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How to Nourish the World Sustainably

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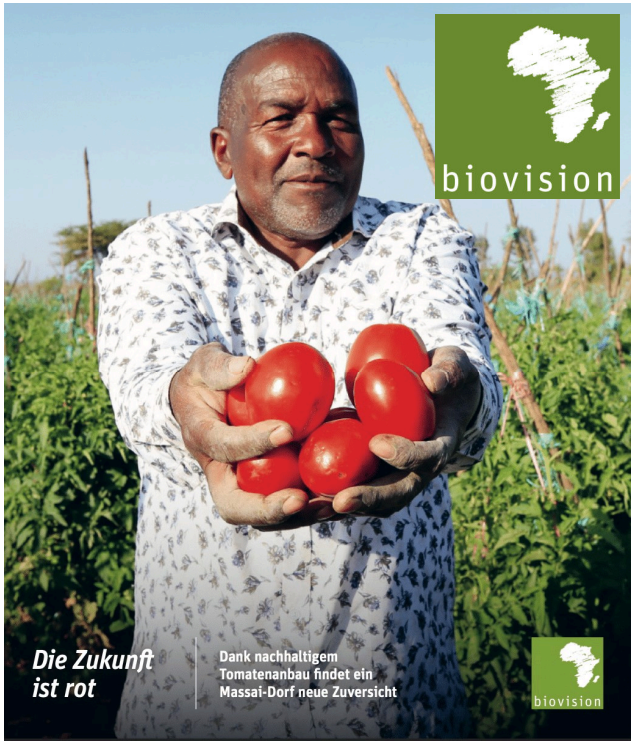
Biovision

Für einen gesunden Planeten dank nachhaltiger Ernährung und ökologischer Entwicklung

MAS ETH in Global Cooperation and Sustainable Development

CAS ETH in Global Cooperation and Sustainable Development



Agenda

- Overview: Food – Where People and Planet Meet
- Levers of Change
- Examples

Overview - Current State of Agriculture, Food and Nutrition Security

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Agriculture is where people and planet meet – uses 45% of habitable land

Harvesting teff on the, Amhara Plateau, Ethiopia
Smallholders

Mexican & Guatemalan immigrants harvesting organically-grown squash in Florida, USA.

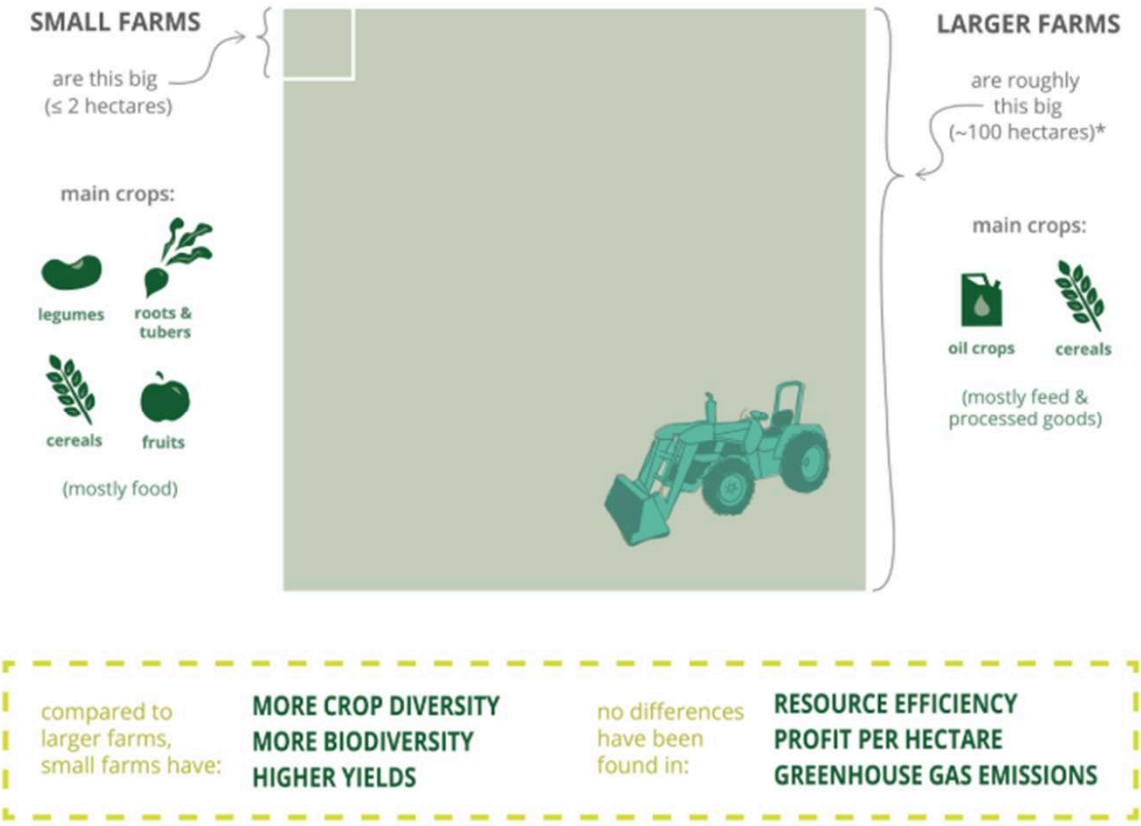
Aerial view of greenhouses illuminated with artificial lights to extend the growing season of tomatoes and flowers near Rotterdam, Netherlands

