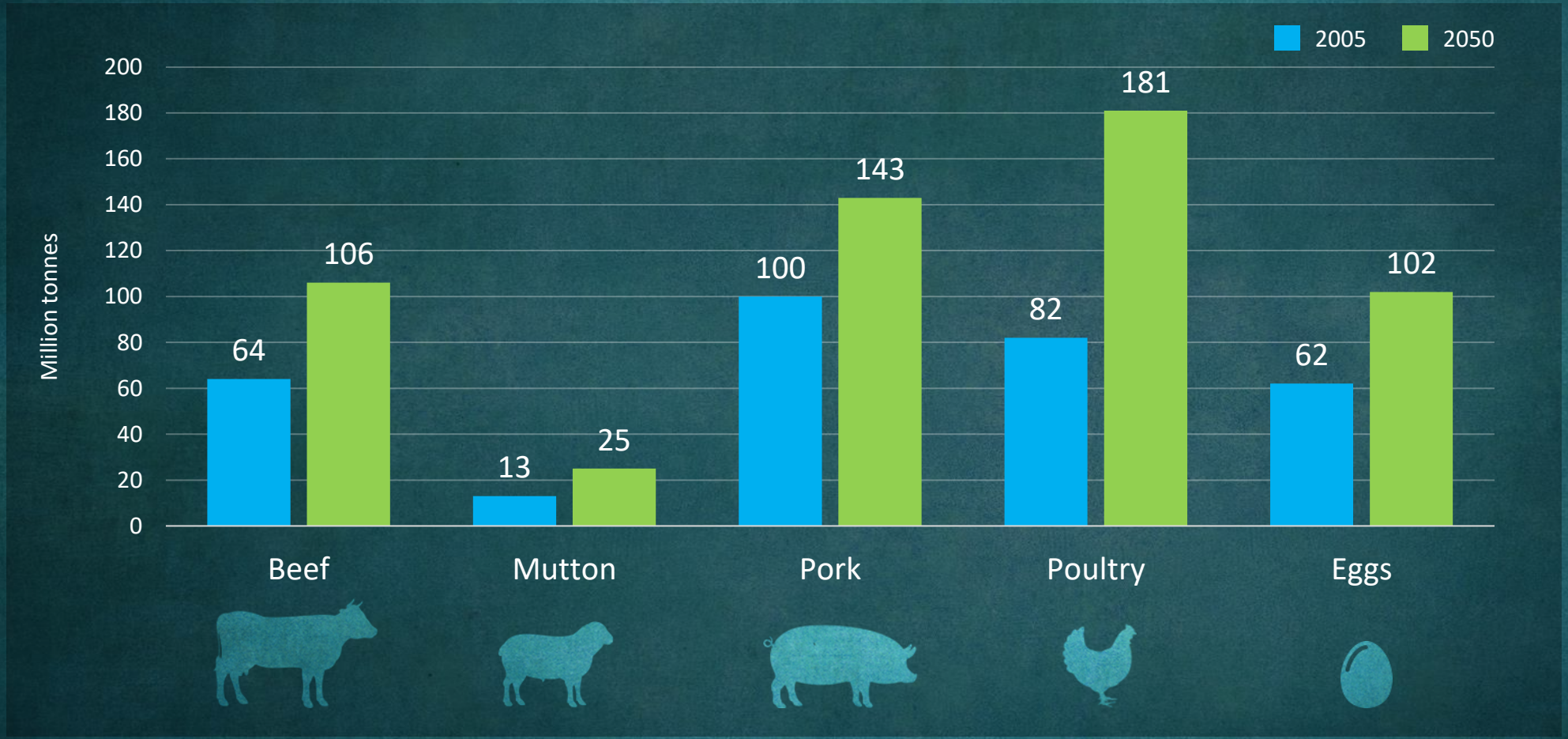
Trade is key
comparative advantage
is critical

Balance of land-use emissions in exports & imports of key countries



Source: Hong *et al.*, *Science* 376, 597–603 (2022)

Global demand for meat, 2005 vs 2050



Source: FAO, ESA Working Paper No. 12-03, p. 131

What is more sustainable
today,
won't be **tomorrow**

Poultry – efficiency matters



Global improvement evolution

	1925	1945	1965	1985	2005	2045*
Conversion – kg feed/kg live	4.7	4.0	2.4	2.0	1.7	1.6
Mortality %	18%	10%	6%	5%	4%	3%
Age (days)	112	84	63	49	42	40
Live commercial weight - kg	1.0	1.4	1.6	1.9	2.4	3.2

