

Nourishing the Future: Sustainable Food Systems for Nutrition and Dietetic Students



JOHNS HOPKINS
CENTER *for* A LIVABLE FUTURE

FOOD + PLANET

Presented by:
Johns Hopkins Center for a Livable Future
Food + Planet

Food and Our Climate

Module 3



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Four Modules



Module 1

Introduction to
Sustainable Food
Systems

Module 2

Food Systems
for All

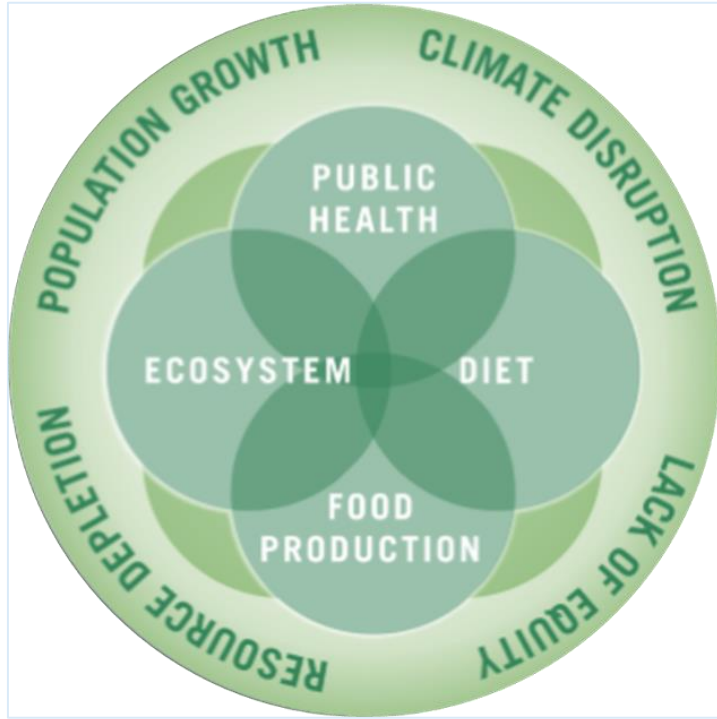
Module 3

Food and
Our Climate

Module 4

Aquatic Foods,
Nutrition, and
Sustainability

The Johns Hopkins Center for a Livable Future



- ▶ Interdisciplinary academic center at the Johns Hopkins Bloomberg School of Public Health
- ▶ Education, research, policy, and practice
- ▶ Vision: a healthier, sustainable, and resilient food system for all

Food + Planet

- *A collective, visionary 501c3 founded by four registered dietitians with varied experience in the food system*
- *Aim: Empower health care professionals to be leaders in sustainable food systems*

Vision: a science and practice of nutrition that honors nature as the foundation of health through the four dimensions of sustainability

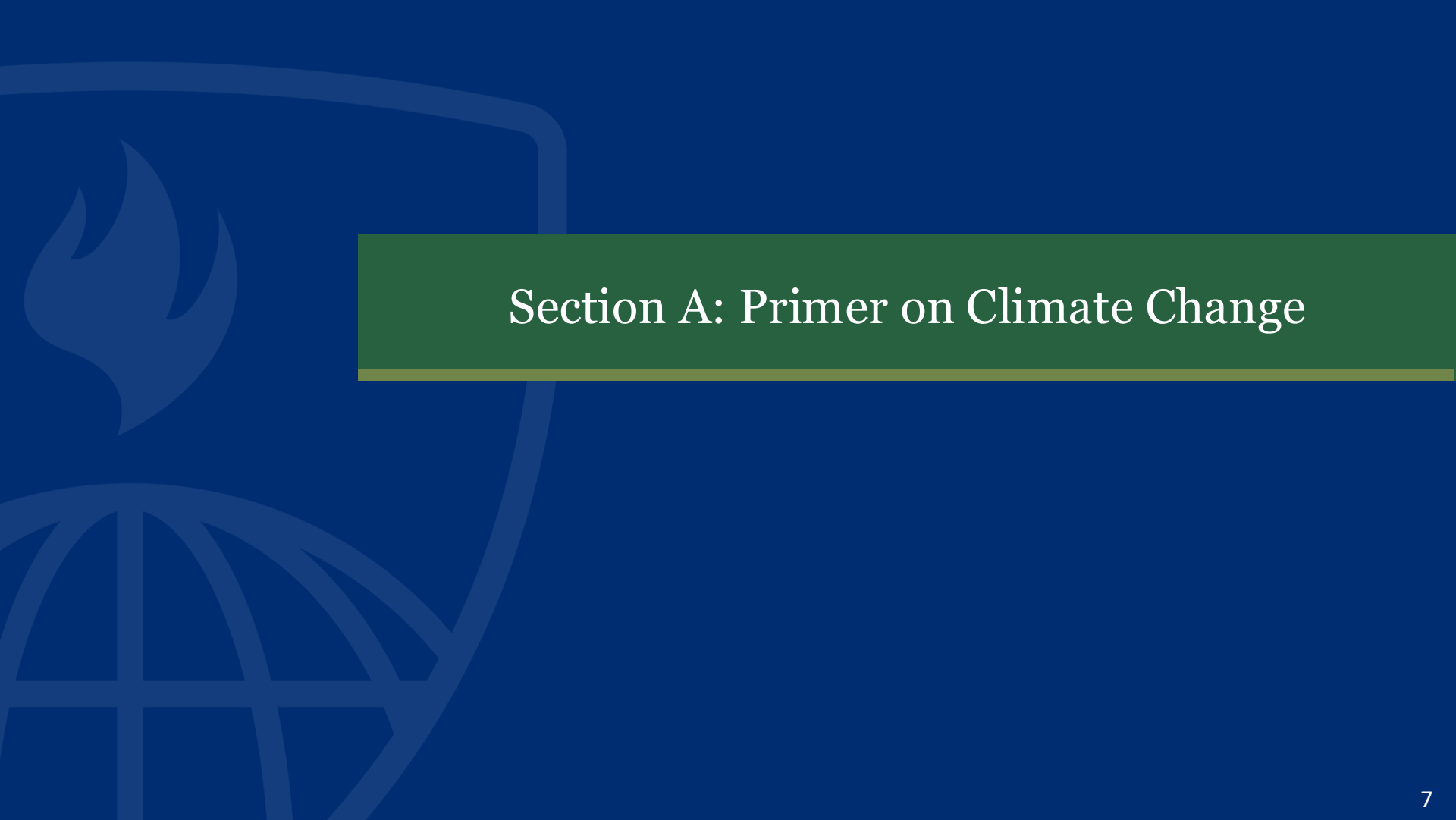


Image source: Vogliano, C., Geagan, K., Chou, S., Palmer, S. (2021). Figure 1. *The 4 dimensions of sustainable diets*. [Infographic]. Empowering nutrition professionals to advance sustainable food systems. Food + Planet. Retrieved September 14, 2025, from <https://7157e75ac0509b6a8f5c-5b19c577d01b9ccfe75d2f9e4b17ab55.ssl.cf1.rackcdn.com/GVJSUTJL-PDF-1-675987-4519061561.pdf>

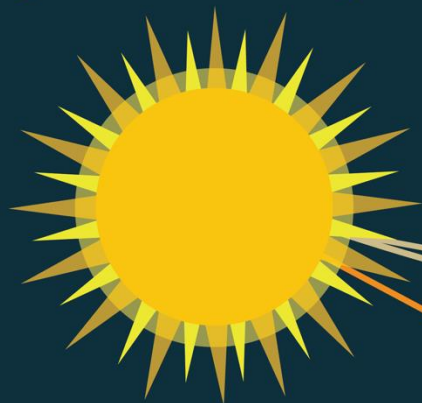
Learning Objectives



- ▶ Summarize the relationship between food systems and climate change
- ▶ Explain risks to our food systems from a changing climate
- ▶ Evaluate dietary shifts to reduce the greenhouse gas (GHG) contributions from food systems
- ▶ Describe the role of registered dietitian nutritionists (RDNs) as leaders in food system change



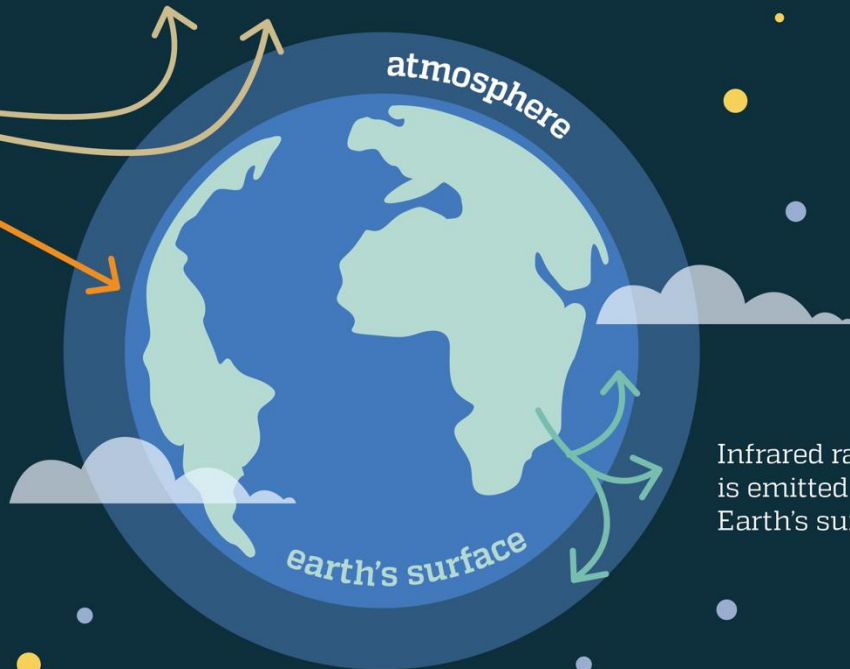
Section A: Primer on Climate Change



Some solar radiation is reflected by the Earth and the atmosphere.

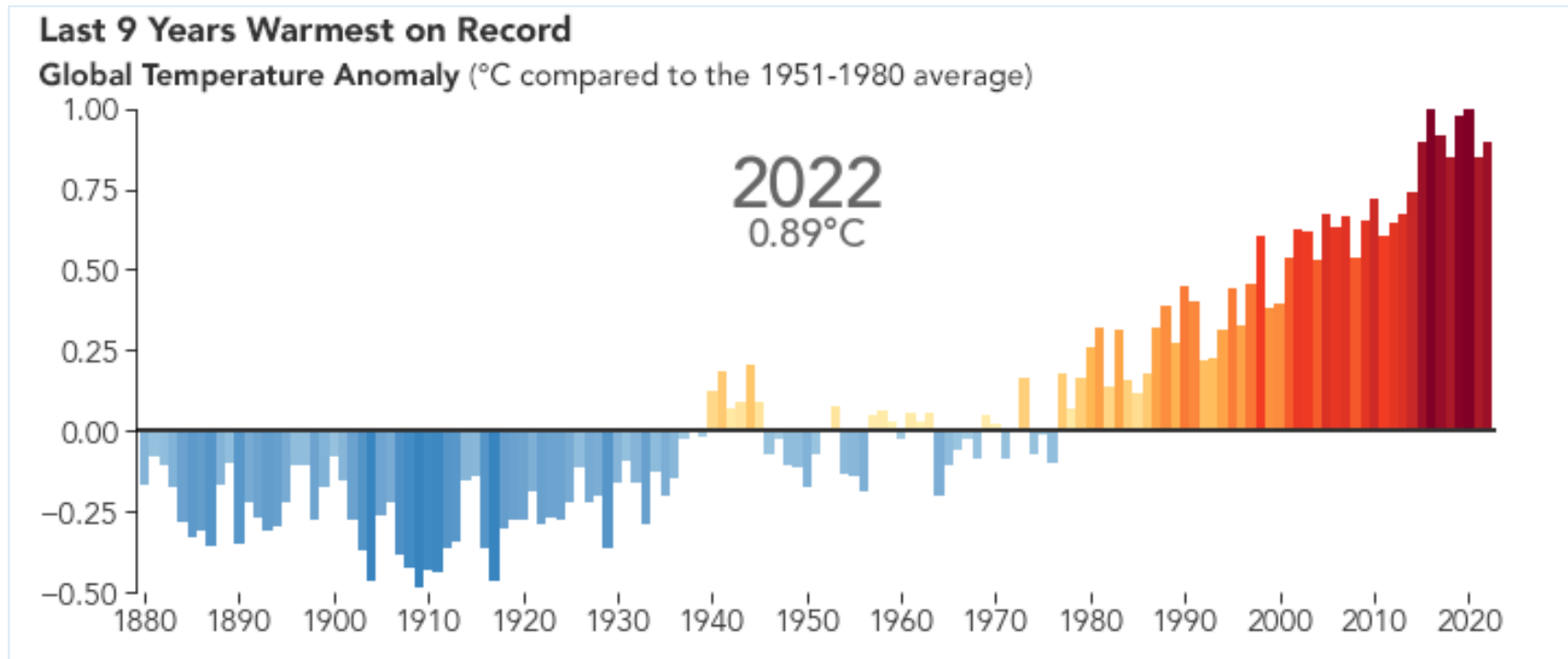
Some of the infrared radiation passes through the atmosphere. Some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.

Most radiation is absorbed by the Earth's surface and warms it.



Infrared radiation is emitted by the Earth's surface.

Average Global Temperature Increases



Sources: NOAA Climate. (2023). Global average surface temperature in 2022 compared to the 1991–2020 average. Climate.gov. <https://www.climate.gov/media/15007>;

Image is from NASA. (2020). Last 9 years warmest on record [Chart]. World of change: global temperatures. NASA Earth Observatory. <https://earthobservatory.nasa.gov/world-of-change/global-temperatures>

Trends in Global Temperature Changes

- ▶ In 2024, Earth was 2.6°F (1.47°C) warmer than in the 1800s prior to the Industrial Revolution
- ▶ The warmest years have all occurred in the recent past (2014–2024)
- ▶ If humans do nothing to reduce greenhouse gas emissions, temperatures are predicted to rise another 2.5–10°F over the next century

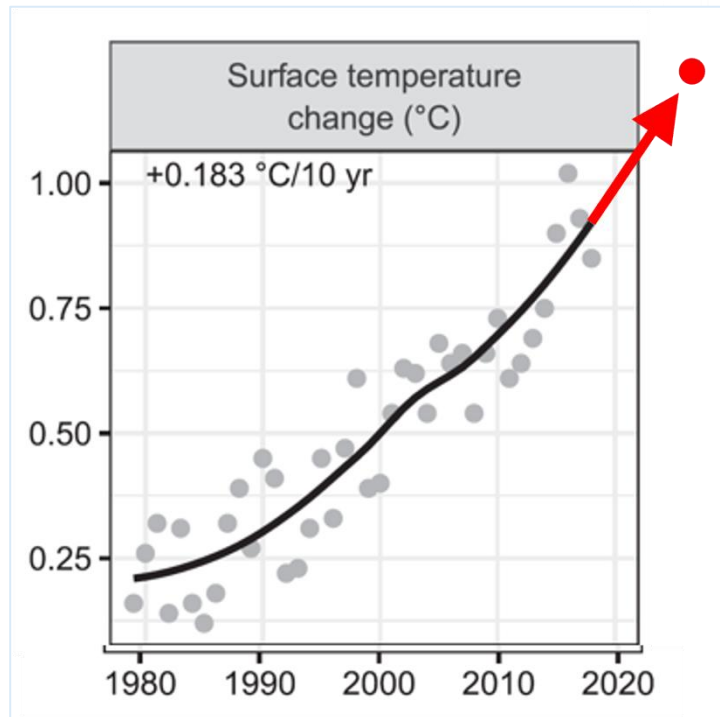
Climate Mitigation Targets

► Average global temperature rise:

- $< 1.5^{\circ}\text{C}$ (2.7°F)
- $< 2.0^{\circ}\text{C}$ (3.6°F)
 - Less ambitious
 - More feasible
 - More dangerous

► How are we doing?

- 2024 average: $\sim 1.4^{\circ}\text{C}$



Sources: UNFCCC. (2022). Nationally determined contributions under the Paris Agreement: Synthesis report by the secretariat (No. GE.22-17490(E)). *United Nations Framework Convention on Climate Change*. <https://unfccc.int/documents/619180>; Climate Central. (2023). The hottest 12-month stretch in recorded history: How carbon pollution affected countries and major cities worldwide from November 2022 to October 2023. *Climate Central*. <https://www.climatecentral.org/report/the-hottest-12-month-stretch-in-recorded-history-2023>; Graph adapted by the Johns Hopkins Center for a Livable Future from Ripple, W. J., Wolf, C., Newsome, T. M., Barnard, P., & Moomaw, W. R. (2020). Figure 2. *Climatic response time series from 1979 to the present* (Graph). *World scientists' warning of a climate emergency*. *BioScience*, 70(1), 8–12. Scopus. <https://doi.org/10.1093/biosci/biz088>

Greenhouse Gases



Carbon dioxide CO₂

- Burning fossil fuels, industrial activity, and deforestation
- Atmospheric lifetime: ≥ 200 years

Methane CH₄

- Livestock, landfills, oil/gas extraction, and rice paddies
- Atmospheric lifetime: approximately 12 years
- 84× more potent than CO₂

Nitrous oxide N₂O

- Fertilizers, livestock, industrial activity, and burning fossil fuels
- Atmospheric lifetime: approximately 120 years
- 284× more potent than CO₂

GHG
equivalents

Total US emissions in 2022 = 6,343 [million metric tons of CO₂ equivalent](#) (excludes land sector). Percentages may not add up to 100% due to independent rounding. Land use, land-use change, and forestry in the United States is a net sink and offsets 13% of these greenhouse gas emissions. This net sink is not shown in the above diagram. All emission estimates are sourced from the [Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2022](#).

