

CLIMATE CHANGE AND AGRICULTURE:

Cows, Corn, and Crap

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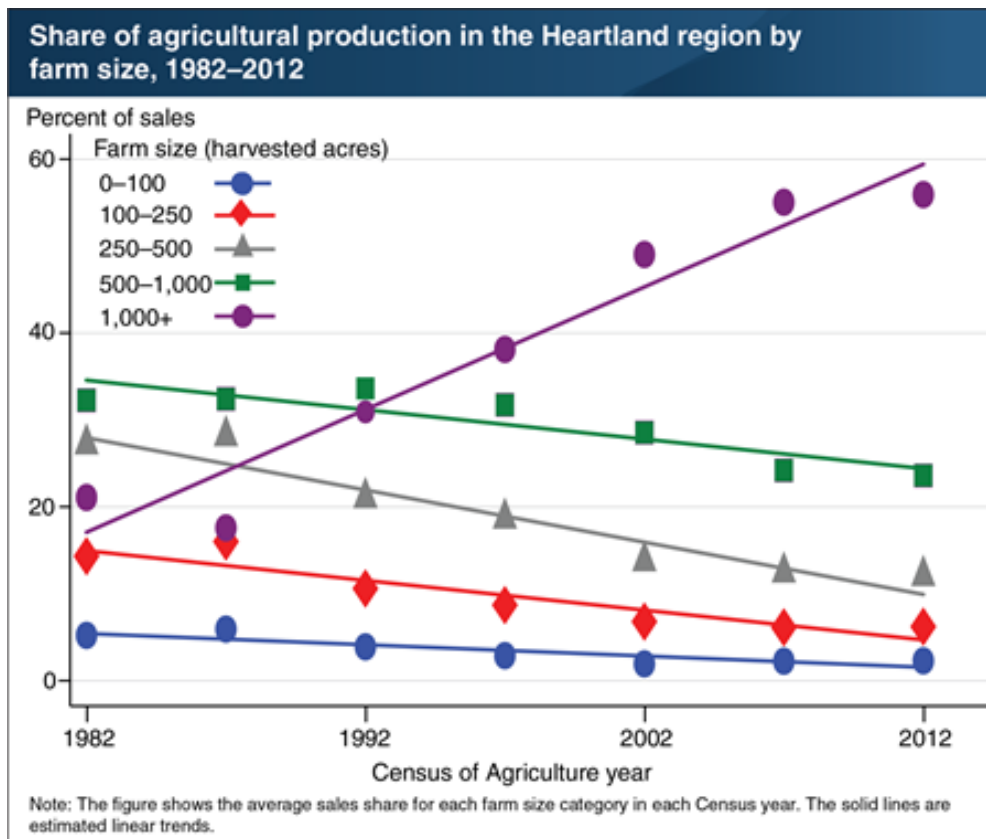