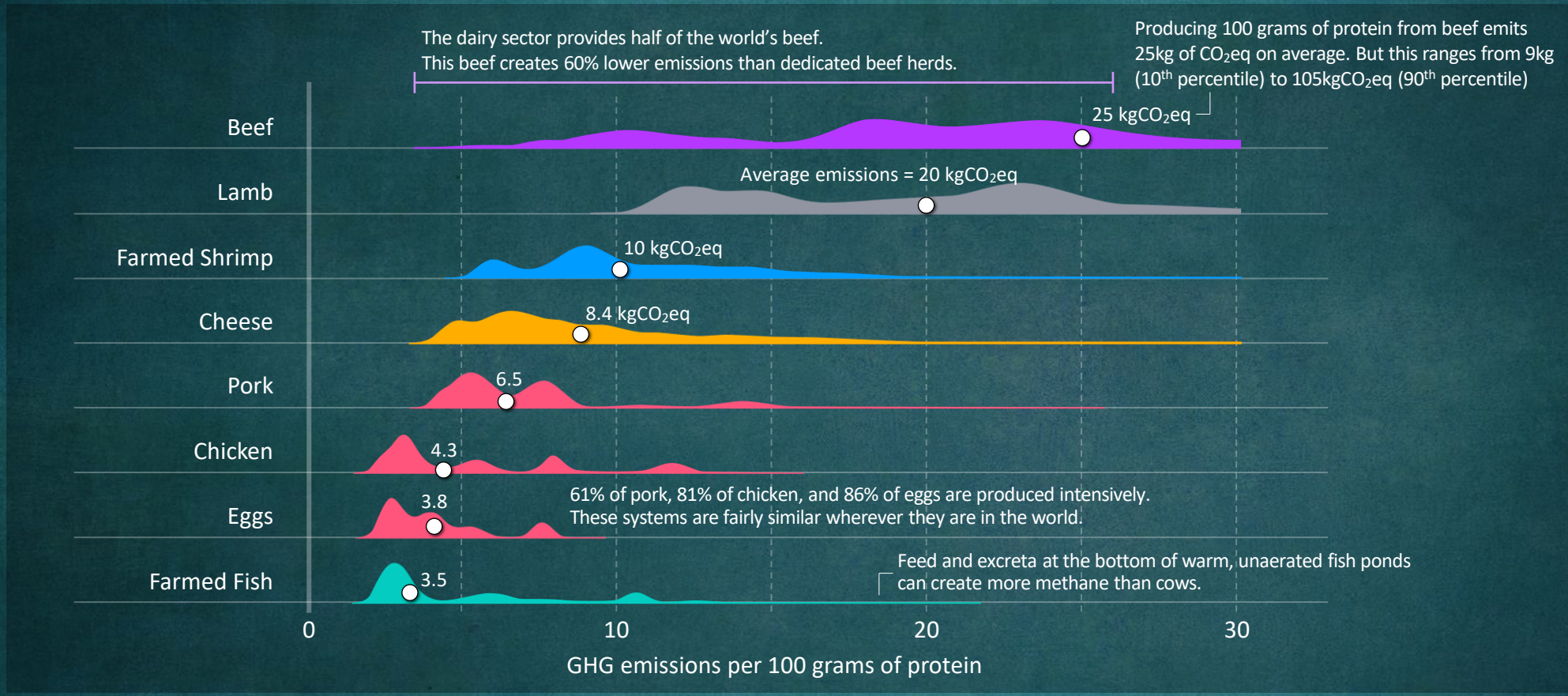
*projected

Source: Dr. Paul Aho, Novus Poultry Roundtable: Feeding the World and the Role of Poultry, January 2010

Efficiency is necessary
but **insufficient**

Comparing carbon footprint of protein-rich foods

Greenhouse gas emissions from protein-rich foods per 100 grams of protein

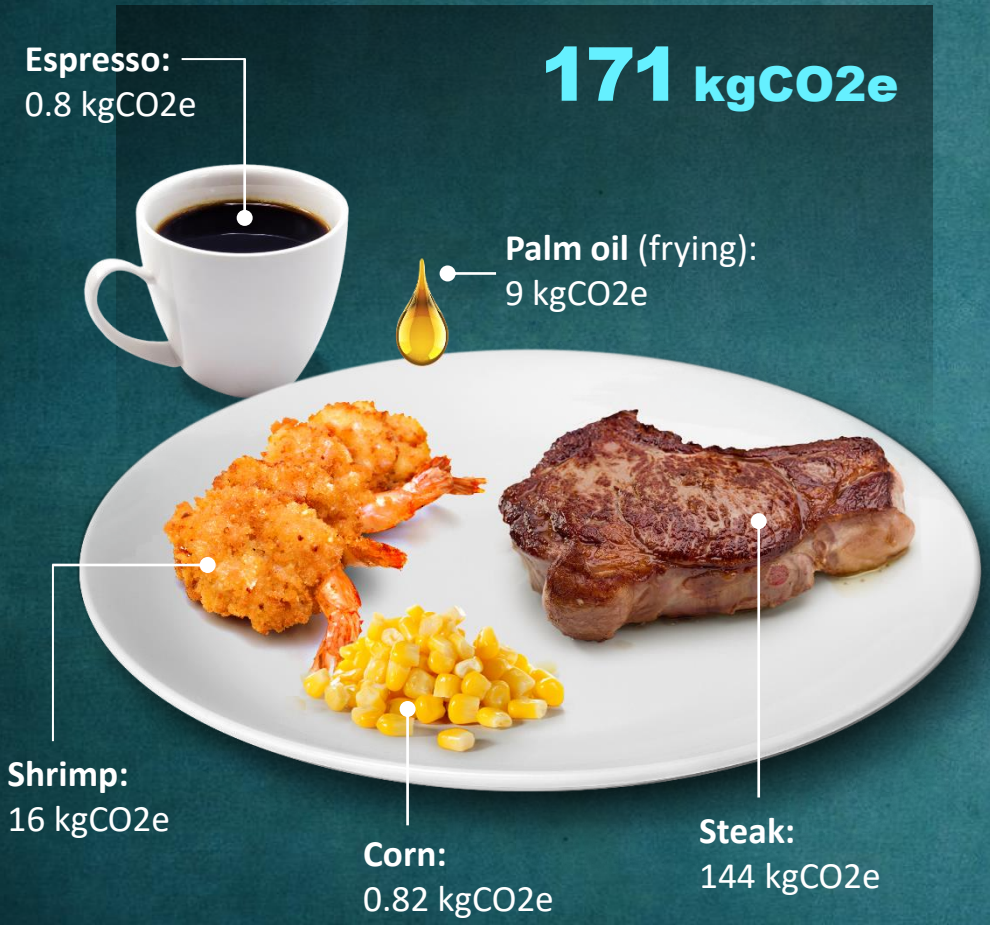


Note: Data refers to the greenhouse gas emissions of food products across a global sample of 38,700 commercially viable farms in 119 countries. Emissions are measured across the full supply-chain, from land use change through to the retailer and includes on-farm, processing, transport, packaging, and retail emissions.

Source: Joseph Poore and Thomas Nemecek (2018). Reducing food's environmental impacts through producers and consumers. *Science.*

OurWorldinData.org – Research and data to make progress against the world's largest problems. Licensed under CC-BY by the authors Joseph Poore & Hannah Ritchie.