Source: US EPA. (2025). *Inventory of U.S. greenhouse gas emissions and sinks*. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>

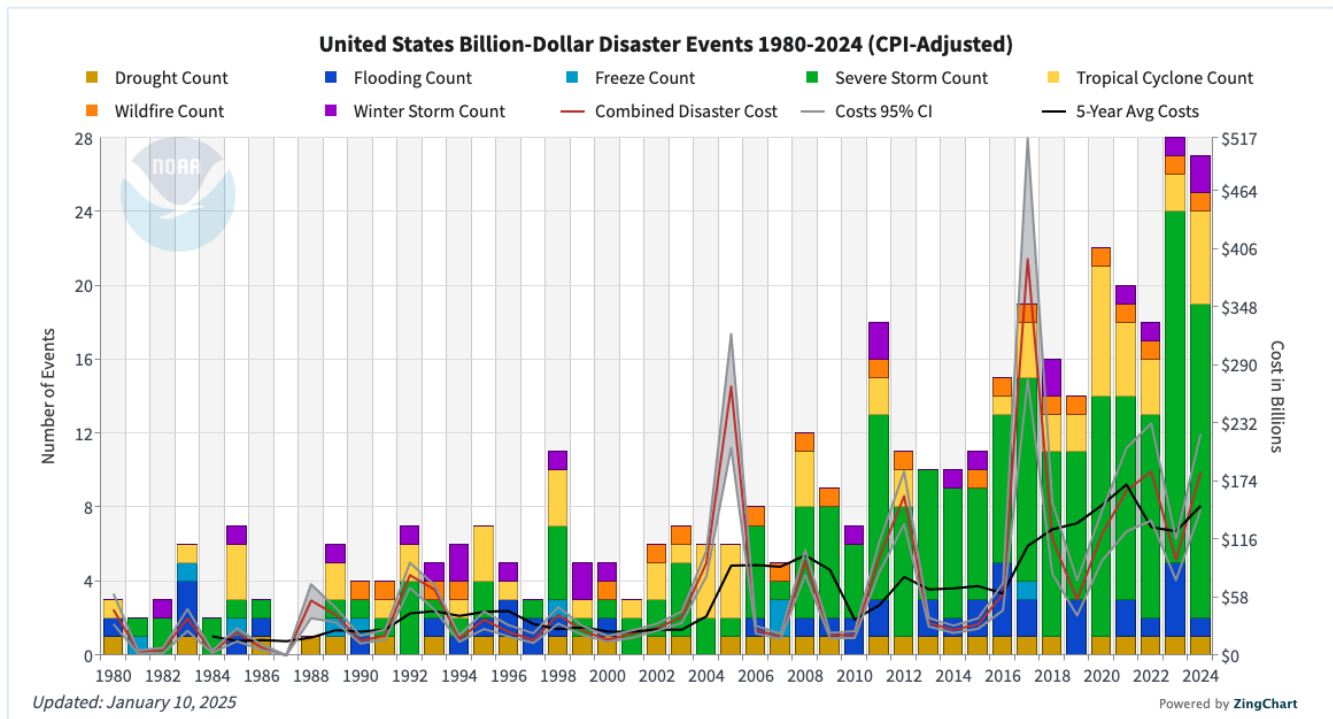
Greenhouse Gases and Climate Change



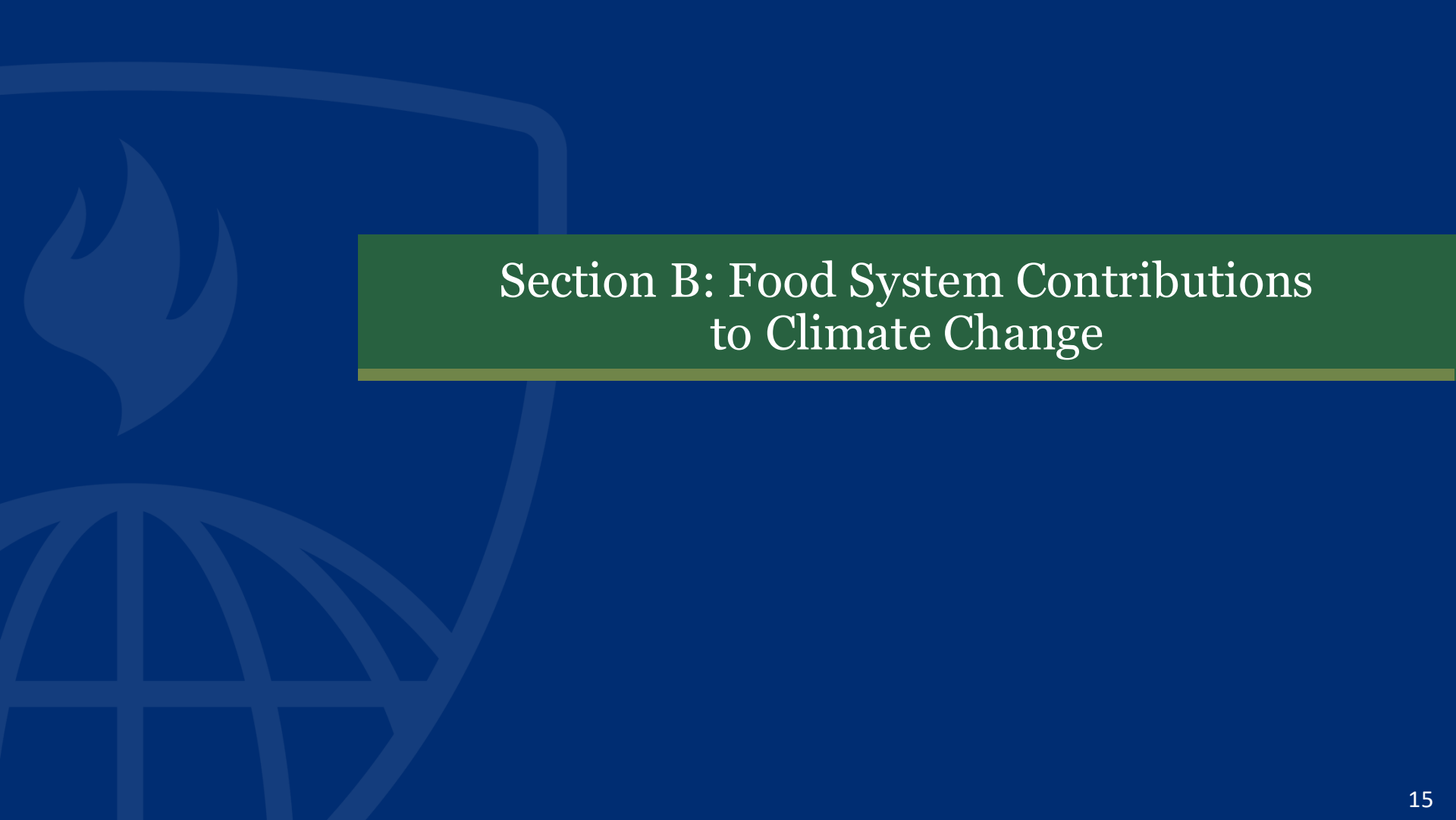
- ▶ Destabilization of climate and weather systems
- ▶ Sea level rise
- ▶ More extreme weather events
 - ▶ Heat waves
 - ▶ Precipitation and flooding
 - ▶ Drought



Weather-Related Events Are Costly



Source: NOAA National Centers for Environmental Information. (2025). *U.S. billion-dollar weather and climate disasters* (2025). <https://www.ncei.noaa.gov/access/billions/time-series/US/cost>;
Full report is available at <https://www.ncei.noaa.gov/access/billions/>



Section B: Food System Contributions to Climate Change

Global GHG Emissions From Food Production

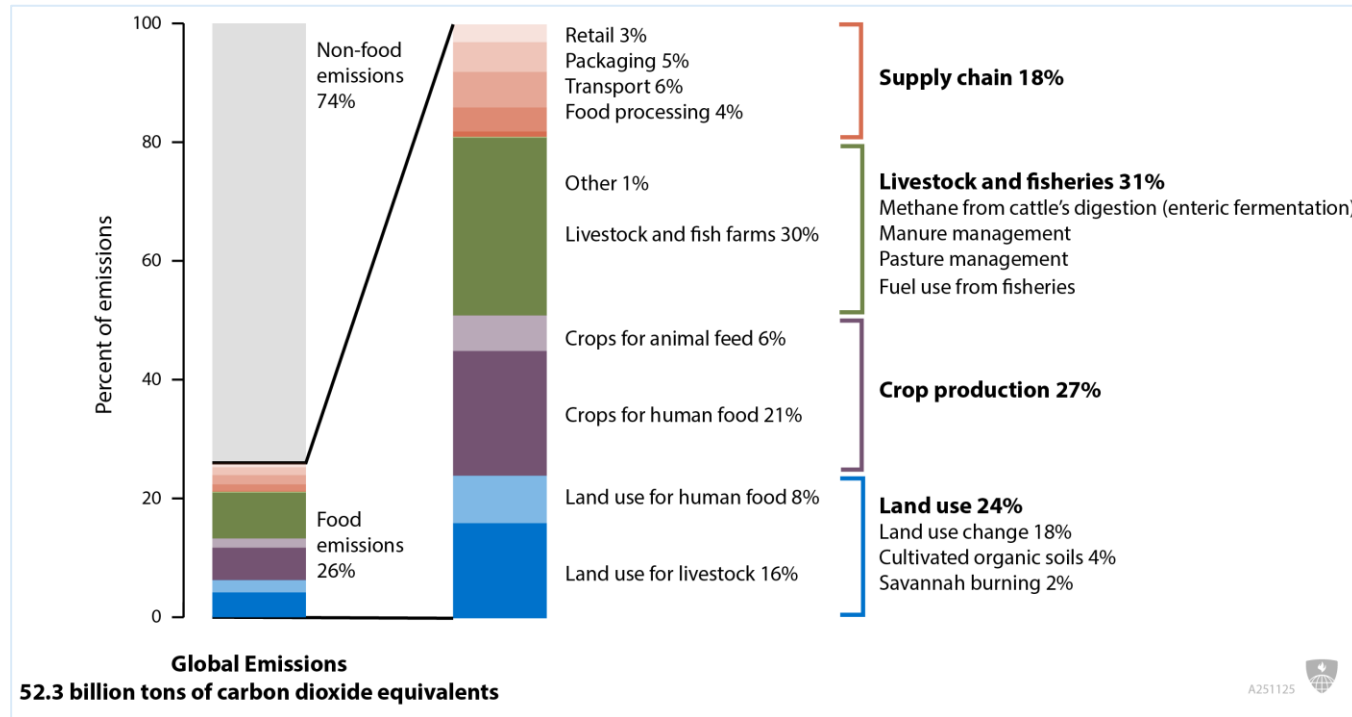


Image source: Adapted by the Johns Hopkins Bloomberg School of Public Health from Ritchie, H. (2019). Food production is responsible for one-quarter of the world's greenhouse gas emissions. *Our World in Data*. <https://ourworldindata.org/food-ghg-emissions> and based on data from Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science*, 360(6392), 987–992. <https://doi.org/10.1126/science.aag0216>

Global Food System Emissions

What aspects of global livestock production contribute the most to GHG emissions?



Enteric Fermentation

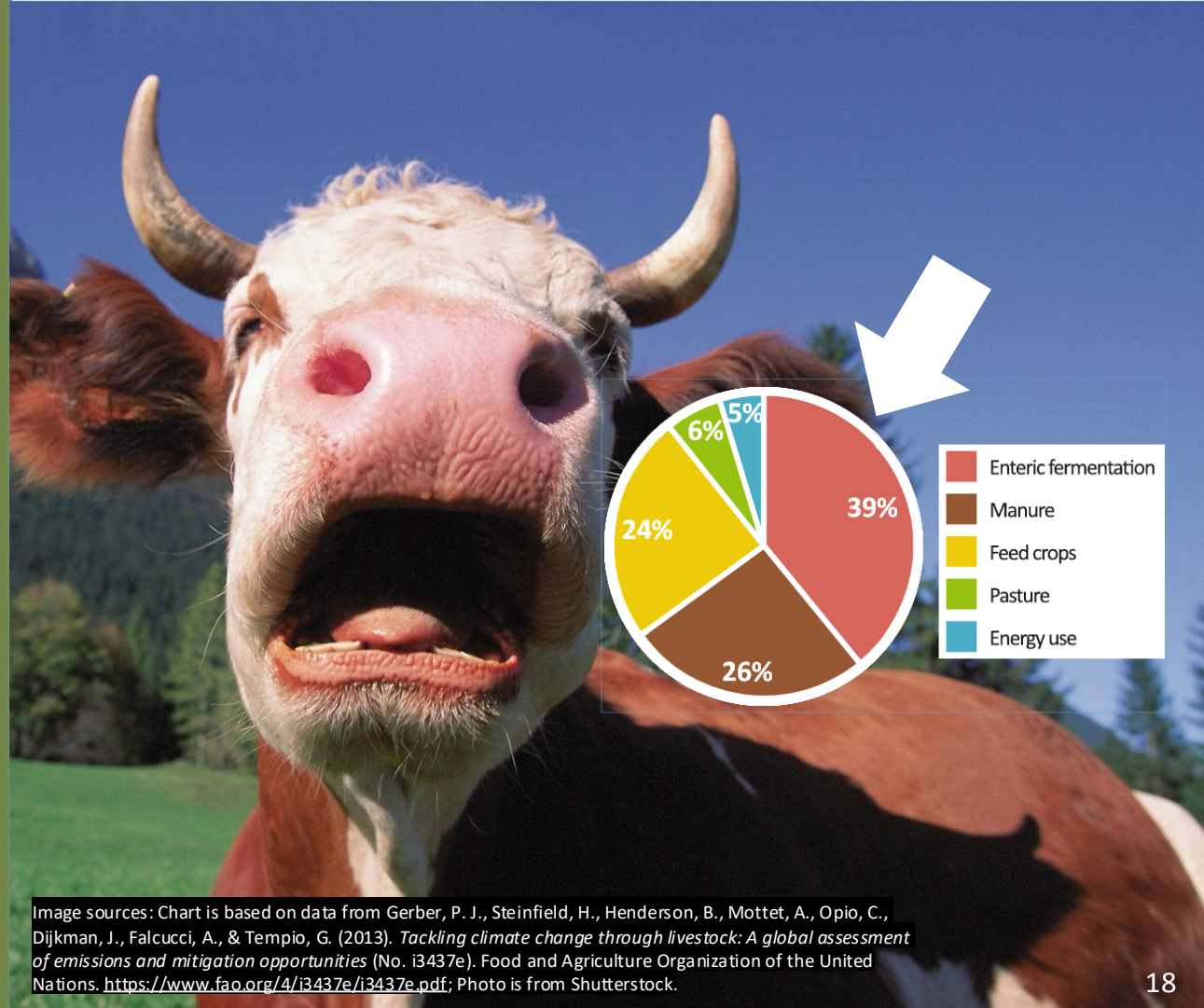


Image sources: Chart is based on data from Gerber, P. J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A., & Tempio, G. (2013). *Tackling climate change through livestock: A global assessment of emissions and mitigation opportunities* (No. i3437e). Food and Agriculture Organization of the United Nations. <https://www.fao.org/4/i3437e/i3437e.pdf>; Photo is from Shutterstock.

Manure

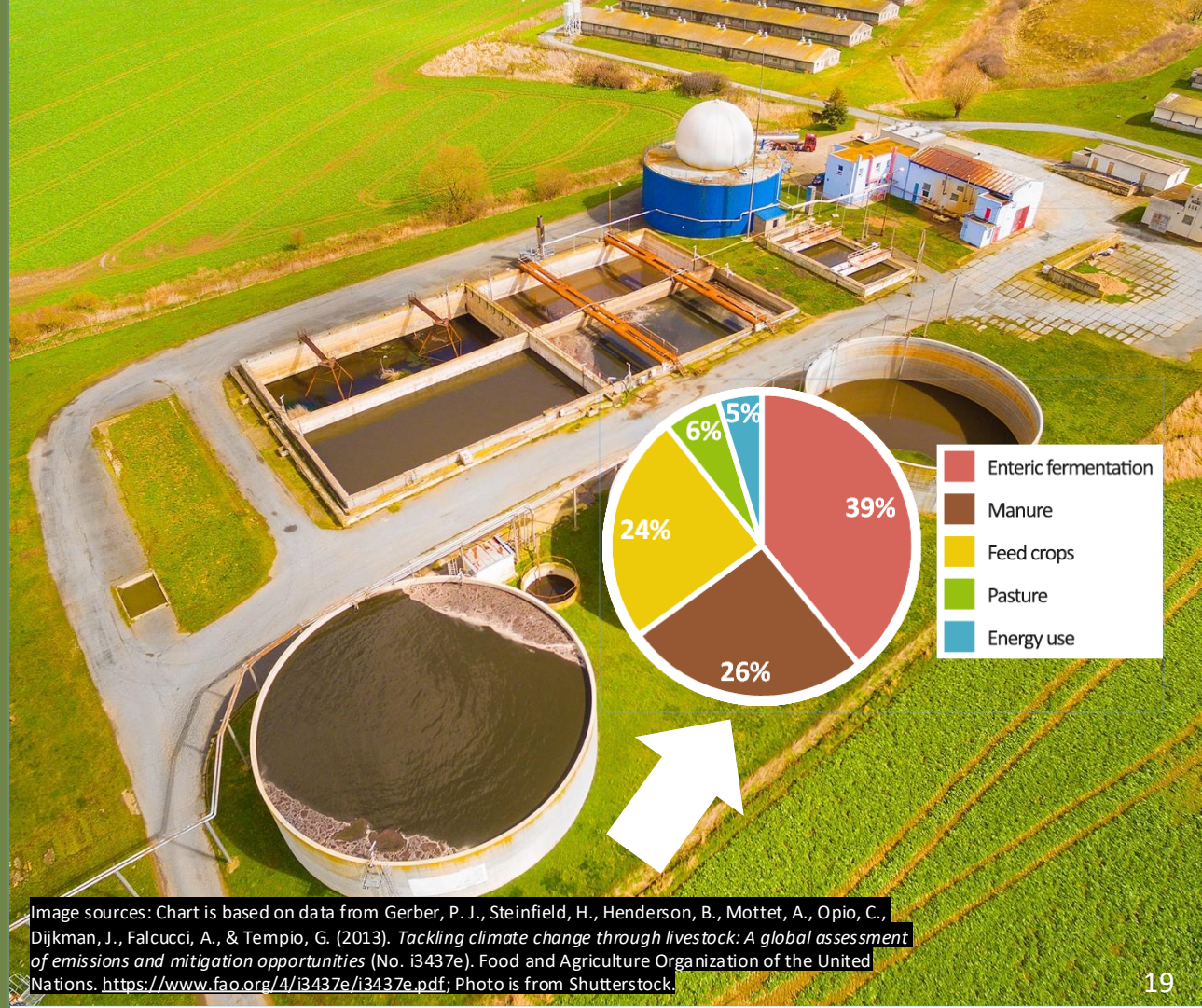


Image sources: Chart is based on data from Gerber, P. J., Steinfield, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A., & Tempio, G. (2013). *Tackling climate change through livestock: A global assessment of emissions and mitigation opportunities* (No. i3437e). Food and Agriculture Organization of the United Nations. <https://www.fao.org/4/i3437e/i3437e.pdf>; Photo is from Shutterstock.