INDUSTRIAL AGRICULTURE PRODUCES A VAST AMOUNT OF INEXPENSIVE FOOD



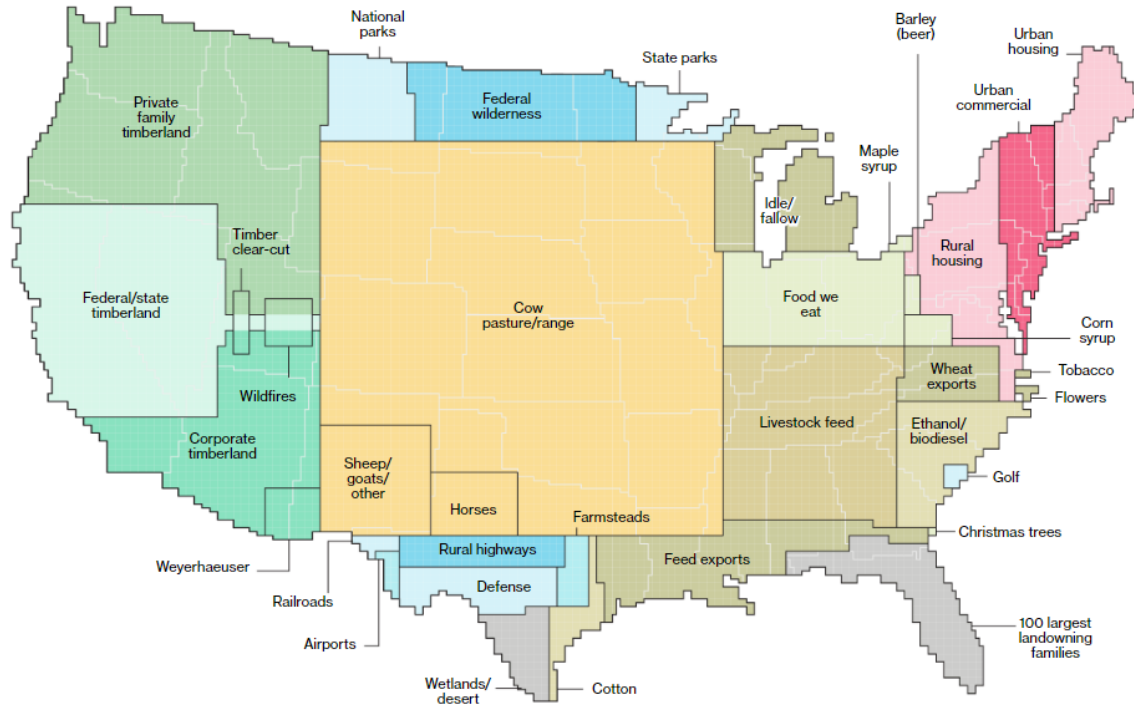
- **430 billion pounds** of food produced annually
 - **3,683 calories** /person / day (~2,200 recommended)
- **20 mm** bales of cotton, 20 mm pounds of wool; 14 bb gallons of biofuel
- **20%** of food produced exported; **15% imported**; **40%** is wasted
- Americans are paying **one third less** for their food than in 1980
- Farmers receive 7.8 ¢/ food \$

INDUSTRIAL AGRICULTURE, LAND & LABOR: INCREASING CONCENTRATION AND DISPARITY



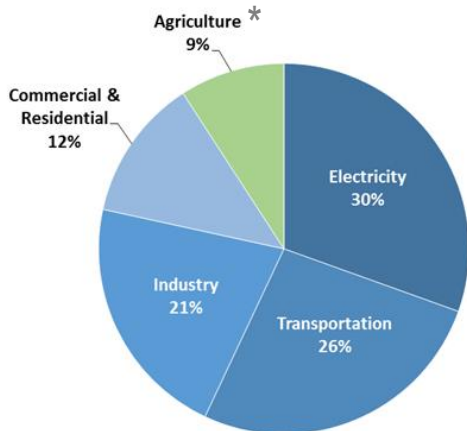
- **>70%** cropland acres are monoculture; **8%** of farms control 40% of farmland
- **6%** of farms produce **90%** of meat, dairy, poultry
- **98%** of farmland owned by whites; **60%** of farm labor people of color
- Under 2% of US labor in agriculture (4 million)

AGRICULTURE DRIVES U.S. LAND AND WATER USE



- **62%** of land use in continental U.S. is agricultural
- **391 million** acres of crops and **798 million** acres of grazing land
 - Only **20%** of land is used for food we directly eat
- **80%** of water use

INDUSTRIAL AGRICULTURE DRIVES ABOUT ONE THIRD OF CLIMATE CHANGE



* Does not include GHG from land conversion, foregone sequestration; additional food system emissions from processing, refrigeration, cooking, transport, etc.