“Average emissions intensity” doesn’t tell the whole story






The problem with
averages
27
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Averages tell you how many, not the **who, where, why** of GHG emissions

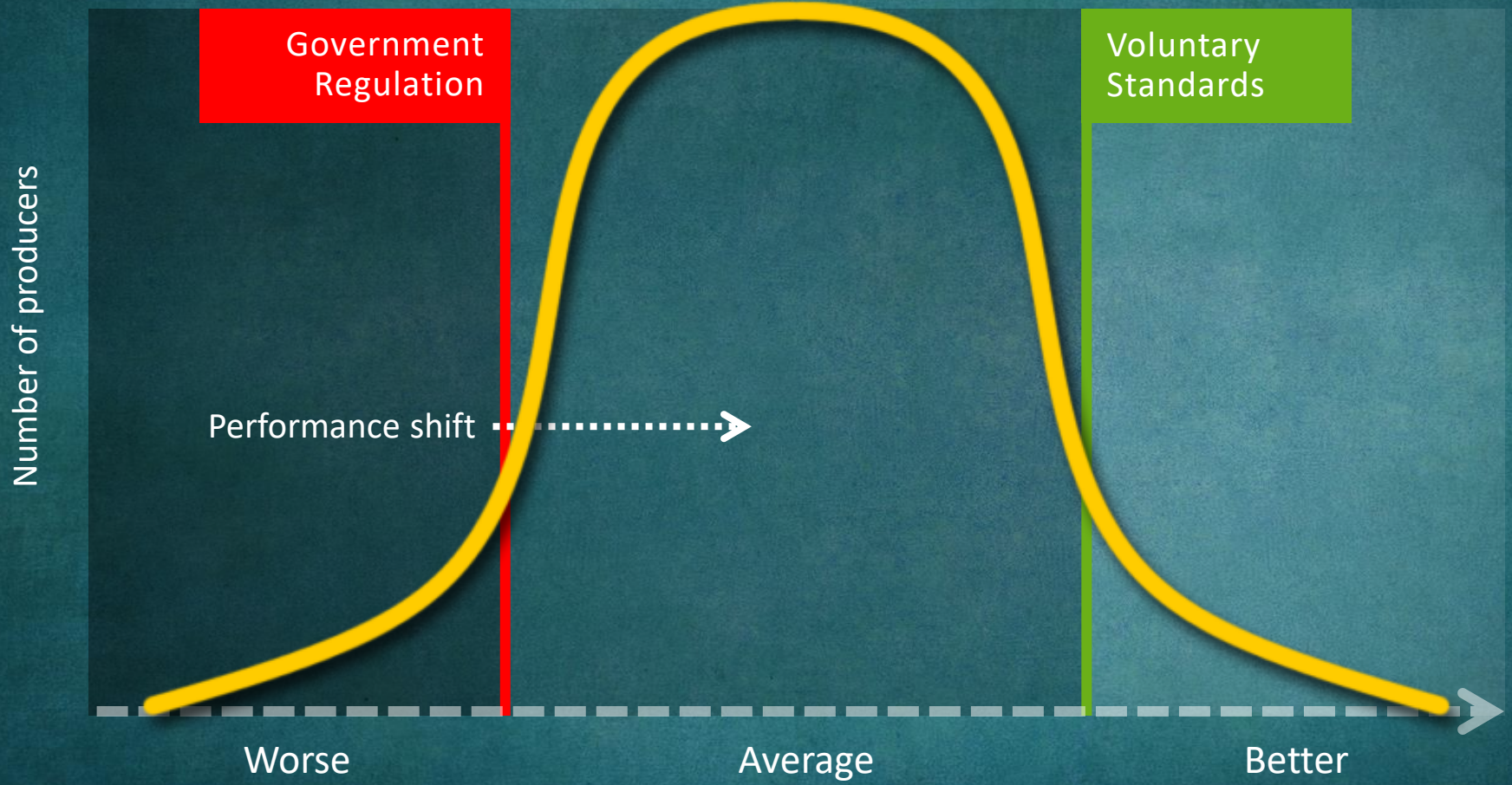
The issue isn't

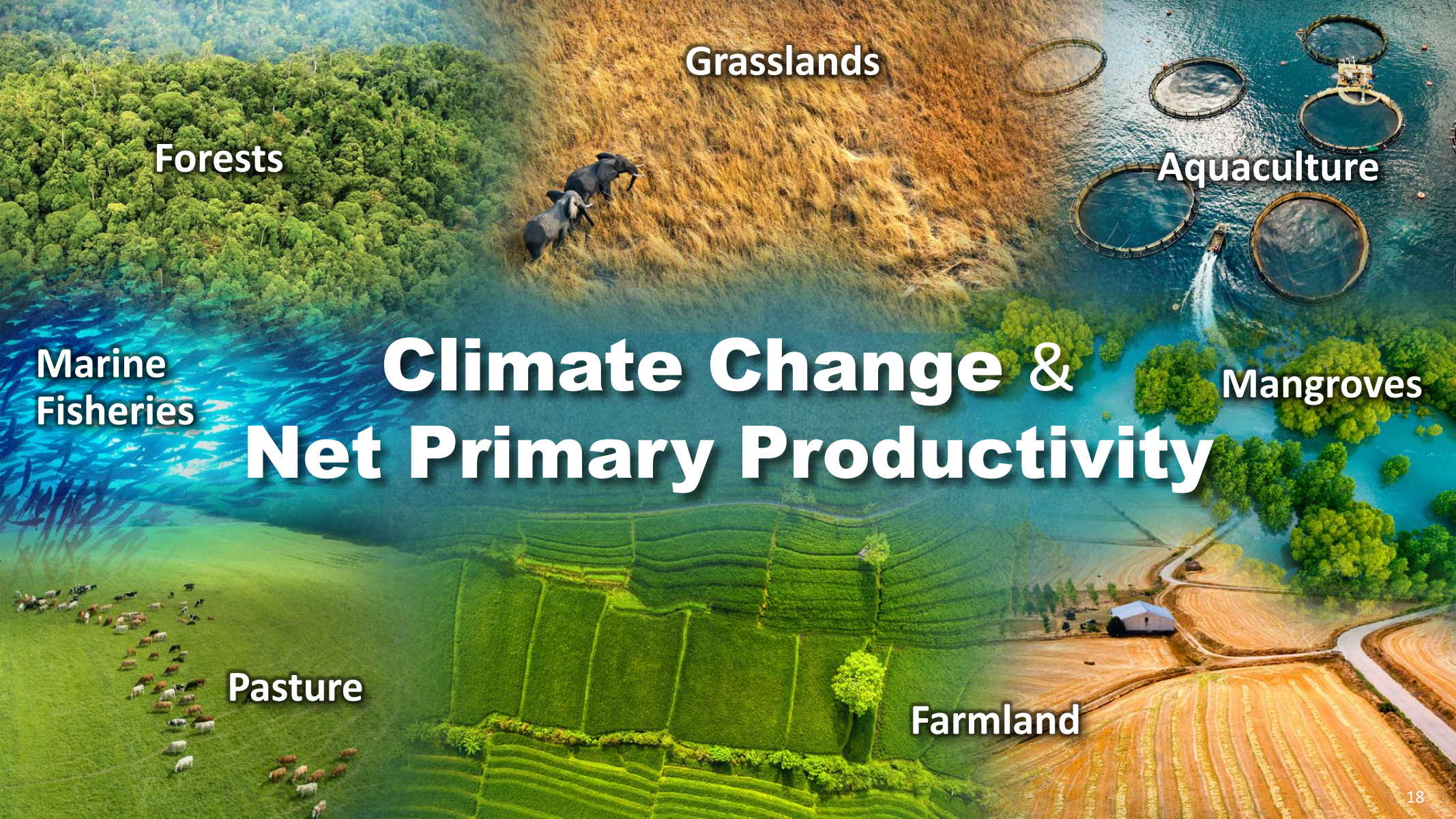
