Food Systems and Food Security in a Time of Crisis

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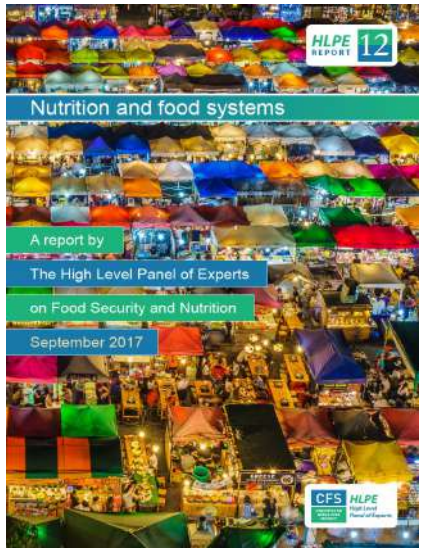
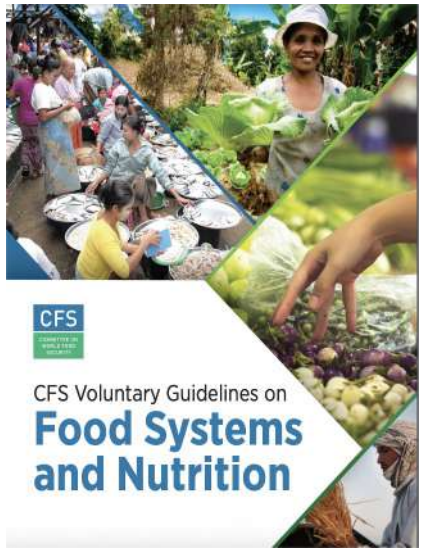
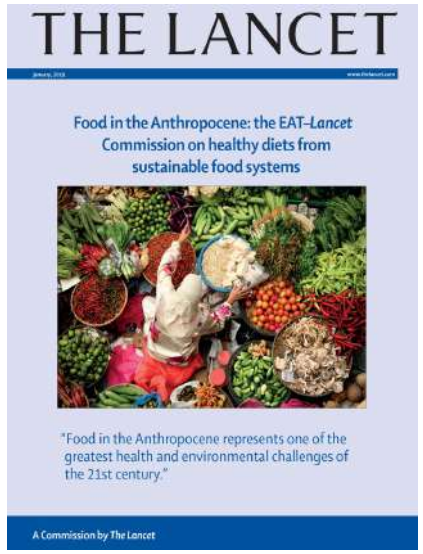
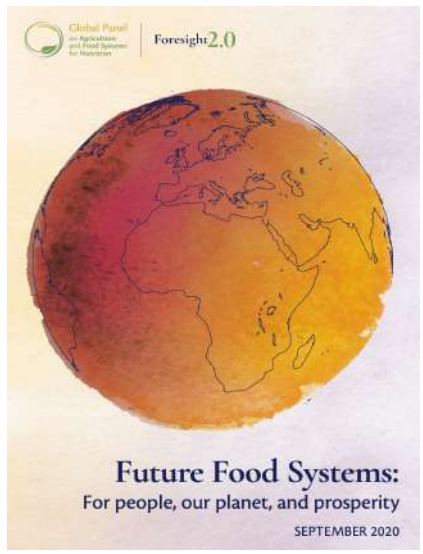
Professor of Climate and Food
Director of the Food for Humanity Initiative
Columbia University's Climate School

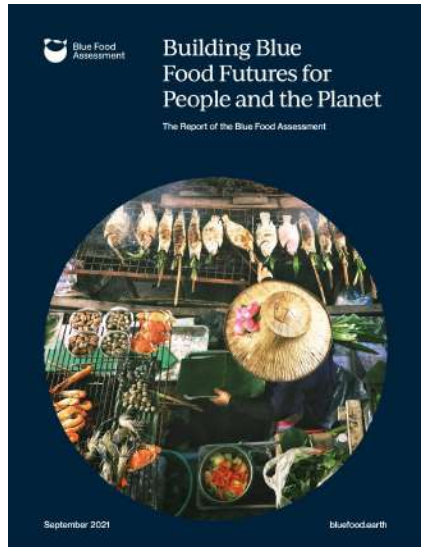
Established the notion of “food systems” and their political relevance for human and planetary health











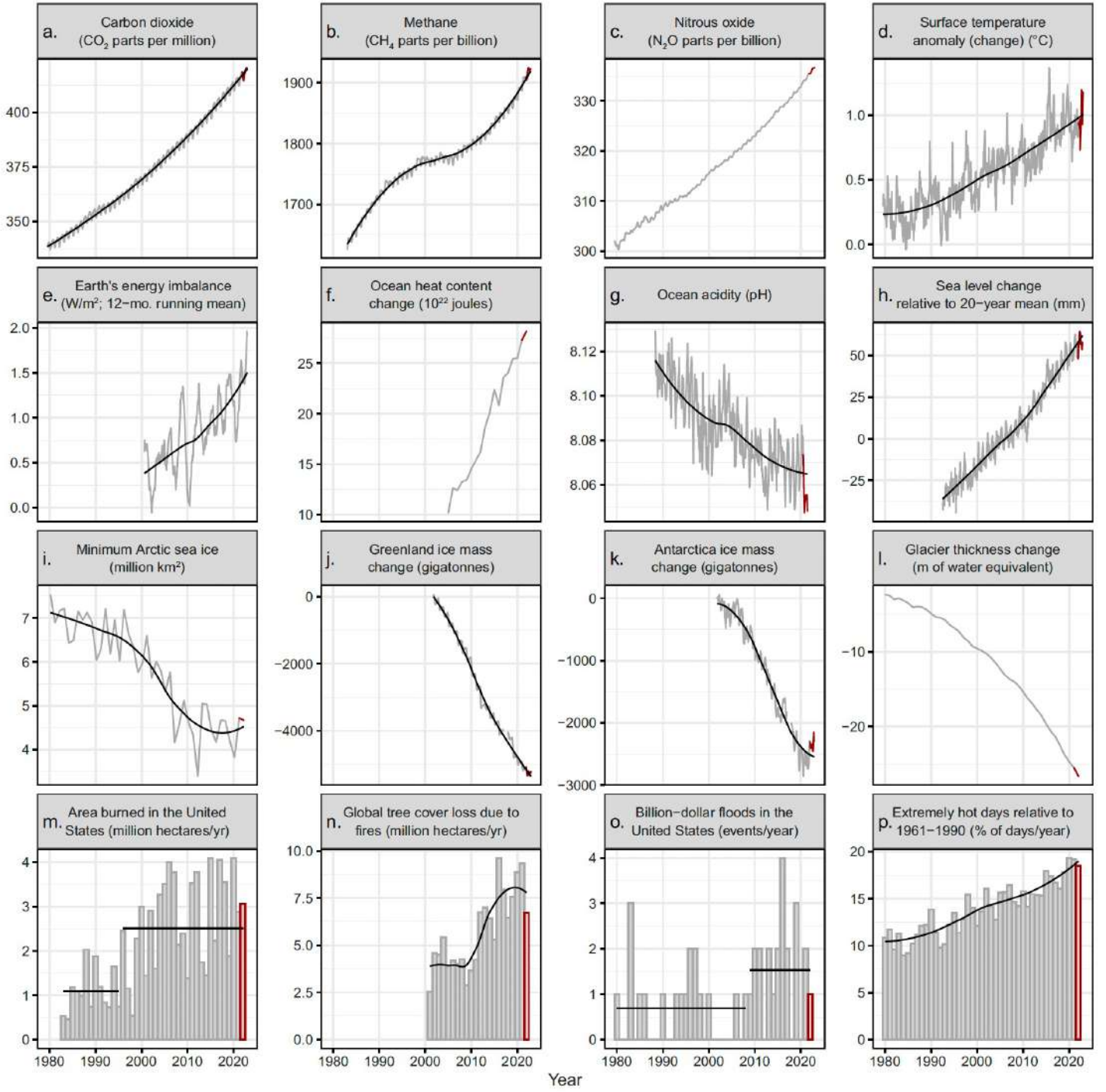
2017 → **2022**

Evidence-based guidelines on appropriate **policies, responsible investments and institutional arrangements** needed to address sustainable food systems while also addressing economic, social and environmental sustainability issues and impacts.

Why food systems are in crisis

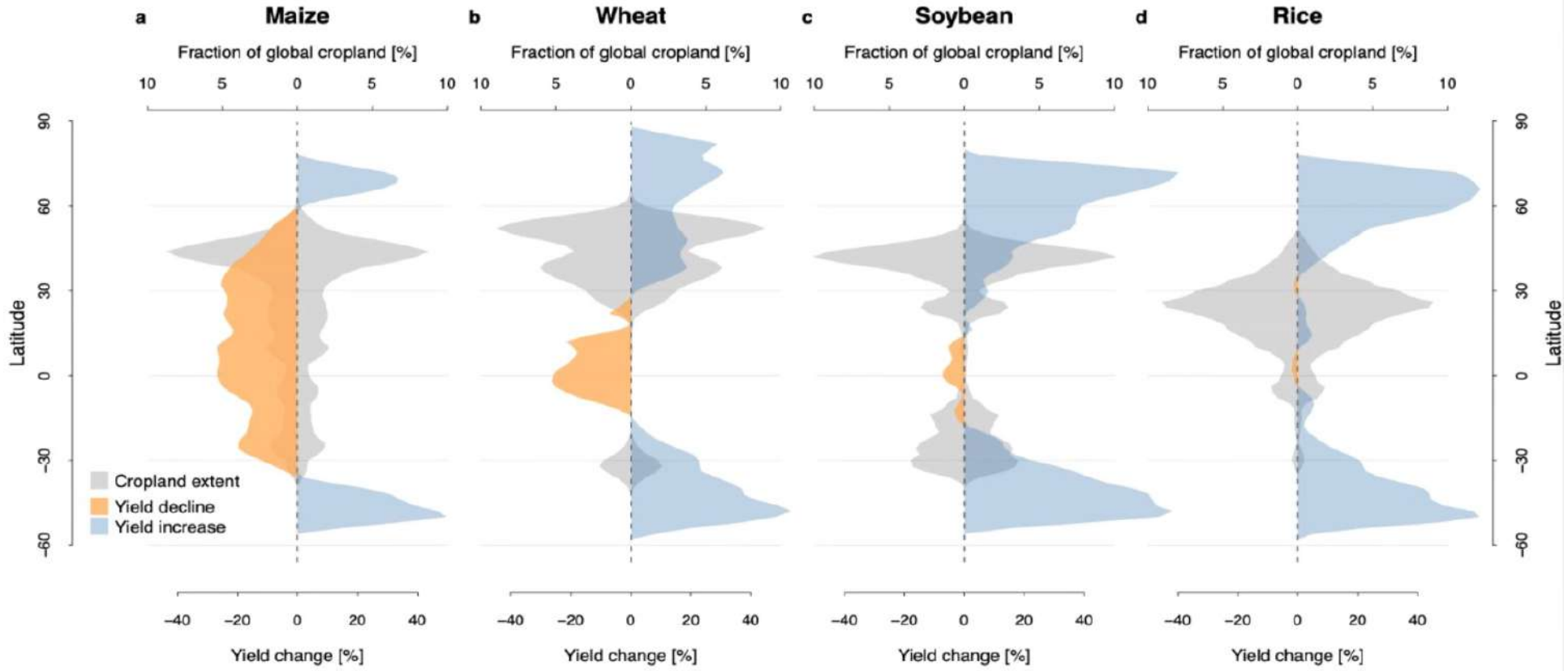
We are in the middle of catastrophic climate breakdown

The **Anthropocene** defines Earth's most recent geologic time period as being human-influenced, or anthropogenic, based on overwhelming global evidence that atmospheric, geologic, hydrologic, biospheric and other earth system processes are now altered by humans.



Ripple et al (2023) The 2023 state of the climate report: Entering uncharted territory. Bioscience.

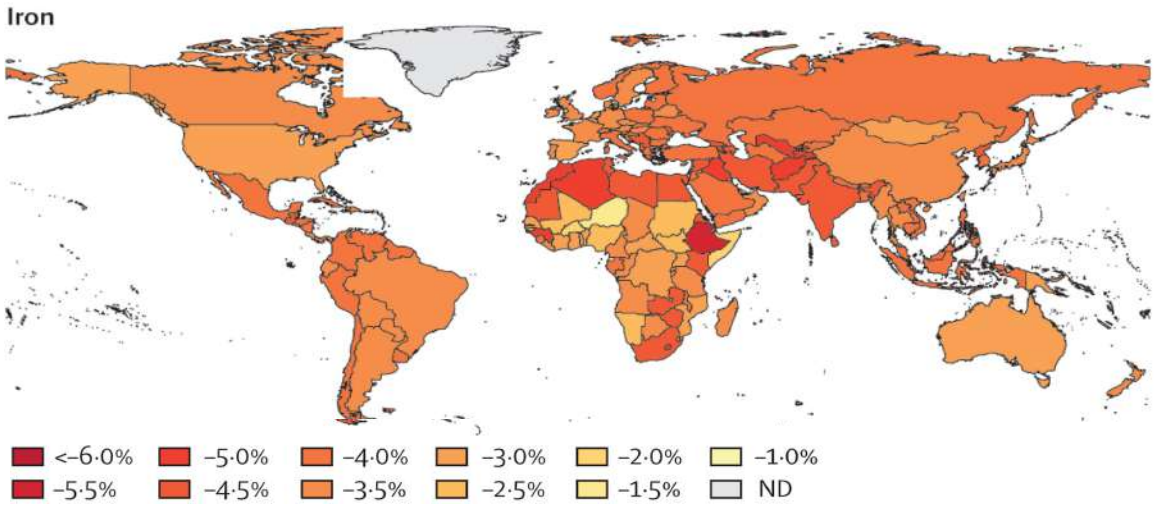
Climate change is & will have net adverse impacts on crop yields



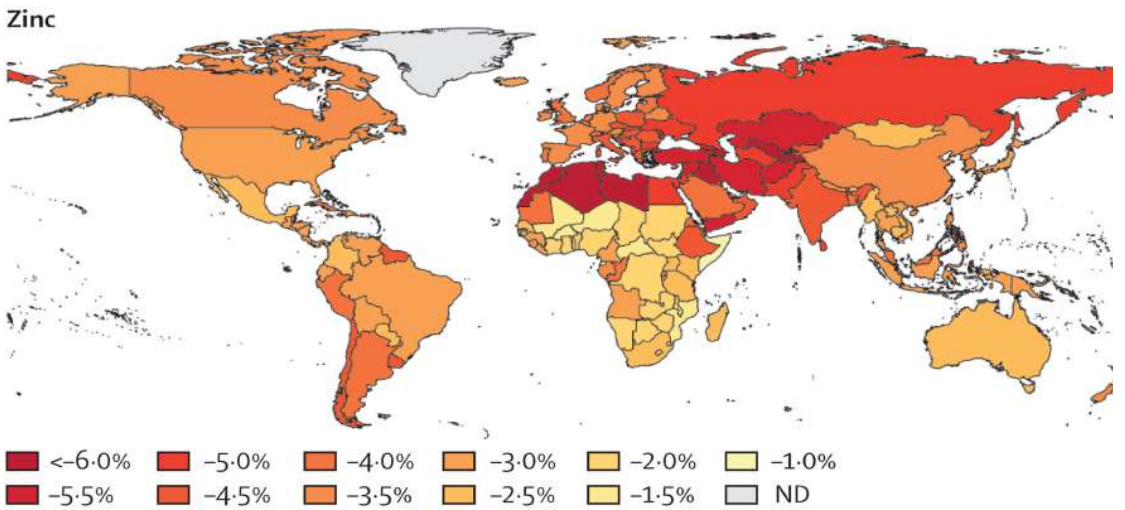
Jägermeyr et al. (2021), *Nature Food*

Climate change is & will have net adverse impacts on nutritional quality of crops