NITROUS OXIDE

- ~285x stronger > CO₂
 - Excess fertilizer, animal manure



SOIL CARBON

- Forest and grassland conversion, tillage
- **7.8M+ acres** converted from 2008-2012
- Continuing impact of prior converted land – largely corn and cows



METHANE

- 85x stronger > CO₂
- Cattle belches
- Animal manure
- Rice, food waste rotting in landfills



CARBON DIOXIDE

- Fertilizer and pesticide manufacture
 - On-farm energy and electricity
- Food processing, distribution, preparation

CLIMATE CHANGE HARMS AGRICULTURE



EXTREME WEATHER

- Hurricanes and storms increase in frequency and severity
- Hurricane Maria: \$780M in ag losses
- CAFO overflows



PESTS, WEEDS, DISEASES

- Better living conditions for pests
- Invasive species expand and spread
- Reduced resilience to disease outbreak
- Reduced nutritional content of foods



HEAT WAVES AND WILDFIRES

- More frequent and severe
- Lead to yield declines
- Dangerous working conditions



FLOODS AND DROUGHTS

- Irregular and extreme precipitation events more frequent and severe
- 2016 CA Drought: \$603M in ag losses
- 2019 Midwest floods: 5-10M bushels corn and soy rotted; 19M acres left unplanted



INDUSTRIAL AGRICULTURE IMPACTS ON THE ENVIRONMENT AND PUBLIC HEALTH



PUBLIC HEALTH

- Diet-related disease over \$1 trillion / year
- 70% American adults overweight or obese
- Major source of lead
- Antibiotics in feed -> antibiotic resistance

WATER POLLUTION

- Water pollution & soil erosion >\$200B/year
- E.g. Gulf dead zone; Toledo drinking water
 - 50 million Americans drink water contaminated with agricultural chemicals



WILDLIFE CONFLICT

- Livestock grazing v. wolves & bears
- Loss of habitat – up to 7.8 million acres converted to cropland between 2007-2012



TOXIC CHEMICAL EXPOSURE

- Pesticide residues found on 85% of tested foods
- 17,000 people die each year from ag air pollution



CURRENT AGRICULTURE SYSTEM IS NOT THE ONLY OPTION



- Current system is profoundly shaped by policy (especially Farm Bill; environmental law exemptions)
- Industrial, chemical-dependent monoculture systems are not necessary to “feed the world”
 - Organic and agro-ecological practices are highly productive
- The “true cost” of food is **at least triple** the market price when include environmental and health costs