Feed Crop Production

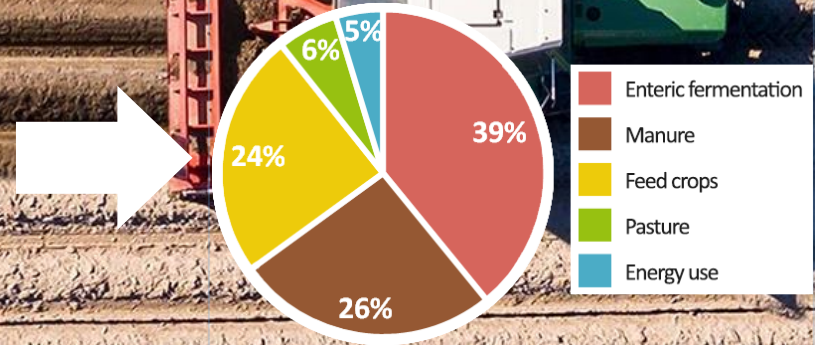


Image sources: Chart is based on data from Gerber, P. J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A., & Tempio, G. (2013). *Tackling climate change through livestock: A global assessment of emissions and mitigation opportunities* (No. i3437e). Food and Agriculture Organization of the United Nations. <https://www.fao.org/4/i3437e/i3437e.pdf>; Photo is from Microsoft Stock Images.

Land Use Change (Deforestation)

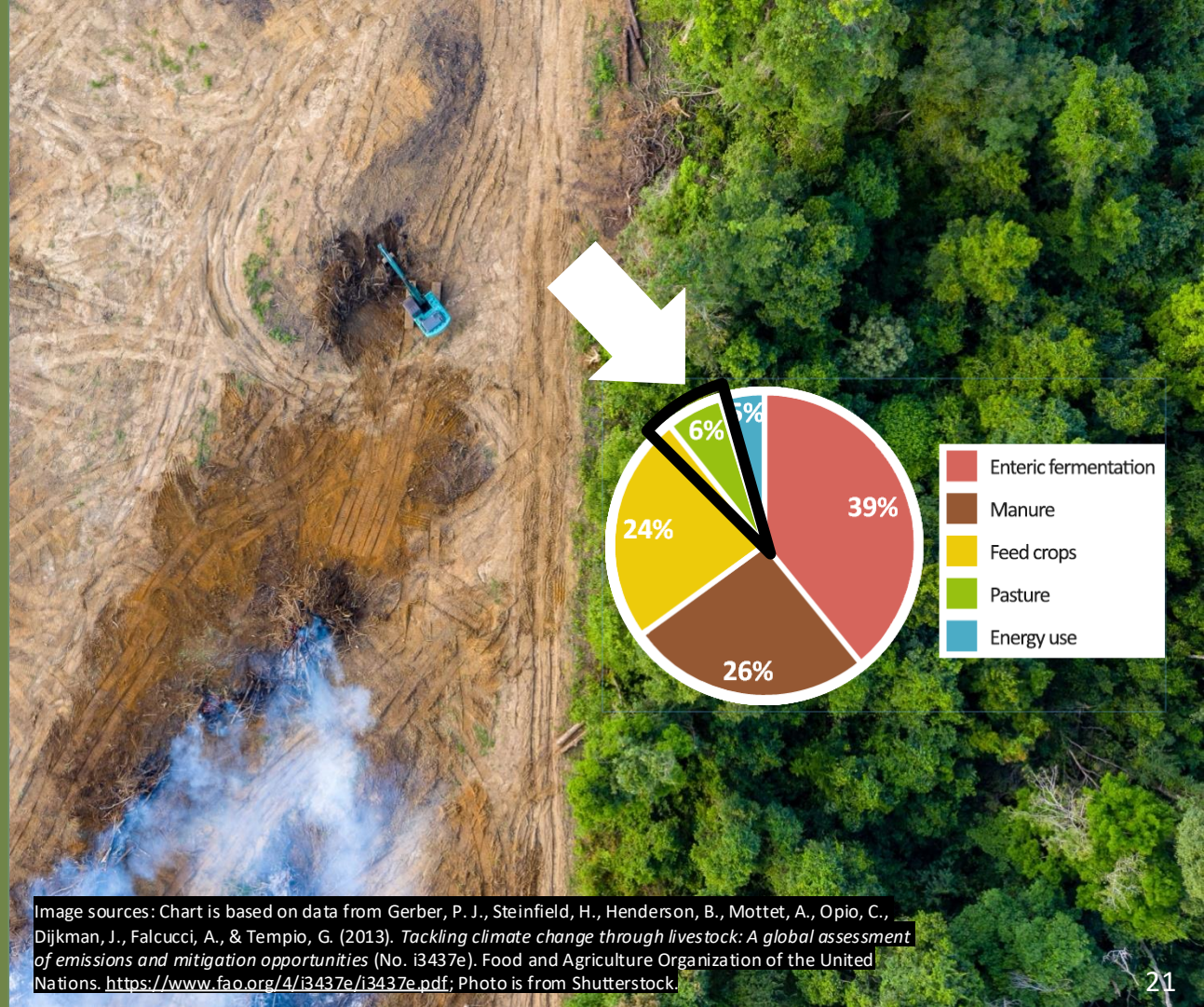


Image sources: Chart is based on data from Gerber, P. J., Steinfield, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A., & Tempio, G. (2013). *Tackling climate change through livestock: A global assessment of emissions and mitigation opportunities* (No. i3437e). Food and Agriculture Organization of the United Nations. <https://www.fao.org/4/i3437e/i3437e.pdf>; Photo is from Shutterstock.

GHG Footprints of Food—1

Per serving GHG footprints

- > 3,800 unique observations
- > 150 countries

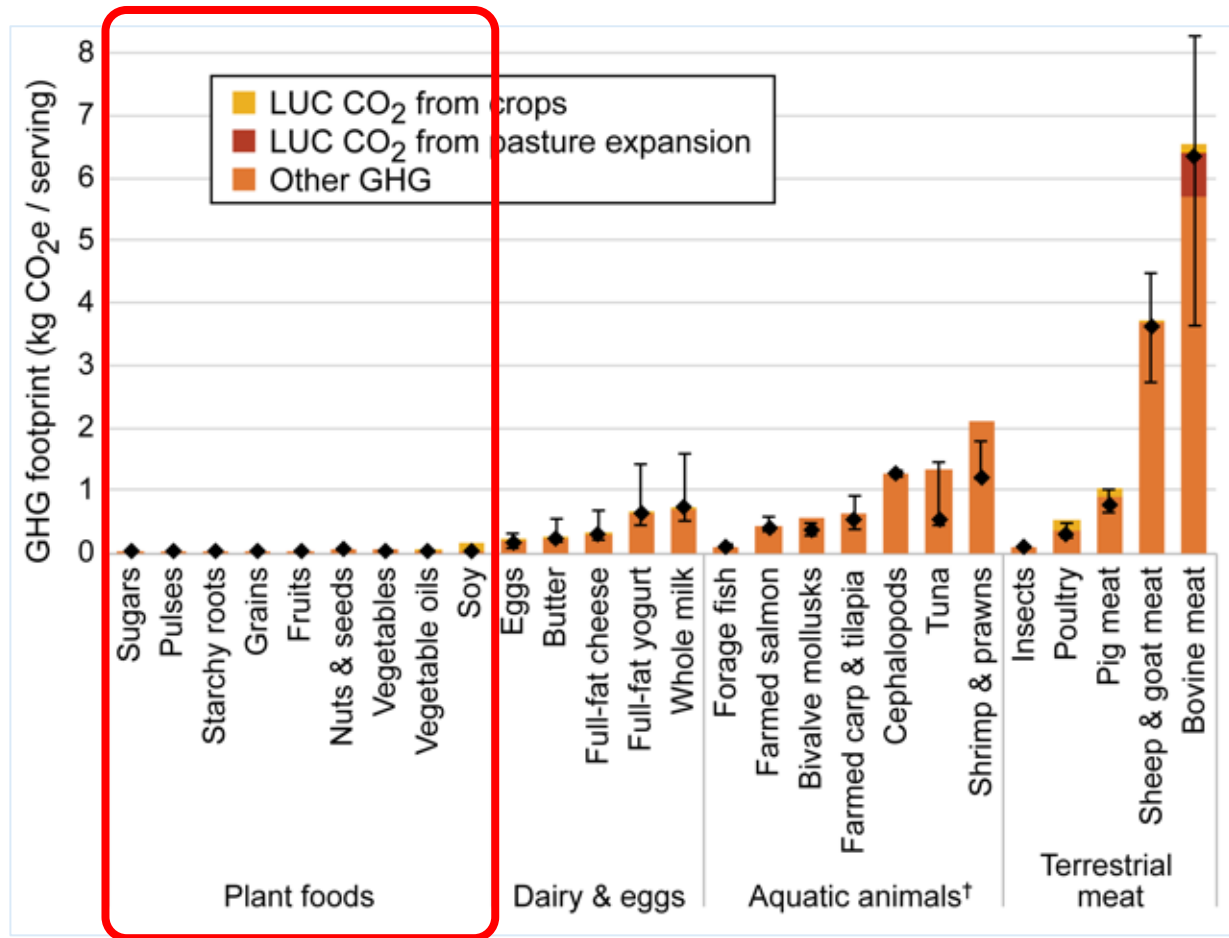


Image source: Kim, B. F., Santo, R. E., Scatterday, A. P., Fry, J. P., Synk, C. M., Cebon, S. R., Mekonnen, M. M., Hoekstra, A. Y., de Pee, S., Bloem, M. W., Neff, R. A., & Nachman, K. E. (2020). Figure 2. *Average per serving GHG* [Chart]. Country-specific dietary shifts to mitigate climate and water crises. *Global Environmental Change*, 62. <https://doi.org/10.1016/j.gloenvcha.2019.05.010>

GHG Footprints of Food—2

Per serving GHG footprints

- > 3,800 unique observations
- > 150 countries

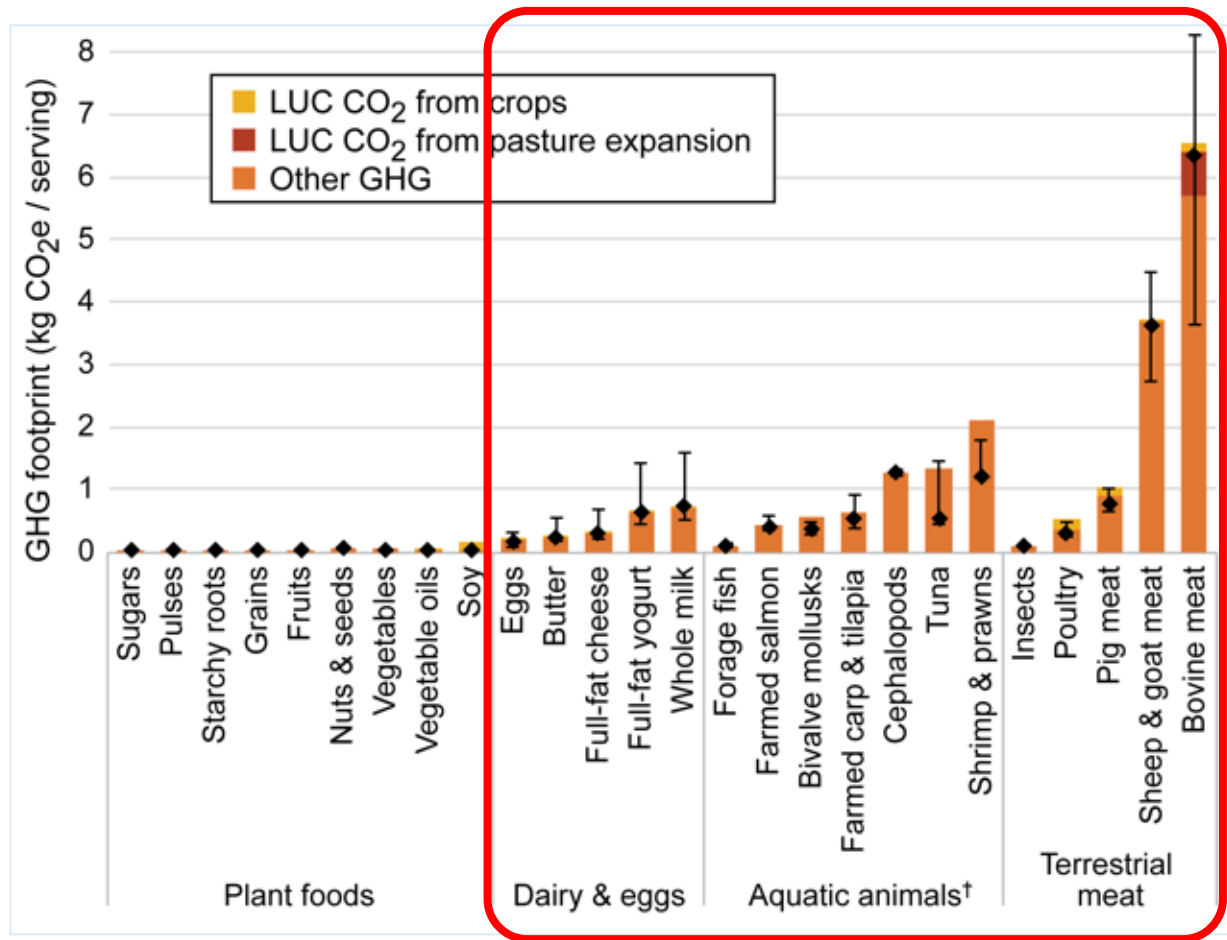


Image source: Kim, B. F., Santo, R. E., Scatterday, A. P., Fry, J. P., Synk, C. M., Cebon, S. R., Mekonnen, M. M., Hoekstra, A. Y., de Pee, S., Bloem, M. W., Neff, R. A., & Nachman, K. E. (2020). Figure 2. *Average per serving GHG* [Chart]. Country-specific dietary shifts to mitigate climate and water crises. *Global Environmental Change*, 62. <https://doi.org/10.1016/j.gloenvcha.2019.05.010>

Global Temperature Rise From Food Demand Driven by Meat and Dairy

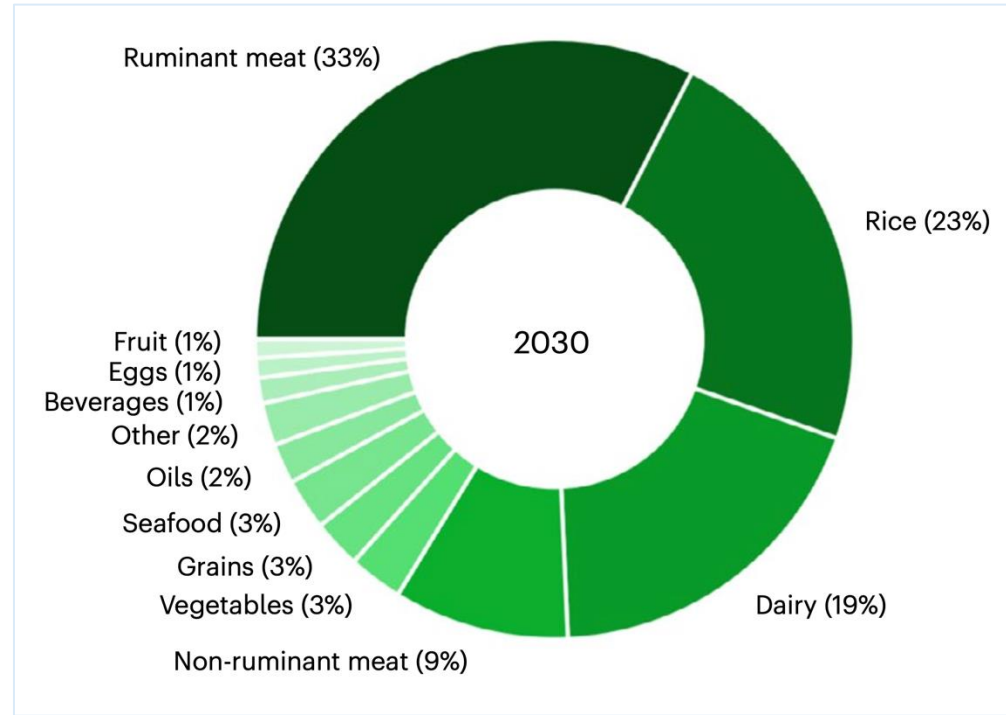
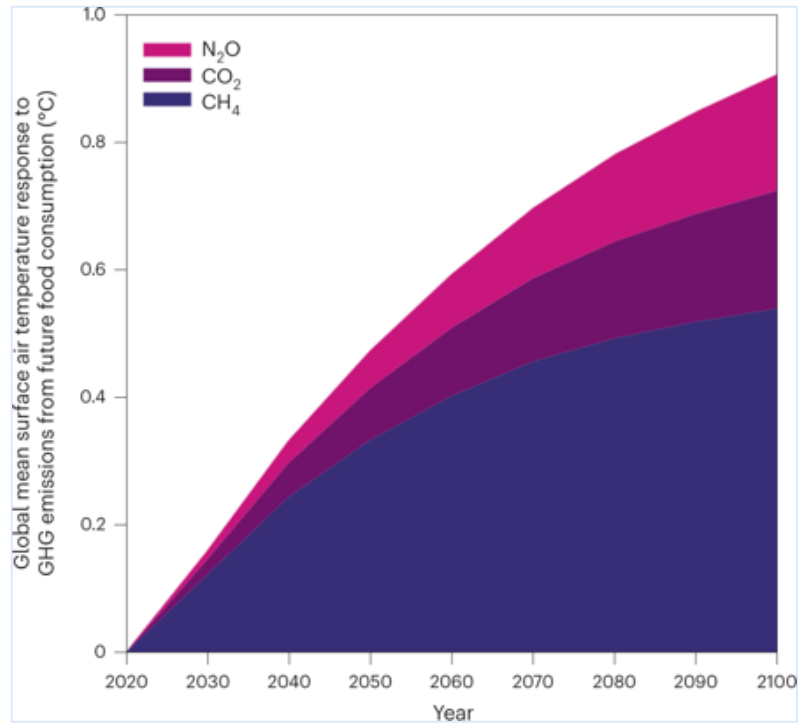