14% declines in iron



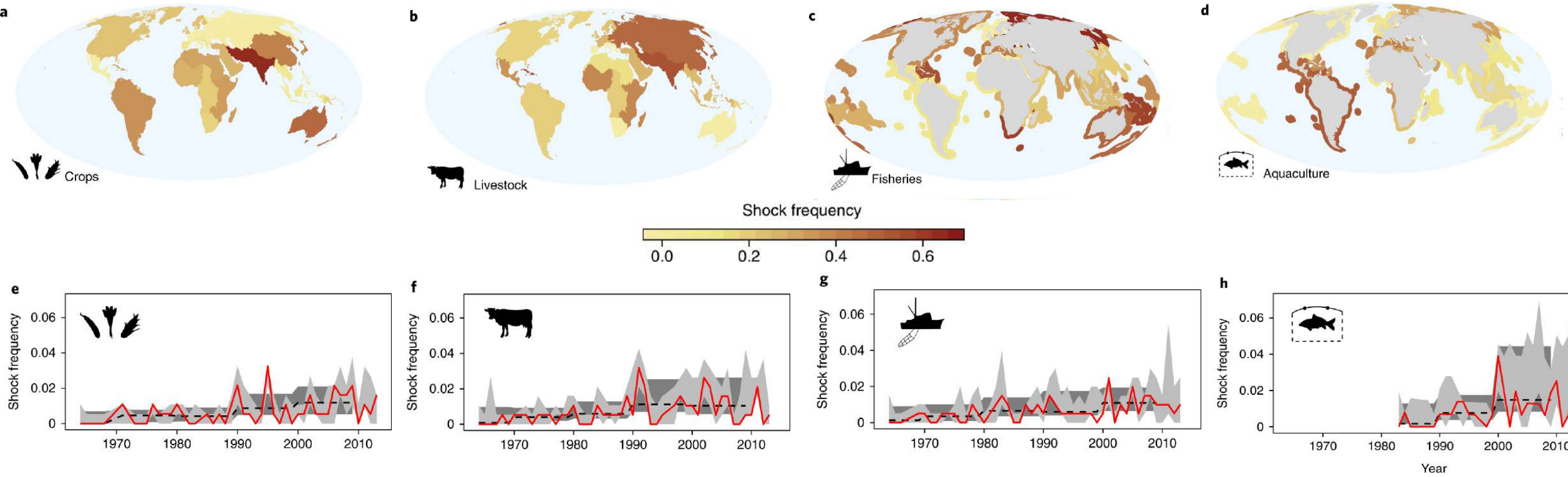
15% declines in zinc



Beach, R.H., et al 2019. Combining the effects of increased atmospheric carbon dioxide on protein, iron, and zinc availability and projected climate change on global diets: a modelling study. *The LPH*, *3*(7), pp.e307-e317.

Food systems are vulnerable with increased risk of multiple breadbasket failures

Climate and weather events
Geopolitical and economic events
Mismanagement and policy change

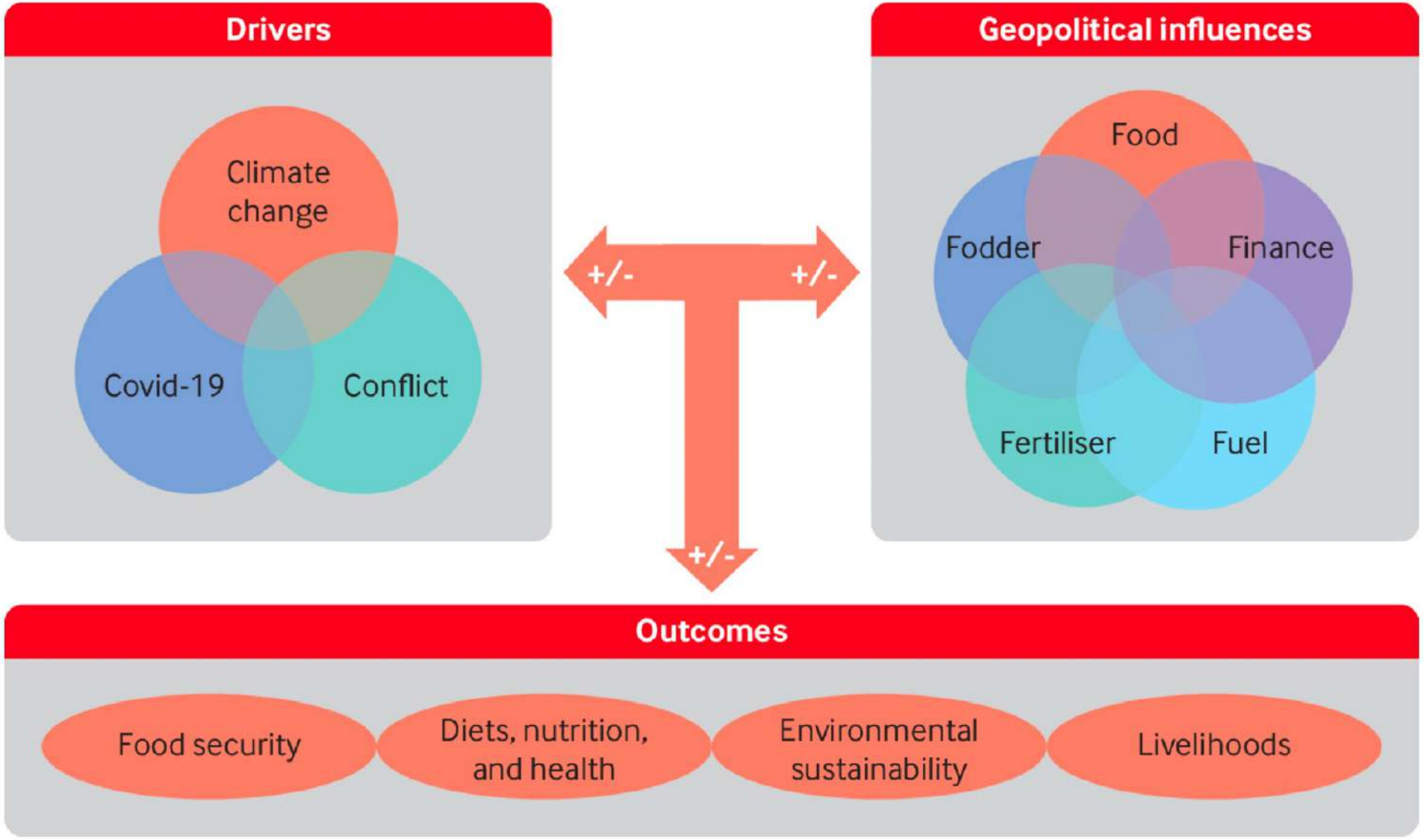


Cottrell, R.S., *et al.* Food production shocks across land and sea. *Nat Sustain* **2,** 130–137 (2019).

Climate-related extreme weather events are front and center: Is the world prepared?

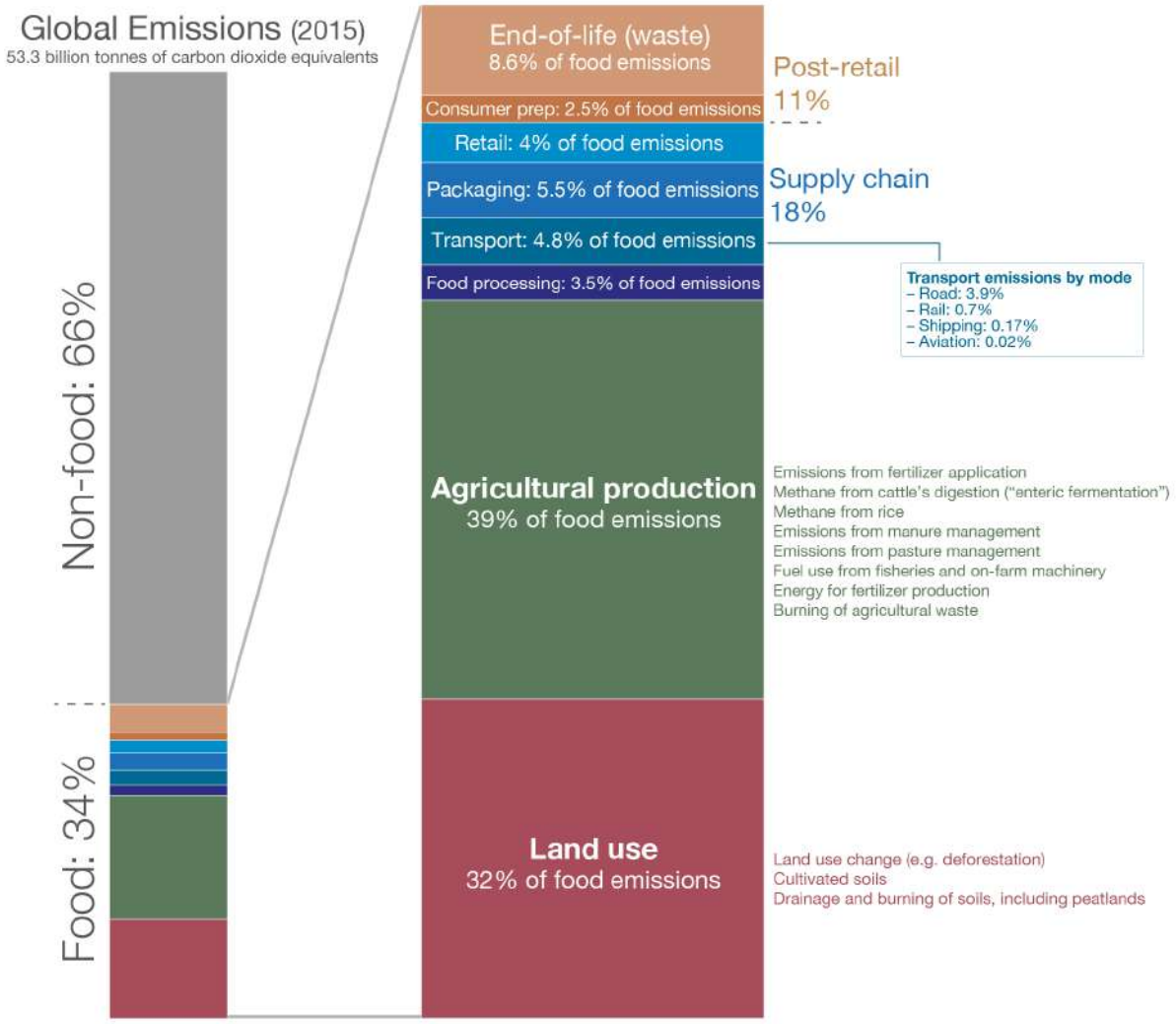
Credit: Brandon Bell/Getty Images; Reutgers; ANGELOS TZORTZINIS/AFP VIA GETTY IMAGES; REUTERS/Adnan Abidi; Unicef Ethiopia

The “three Cs” and “five Fs” of concern

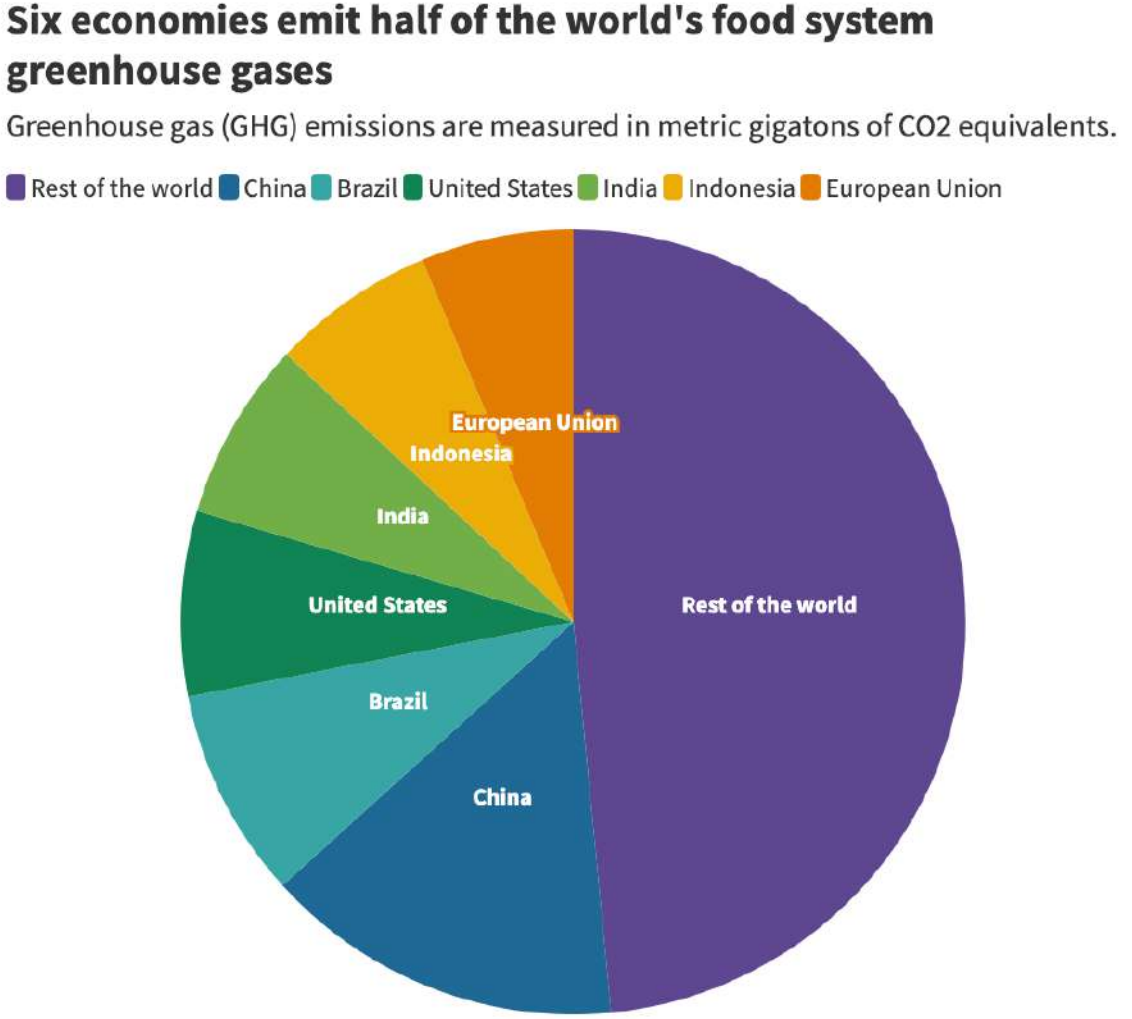


Hendriks, S.L., et al 2022. Global environmental climate change, covid-19, and conflict threaten food security and nutrition. *bmj*, *378*.