Images: www.georgesteinmetz.com

80% of agricultural land is used for livestock & animal feed

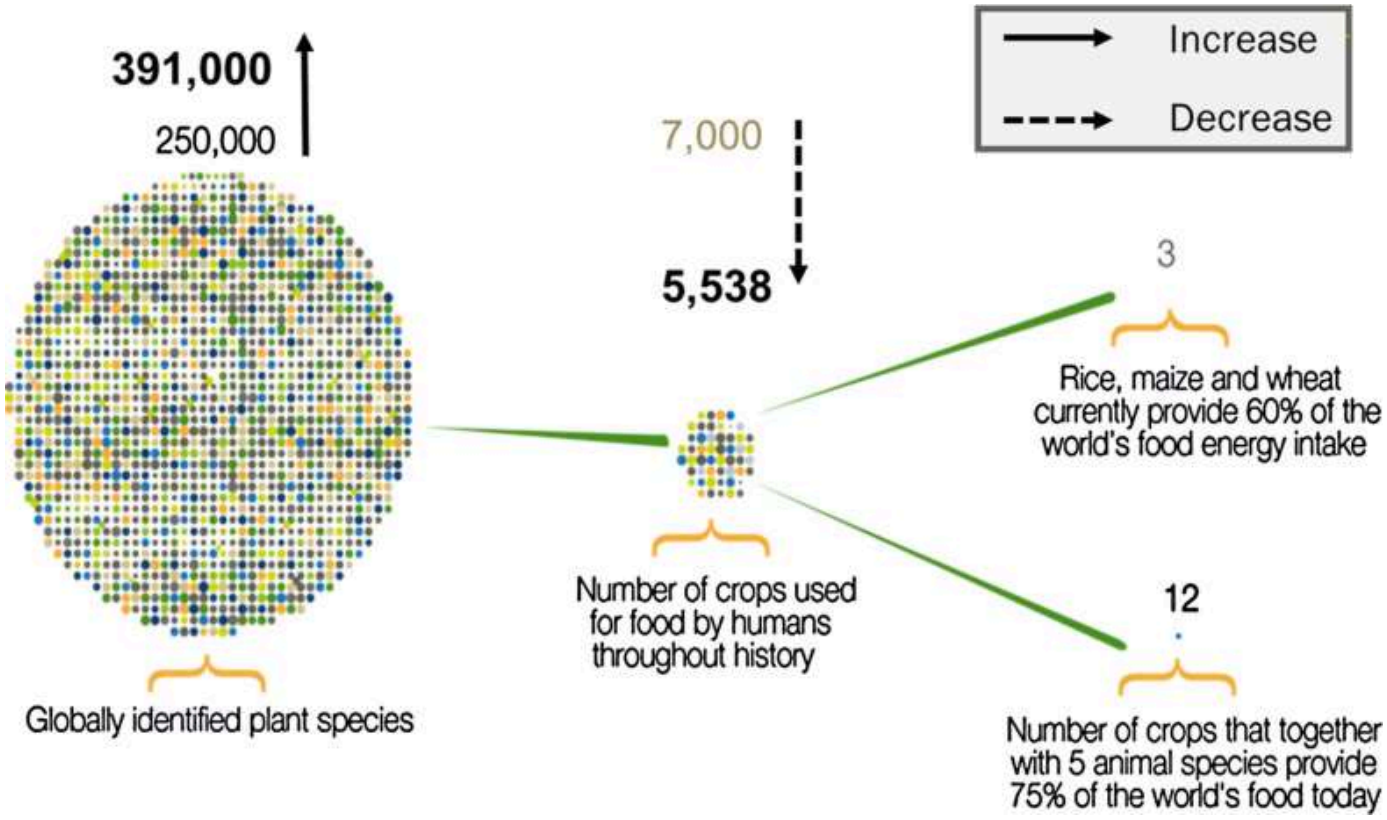
George Steinmetz, New York Times 2016, The Dizzying Grandeur of 21st Century Agriculture
https://www.nytimes.com/interactive/2016/10/09/magazine/big-food-photo-essay.html