what to think,

it's **how** to think

Which reduces meat's GHG emissions **most**?

Reward the best, or move the rest?



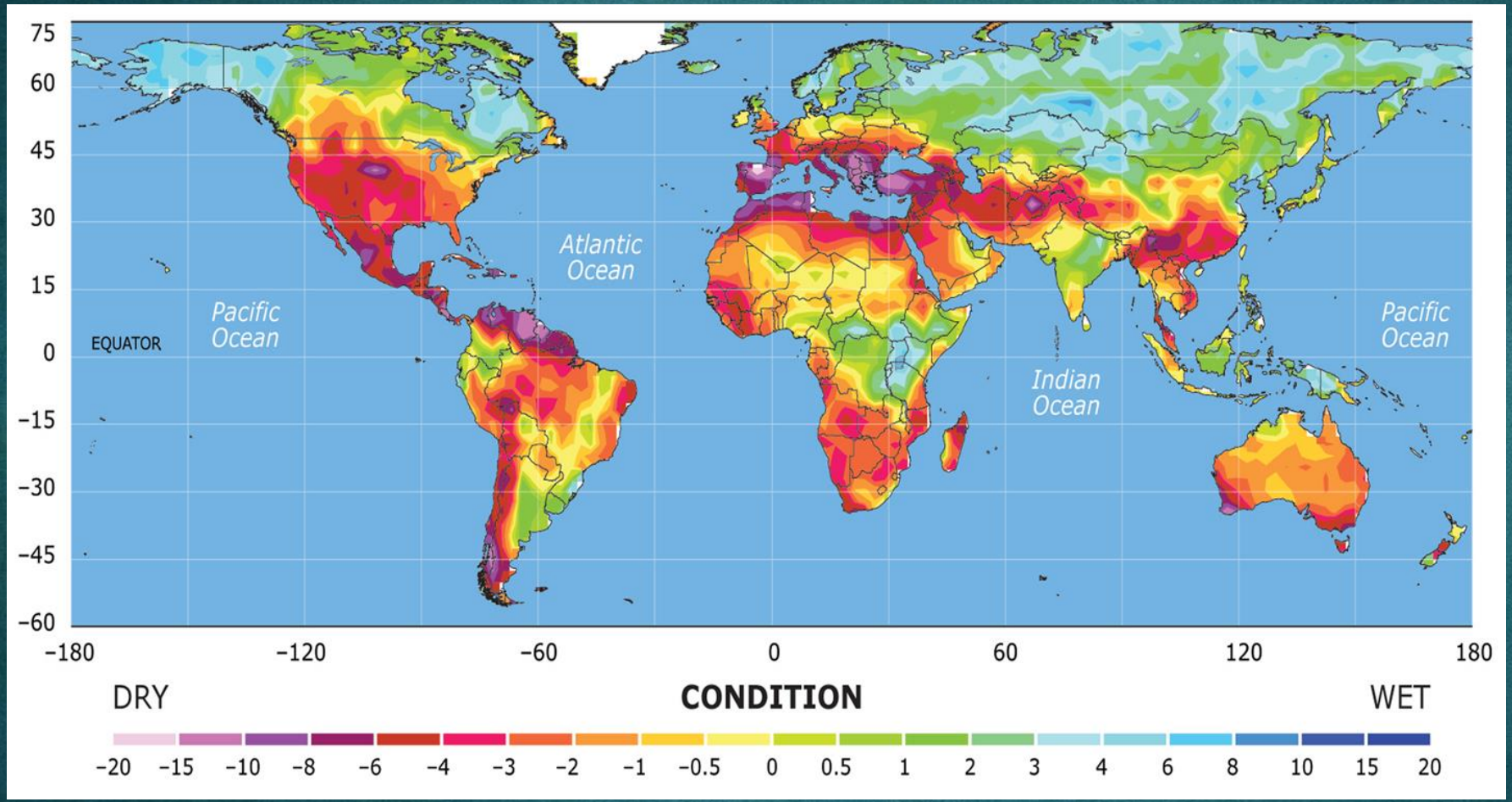

Grasslands
Forests
Aquaculture
Marine
Fisheries
Climate Change &
Net Primary Productivity
Mangroves
Pasture
Farmland