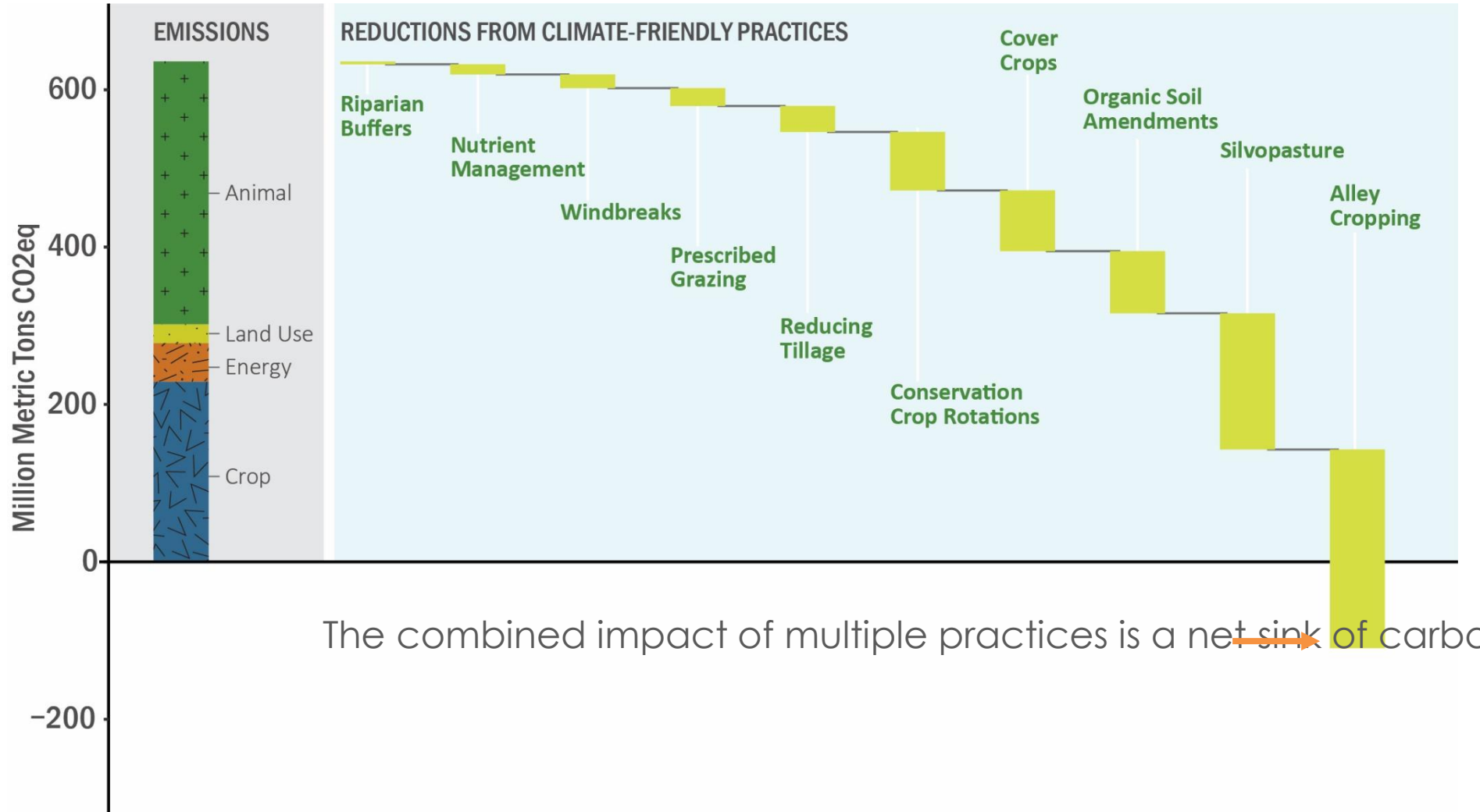
BETTER PRACTICES REDUCE CLIMATE IMPACTS, CHEMICAL USE, POLLUTION



Annual crop root mass (left) vs. perennial crop root mass (right).
Greater root mass improves drought/flood resilience and nutrient uptake.

- **Organic and agroecological practices can provide ample nutritious food** while reducing fertilizer/pesticide needs and costs
- These proven practices include:
 - Perennial crops (*see image*)
 - Precision fertilizer management
 - Crop rotations (different yearly crops)
 - Cover crops (avoiding winter bare ground)
 - No-till, reduced till; prairie strips
 - Management intensive grazing
 - Agroforestry & silvopasture (trees)
 - Dry manure management
 - Organic fertilizer, compost, biochar
- And **many new opportunities** since this area has been starved for R&D. E.g. Feed additives, climate-focused GM, remote sensing, drones

WHY THIS MATTERS: HEALTHY SOIL & GHG REDUCTION PRACTICES CAN MAKE AGRICULTURE CARBON-NEUTRAL



Based on estimates from USDA NRCS COMETS planner.

POLICY GOALS TO ACCELERATE CLIMATE-FRIENDLY AGRICULTURE

- **The Farm Bill and USDA Programs**

- Better target **conservation programs** to practices with climate change mitigation and resilience potential and away from practices with negative impacts
- Ensure Inflation Reduction Act funds (\$20 billion) spent well
- Ensure Climate-Smart Commodity Program well focused and transparent
- Increase funding for **R&D** into climate-friendly practices, education, & outreach

- **Energy policy and laws**

- Fix **renewable fuel standard**
- Encourage **on-farm renewable energy** and energy efficiency