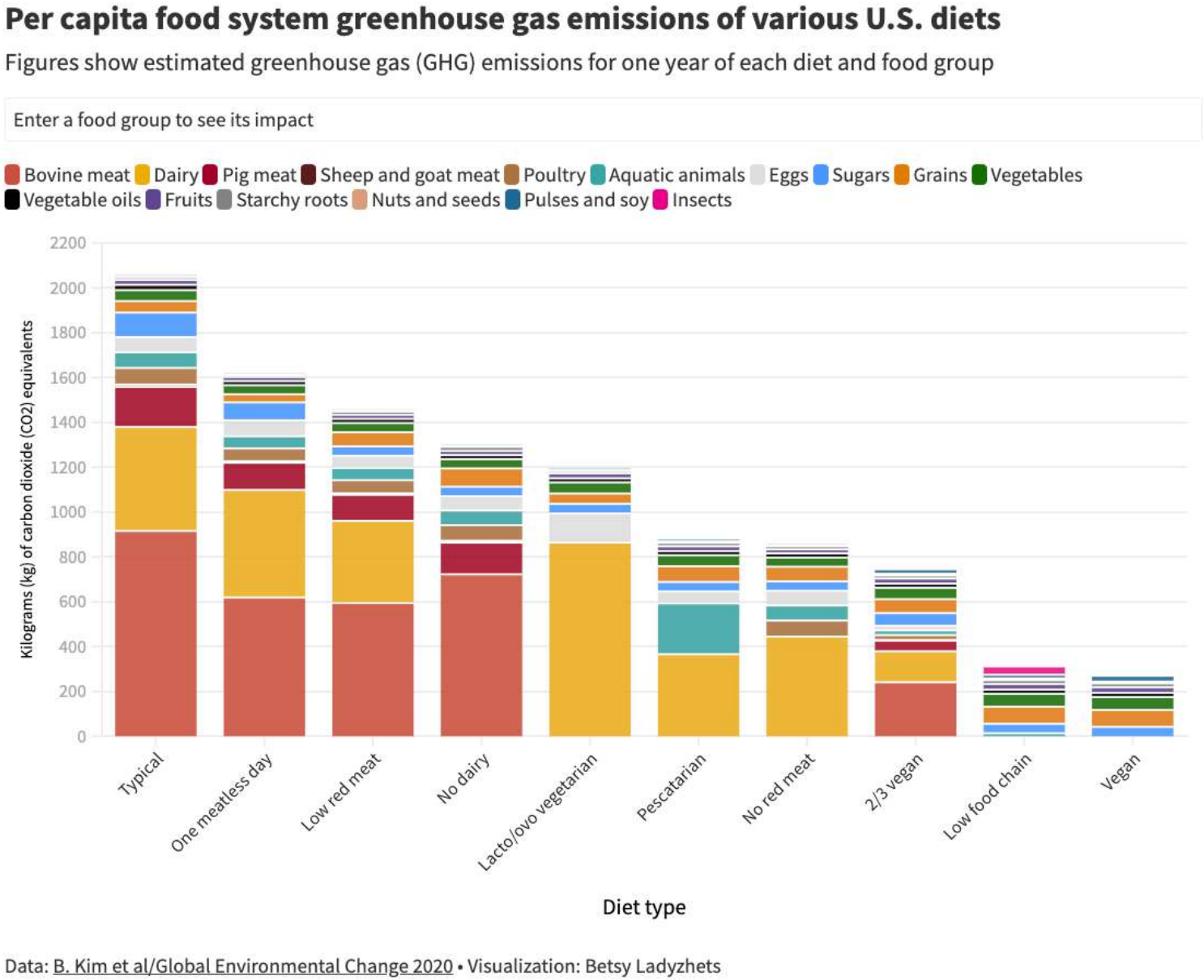
Food systems are contributors to climate change & environmental degradation



Data source: Crippa, M., et al. (2021) Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food*.
OurWorldinData.org – Research and data to make progress against the world's largest problems. Licensed under CC-BY by the author Hannah Ritchie.

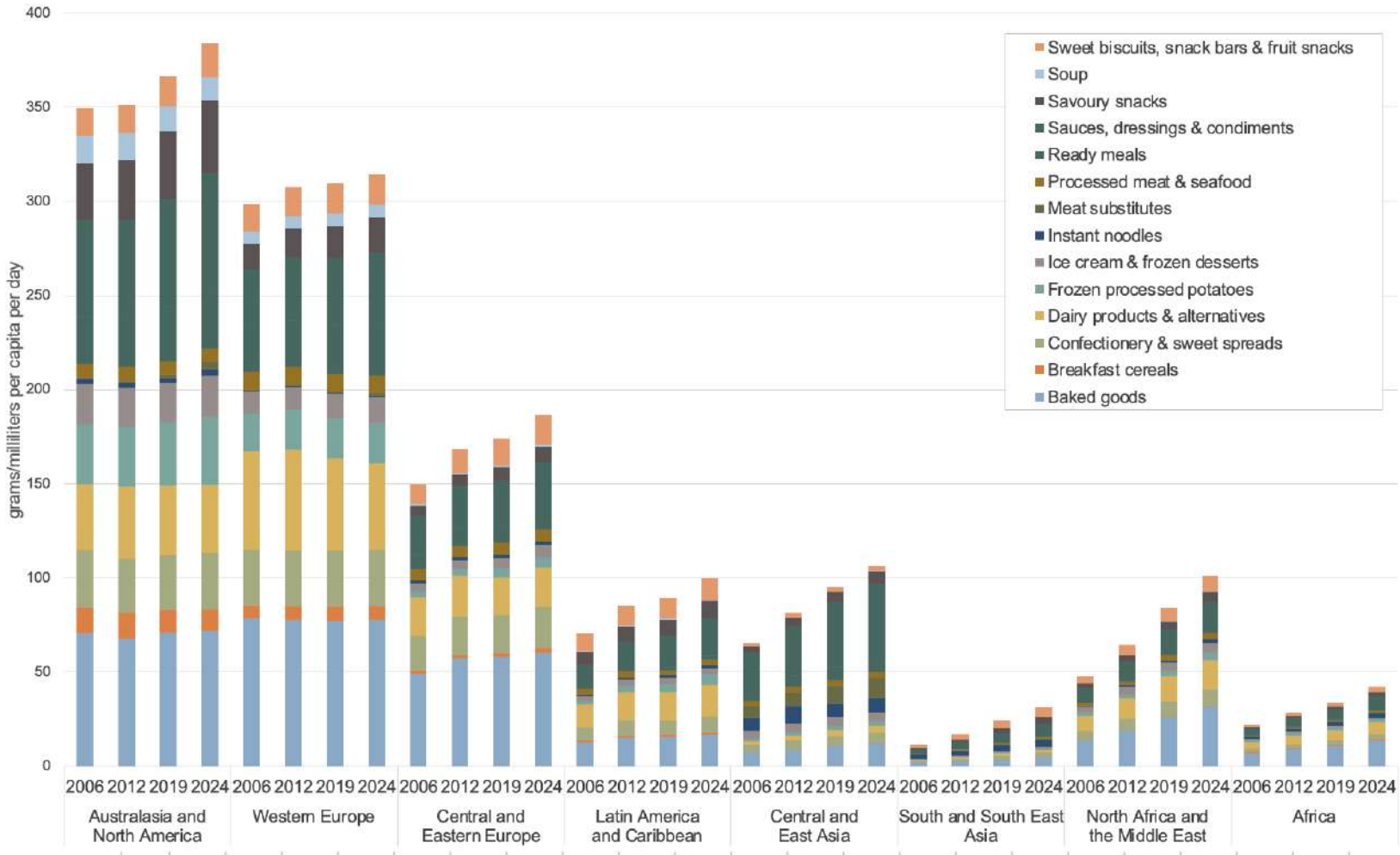


The type of diets we consume also matter for climate



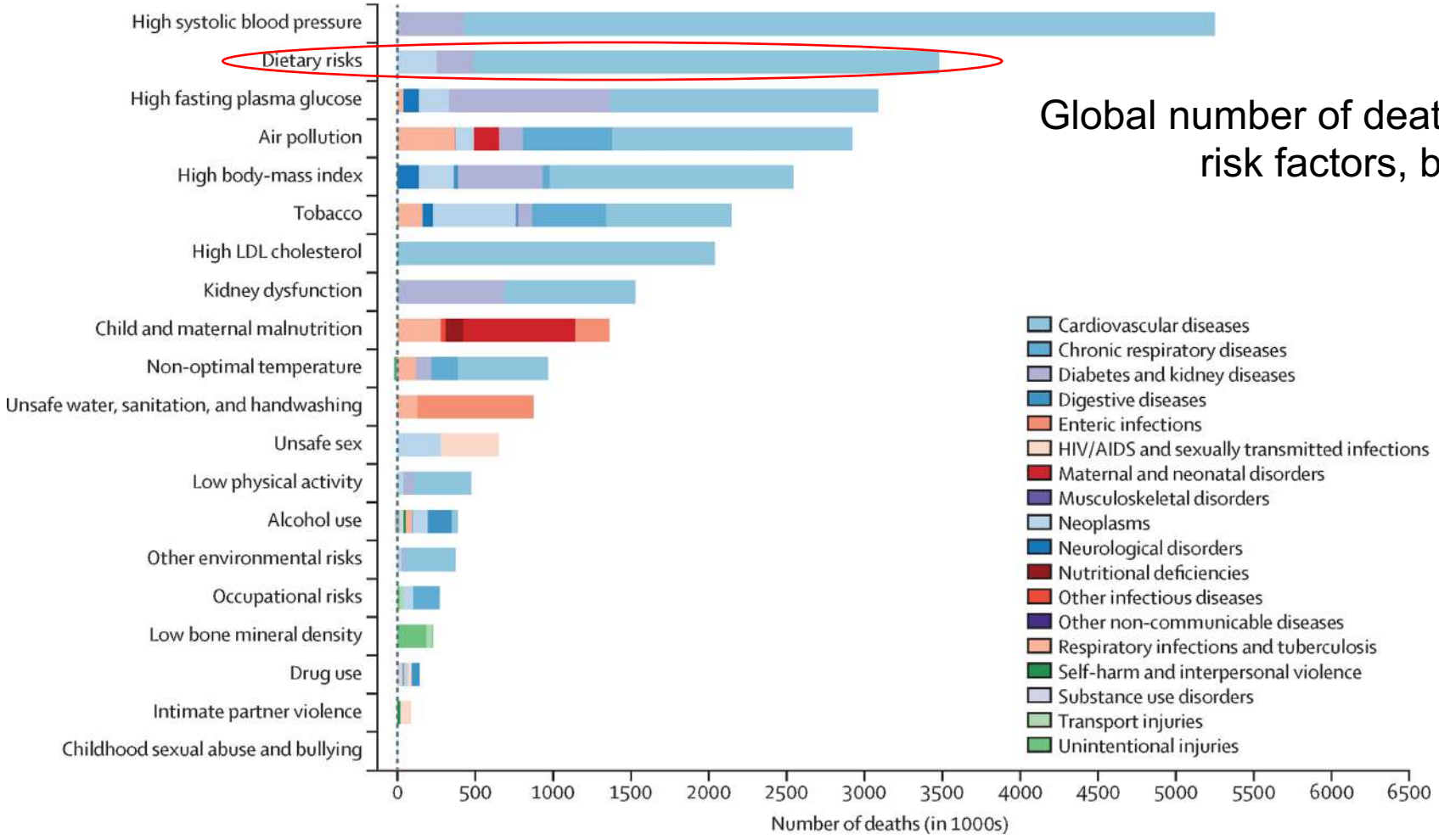
The types of foods available to most are not optimal

Sales of ultra-processed food (kg/capita, 2006-2024)



P.I. Baker, et al., “Ultra-Processed Foods and the Nutrition Transition: Global, Regional and National Trends, Food Systems Transformations and Political Economy Drivers,” Obesity Reviews 21, 12 (2020): e13126.

Sub-optimal diets are a major risk factor of death and disease



Global number of deaths attributable to risk factors, by cause

Murray, C.J., et al 2020. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, *396*(10258), pp.1223-1249.

The scale of malnutrition is universal and worsening

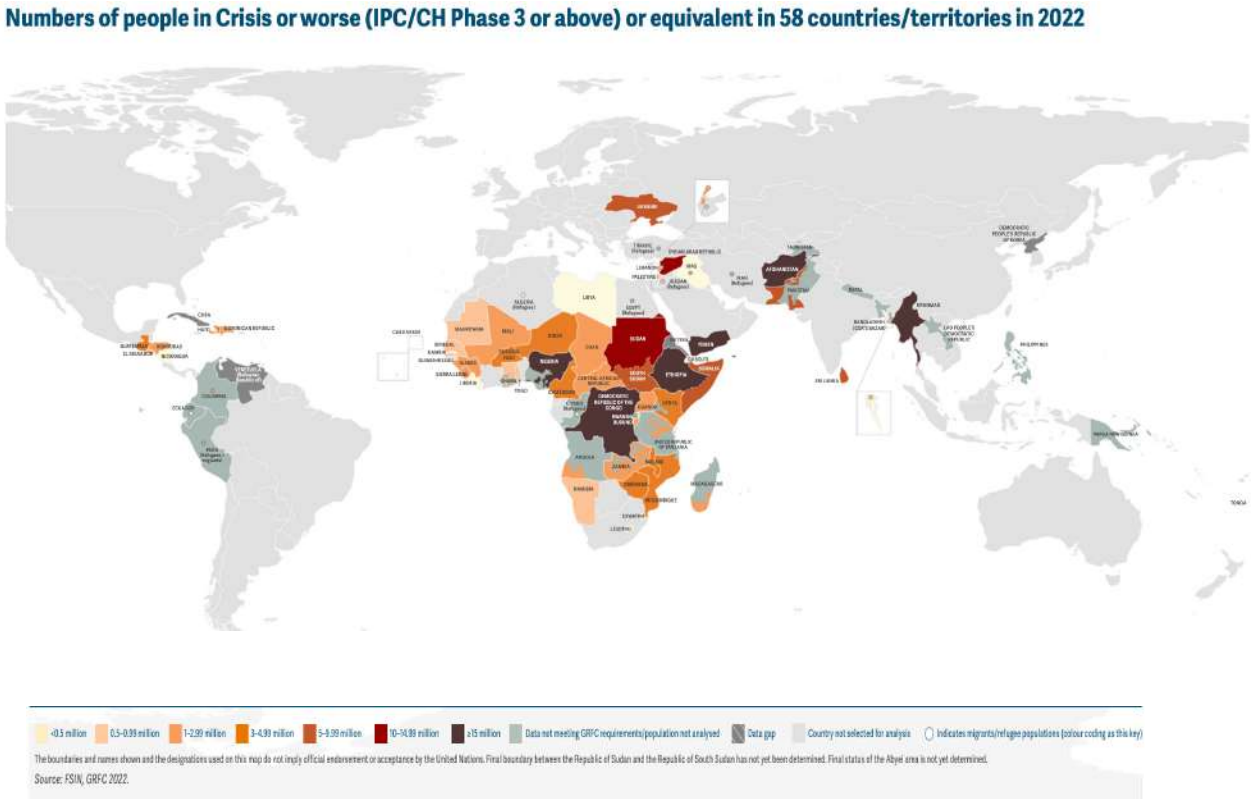
735 million (10%)
of the world's population are undernourished