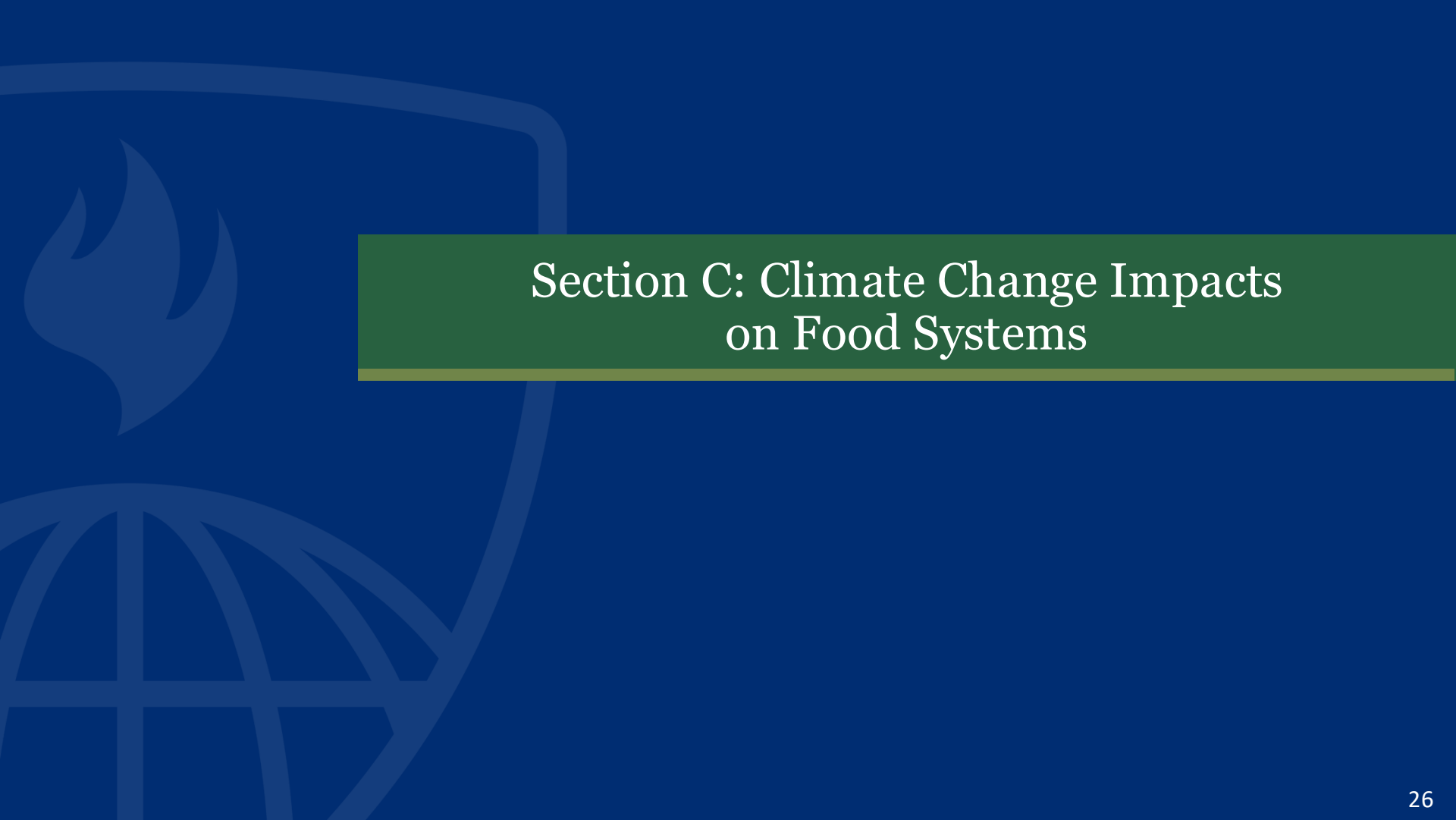
Image sources: Ivanovich, C., Sun, T., Gordon, D., & Ocko, I. (2023). Figure 2. *Global mean surface air temperature responses attributed to individual GHG emissions (methane, carbon dioxide and nitrous oxide) from future food consumption under a high-population projection* [Chart] and Figure 3. *Relative contribution of food groups to global mean surface air* [Chart]. Future warming from global food consumption. *Nature Climate Change*, 13, 297–302. <https://doi.org/10.1038/s41558-023-01605-8>

Carbon Sequestration

- ▶ Can reduce net CO_2 but is it enough to offset CH_4 and/or N_2O ?
- ▶ Diminishing returns
- ▶ Under specific conditions
- ▶ Also land-use constraints



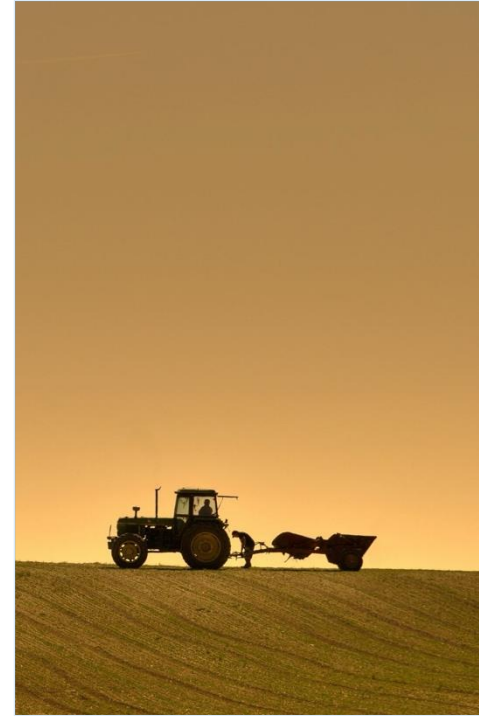
Image source: Microsoft Stock Images.



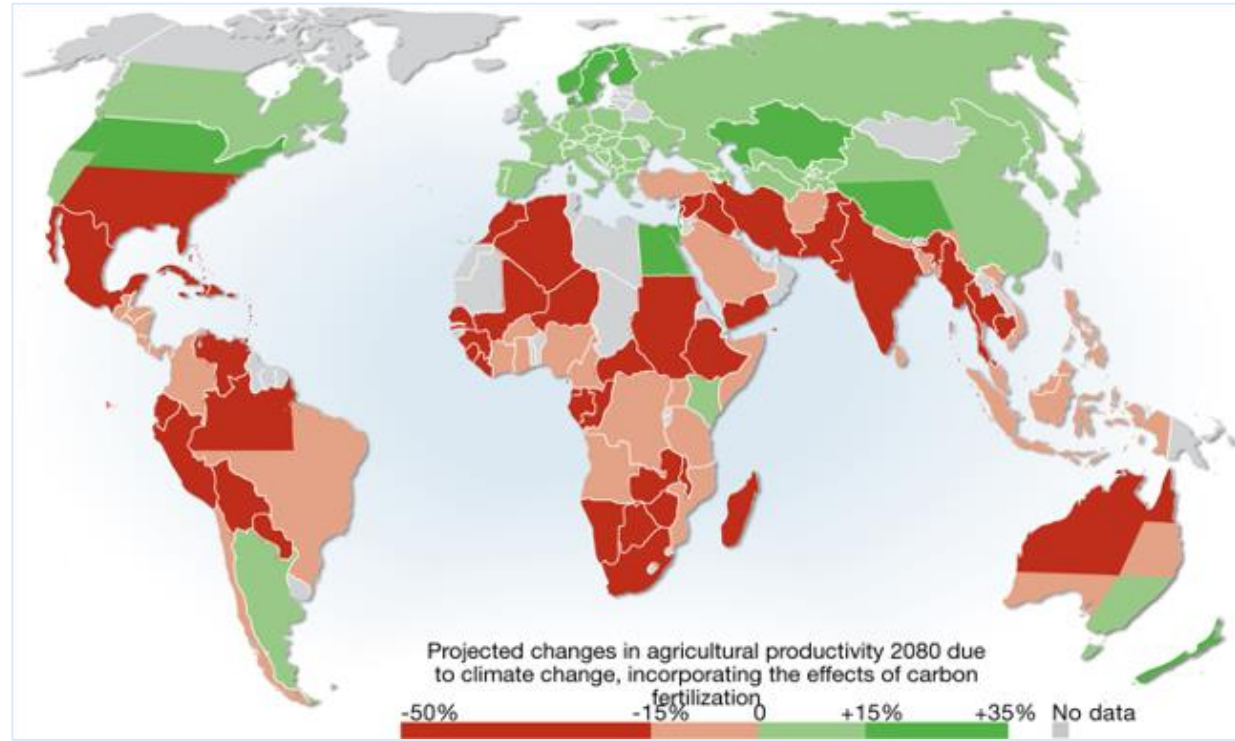
Section C: Climate Change Impacts on Food Systems

Effects of Climate Change on Food Systems

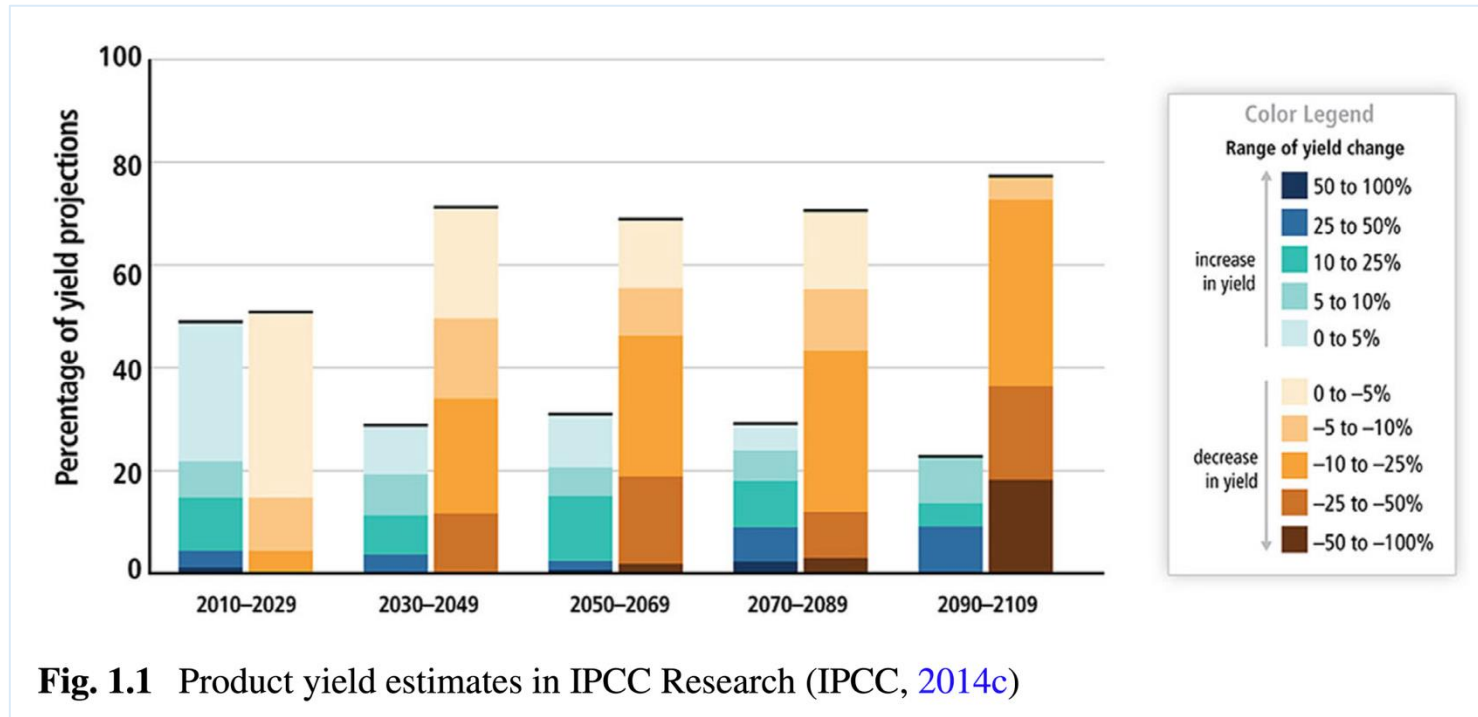
- ▶ Reduced yields and economic losses
- ▶ Extreme events such as droughts, floods, and heat waves
- ▶ Shifts in climate mean shifts in:
 - ▶ Biological cycles and growing seasons
 - ▶ Habitats for pests and pollinators
- ▶ Changes in nutritional content of crops
 - ▶ Atmospheric conditions (higher CO₂ impacts nutrients and growth)
- ▶ Risks to food safety and food security (prices, access, availability, etc.)
- ▶ Occupational exposures and health



Climate Change and Agricultural Productivity



Projected Changes to Crop Yields Due to Climate Change



Higher CO₂ Alters Nutrient Levels in Crops

Carbohydrates

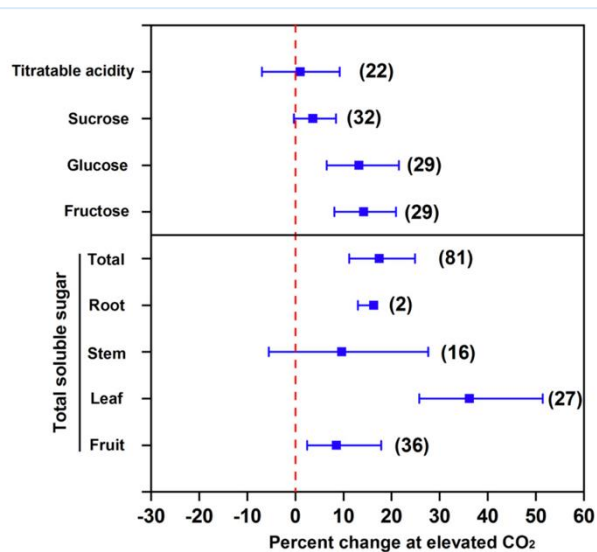


FIGURE 1 | Effect of elevated CO₂ on the concentrations of soluble sugar and acidity in vegetables. Data are means of percent change with 95% confidence intervals (indicated with error bars) under elevated CO₂ compared to ambient CO₂. The number of observations is in parentheses.

Micronutrients

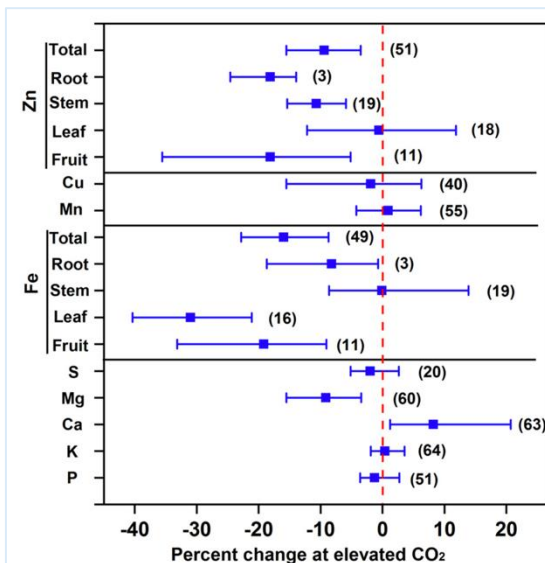


FIGURE 4 | Effect of elevated CO₂ on the concentrations of minerals in vegetables. Data are means of percent change with 95% confidence intervals (indicated with error bars) under elevated CO₂ compared to ambient CO₂. The number of observations is in parentheses.