Climate change will shift

where and **how**

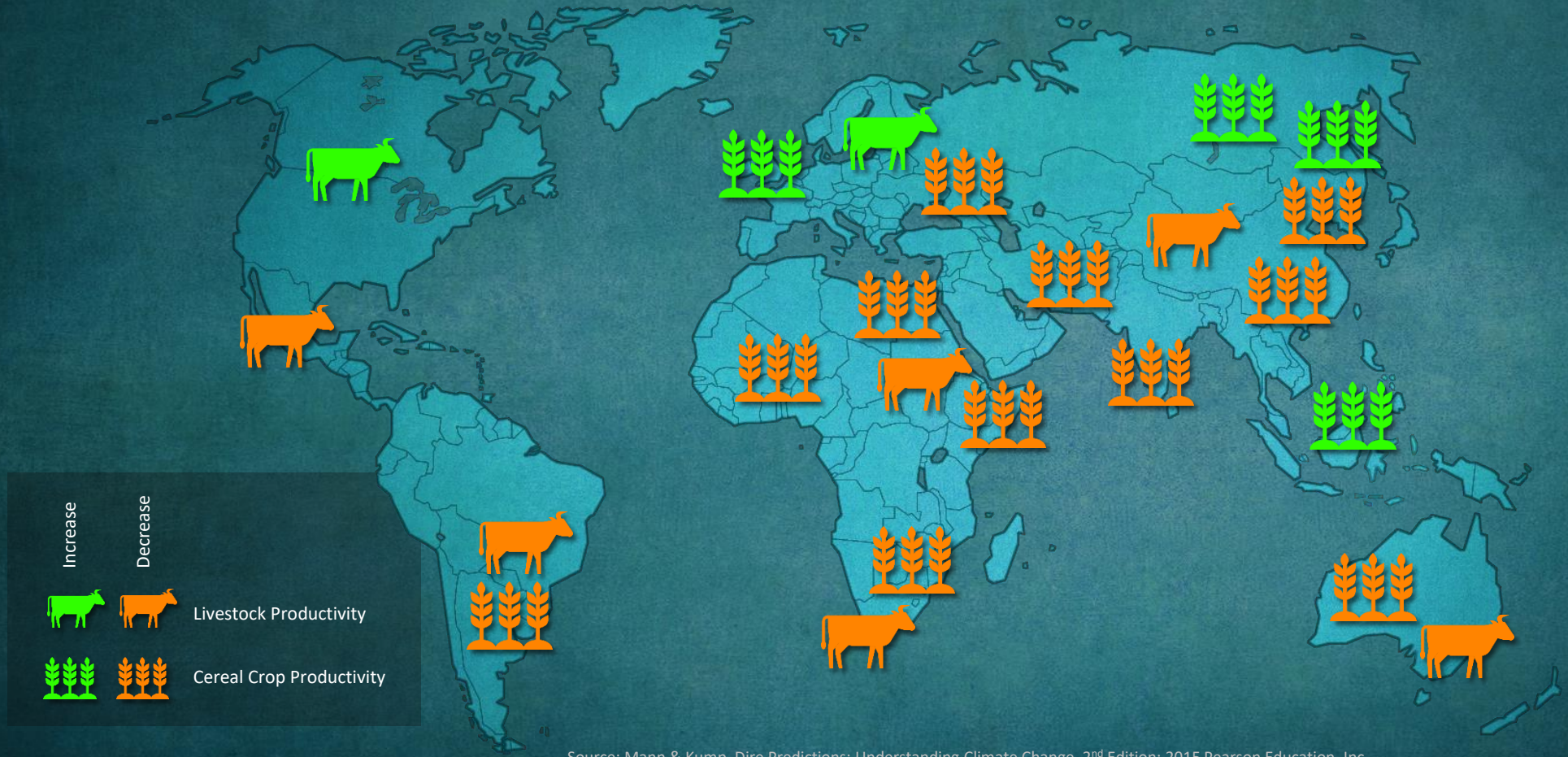
we produce meat and feed

Global drought forecast – 2030-2039



Source: UCAR

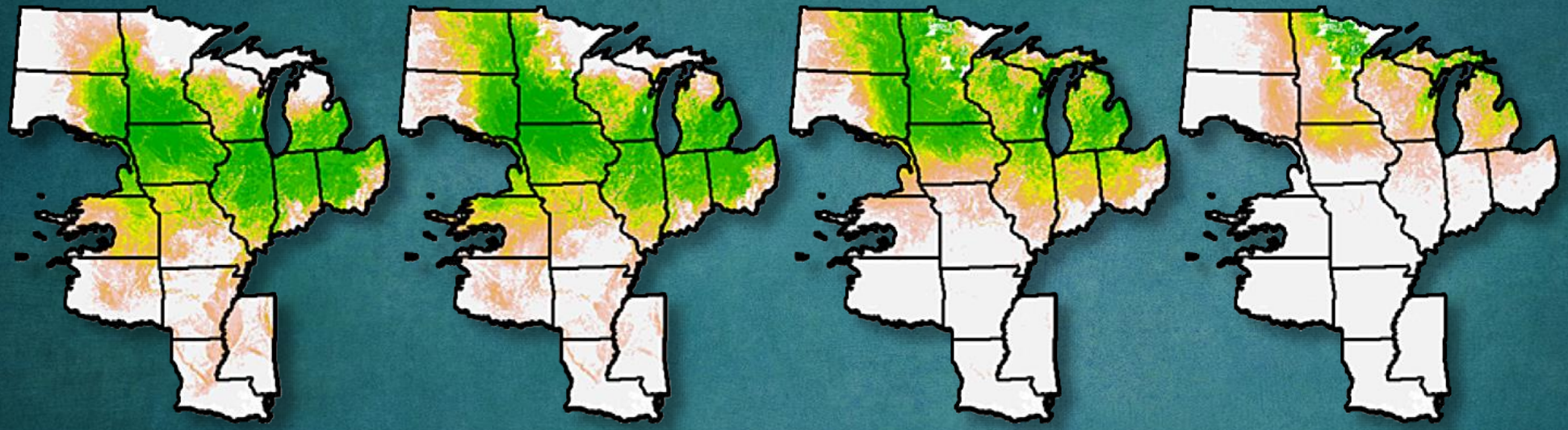
Projected climate change impacts on livestock & crop yields



Source: Mann & Kump, Dire Predictions: Understanding Climate Change, 2nd Edition; 2015 Pearson Education, Inc.