148 million (23%)
children under five years of age are stunted

45 million
children under five years of age are wasted

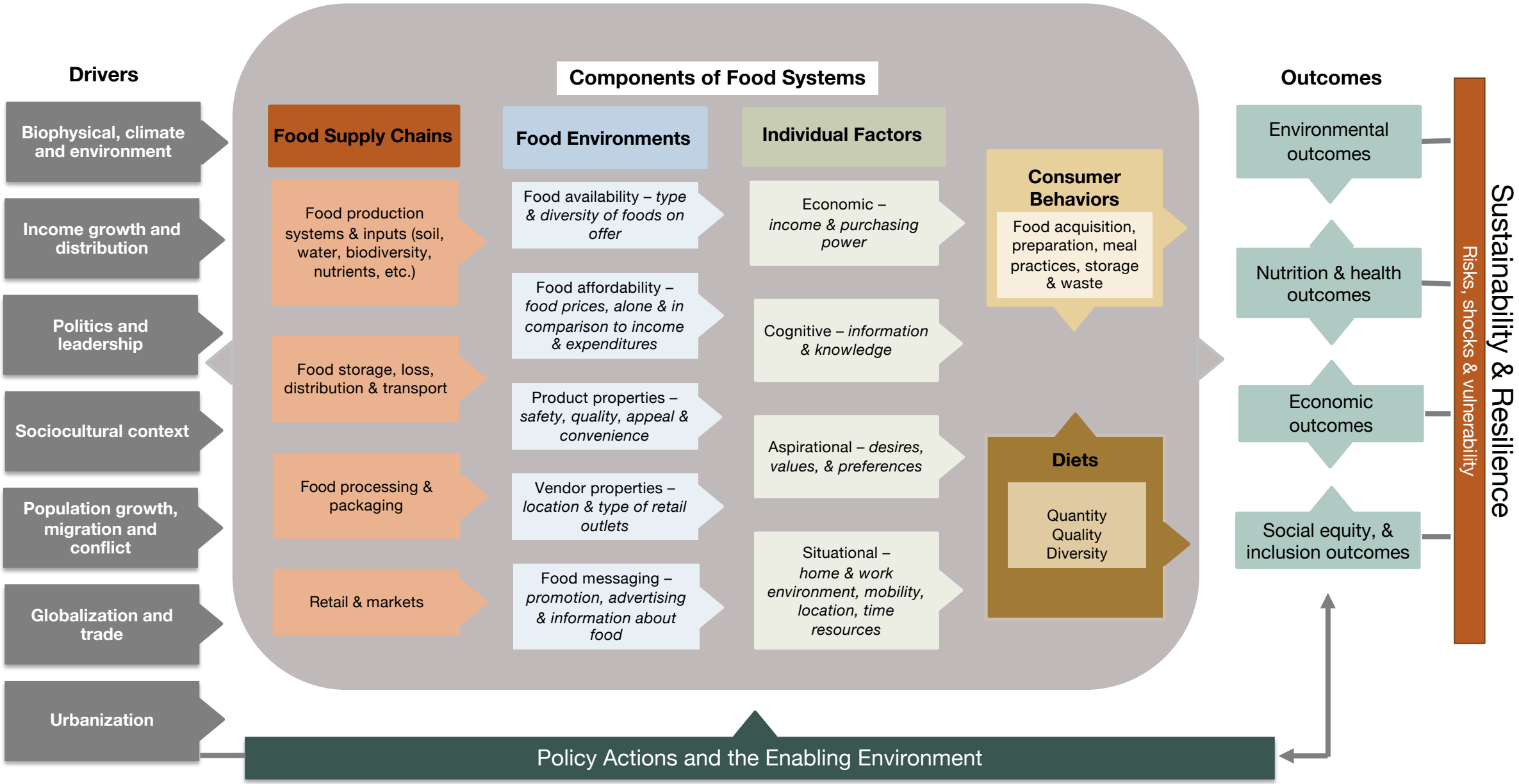
37 million
children under five years of age are overweight

2.2 billion
adults are overweight or obese



Global Nutrition Report 2022; WHO/UNICEF/World Bank Group. Joint Malnutrition Estimates 2023; FSIN and Global Network Against Food Crises. 2023. GRFC 2023. Rome.

Transformation of this system is not easy!

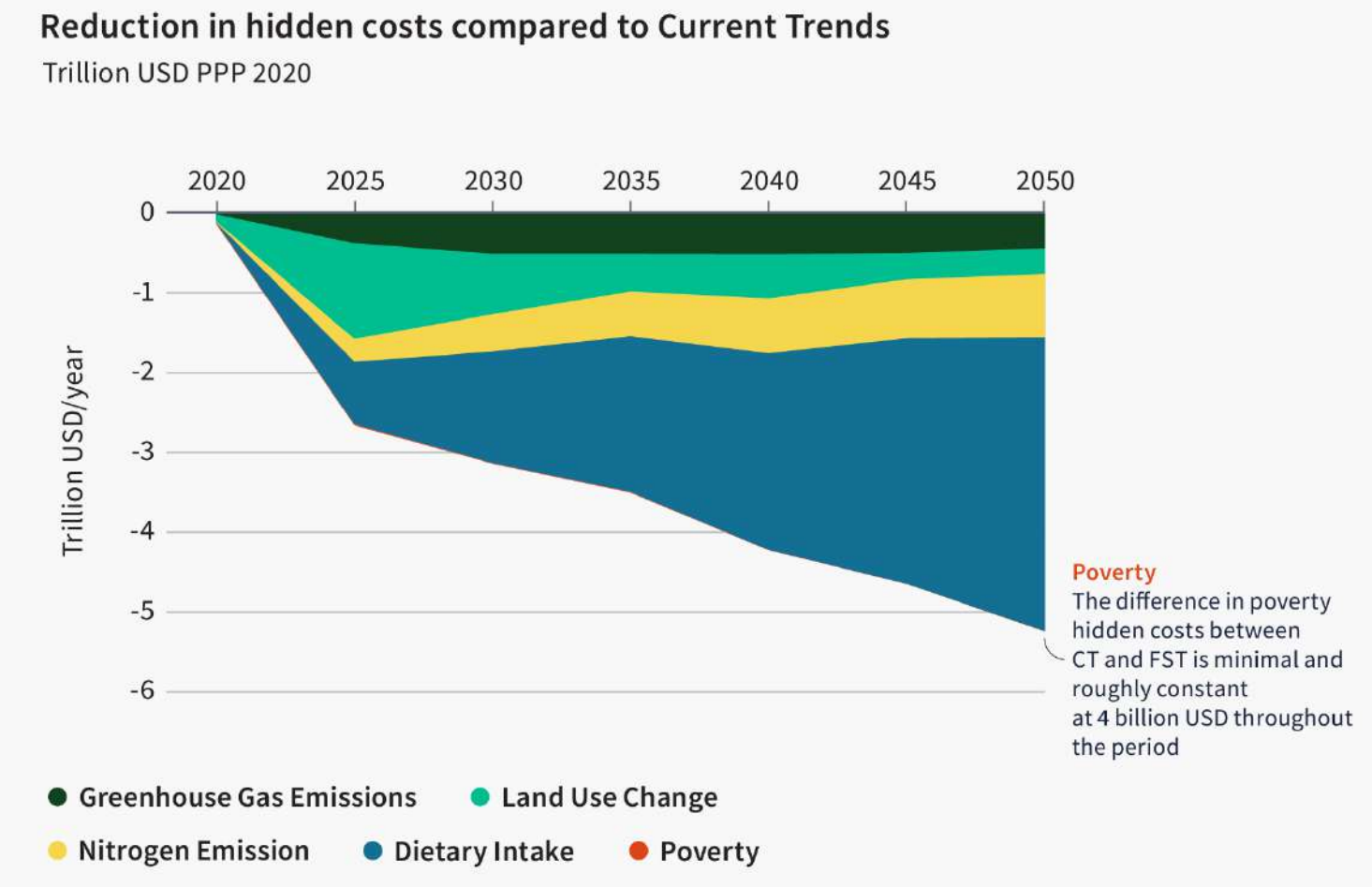


Fanzo, J., et al, 2020. The Food Systems Dashboard is a new tool to inform better food policy. *Nature Food*, *1*(5), pp.243-246.

Food System Economics Commission

The cost of inaction is massive

- The unaccounted costs of food systems' burdens on people and the planet are estimated at 15 trillion USD a year, equivalent to 12% of GDP in 2020.
  - Health costs are 11 trillion USD per year
  - Environmental costs are 3 trillion USD a year
- Transforming food systems would provide economic benefits equivalent to at least 5 trillion USD a year



Ruggeri Laderchi, C., et al (2024). The Economics of the Food System Transformation. Food System Economics Commission, Global Policy Report.

Food System Economics Commission

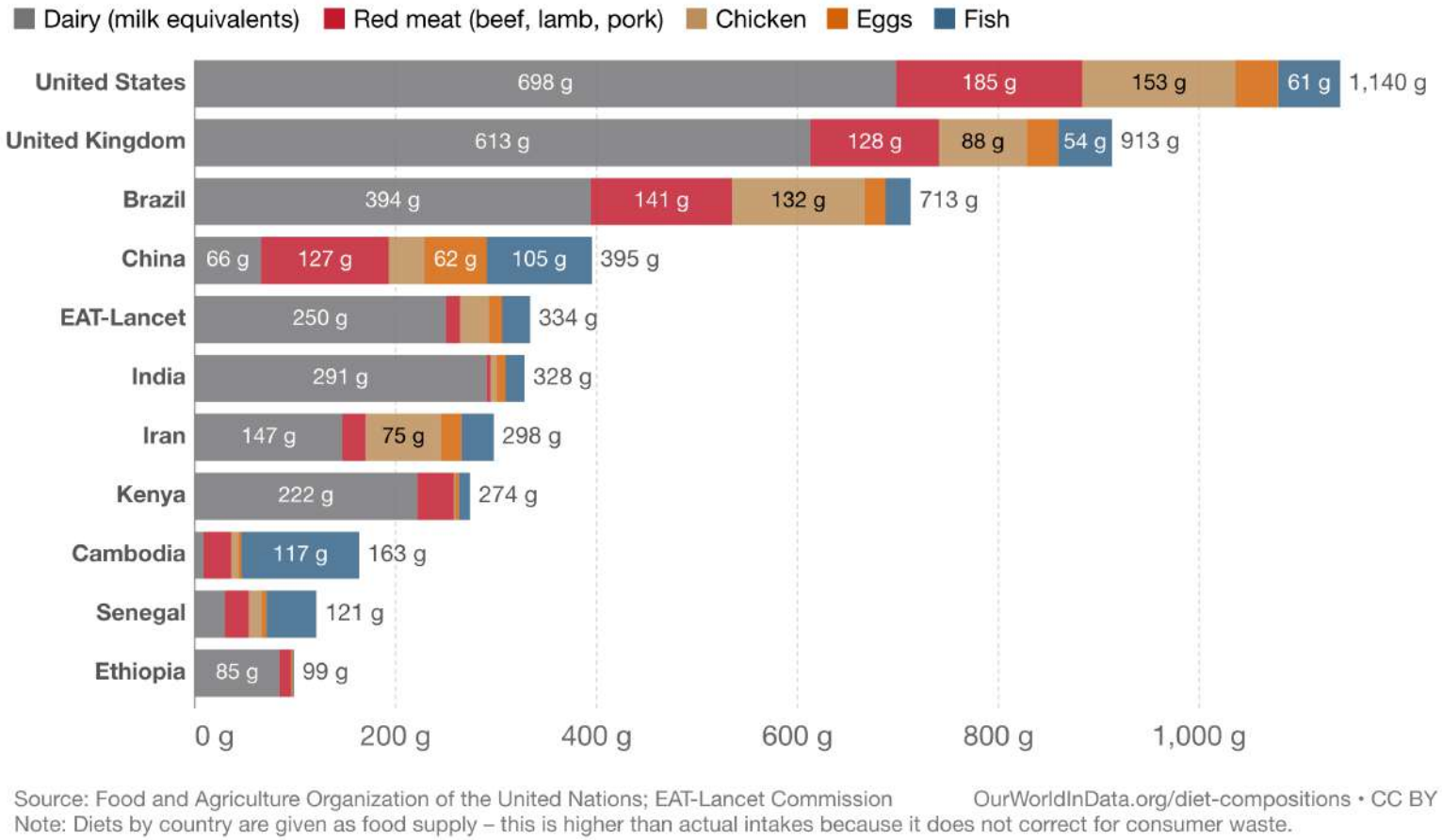
At 200–500 billion USD a year, the estimated costs of global food system transformation are low compared to its economic benefits

Ruggeri Laderchi, C., et al (2024). The Economics of the Food System Transformation. Food System Economics Commission, Global Policy Report.

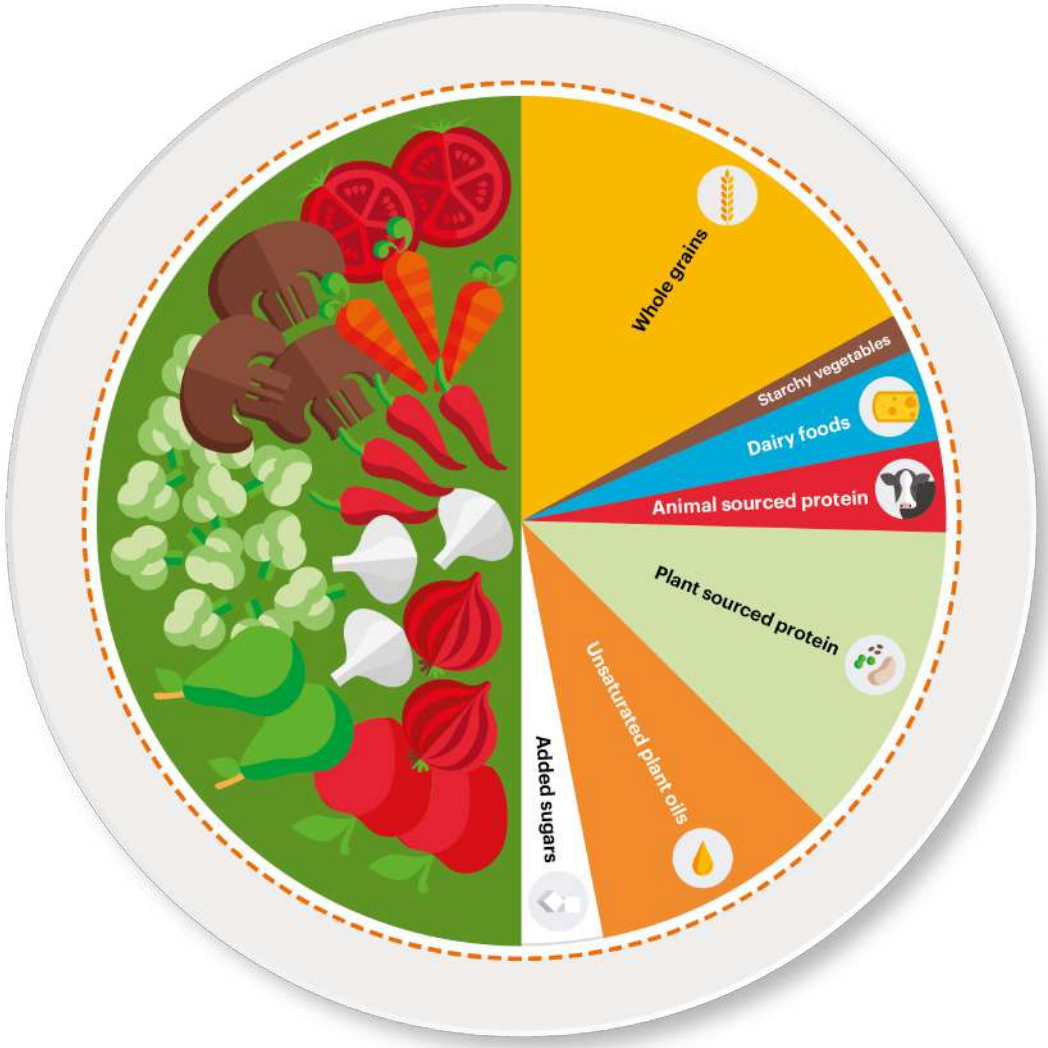
What issues limit food system transformation?