Image source: Dong, J., Gruda, N., Lam, S. K., Li, X., & Duan, Z. (2018). Figure 1. *Effect of elevated CO₂ on the concentrations of soluble sugar and acidity in vegetables* [Chart] and Figure 4. *Effect of elevated CO₂ on the concentrations of minerals in vegetables* [Chart]. Effects of elevated CO₂ on nutritional quality of vegetables: A review. *Frontiers in Plant Science*, 9. <https://doi.org/10.3389/fpls.2018.00924>

Pests and Pollinators

- ▶ Pollinator-dependent crops contribute one-third of global crop production
- ▶ 1,500 crops require pollination



Changes to Oceans and Aquatic Ecosystems

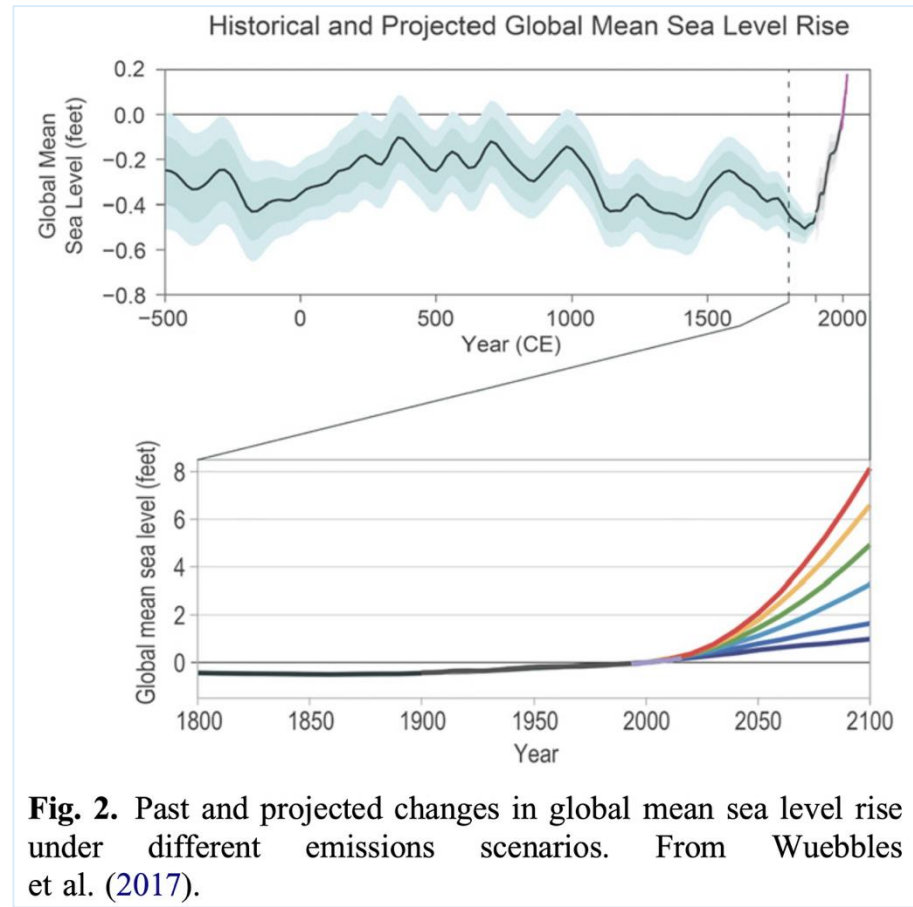


Image source: Culligan, P. J. (2019). Figure 2. *Past and projected changes in global mean sea level rise under different emissions scenarios* [Chart] from [Wuebbles et al. \(2017\)](#). Green infrastructure and urban sustainability: A discussion of recent advances and future challenges based on multiyear observations in New York City. *Science and Technology for the Built Environment*, 25(9), 1113–1120. <https://doi.org/10.1080/23744731.2019.1629243>

Air Pollution & Increasing Allergens

Asthma, allergies, cardiovascular and respiratory diseases

Extreme Heat

Heat-related illness and death, cardiovascular failure

Drought

Water supply impacts, dust storms, Valley Fever

Environmental Degradation

Forced migration, civil conflict, loss of jobs and income

Wildfires & Smoke

Injuries, fatalities, loss of homes, cardiovascular and respiratory diseases

Degraded Living Conditions & Social Inequities

Exacerbation of racial and health inequities and vulnerabilities, loss of employment

Changes In Vector Ecology

Lyme disease, West Nile Virus, hantavirus, malaria, encephalitis

Food System Impacts

Malnutrition, food insecurity, higher food prices, foodborne illness

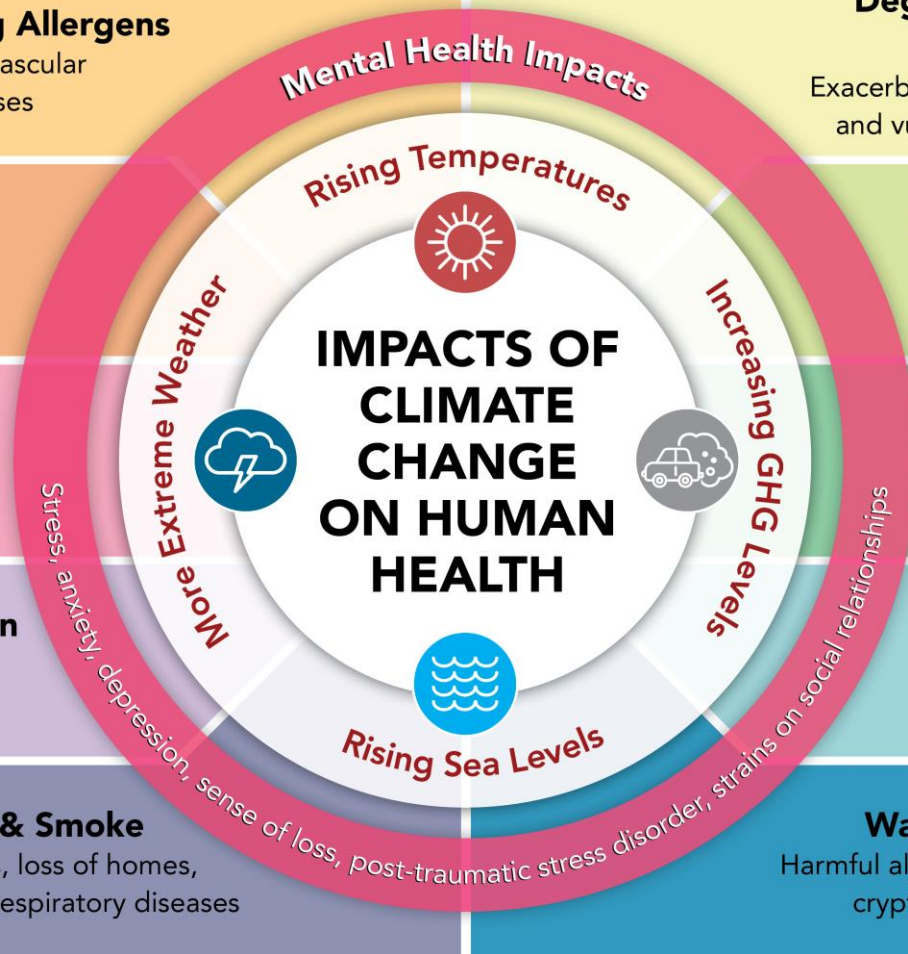
Severe Weather & Floods

Injuries, fatalities, loss of homes, indoor fungi and mold

Water Quality Impacts

Harmful algal blooms, campylobacteriosis, cryptosporidiosis, leptospirosis

(Adapted from CDC; J. Patz)



Climate Impacts and Health Outcomes

Top three:

1. *Infectious diseases*
2. *Overall mortality*
3. *Respiratory, cardiovascular, or neurological outcomes*

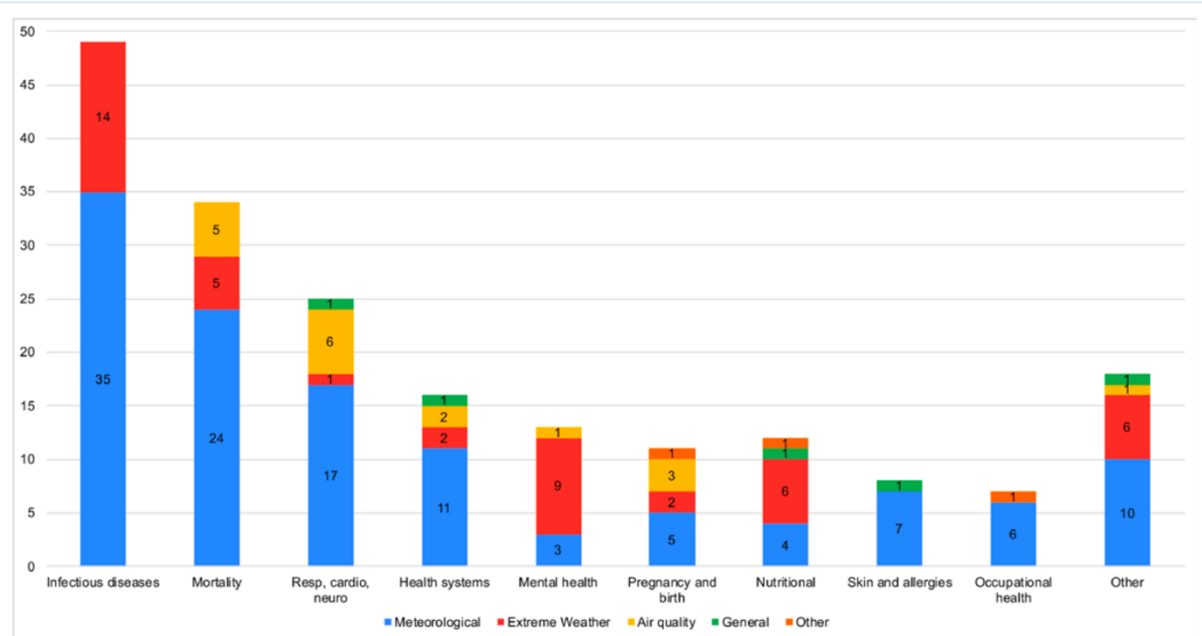


Figure 4 Summary of the combination of climate impact and health outcome (frequencies).

Image source: Rocque, R. J., Beaudoin, C., Ndjaboue, R., Cameron, L., Poirier-Bergeron, L., Poulin-Rheault, R.-A., Fallon, C., Tricco, A. C., & Wittman, H. O. (2021). Figure 4. *Summary of the combination of climate impact and health outcome (frequencies)* [Chart]. Health effects of climate change: An overview of systematic reviews. *BMJ Open*, 11(6). <https://doi.org/10.1136/bmjopen-2020-046333>

Climate Impacts and People



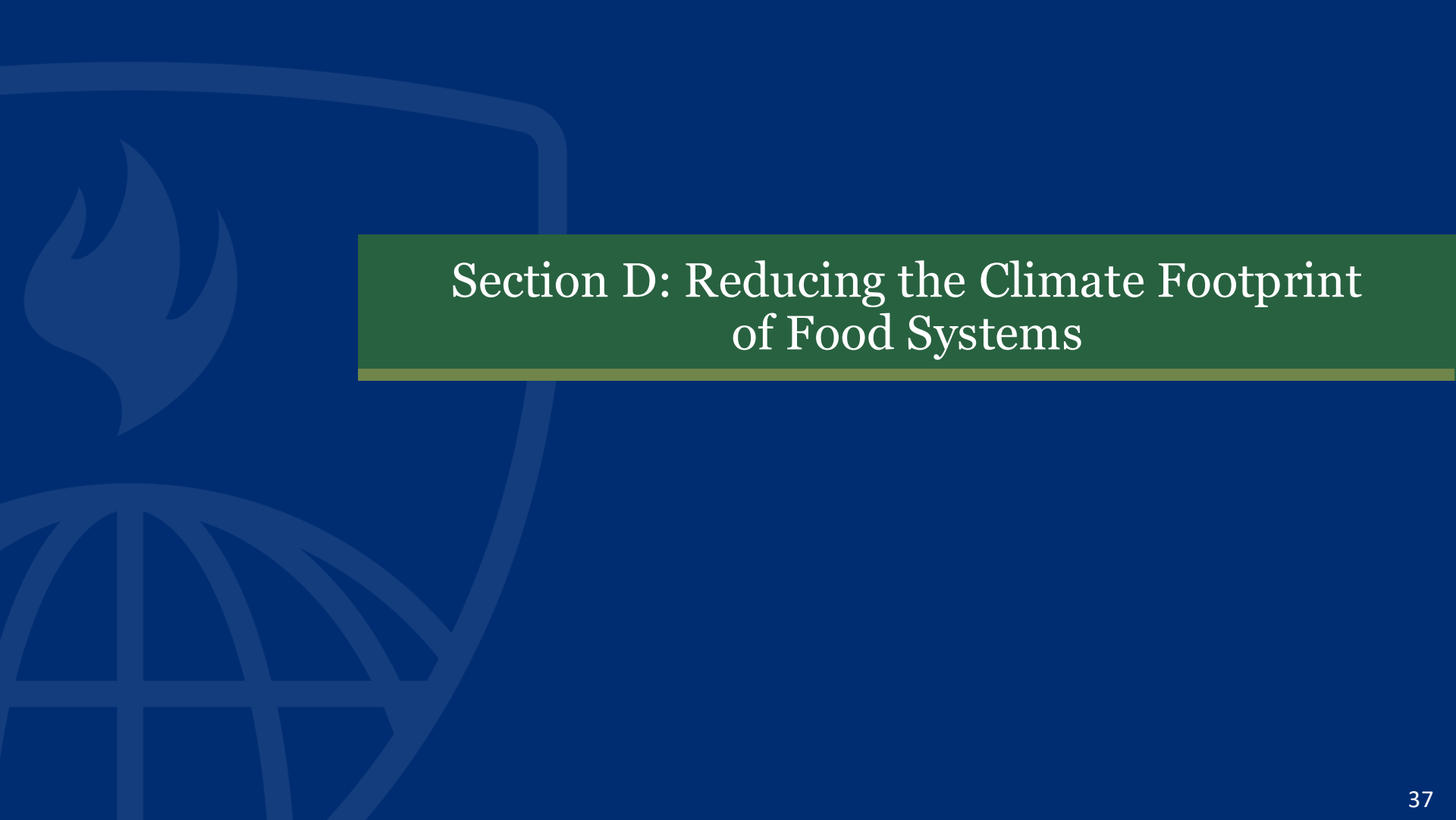
- ▶ 40% of world labor force in food system
- ▶ Agriculture accounts for 4% world gross domestic product (GDP)
- ▶ Greater exposure to occupational hazards

Sources: FAO. (2024). *Employment indicators 2000–2022 (October 2024 update)* (No. FAOSTAT Analytical Brief 92). Food and Agriculture Organization of the United Nation. [https://www.fao.org/statistics/highlights-archive/highlights-detail/employment-indicators-2000-2022-\(september-2024-update\)/en](https://www.fao.org/statistics/highlights-archive/highlights-detail/employment-indicators-2000-2022-(september-2024-update)/en); World Bank. (2024). *Agriculture, forestry, and fishing, value added (% of GDP)*. <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS> Photo is from Microsoft Stock Images.

Discussion 1: Climate Change and Nutrition



- ▶ How do you think the changing nutrient content of crops will impact the clients you will work with? Will it differ by diet type? What about by location and/or community?
- ▶ Should these changes influence nutrient databases and nutrition labeling?
- ▶ How can nutritional professionals guide consumers toward nutrient-dense food choices given the inconsistencies in nutrient quality of foods?
- ▶ What are some additional ways that nutrition professionals can support consumers in this topic?



Section D: Reducing the Climate Footprint of Food Systems

Food, Agriculture, and Land Use

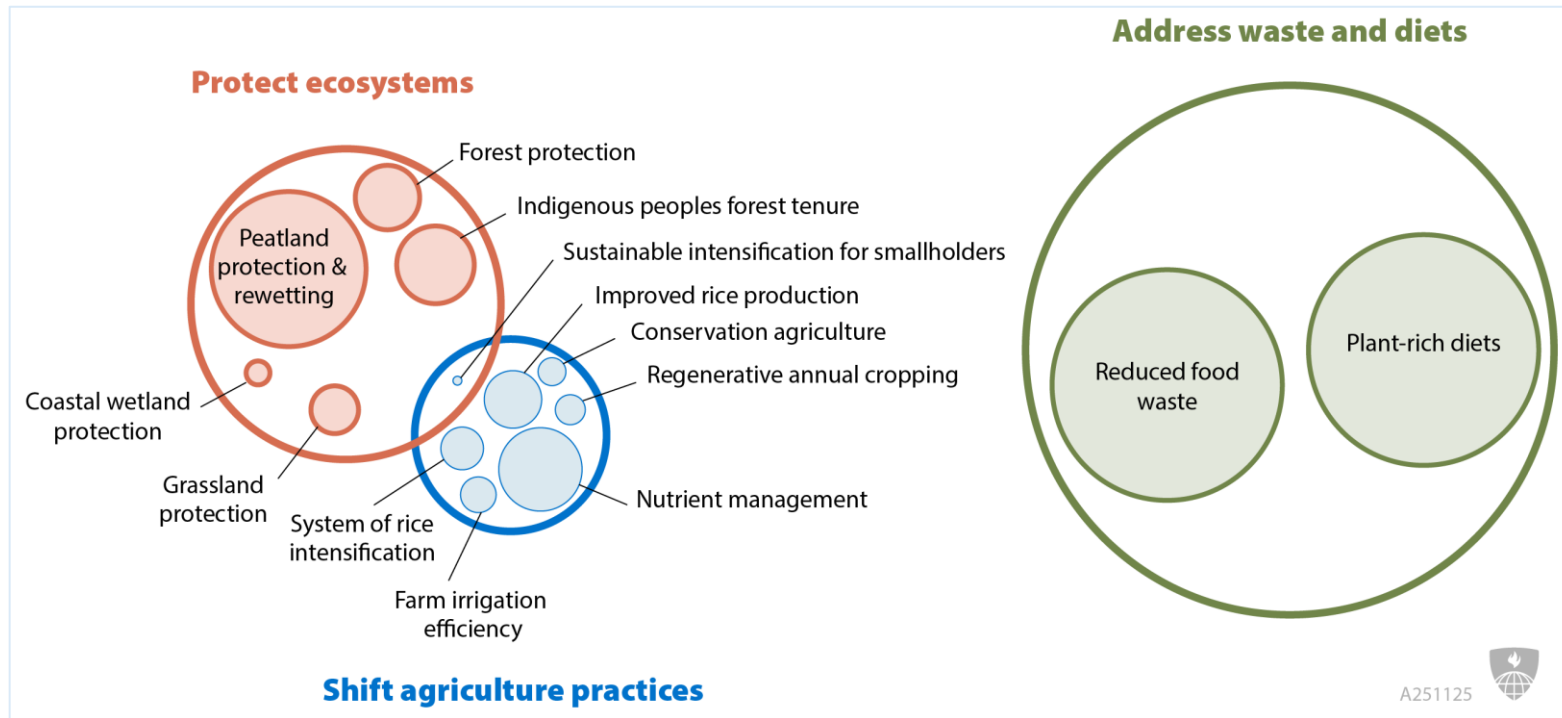


Image source: Adapted by the Johns Hopkins Bloomberg School of Public Health from Mehra, M. (2021). *Resilient & sustainable land management practices*. Project Drawdown. [Presentation Slides].
https://unfccc.int/sites/default/files/resource/2%20PD_NBS_Mamta%20Mehra_Oct2021.pdf#:~:text=How%20can%20we%20reduce%20the%20pressures%20on,worldwide%20along%20with%20addressing%20the%20issue%20of

Solutions: Reducing the Food System Contribution to Climate Change Through Less Meat and Less Waste

“A diet that includes more plant-based foods and fewer animal source foods is healthy, sustainable, and good for both people and planet. It is not a question of all or nothing, but rather small changes for a large and positive impact.”