Most farm area is covered by large farms producing oil crops, cereals mostly for feed and processed goods



Ricciardi, Mehrabi, James & Ramankutty, Systematic Review & Meta-analysis, Nature 2019

These patterns and proportions show up on our plates

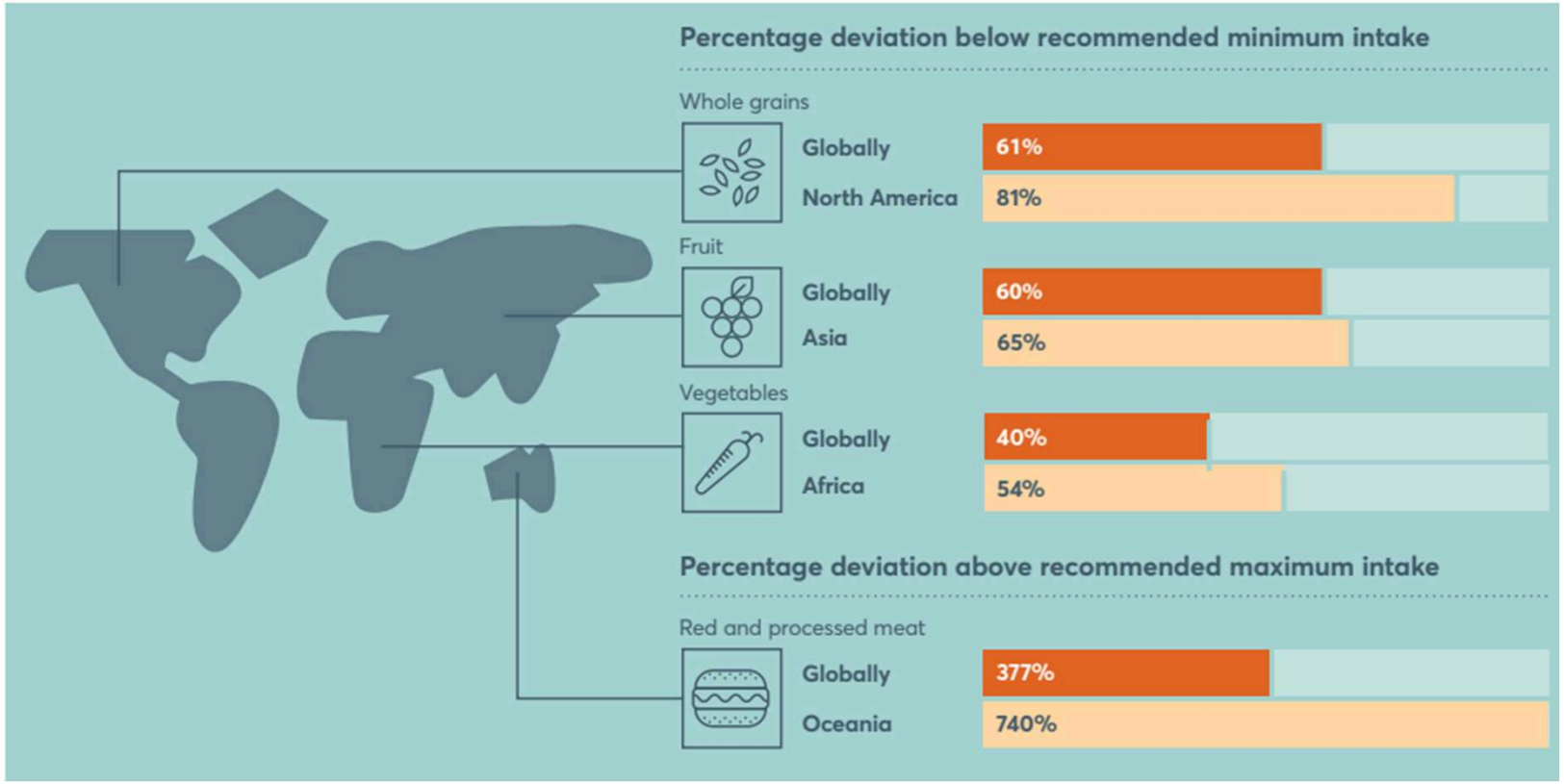


Numbers are estimates for the period 1995 – 2000 compared to 2016

12 Crops + 5 Animal Species = 75% of the world's food: sugar, maize, rice, wheat, potatoes, soybeans, cassava, tomatoes, banana, onions, apples, and grapes (wine), milk, chicken, eggs