- **Pollution and land management statutes**

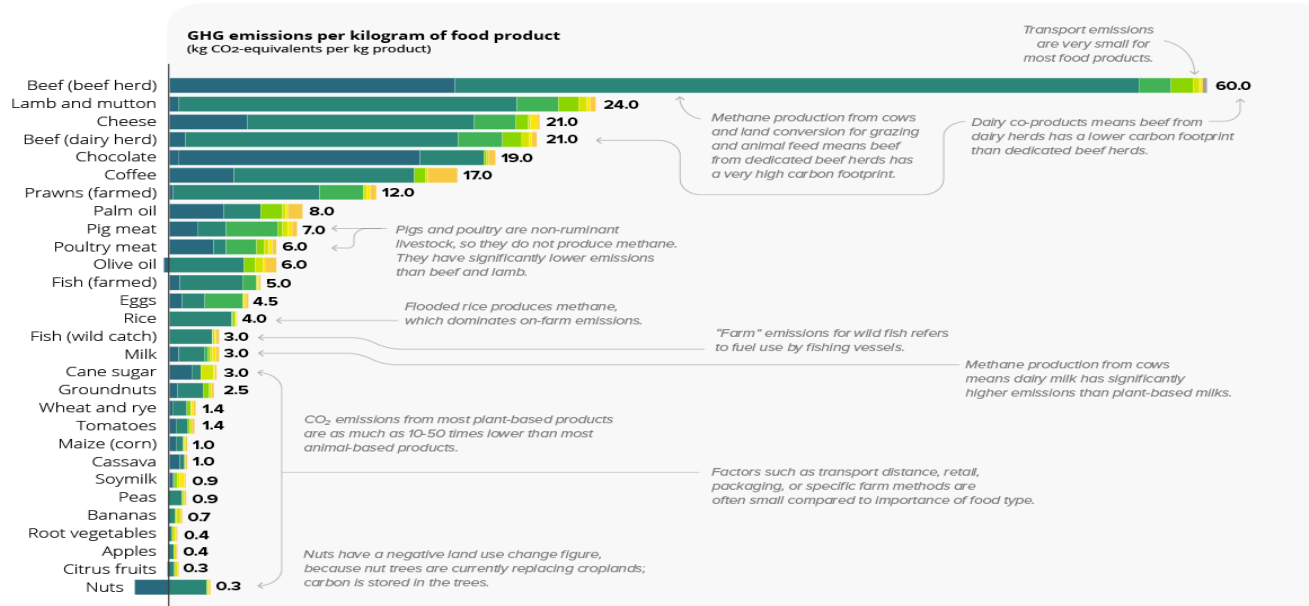
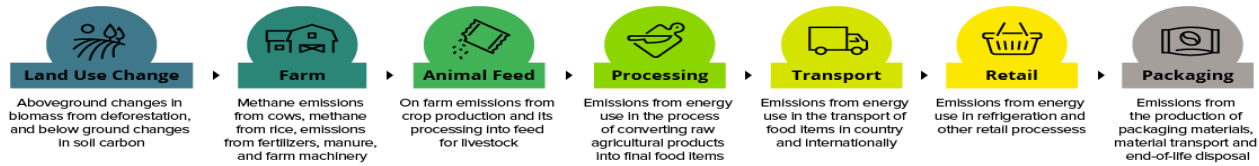
- Improve models and monitoring of air and water pollution; stricter limits
- Eliminate barriers and create incentives for management intensive grazing
- Increase information sharing and data availability
- Prioritize climate beneficial practices in other water and air quality programs (e.g. nonpoint source)

DIETARY CHANGE WILL BE NECESSARY

FOOD / Greenhouse gas emissions across the supply chain

Original graphic by
Our World
in Data

There is a vast difference in greenhouse gases (GHG) that are produced across various food types.