—EAT-*Lancet* Planetary Health



Strategies for a Healthy Climate

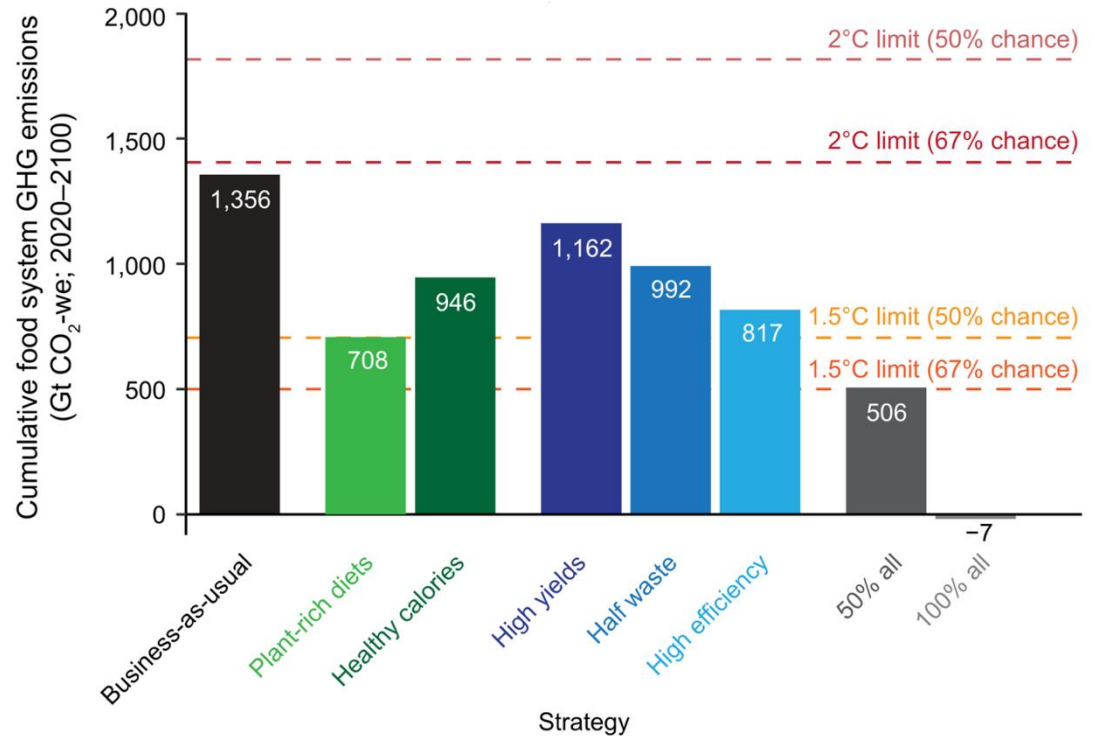


Fig. 1. Projected cumulative 2020 to 2100 GHG emissions solely from the global food system for business-as-usual emissions and for various food system changes that lead to emission reductions.

Image source: Clark, M. A., Domingo, N. G. G., Colgan, K., Thakrar, S. K., Tilman, D., Lynch, J., Azevedo, I. L., & Hill, J. D. (2020). Figure 1. *Projected cumulative 2020 to 2100 GHG emissions solely from the global food system for business-as-usual emissions and for various food system changes that lead to emission reductions* [Chart]. Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. *Science*, 370(6517), 705–708. <https://doi.org/10.1126/science.aba7357>

Equity: Per Capita Meat Supply, by Country

Meat supply per person, 2022

Average total meat supply per person measured in kilograms per year.

Our World
in Data

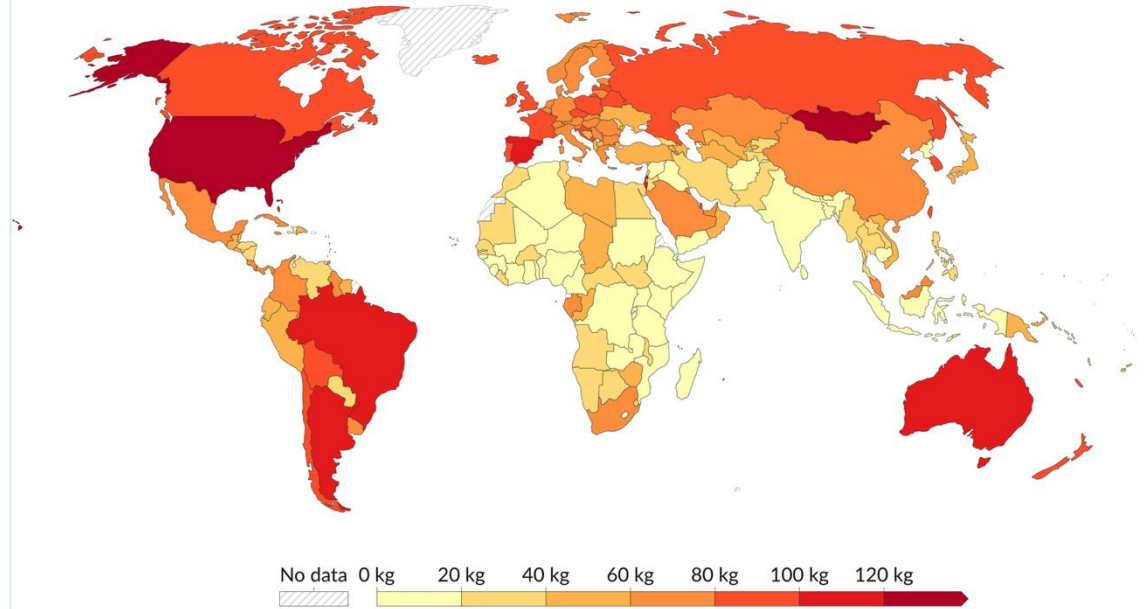


Image source: Our World in Data. (2025). *Yearly per capita supply of all meat: Meat supply per person*.
Our World in Data. <https://ourworldindata.org/grapher/meat-supply-per-person?time=2022>

What Can High-Income Countries Do to Make Diets More Sustainable and Aligned With the Planetary Health Diet?—1

1

Eat less meat
and dairy
(for most)

2

Consume more
whole grains,
vegetables, legumes,
and nuts

1. Eat Less Meat and Dairy (for Most)

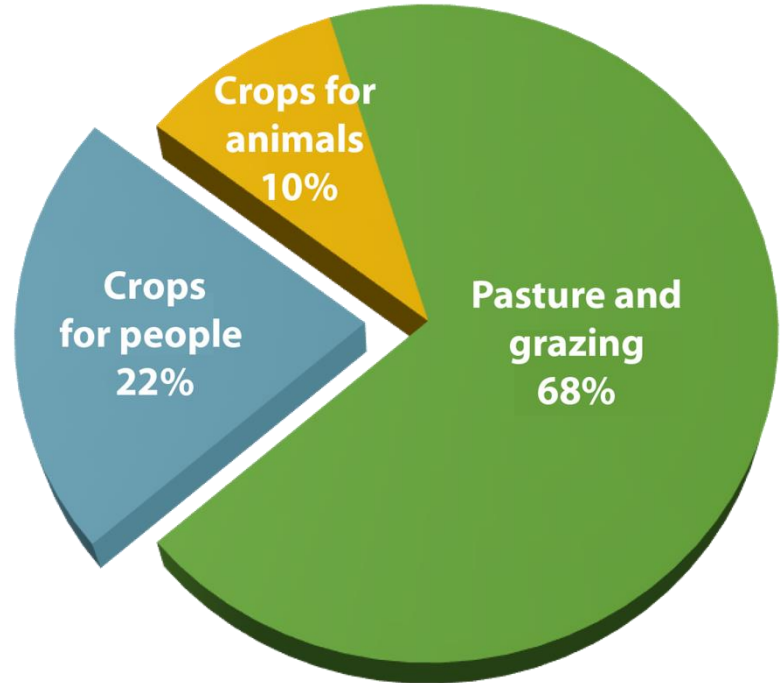
- ▶ Replace animal proteins with healthy plant proteins
 - ▶ Beans
 - ▶ Lentils
 - ▶ Nuts
- ▶ Emphasize sustainably and regeneratively produced animal foods
 - ▶ Including aquatic foods
- ▶ Moderate portions of dairy



What if We Choose Only Grass-Fed Beef?



Global Agricultural Land Use



Dairy: The Complexities



Nutrition

- ▶ Source of affordable micronutrients (calcium, magnesium, phosphorus, iodine, and zinc)
- ▶ Associated with growth and cognition for children
- ▶ Favorable evidence of protection against serious heart disease and all-cause mortality
- ▶ Plant-based milks vary by source
- ▶ Form matters

Environment

- ▶ Generally, more GHG emissions per liter and water-intensive than dairy alternatives
- ▶ Products using large quantities of milk per serving have greater environmental impacts
- ▶ Most impact from animal feed production and farm activities, including solid waste disposal

Sources: Smedman, A., Månsson, H. L., Drewnowski, A., & Edman, A.-K. M. (2010). Nutrient density of beverages in relation to climate impact. *Food & Nutrition Research*, 54(5170). <https://doi.org/10.3402/fnr.v54i0.5170>; Drewnowski, A., Rehm, C. D., Martin, A., Verger, E. O., Voinnesson, M., & Imbert, P. (2015). Energy and nutrient density of foods in relation to their carbon footprint. *The American Journal of Clinical Nutrition*, 101(1), 184–191. <https://doi.org/10.3945/ajcn.114.092486>; Johnson, A. J., Stevenson, J., Pettit, J., Jasthi, B., Byhre, T., & Harnack, L. (2025). Assessing the nutrient content of plant-based milk alternative products available in the United States. *Journal of the Academy of Nutrition and Dietetics*, 125(4), 515–527. <https://doi.org/10.1016/j.jand.2024.06.003>

GHG Emissions Associated With Dairy and Plant-Based Milk

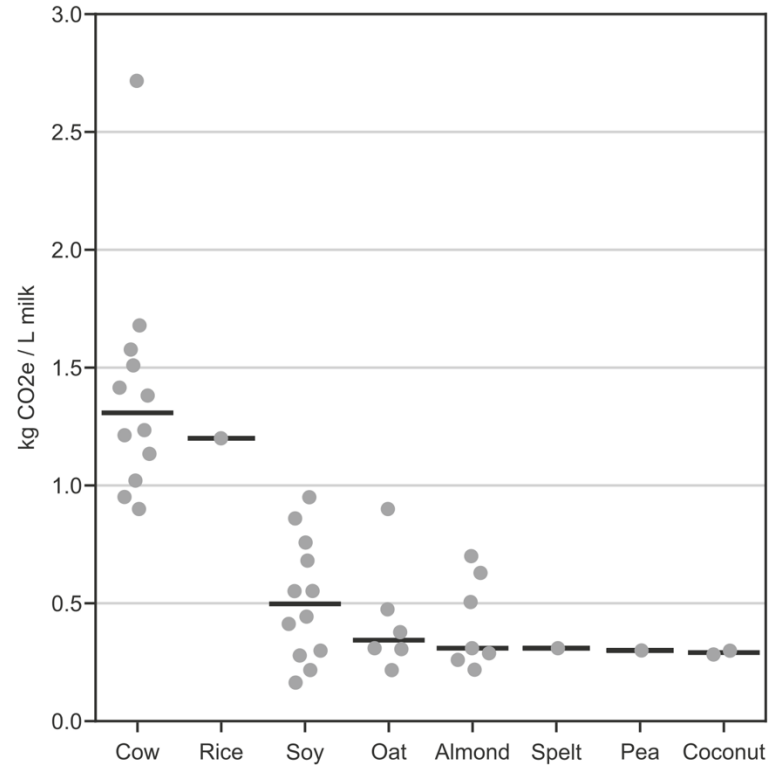
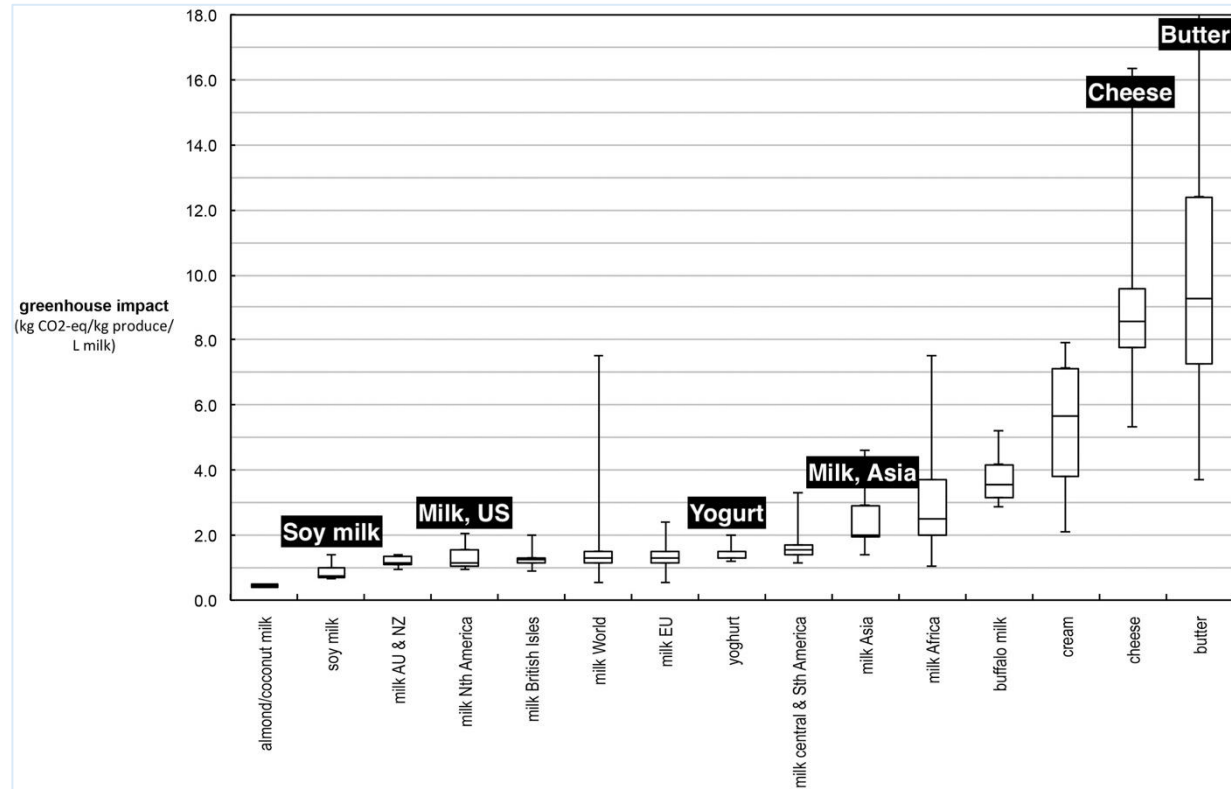


Fig. 3 Greenhouse gas emissions (kg CO₂e/L milk) associated with dairy and plant-based milks.

Image source: Ramsing, R., Santo, R., Kim, B. F., Altema-Johnson, D., Wooden, A., Chang, K. B., Semba, R. D., & Love, D. C. (2023). Figure 3. *Greenhouse gas emissions (kg CO₂e/L milk) associated with dairy and plant-based milks* [Chart]. Dairy and plant-based milks: implications for nutrition and planetary health. *Current Environmental Health Reports*, 10(3), 291–302. <https://doi.org/10.1007/s40572-023-00400-z>

Comparison of Global Warming Potential (GWP) Values for Dairy and Dairy Substitutes



Sources: Shalant, J. (2017). To shrink your carbon footprint, ease up on the dairy. National Resource Defense Council.