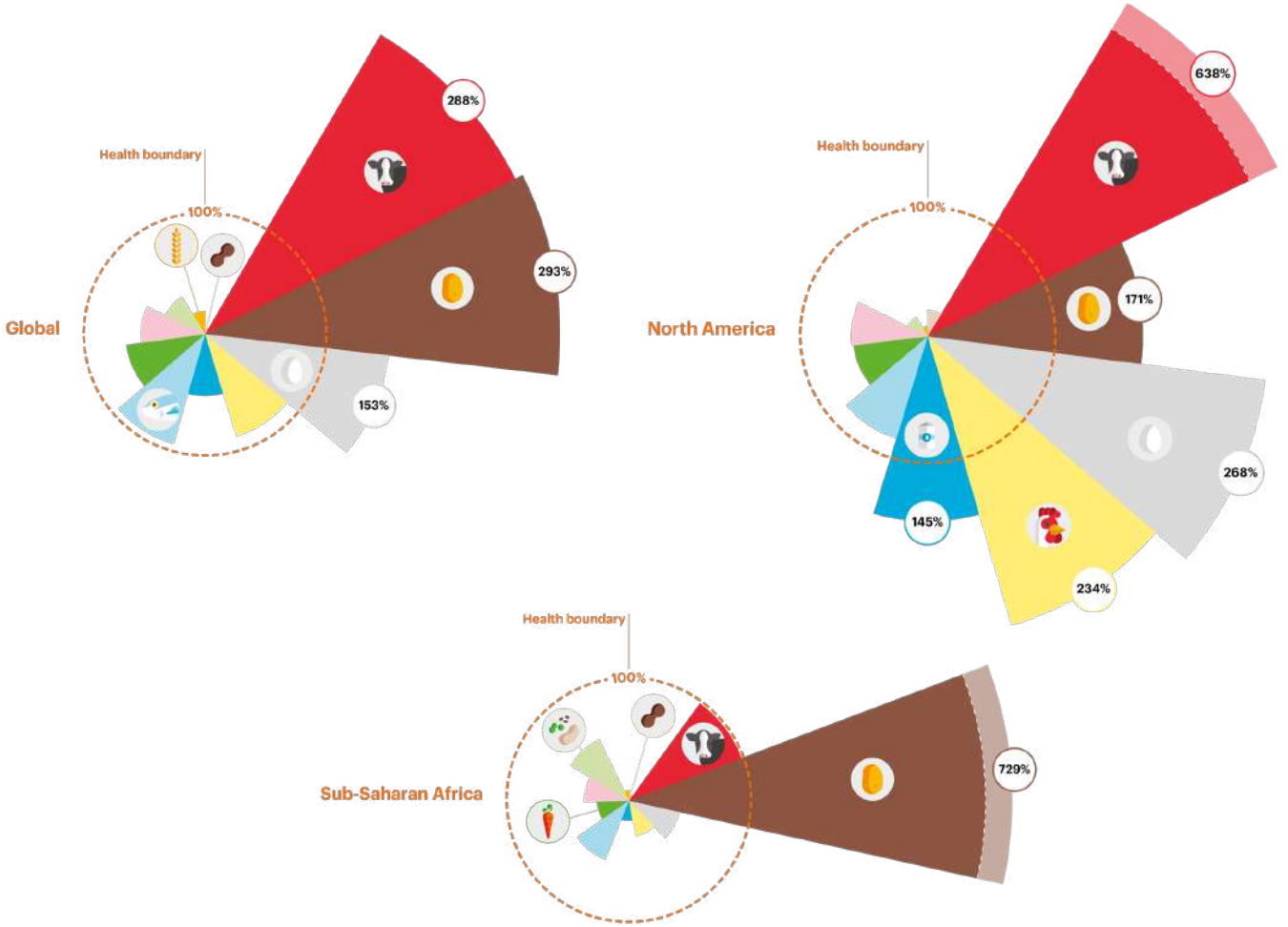
1. Should some countries/individuals make larger changes to their diets to benefit the whole of society?

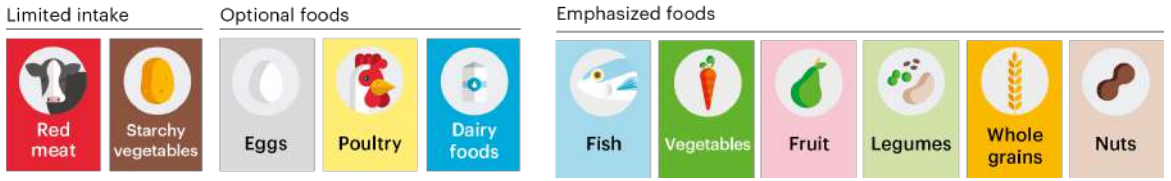
Energy intensive lifestyles and dietary choices of those living in high-income countries are significant anthropogenic contributors to climate change.



EAT-Lancet Commission



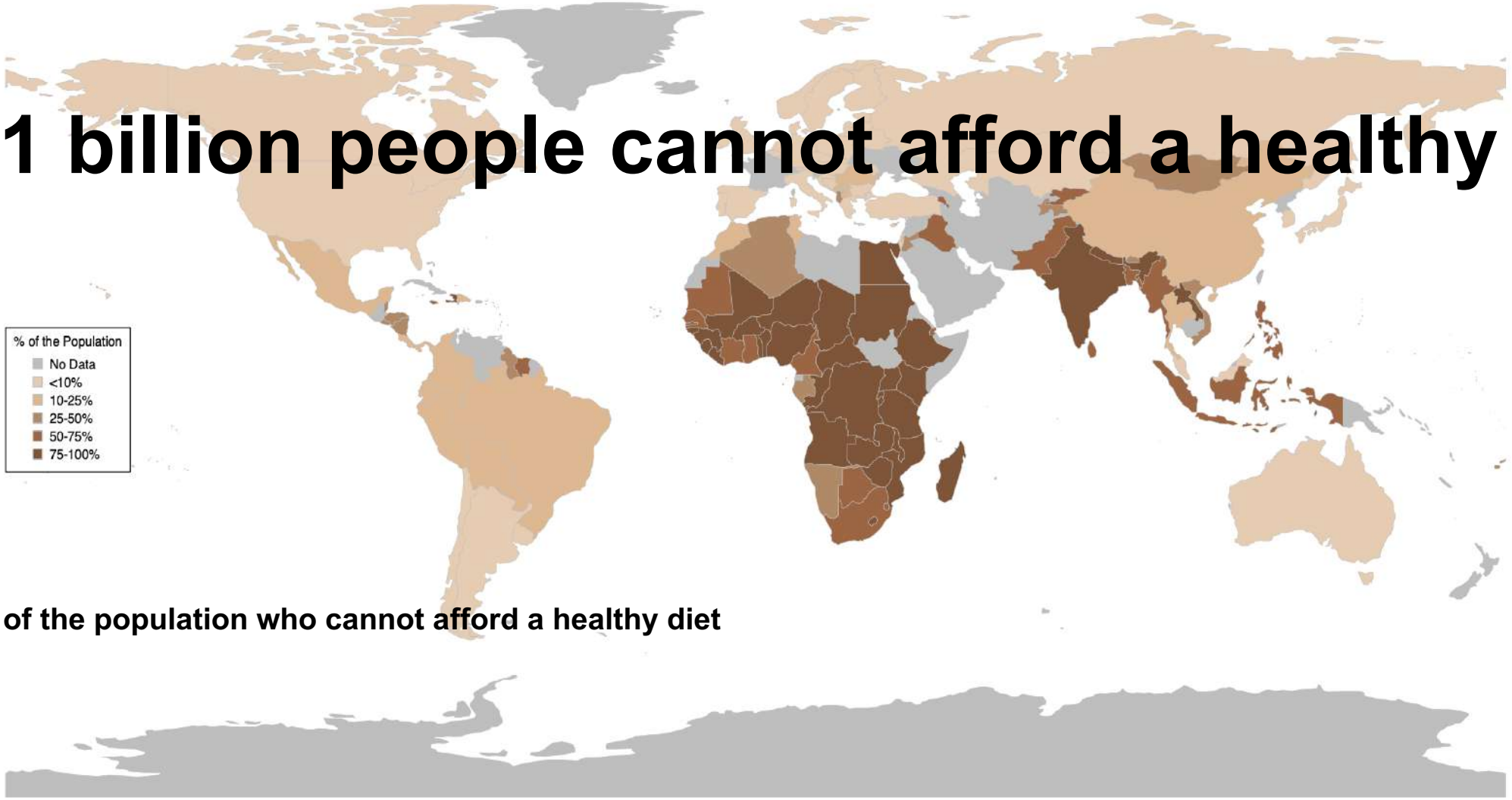




Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., ... & Murray, C. J. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The lancet*, *393*(10170), 447-492.

Inequities are deepening

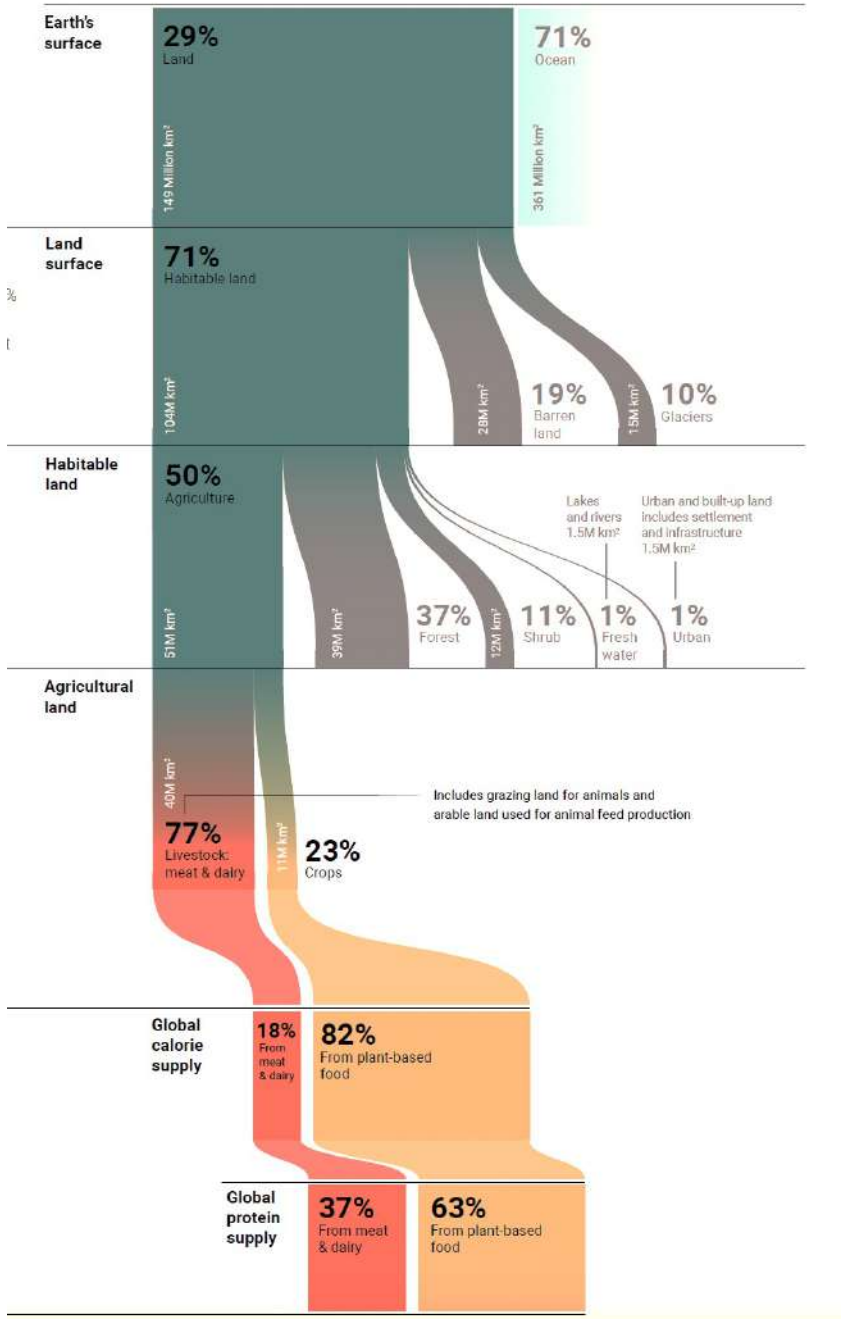
3.1 billion people cannot afford a healthy diet!



% of the population who cannot afford a healthy diet

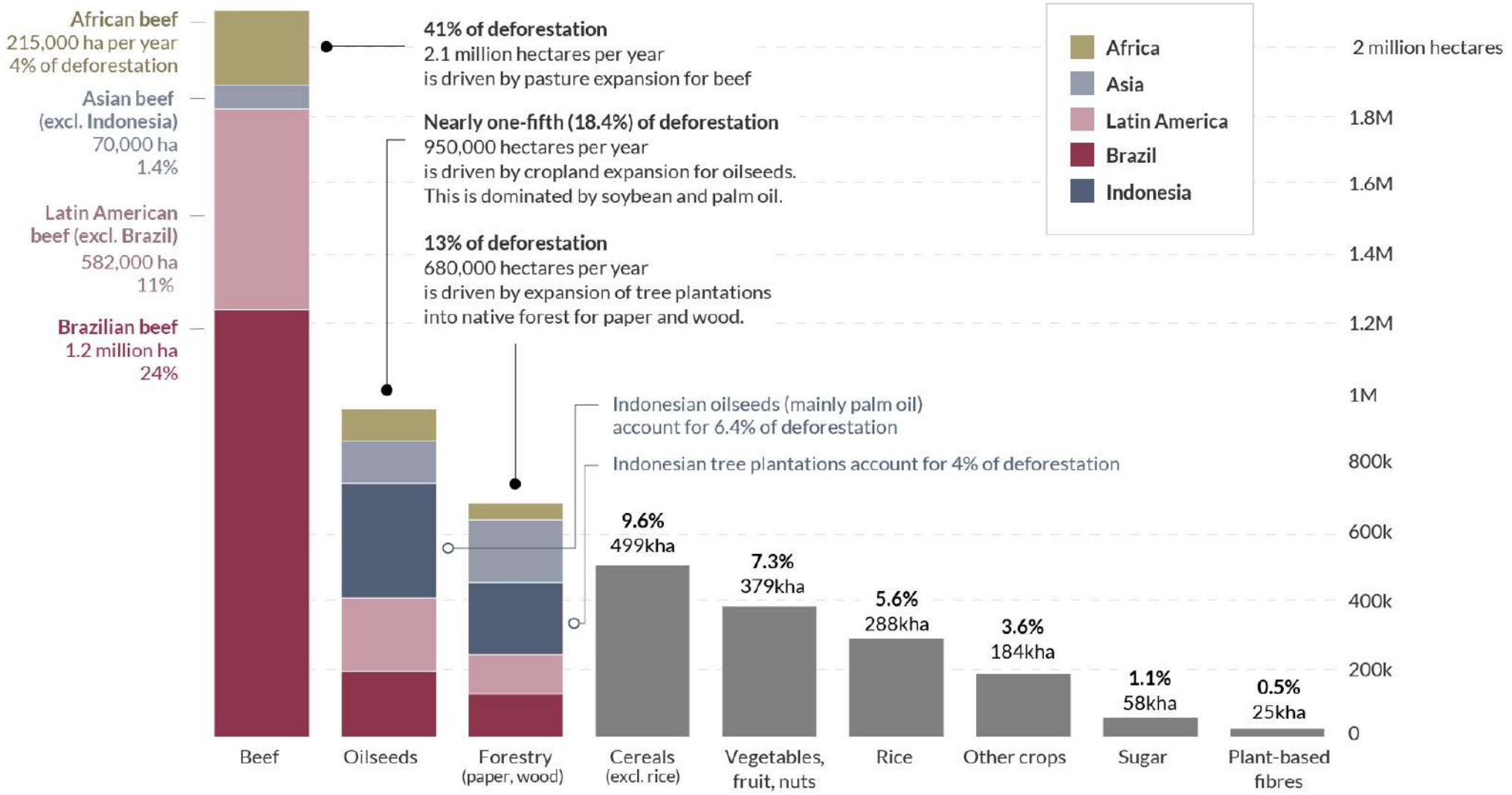
FAO, IFAD, UNICEF, WFP and WHO. 2020. The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets. Rome, FAO.

2. How do we best use finite resources when we still have hunger?



Food and Agriculture Organization of the United Nations (2023). FAOSTAT Database. Figure in: United Nations Environment Programme (2023).Frontiers 2023. What's Cooking? An assessment of the potential impacts of selected novel alternatives to conventional animal products. Nairobi. https://doi.org/10.59117/20.500.11822/44236.