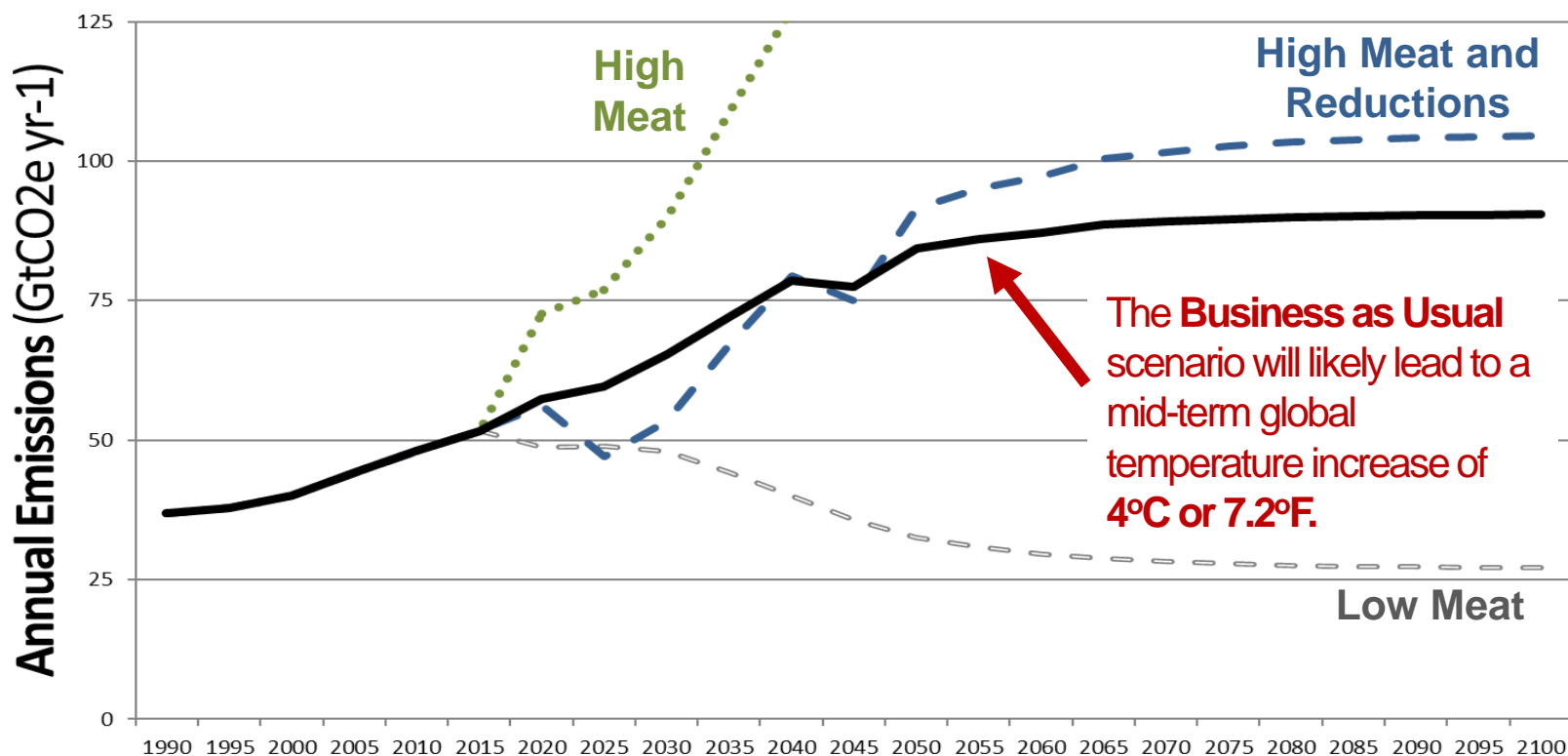


Note: Greenhouse gas emissions are given as global average values based on data across 38,700 commercially viable farms in 119 countries. Data source: Poore and Nemecek (2018). Reducing food's environmental impacts through producers and consumers. Science. Images sourced from the Noun Project. OurWorldinData.org - Research and data to make progress against the world's largest problems.



IT'S NOT JUST *HOW* WE GROW FOOD, BUT *WHAT* WE GROW

- Diet drives both **climate change** and **land-use change**
 - If the entire world ate a Western diet, we would need another Canada of cropland



THANK YOU AND QUESTIONS