<https://www.nrdc.org/stories/shrink-your-carbon-footprint-ease-dairy>; NRDC. (2017). Less beef, less carbon: Americans shrink their diet-related carbon footprint by 10 percent between 2005 and 2014 (Nos. 16-11-B; Issue Paper). National Resource Defense Council. <https://www.nrdc.org/sites/default/files/less-beef-less-carbon-ip.pdf>; Graph adapted by the Johns Hopkins Center for a Livable Future from Figure 9. *Comparisons of synthesized GWP values for dairy and dairy substitutes* [Chart]. Clune, S., Crossin, E., and Verghese, K. (2017). Systematic review of greenhouse gas emissions for different fresh food categories. *Journal of Cleaner Production*, 140, 2, 766–783. <https://doi.org/10.1016/j.jclepro.2016.04.082>

What Can High-Income Countries Do to Make Diets More Sustainable and Aligned With the Planetary Health Diet?—2

1

Eat less meat
and dairy
(for most)

2

Consume more
whole grains,
vegetables, legumes,
and nuts

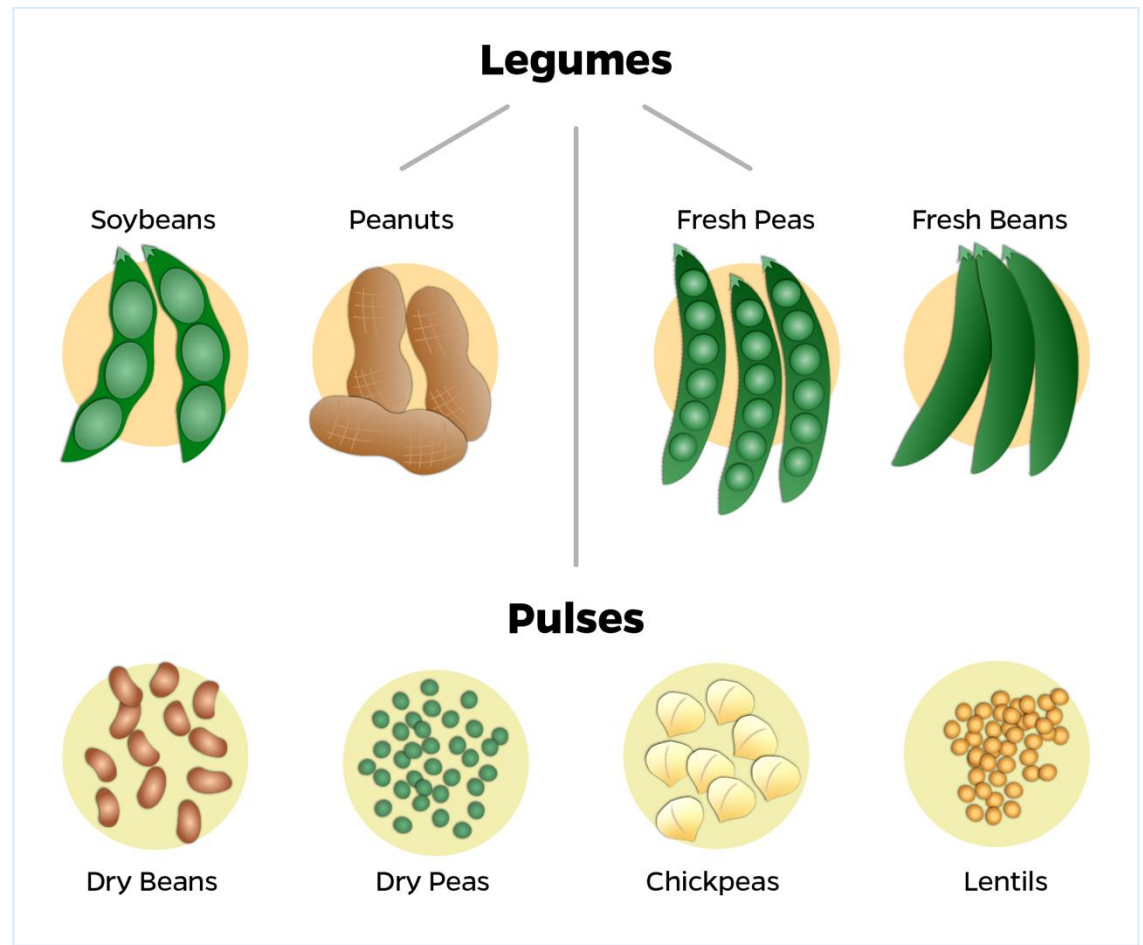
2. Consume More Whole Grains, Vegetables, Legumes, and Nuts

- ▶ Choose healthy plant proteins
- ▶ Choose a variety of whole grains and reduce reliance on refined staples
- ▶ Purchase local produce in season
- ▶ Focus on diversity and variety



Plant-Based Proteins

- *Pulses (legumes and beans)*
- *Soy products*
- *Nuts and seeds*
- *“Alt meats” (processed products)*



Nuts and Seeds

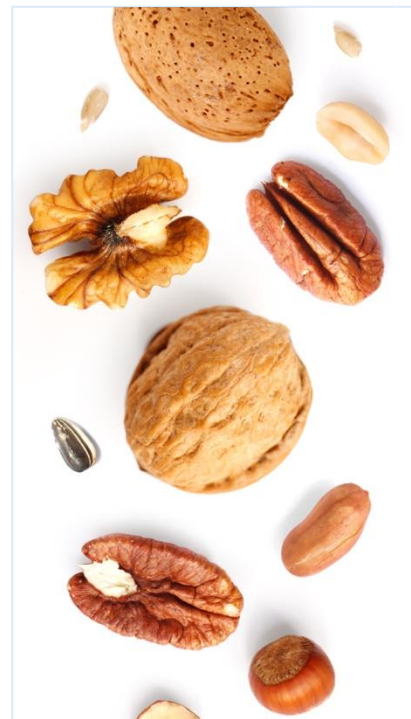


Environment

- ▶ Water needs
 - ▶ Tree versus plant
 - ▶ Water-scarce areas
- ▶ Yields
 - ▶ Trees = higher yields
- ▶ Soil health
 - ▶ Peanut = nitrogen fixing

Nutrition

- ▶ Protein and healthy fats
 - ▶ Omega-3, alpha-linolenic acid (ALA)
 - Flax, walnuts, and chia
 - ▶ Monounsaturated fatty acids (MUFAs)
 - ▶ Polyunsaturated fatty acids (PUFAs)
- ▶ Fiber
- ▶ Micronutrients
 - ▶ Vitamin E, calcium, magnesium, and other minerals

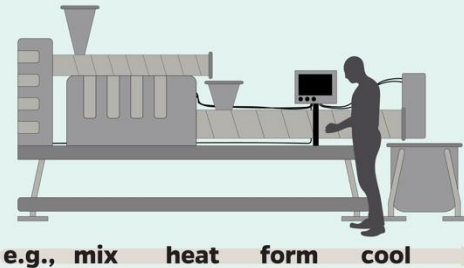


“Alt Meats” and Plant-Based Meat Substitutes

Inputs

- ▶ Protein ingredients: soy, pea protein, wheat gluten, etc.
- ▶ Fats and vegetable oils
- ▶ Structural ingredients
- ▶ Binding and coloring agents
- ▶ Seasonings

Processing



Outputs

- ▶ Coarse ground products (sausages and nuggets)
- ▶ Foods that mimic deli meat and hot dogs
- ▶ Crumbles that resemble ground meat

Comparison of Greenhouse Gas Emissions of “Alt Proteins”

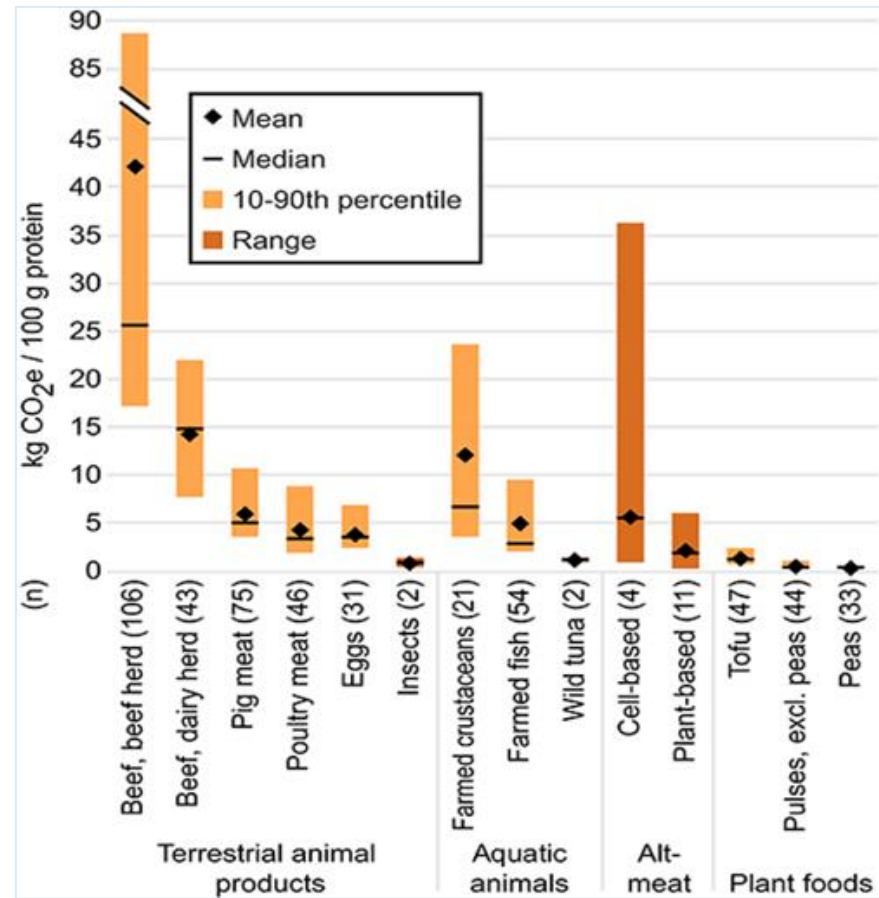


Image source: Santo, R. E., Kim, B. F., Goldman, S. E., Dutkiewicz, J., Biehl, E. M. B., Bloem, M. W., Neff, R. A., & Nachman, K. E. (2020). Figure 3. *Cradle-to-processing gate GHG footprints (wherever possible) per 100 g protein* [Chart]. Considering plant-based meat substitutes and cell-based meats: A public health and food systems perspective. *Frontiers in Sustainable Food Systems*, 4. <https://doi.org/10.3389/fsufs.2020.00134>

Discussion 2: An Optimal Diet Pattern



- ▶ Given what was covered in the last section, how would you describe an ideal diet pattern?
- ▶ How would this differ by individual, income, community, or location?
 - ▶ Urban versus rural
 - ▶ Coastal versus inland
 - ▶ Any others
- ▶ What challenges do you anticipate in providing guidance to consumers and patients?
- ▶ What might be some barriers to implementation of plant-forward menus in food service?

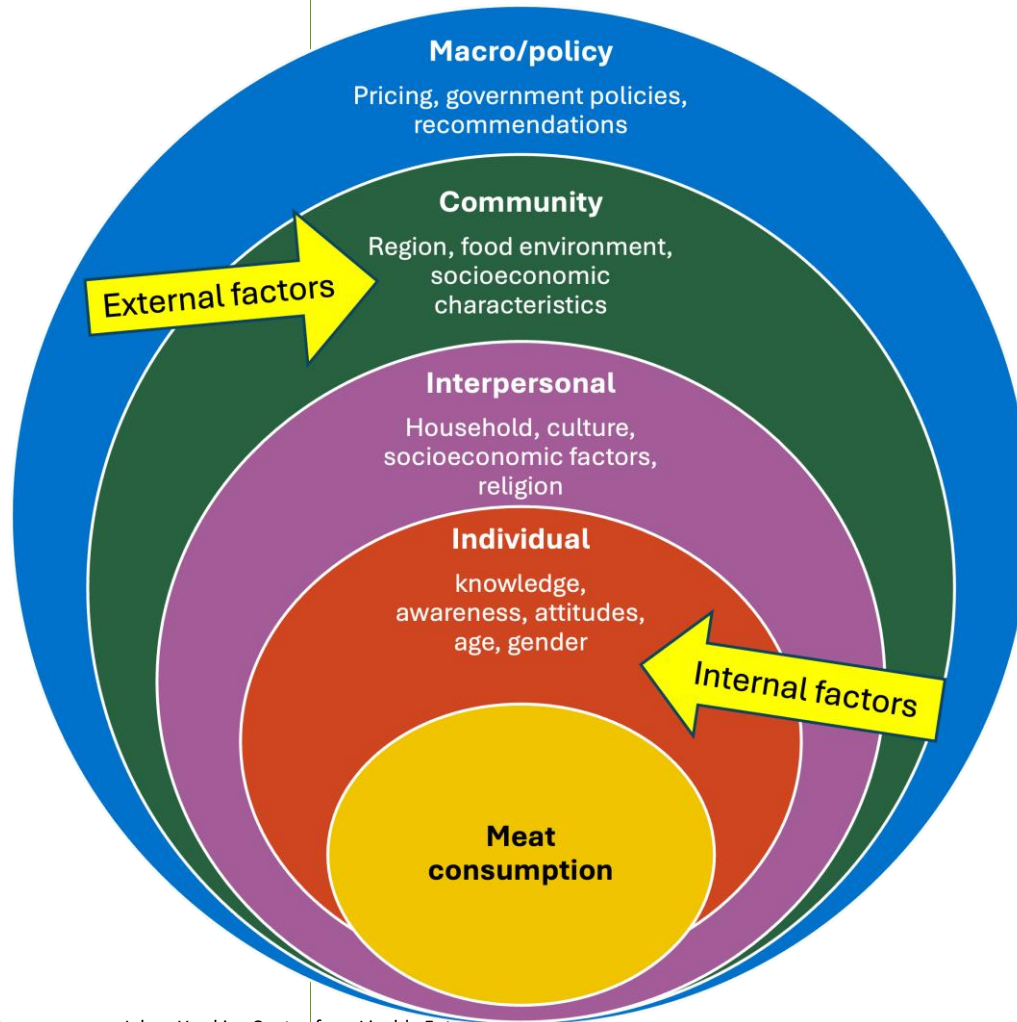


Section E: Connecting with Consumers to Shift Diets

Food Choice is Complex—Not Logical or Linear!



Drivers of Meat Consumption



Macro/policy: pricing and marketing of meat, government policies, and recommendations

Community/institution: geographic region, urban versus non-urban, food environment, school/workplace environment, socioeconomic characteristics, media, culinary trends, availability, and attractiveness of “alt proteins”

Interpersonal: household/family/friend dietary norms, culture, socioeconomic factors, relationships, and religion

Individual: knowledge, awareness, attitudes, values (moral disengagement, openness to change, altruism, etc.), age, gender, health, environment, and animal welfare concerns

Reasons People Do Reduce Meat Intake

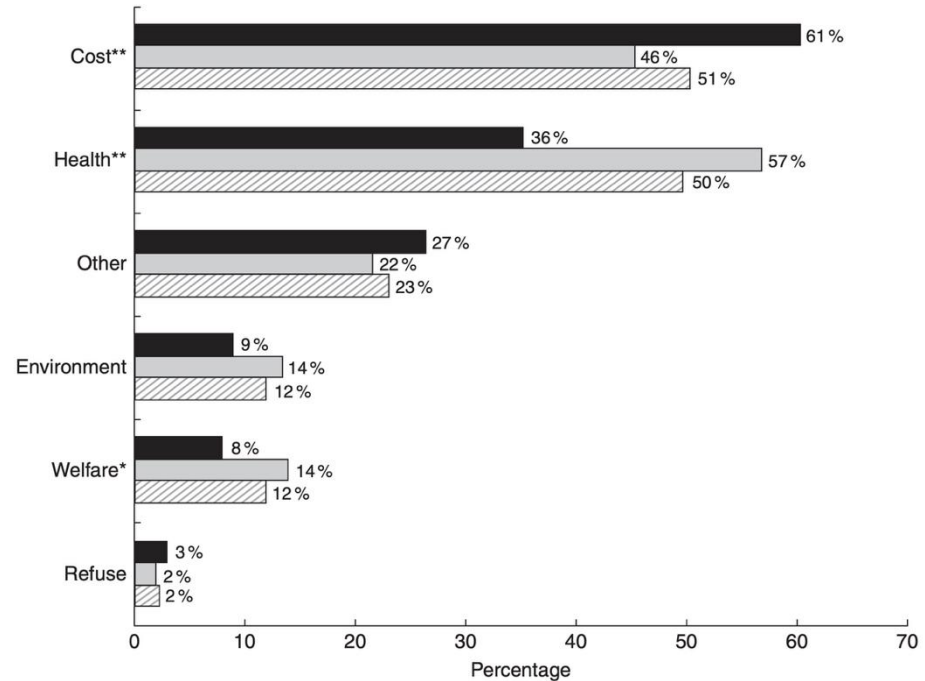


Fig. 1 Reasons for meat reduction by income (■, <\$US 40 000; □, ≥\$US 40 000; ▨, overall) in a nationally representative adult sample: USA, 2015. Figure depicts the stratified results for percentage indicating each item was a reason for meat reduction, by income. *P* values reflect χ^2 for cross-tabulation: **P* < 0.05, ***P* < 0.01, ****P* < 0.001

Reasons People *Do Not* Reduce Meat Intake

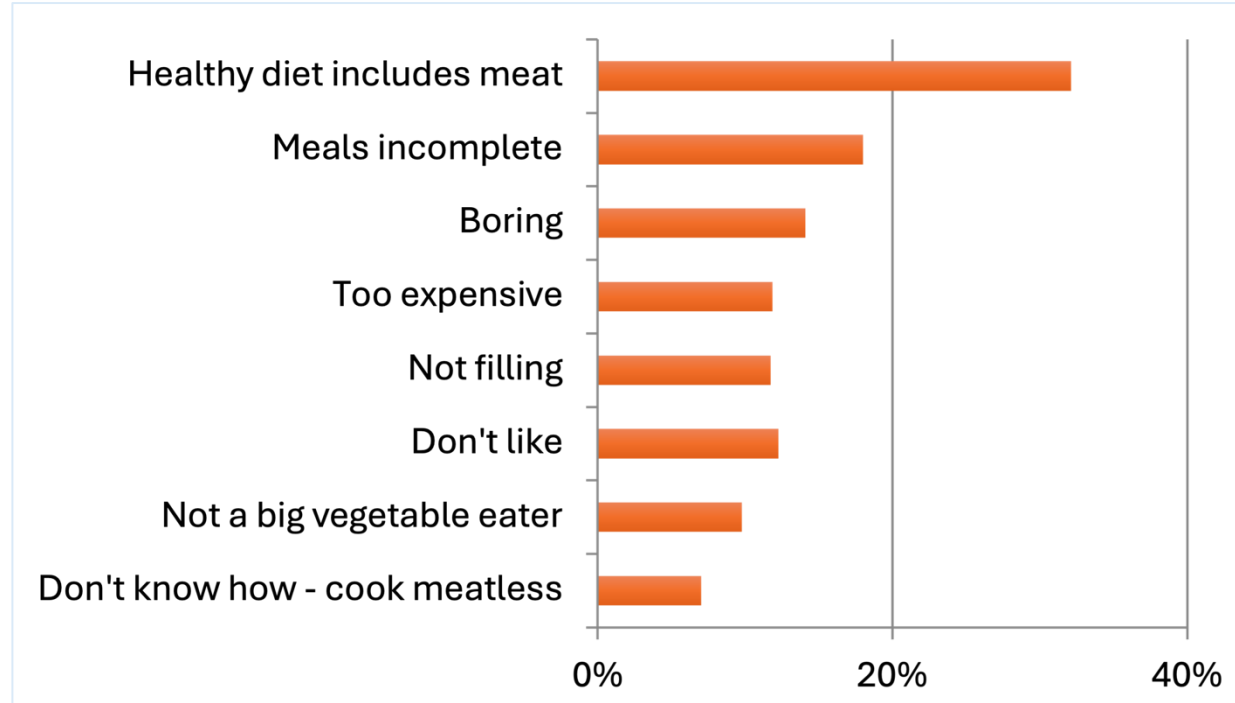


Image source: Adapted by the Johns Hopkins Center for a Livable Future from Neff, R. A., Edwards, D., Palmer, A., Ramsing, R., Righter, A., & Wolfson, J. (2018). Figure 2. *Non-meat reducers' agreement with statements reflecting possible reasons for non-reduction*. [Chart]. Reducing meat consumption in the USA: A nationally representative survey of attitudes and behaviours. *Public Health Nutrition*, 21(10), 1835–1844. <https://doi.org/10.1017/S1368980017004190>