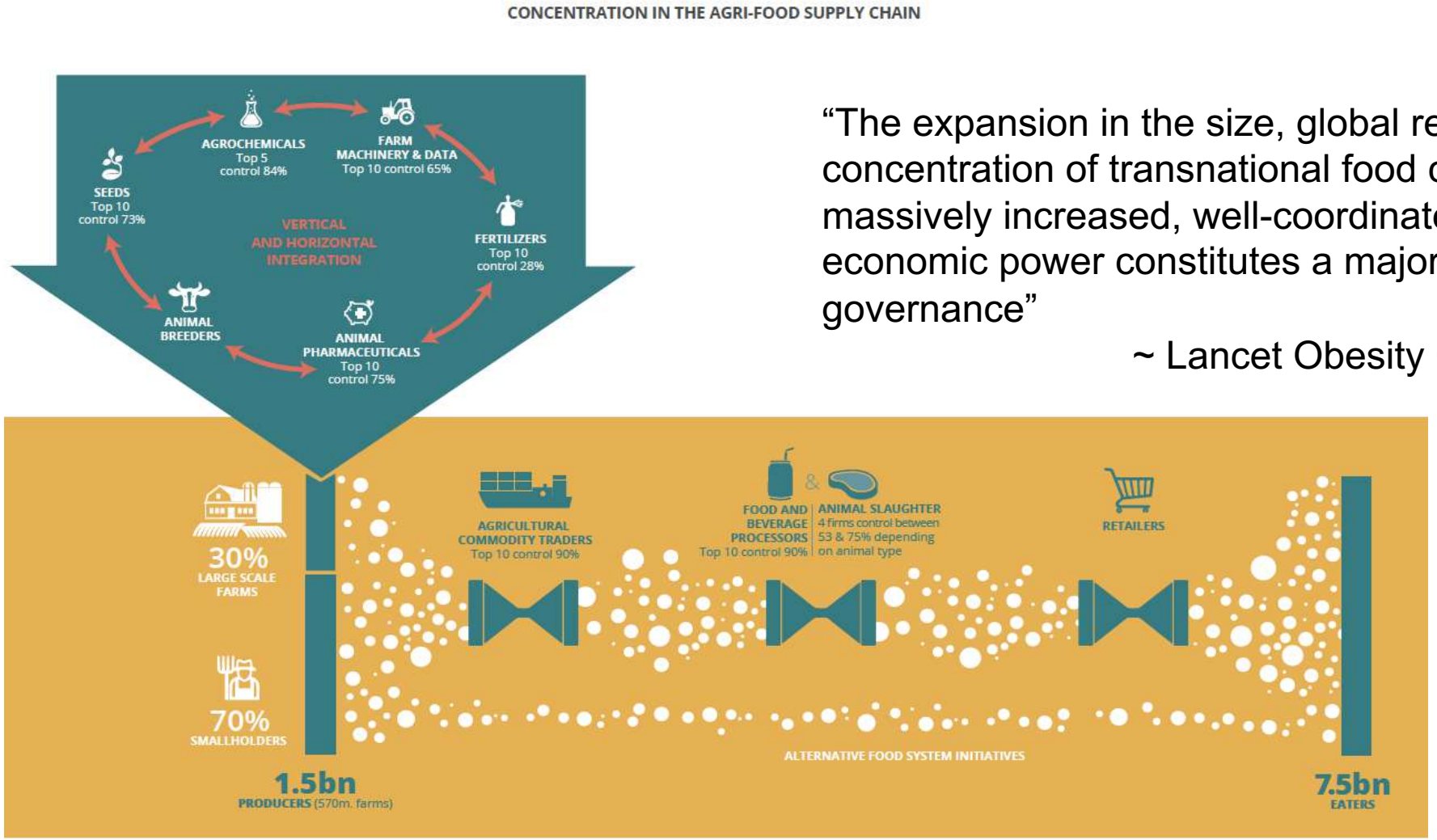
Conversion drivers of tropical deforestation, 2005 to 2013



Data source: Florence Pendrill et al. (2019). Deforestation displaced: trade in forest-risk commodities and the prospects for a global forest transition.

OurWorldinData.org – Research and data to make progress against the world's largest problems.

3. *Who* shapes and ”governs” food systems?

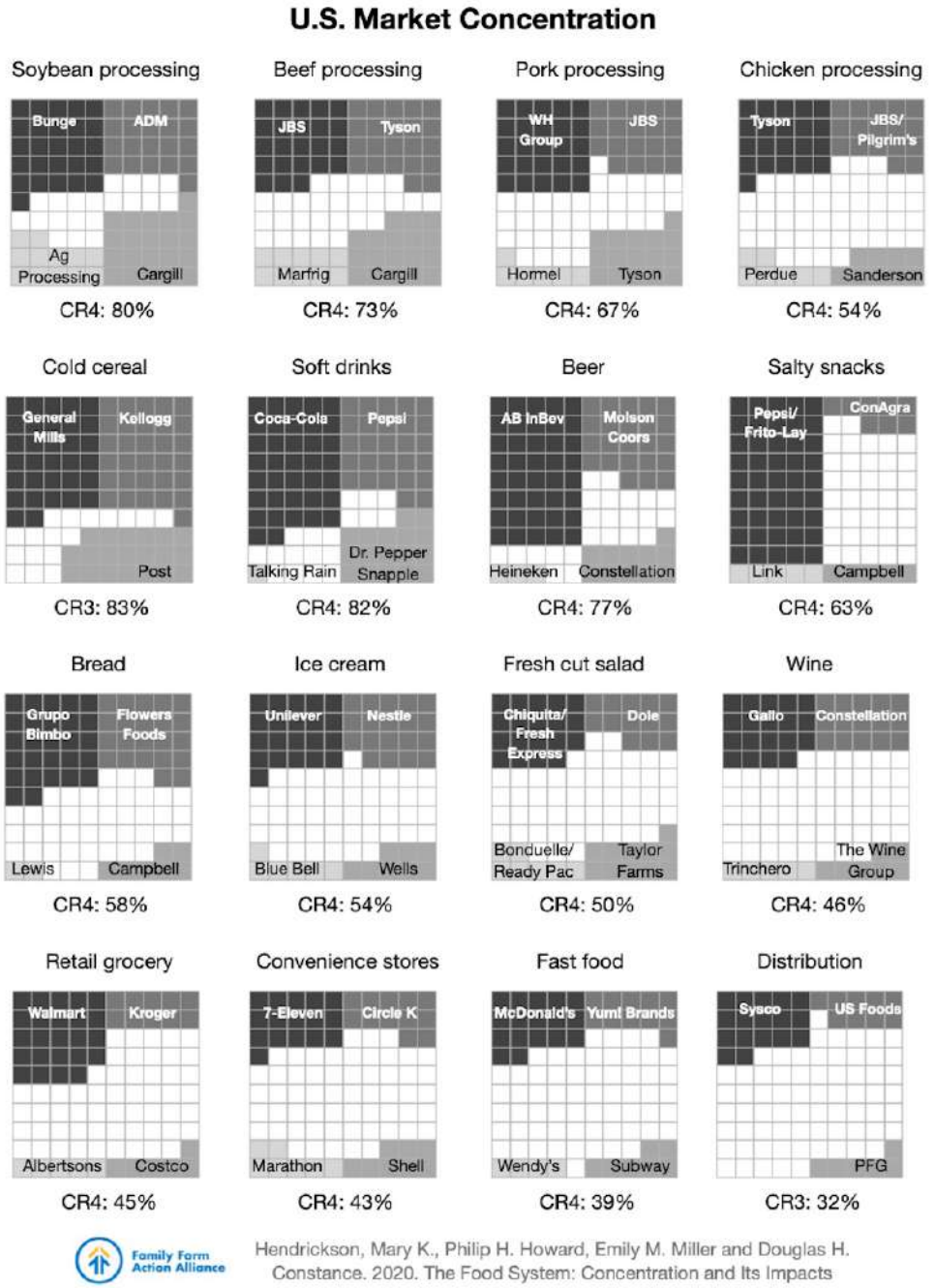


“The expansion in the size, global reach, and concentration of transnational food corporations and their massively increased, well-coordinated, political and economic power constitutes a major challenge to governance”

~ Lancet Obesity Commission, p27

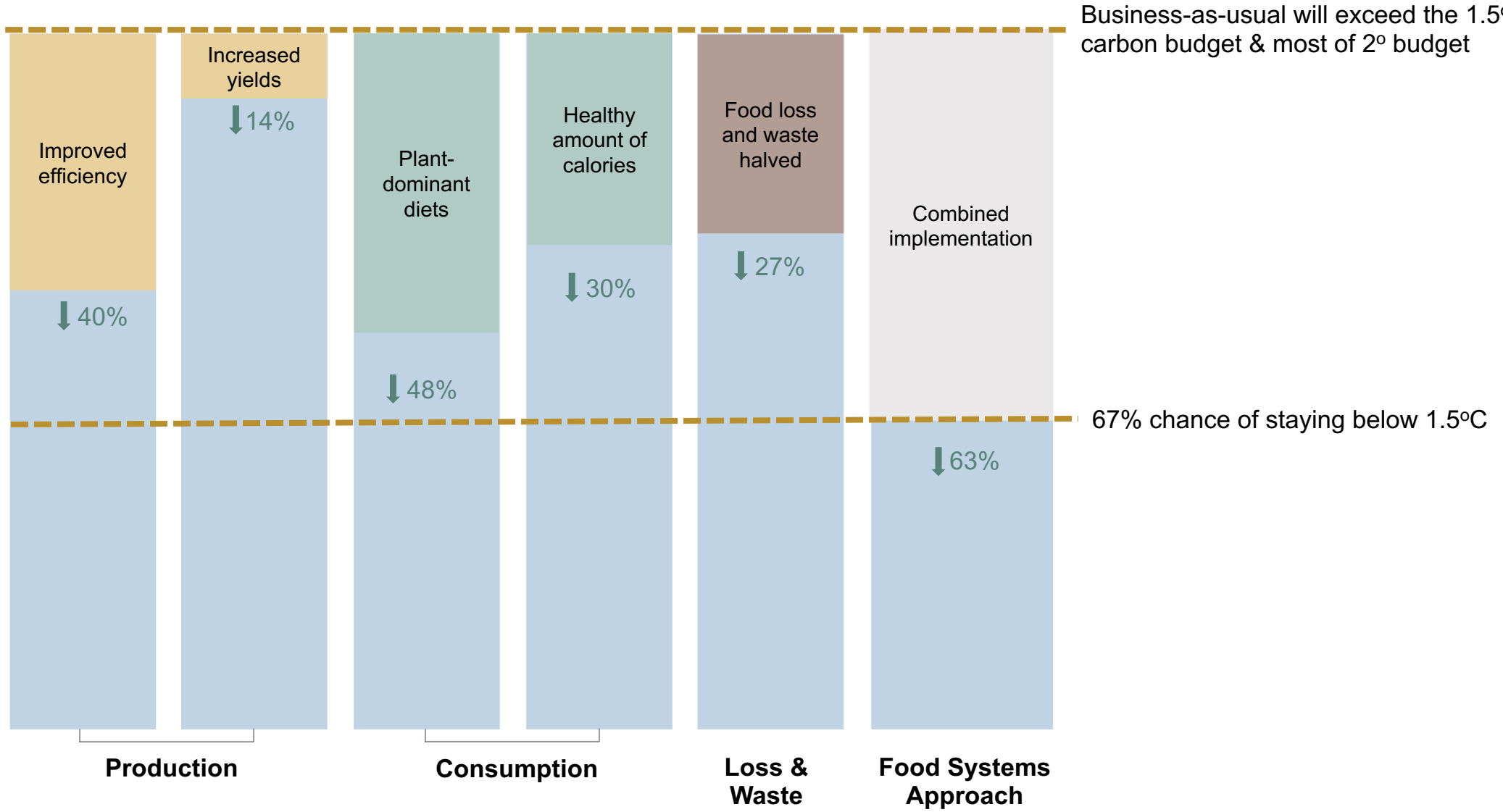
IPES-Food. 2017. Too big to feed: Exploring the impacts of mega-mergers, concentration, concentration of power in the agri-food sector. www.ipes-food.org;

The combined share of sales for the top four firms (CR4) for selected U.S. commodities, food processing/manufacturing and distribution/retail channels.



How do we ensure inclusive diets within planetary boundaries?

Achieving the Paris climate change targets requires multi-level food systems action



Clark, M.A., et al 2020. Global food system emissions could preclude achieving the 1.5 and 2 C climate change targets. *Science*, *370*(6517), pp.705-708.

It is not just one thing – it has to be a host of policies and interventions across food systems

Agricultural production

- **Diversification** - Incentives for horticulture and crop diversification
- **Adaptation** - Crop insurance and access to credit
- **Technology** - Investment in R&D and technology
- **Subsidies -** Policies that promote nutritious crops

Processing & Transport

- **Reformulation** - healthier ingredients in food processing
- **Standards** – setting standards in food (salt, fat quantity in meat)
- **Fortification** - adding nutrients to staple foods
- **Processing** - fermenting, preserving, processing to enhance the nutritional content of foods
- **Cold chain storage and transport** – ensuring perishable foods do not rot and are safe for sale to avoid loss

Food environments

- **Economic incentives** – taxing unhealthy foods and subsidizing healthy foods
- **Access innovations –** remove barriers and facilitate to access (e.g. junk food free check-outs), zoning laws
- **Reaching youth -** Farm-to-school programs, school meal programs, school gardens
- **Community cohesion -** Community gardens and farms

Labeling and Promotion

- **Labels -** Improved labeling (leads to product reformulation)
- **Advertising -** Restrictions on food marketing
- **Messages -** Mass media campaigns

Haddad, L., Hawkes, C., Waage, J., Webb, P., Godfray, C., & Toulmin, C. (2016). Food systems and diets: Facing the challenges of the 21st century.

1. Provide *adaptation* support & tools for food system actors

Number of people who work in food systems = 4.5 billion

Small farms (≤20 ha) produce more than 75% of food in SSA, SA, and SEA

53-81% of micronutrients are produced on diverse agricultural landscapes

- For small-scale farmers and other food actors, providing innovative tools & information to adapt is key so they can produce nutritious foods and get them to markets in places where these foods can be grown
- For large-scale actors, incentivize them to produce nutritious, sustainable, cheap and convenient foods
- Invigorate youth to work and invest in food systems and learn from our elder food system experts