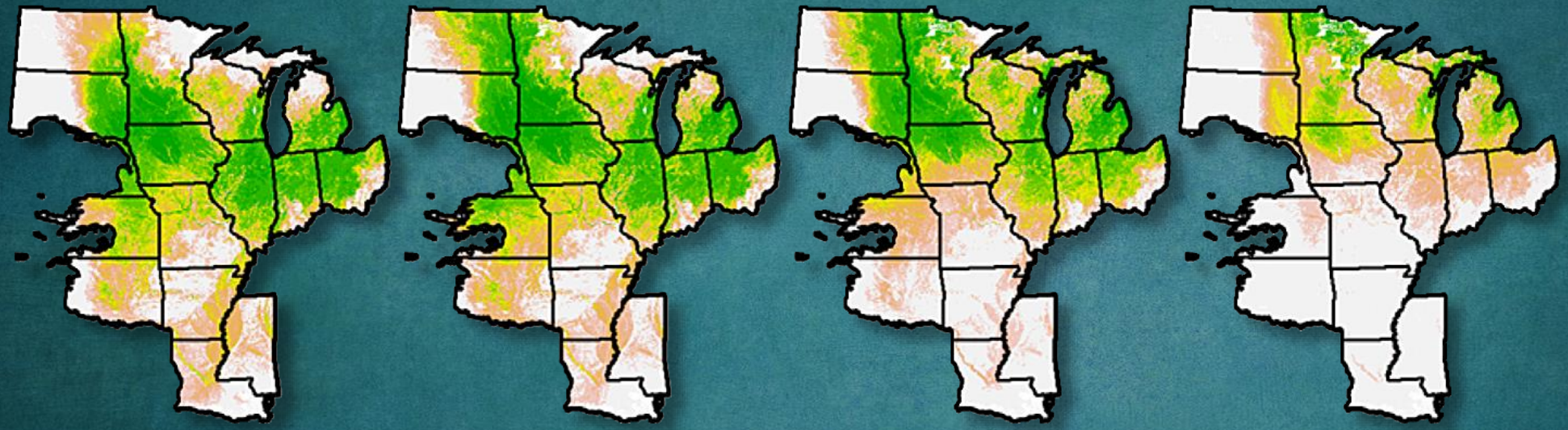
US Midwest climate suitability for corn production, 2010-2100



Current 2040 2070 2100

Source: "The Effect Of Climate Change On Rural Land Cover Patterns In The Central United States", Christopher Lant, Timothy J. Stoebner, Justin T. Schoof , Benjamin Crabb, 2015

US Midwest climate suitability for soybean production, 2010-2100



Current 2040 2070 2100

Source: "The Effect Of Climate Change On Rural Land Cover Patterns In The Central United States", Christopher Lant, Timothy J. Stoebner, Justin T. Schoof , Benjamin Crabb, 2015


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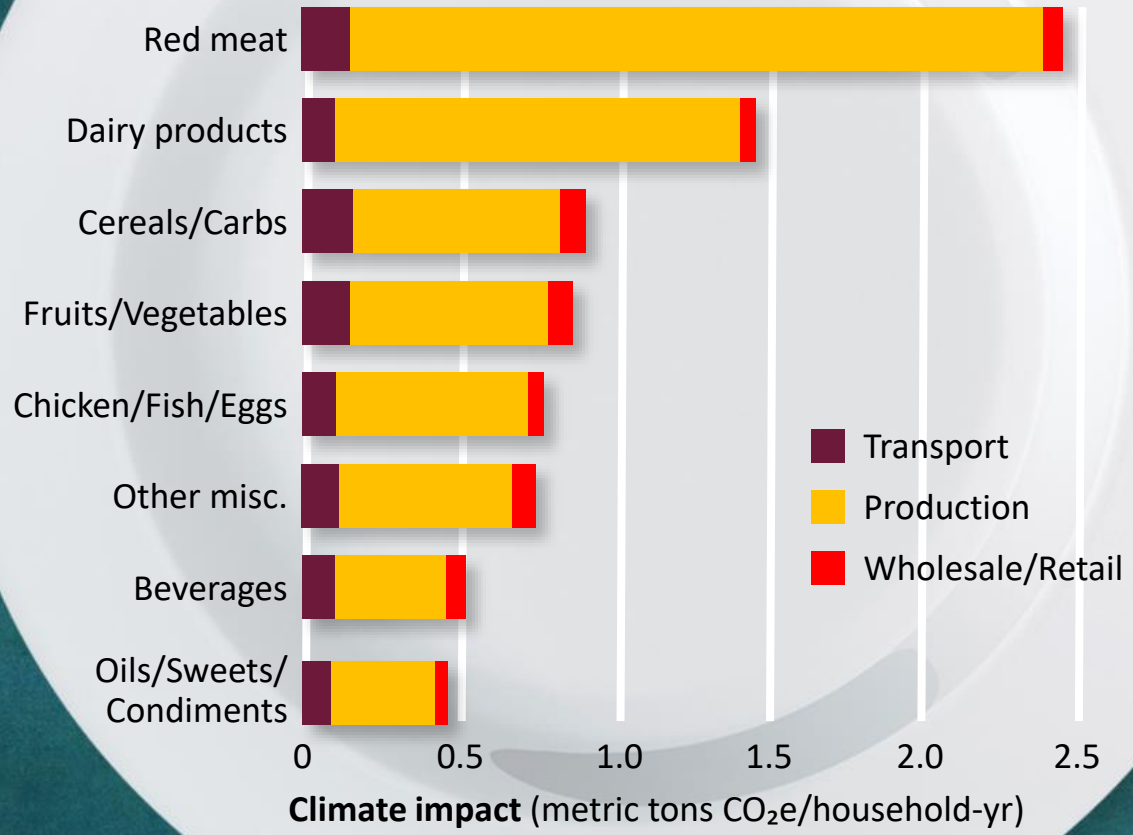

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Climate impacts on livestock

- Higher temperatures
- Water availability
- Pasture and feed quality, availability, and cost
- Supply chain shifts and substitutions
- Increased stress, disease, and mortality rates


The food system
is responsible for
21-37%
of global GHG
emissions

Total greenhouse gas emissions by supply chain tier associated with household food consumption in the U.S.