Approaches to Shifting to Plant-Forward Diets Vary

Eliminate choices
(remove meat
options)

Fiscal incentives
(taxes and
discounts)

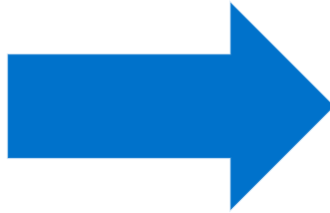
Change defaults
(visibility and
menu design)

Provide services
(cooking classes)

Provide
information
(education and
promotion)

Consumer Connections

- ▶ Combined approaches are most likely to be accepted and successful when they:
 - ▶ Raise awareness
 - ▶ Facilitate access and remove barriers



The Power of Our Food Environment

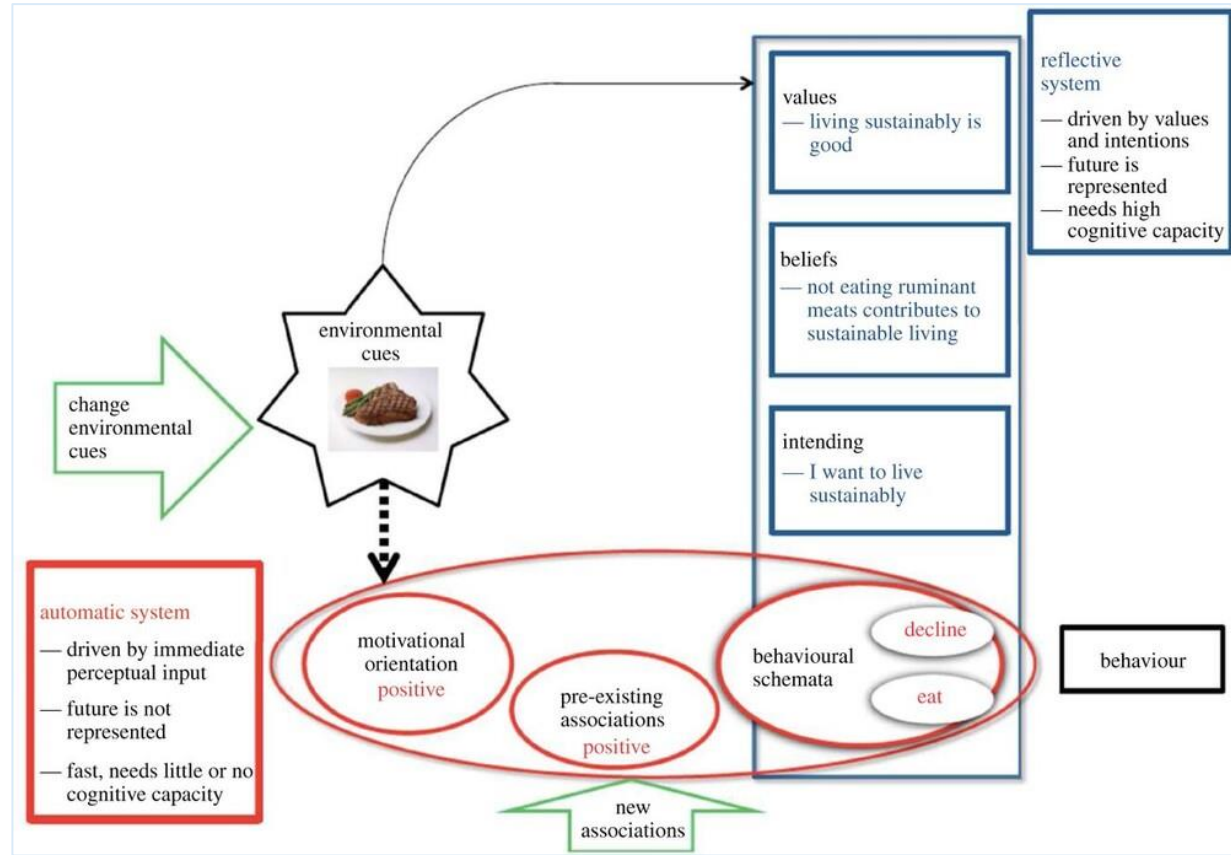
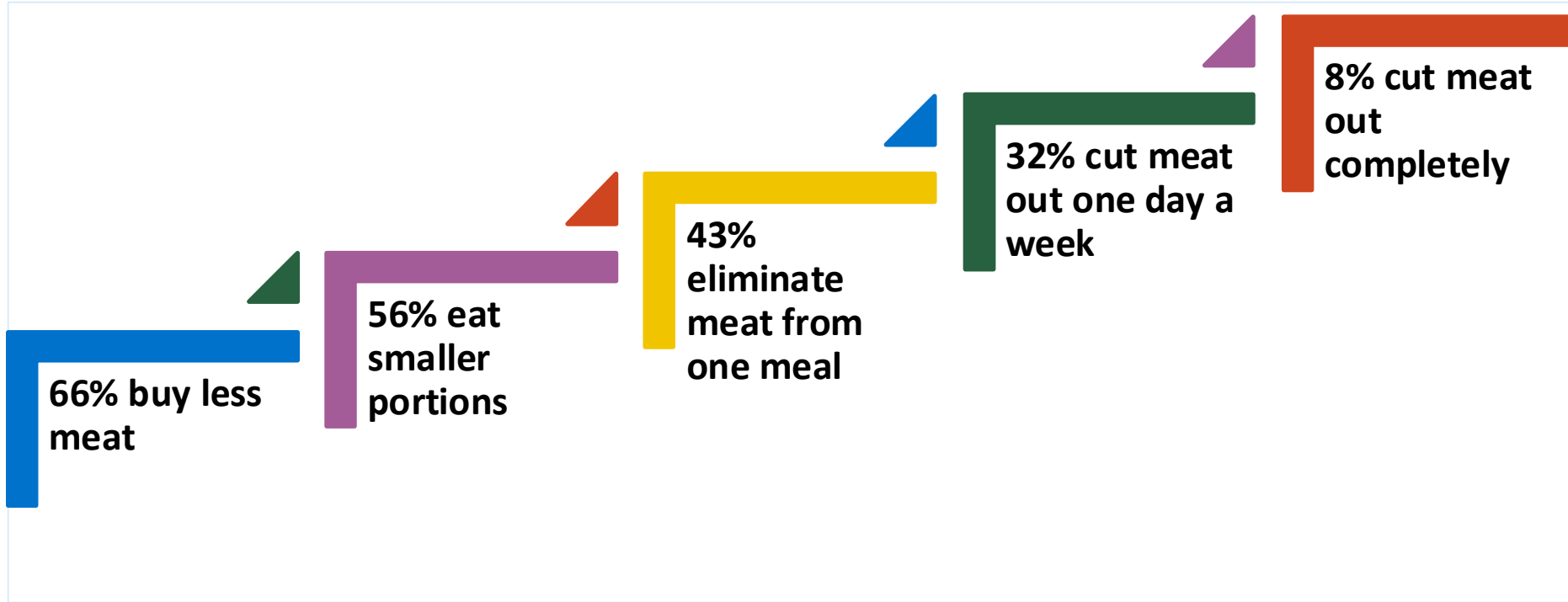


Image source: Marteau, T. M. (2017). Figure 1. *Automatic and reflective systems guiding behaviour, with potential points for intervention* [Chart]. Towards environmentally sustainable human behaviour: Targeting non-conscious and conscious processes for effective and acceptable policies. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 375(2095). <https://doi.org/10.1098/rsta.2016.0371>

One Quick Slide on Policy as a Lever for Change!

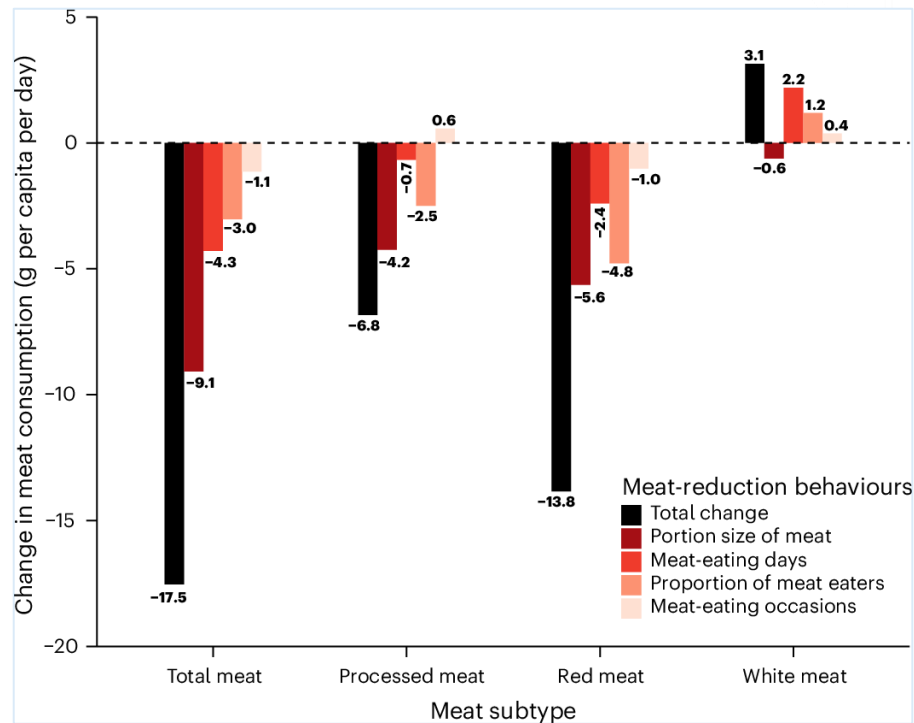
- ▶ Challenges of moving from food trend to dietary transition:
 - ▶ Consumer intention-behavior gap
 - ▶ Bottom-up consumer pressure is valuable but limited
- ▶ Policy actions can support interventions that lead to triggering points
 - ▶ Impacts the broader external environment where the shift can happen
- ▶ Types of policy supporting consumer shifts
 - ▶ Mandates
 - ▶ Restrictions
 - ▶ Economic incentives
 - ▶ Marketing limits
 - ▶ Information provision
 - ▶ Environmental defaults

Gradual Change and Small Steps



Understanding Consumption Changes

The modest contribution of reducing meat-eating days indicates that we should not overestimate the impact of a weekly Meatless Monday or Veggie Thursday.



Sources: Reinders, M. J., & Dagevos, H. (2024). Meat reduction in small portions. *Nature Food*, 12(5), 972–973. <https://doi.org/10.1038/s43016-024-01084-w>;

Graph is from Vonderschmidt, A., Jaacks, L. M., Alexander, P., Green, R., Bellows, A. L., & Stewart, C. (2024). Figure 2. *Decomposition analysis of meat-eating behaviours in the UK NDNS rolling programme years 1–11* [Chart]. Smaller meat portions contribute the most to reducing meat consumption in the United Kingdom. *Nature Food*, 5(12), 982–987. <https://doi.org/10.1038/s43016-024-01070-2>

Intervention Examples

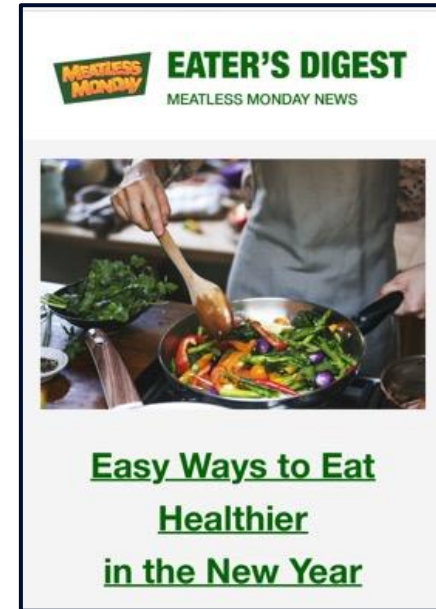


GREENER BY
DEFAULT

Study Overview

The impact of a weekly Meatless Monday email

- ▶ Those who practiced Meatless Monday were 15 times more likely to avoid meat on more than one day a week and five times more likely to have more meatless meals at home
- ▶ The longer people received the Meatless Monday newsletter, the more likely they were to reduce their meat intake overall and skip meat more than once a week
- ▶ Those who received the e-newsletter for more than three years showed a trend toward increasing meatless meals at home



Case Study 1

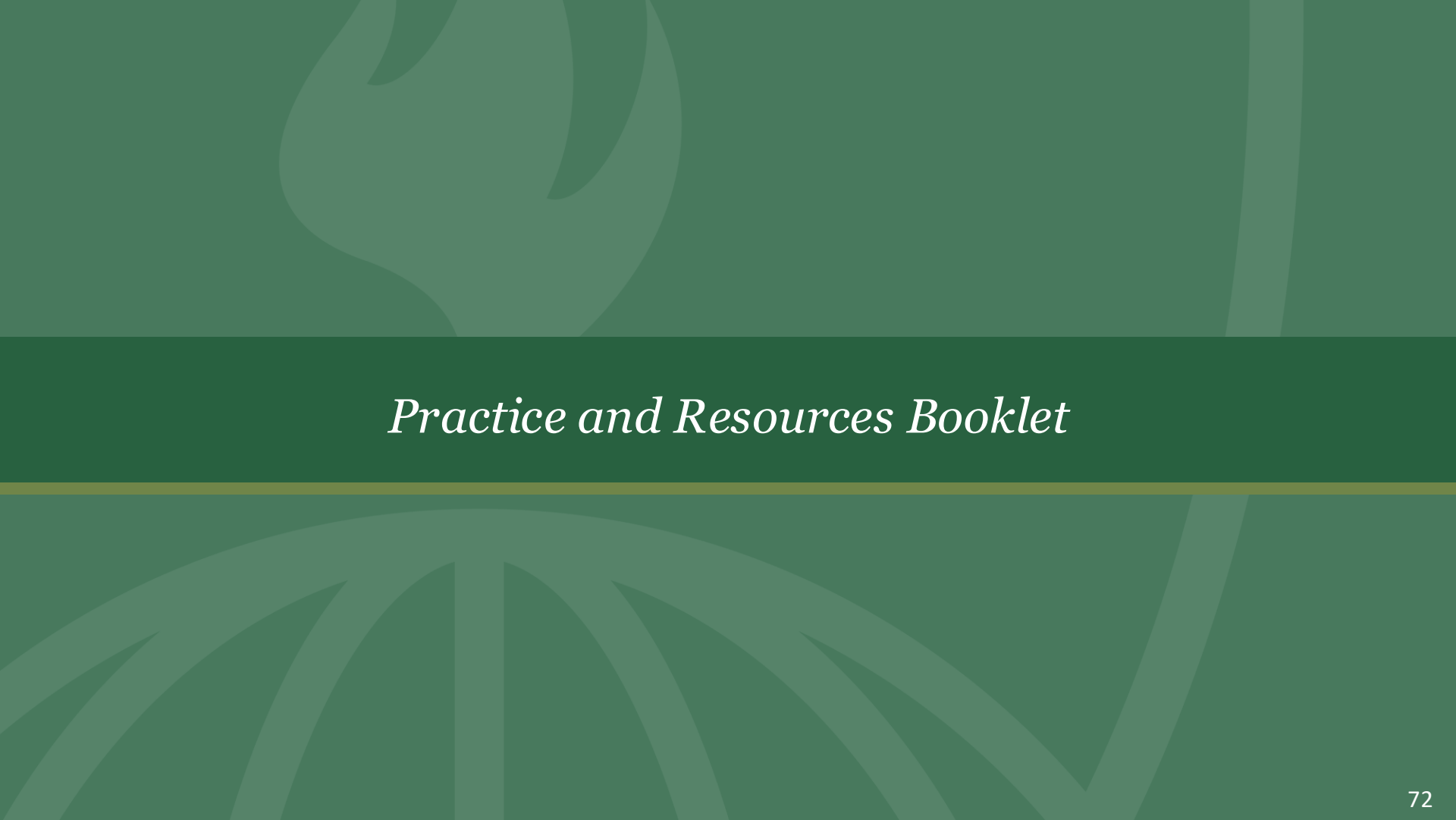
Key Points: Food Systems and Climate

- ▶ Our food system is a key driver of climate change
- ▶ Climate change increasingly puts our food supply at risk
- ▶ There is consensus among climate, health, and environmental scientists about strategies to reduce the food system's contributions to climate
- ▶ Different strategies are needed in different places; responsibility for reducing meat and dairy falls mainly on countries with the highest intake
- ▶ Low consumer awareness is an opportunity for education

Thank You!



Image source: Microsoft Stock Images.

The background is a solid dark green color. It features large, faint, organic shapes in a lighter shade of green. These shapes resemble stylized leaves or petals, with some having curved, pointed edges and others being more elongated and vertical. The overall effect is a textured, naturalistic pattern.

Practice and Resources Booklet

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the Johns Hopkins Bloomberg School of Public Health