Fanzo et al 2021 Food Policy; Herrero et al 2017 LPH

2. Promote stronger governance of food environments & actors for better access & information

53 countries have introduced a tax on SSBs

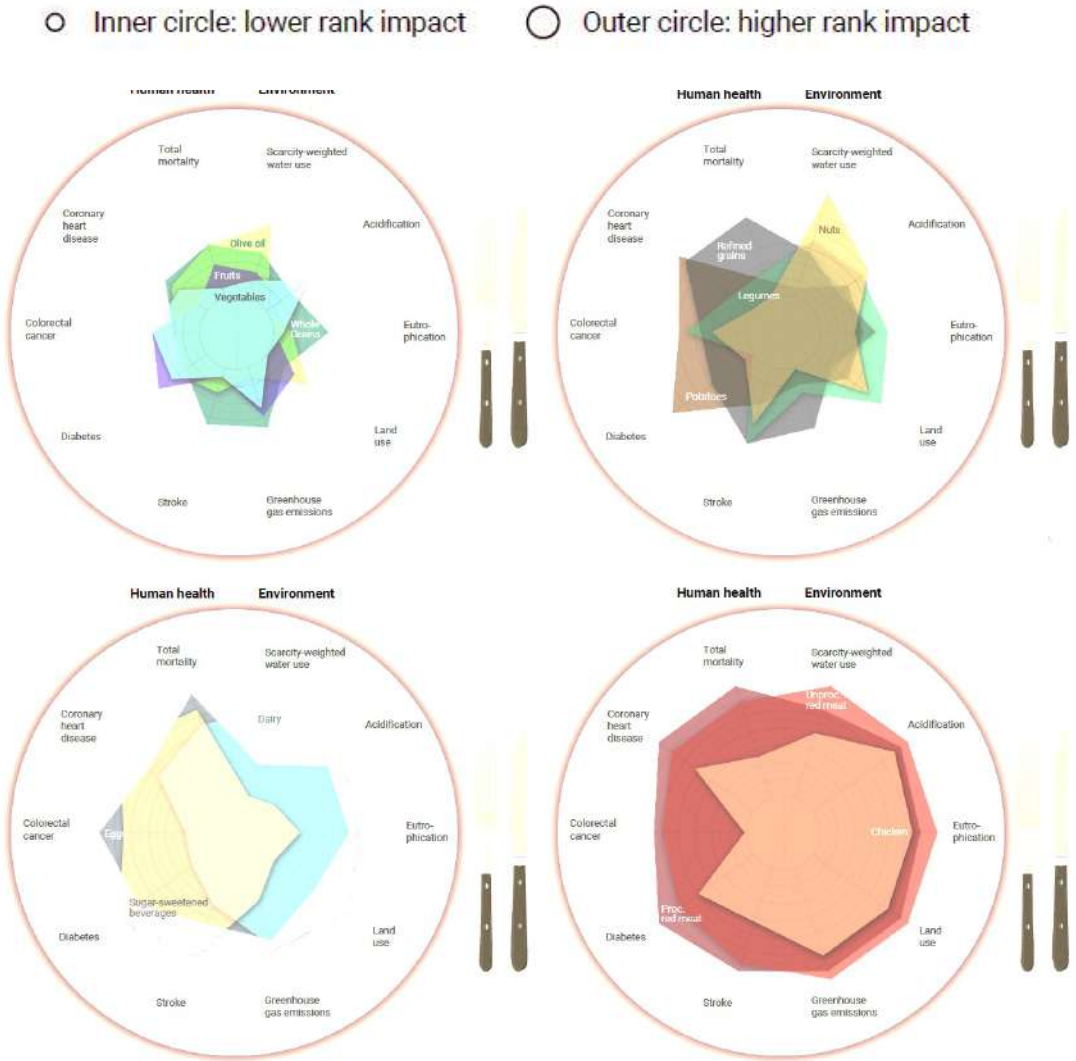
90 countries have a food-based dietary guideline

85 countries have a school meal program

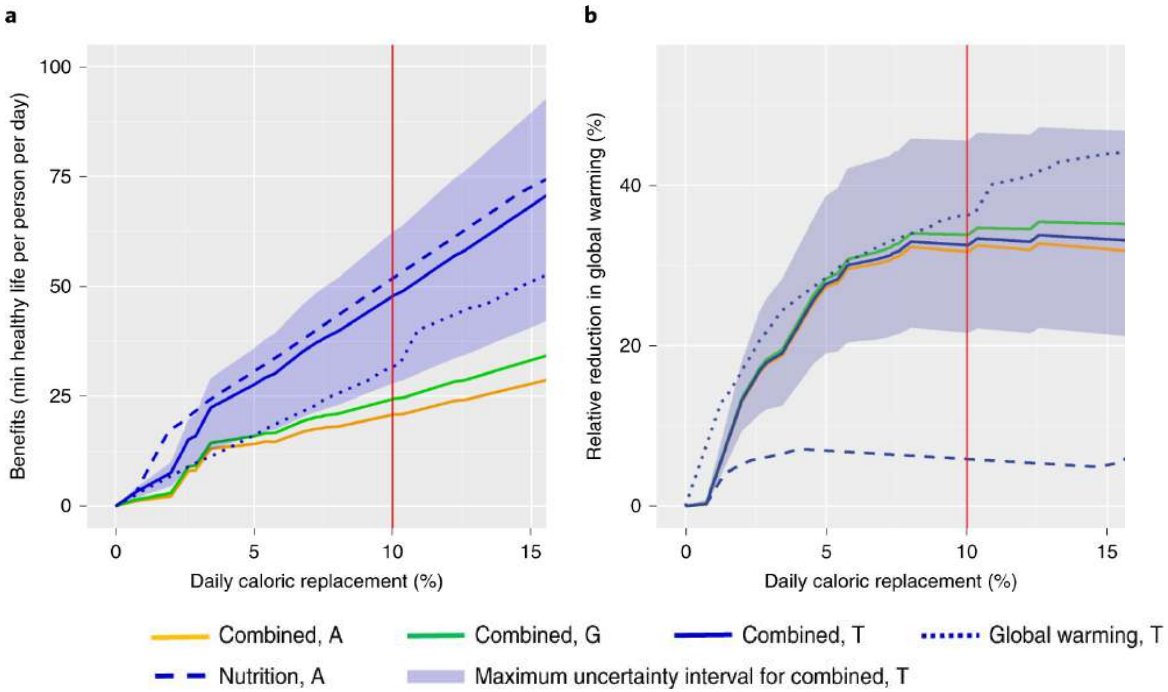
- Increase food access to diverse and nutritious food at local levels and in public institutions
- Introduce regulations to incentivize sustainable food choices through lower prices and disincentivize unhealthy and unsustainable foods through taxation
- Support policy measures and awareness programs to engage and involve consumers to encourage healthy and sustainable diets

The Global Survey of School Meal Programs, 2019; WHO 2022; Herforth et al 2020

3. Incentivize changes in demand towards healthy diets



Substituting 10% of daily caloric intake from beef and processed meat for fruits, vegetables, nuts, legumes and selected seafood provides health improvements of 48 min gained per person per day and a 33% reduction in dietary carbon footprint.



Stylianou, K.S., et al 2021. Small targeted dietary changes can yield substantial gains for human health and the environment. *Nature Food*, *2*(8), pp.616-627.

4. Improve *national* food system decision-making with better food systems science

- Food system transformation is urgent, requiring rigorous, science-based monitoring to guide public and private decisions and support those who hold decision-makers to account.
- Yet, policymakers are often in the dark on how food systems are performing, potential near- and long-term risks, and where to intervene.
- We are developing global guidance & better data tools, metrics, and models to unpack some of the most complex food systems science issues.

Food Systems Dashboard

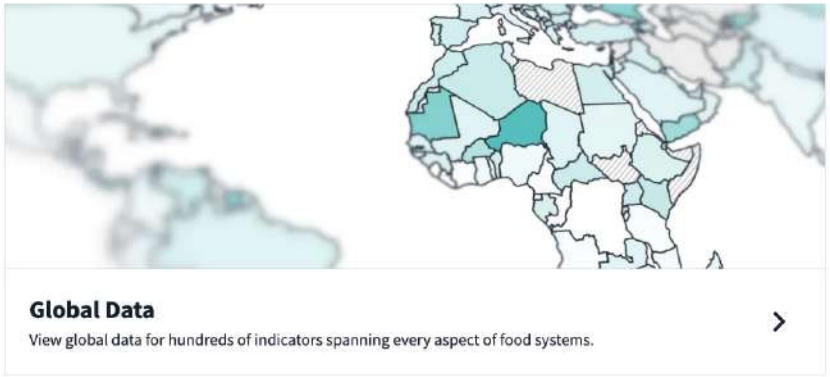
Food Systems Countdown Initiative

Ensure evidence and data helps policymakers make informed decisions

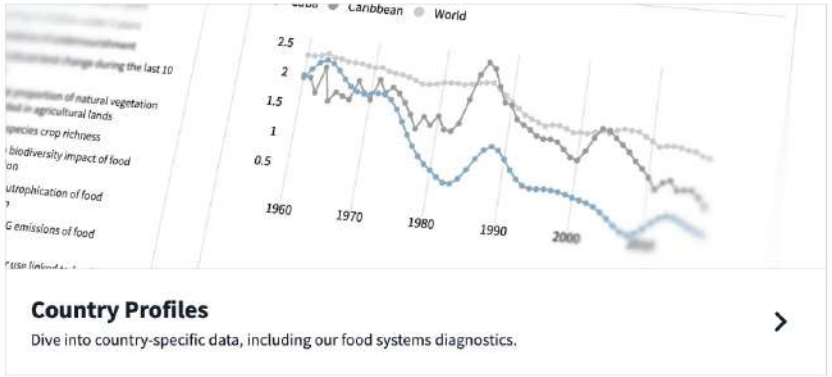
Food Systems Dashboard

foodsystemsdashboard.org

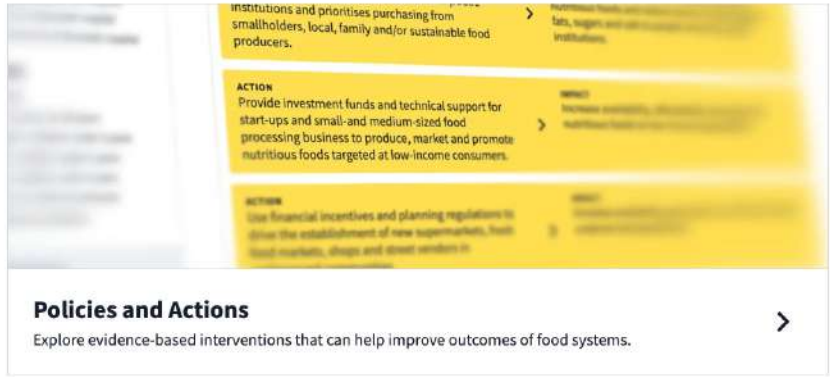
The Food Systems Dashboard gives a complete view of food systems by bringing together data from multiple sources. It's now possible to compare drivers, components, and outcomes of food systems across countries and regions, gain insights into challenges, and identify actions to improve nutrition, health, and environmental outcomes.



Global Data
View global data for hundreds of indicators spanning every aspect of food systems.



Country Profiles
Dive into country-specific data, including our food systems diagnostics.



Policies and Actions
Explore evidence-based interventions that can help improve outcomes of food systems.

Describe → Diagnose → Decide

Fanzo, J., et al 2020. The Food Systems Dashboard is a new tool to inform better food policy. *Nature Food*, *1*(5), pp.243-246.

Monitoring food systems contributes to accountability and action

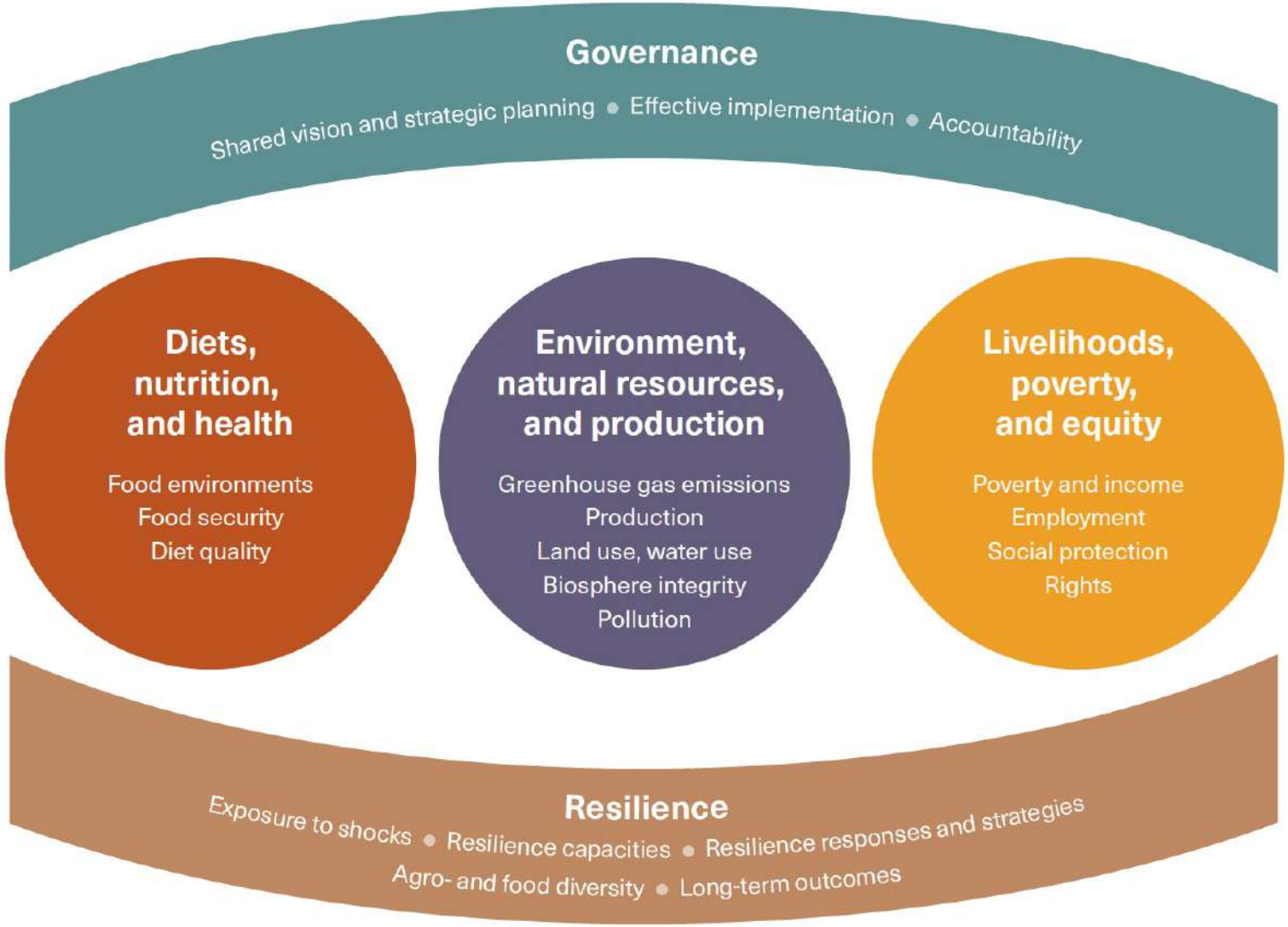
Food Systems Countdown Initiative

- **The Food Systems Countdown Initiative** is a collaborative effort to monitor food system change and performance over the next 8 years.
- Such monitoring can help aligning decision makers around key priorities, incentivize action, hold stakeholders accountable, sustain commitment by demonstrating progress, and enable course-corrections.
- The FSCI is an interdisciplinary collaboration of 65 scientists representing every region of the world from 32 organizations -- Civil Society, Academia and the UN that emerged from the 2021 United Nations Food Systems Summit.