"The Problem of What to Eat" *Conservation.* Natasha Loder, Elizabeth Finkel, Craig Meisner, and Pamela Ronald. July-September 2008 9(3):31





Feed in livestock's footprint

- **45%** of all livestock GHG emissions
- **98%** of water for livestock
- **80%** of ag land for pasture and feed crops

Source: FAO, 2013. Mekonnen-Hoekstra, 2012

Feed’s embedded GHG emissions are **multiplied** in meat



Global Salmon Initiative

50% of global production certified by 2020, 50% of GHG emissions reduced by 2030







Goal: Reduce meat's GHG emissions —

50% by 2030



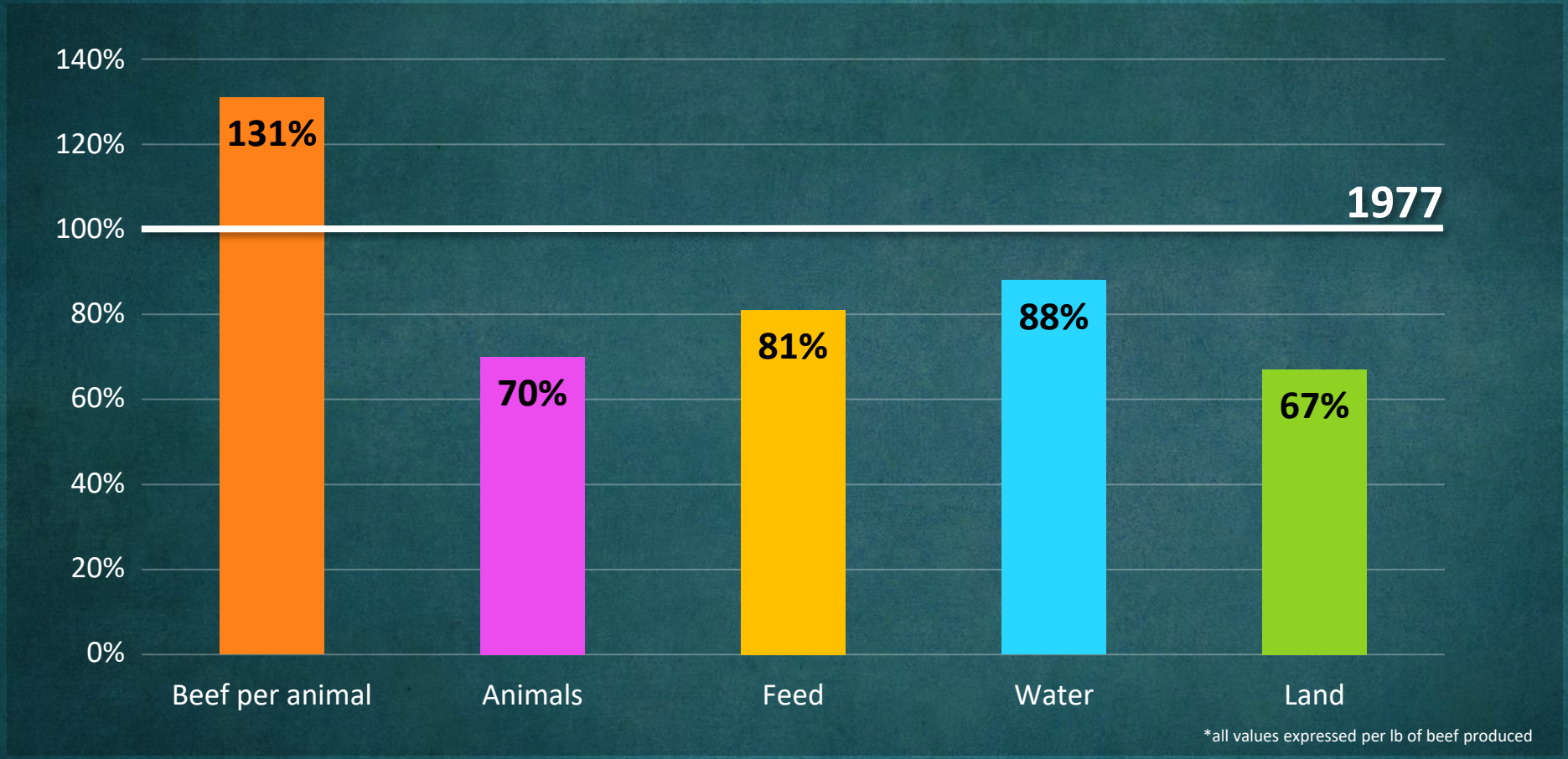


Scope 3 GHG emission strategies

- Know your emissions
- Start with the biggest
- Focus on continuous improvement
- Work with others to move the bottom
- Report results as sectors

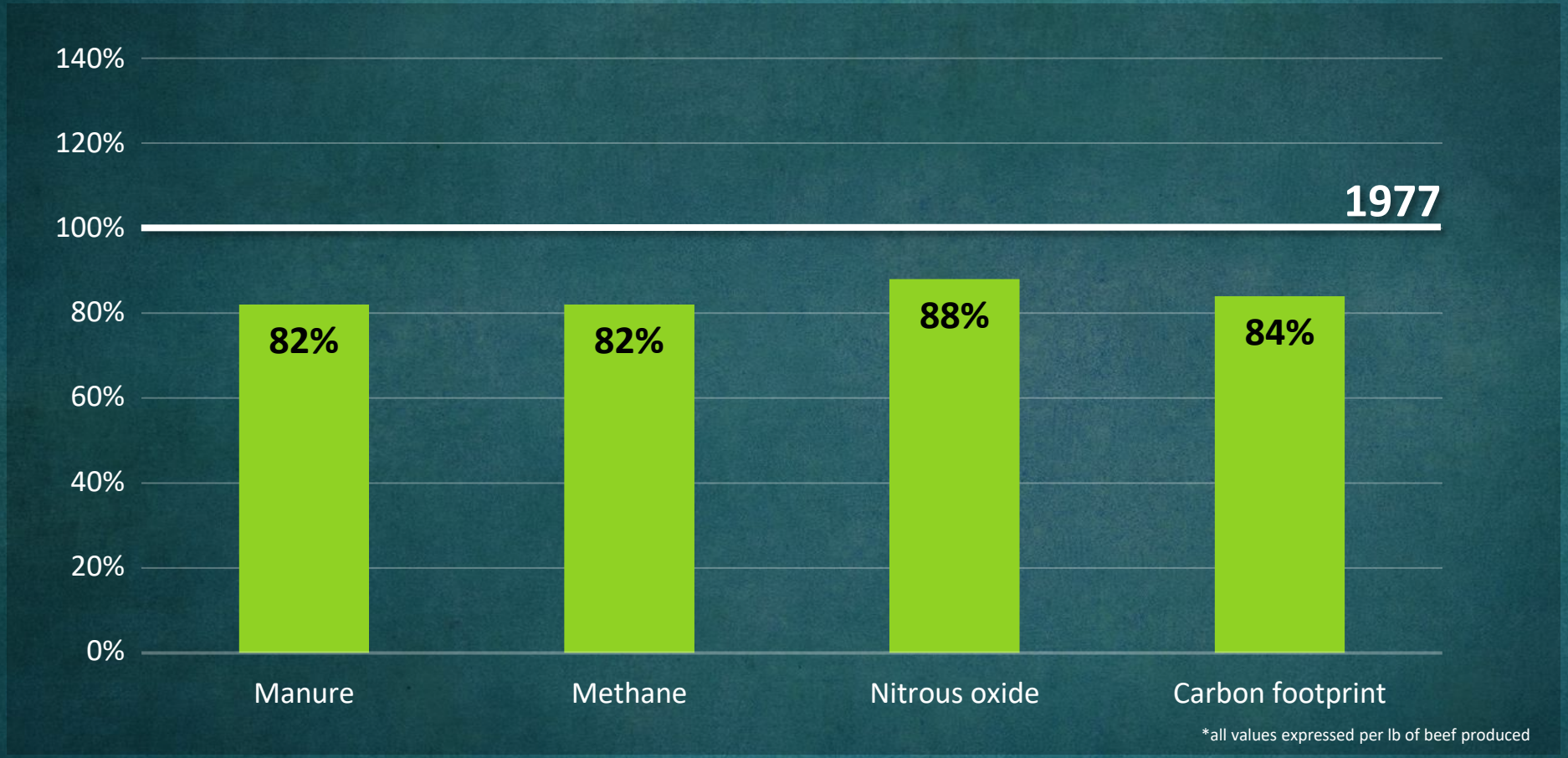
We need common metrics, measurements, and **absolute reductions**