foodcountdown.org

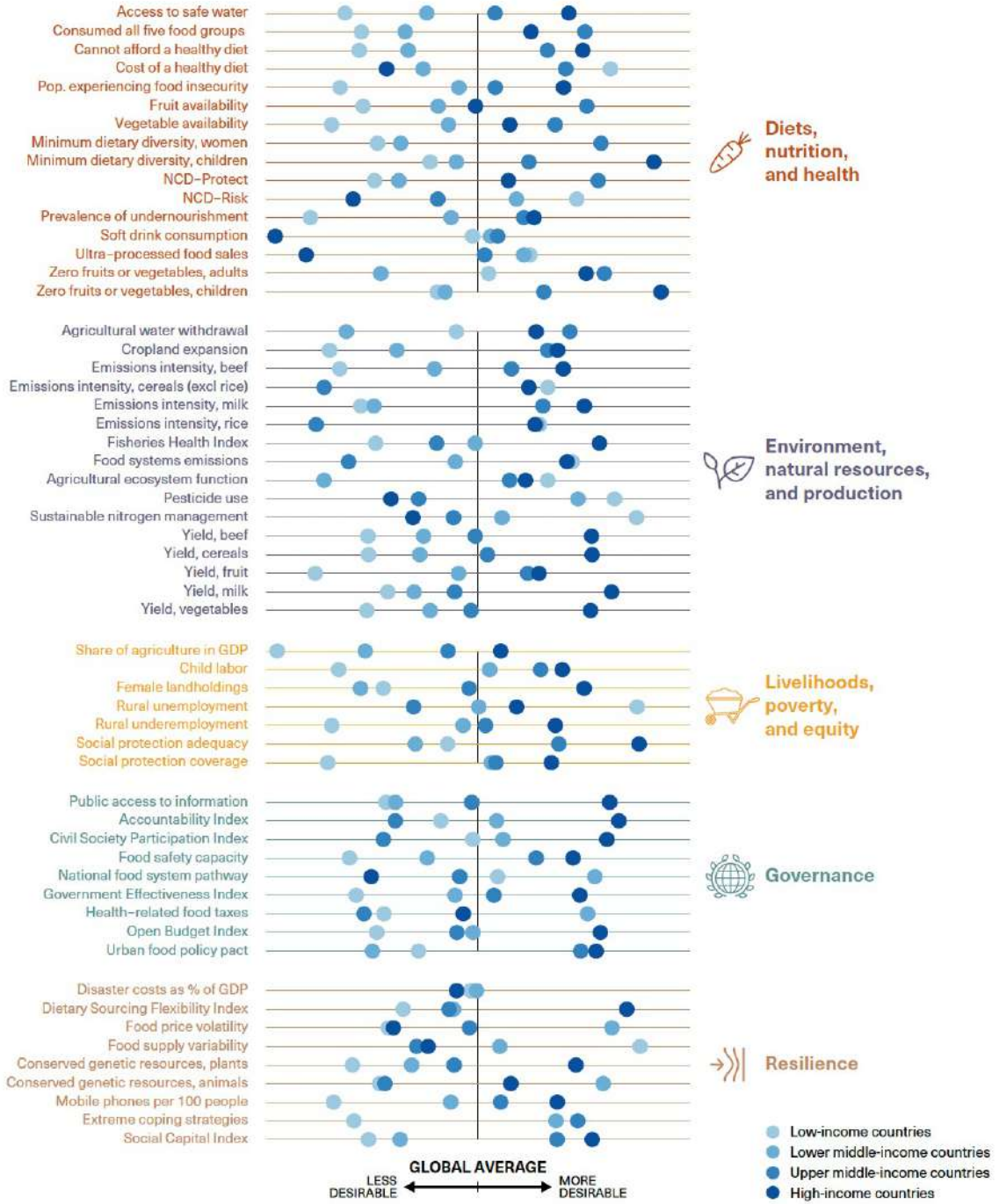
Fanzo, J., et al 2021. Rigorous monitoring is necessary to guide food system transformation in the countdown to the 2030 global goals. *Food Policy*, *104*, p.102163

How the FSCI is organized

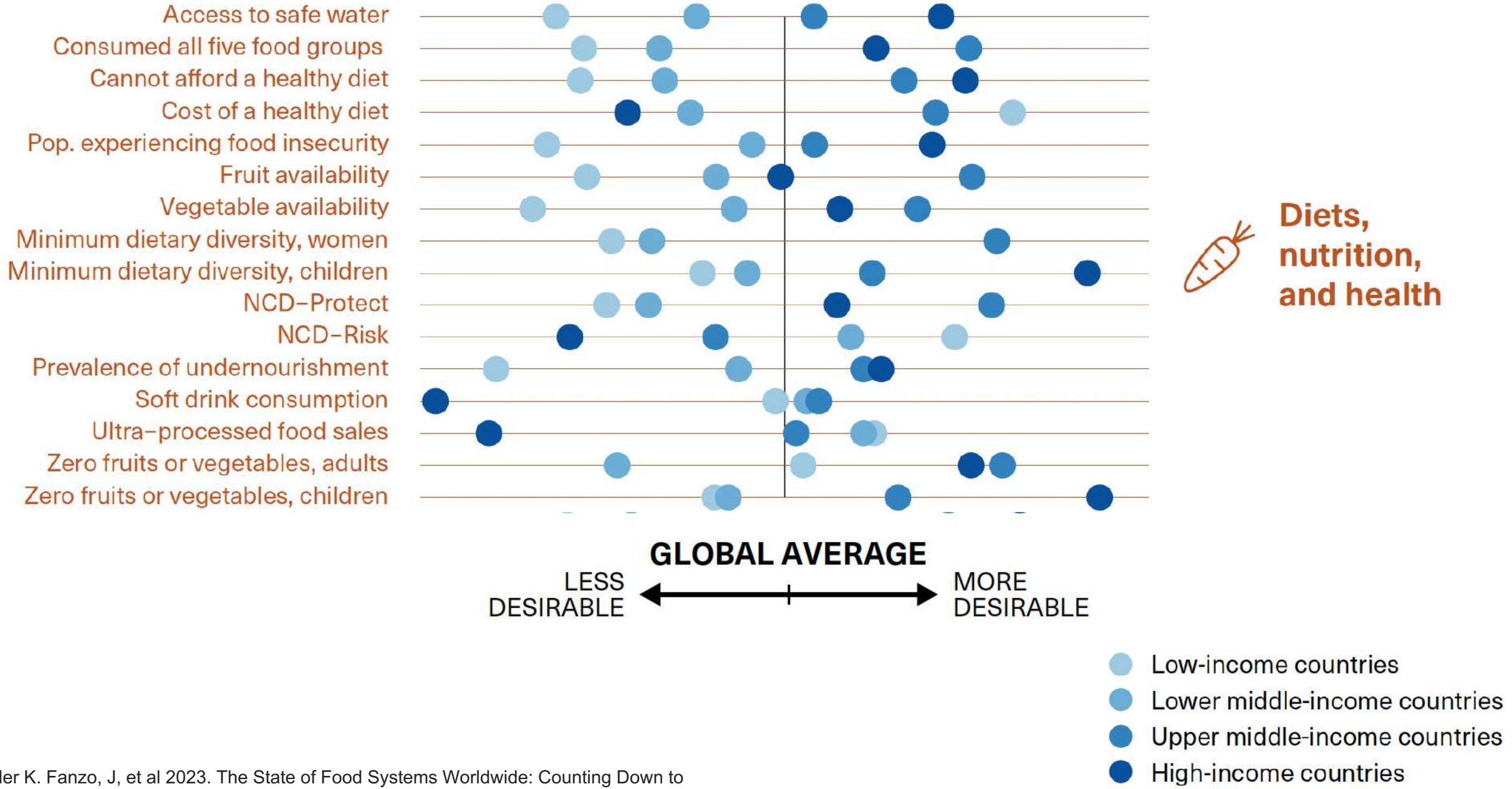


Fanzo, J., et al 2021. Rigorous monitoring is necessary to guide food system transformation in the countdown to the 2030 global goals. *Food Policy*, *104*, p.102163

Indicator Performance by Country Income Group

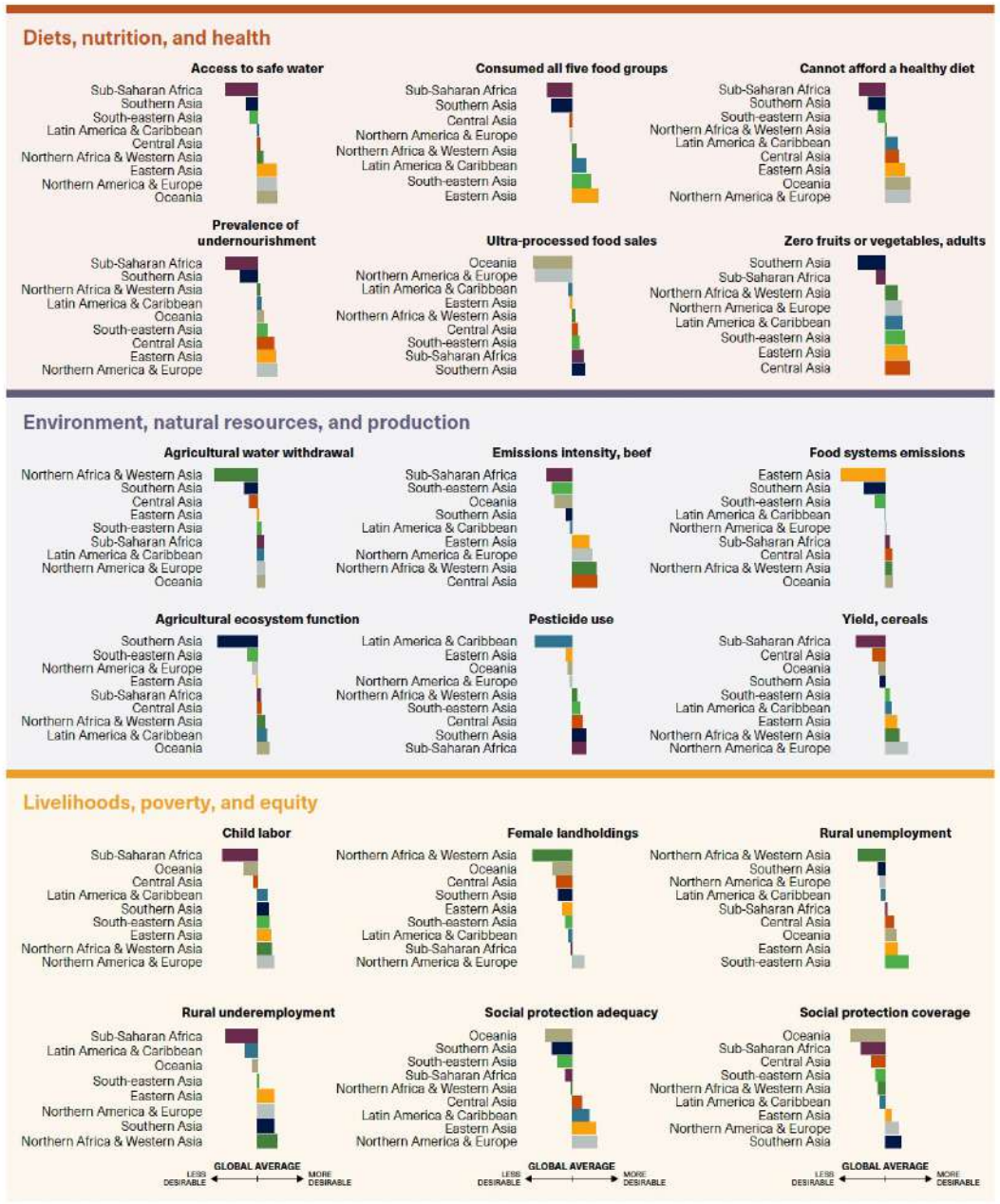


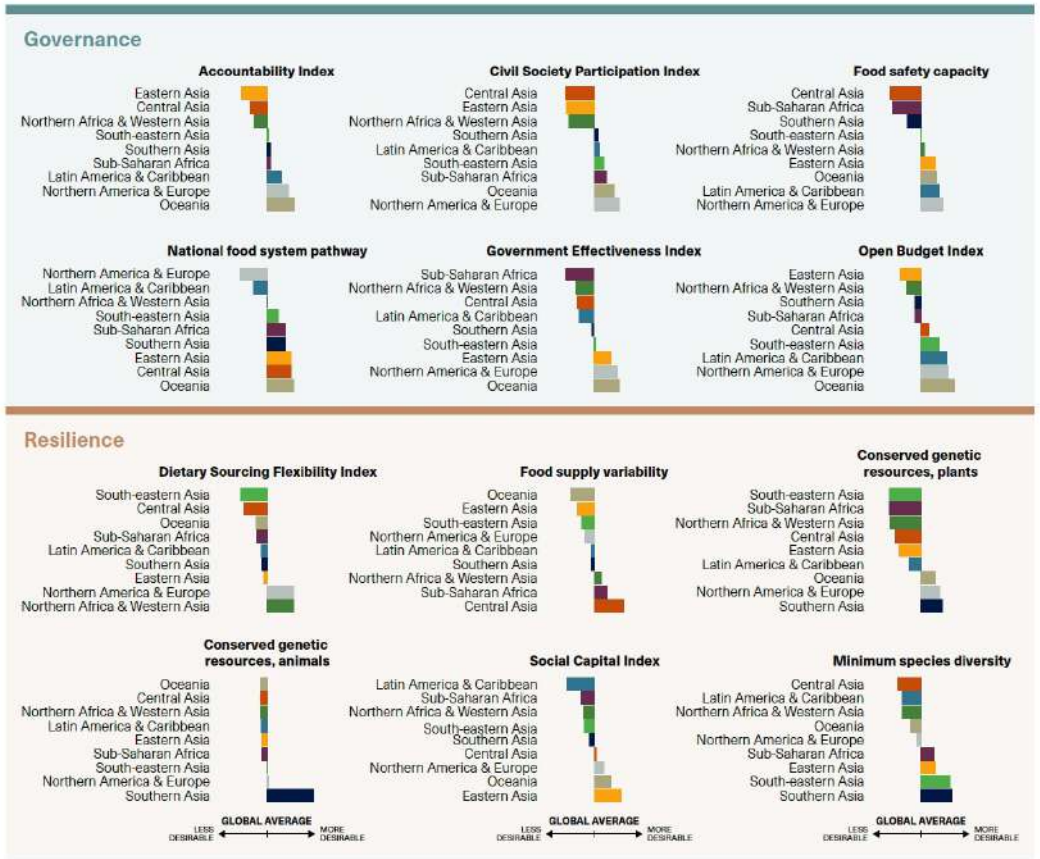
Schneider K. Fanzo, J, et al 2023. The State of Food Systems Worldwide: Counting Down to 2030. Preliminarily accepted in Nature Food, to be published Dec 2023.



Schneider K. Fanzo, J, et al 2023. The State of Food Systems Worldwide: Counting Down to 2030. Preliminarly accepted in Nature Food, to be published Dec 2023.

Regional patterns in selected FSCI food system outcome indicators



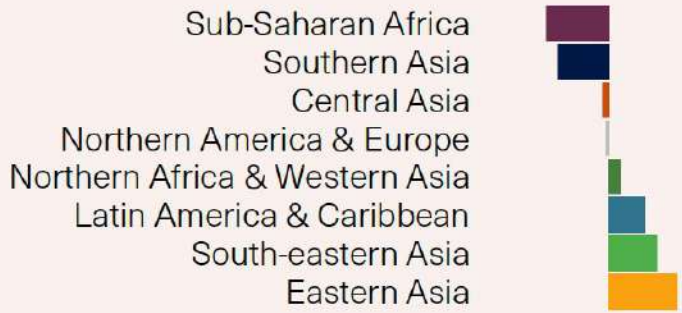


Schneider K. Fanzo, J, et al 2023. The State of Food Systems Worldwide: Counting Down to 2030. Preliminarly accepted in Nature Food, to be published Dec 2023.

Diets, nutrition, and health

Access to safe water

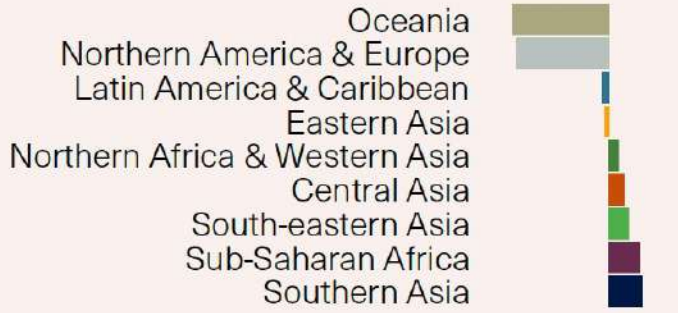
Consumed all five food groups



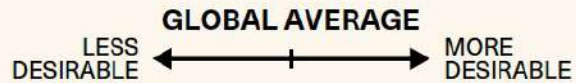
Cannot afford a healthy diet

Prevalence of undernourishment

Ultra-processed food sales



Zero fruits or vegetables, adults



Lessons from the national food systems science level

- No single region of the world has a monopoly on food systems successes or on food systems challenges. Every region has significant room for improvement and countries can learn from each other.
- Without a monitoring system that shows strengths and weaknesses at the national level, country attempts to transform their food systems will lose their bearings and lose their way.
- There are critical data gaps that are preventing to effectively monitor progress of food systems transformation in different dimensions. Efforts and investments should be made in the near term to fill existing data gaps.
- Researchers should ensure these indicators and their data are useful and interpretable by policymakers and other food actors in ways that are relevant for food system decisions and action.

Thank you!

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