Environmental impact of US beef production reduced by improved productivity & efficiency (1977 & 2010)



Source: Capper, J.L. (2011). The environmental impact of U.S. beef production: 1977 compared with 2007. *J Anim Sci*

Environmental impact of US beef production reduced by improved productivity (33 years)



Source: Capper, J.L. (2011). The environmental impact of U.S. beef production: 1977 compared with 2007. *J Anim Sci*

BAU is **too slow**

Skate to where the

puck will be

not where it is







What is needed will change – review, revise & reflect

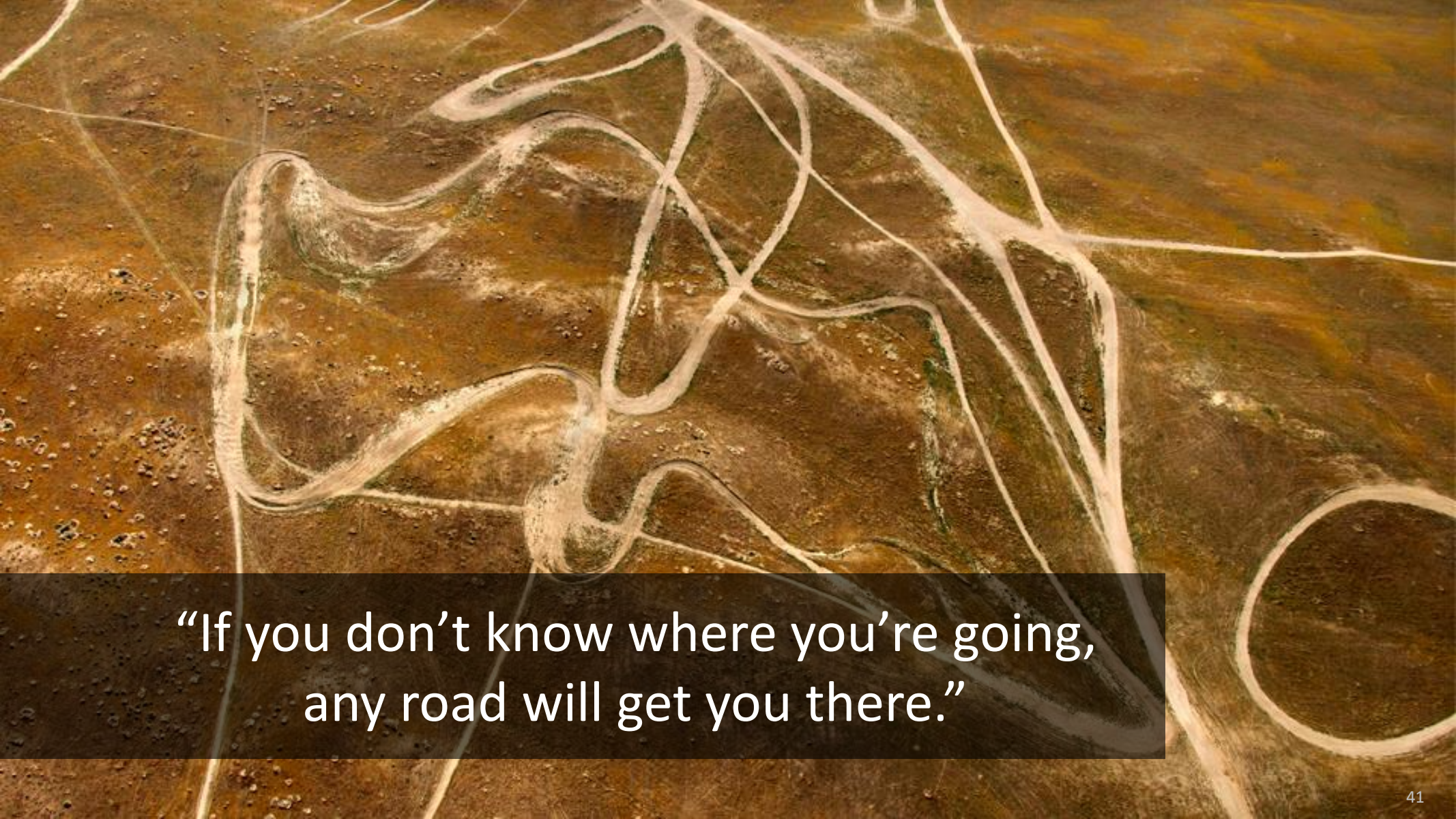
- Science will improve
- Tools (LCAs, methodologies) will be standardized
- Technology will improve
- Markets will shift as will requirements

Reputational **risks**
for meat
are global

Solutions are

pre-competitive

Knowledge sharing **platforms** are **critical**


“If you don’t know where you’re going,
any road will get you there.”


Think about it.
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LI: JasonWClay
Markets Institute website: WWF Markets Institute