FAO 1995, Dimensions of Need: An Atlas of Food & Agriculture, Kew 2016, Bioversity International, 2020

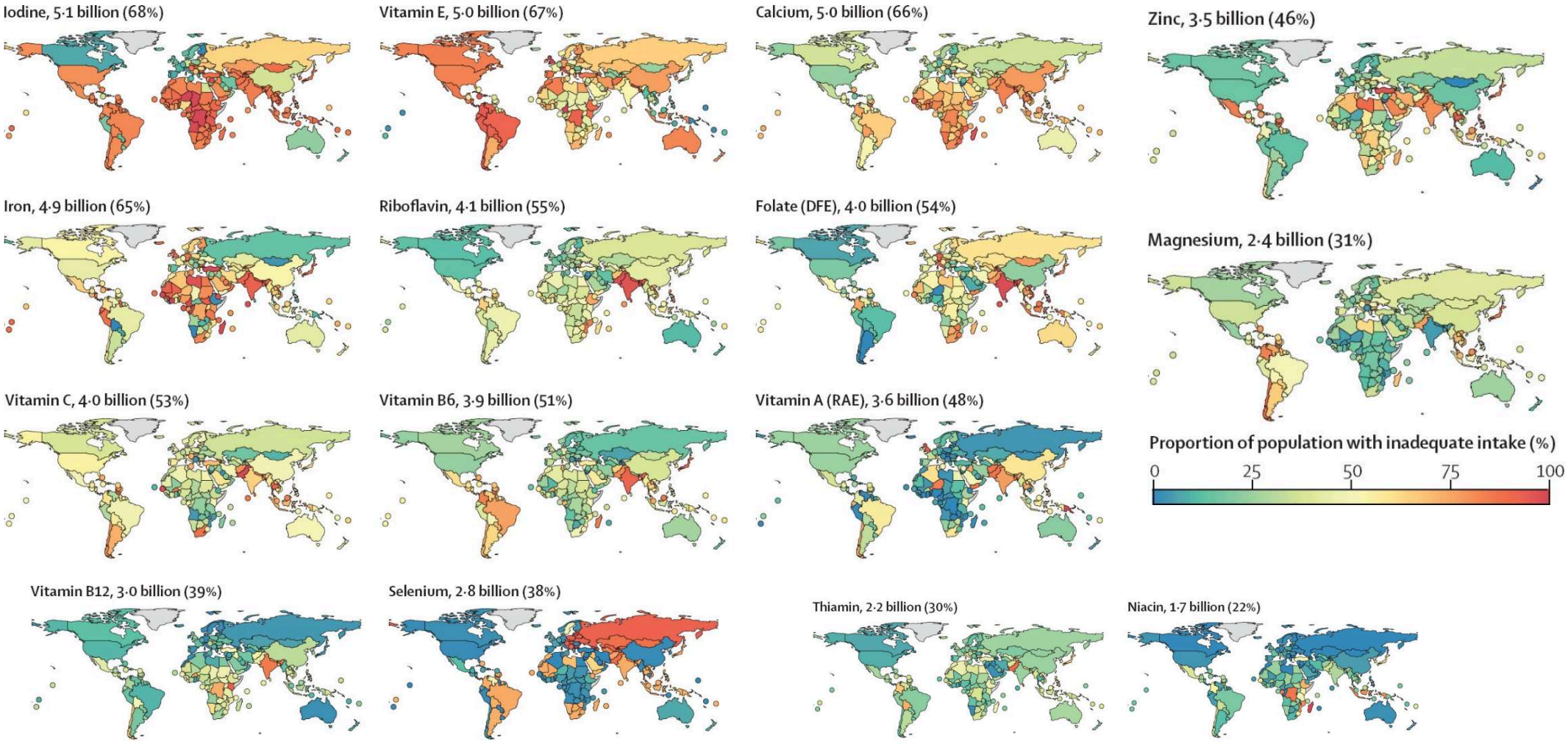
No region meets the WHO recommendation for a healthy diet



- Approx. 3 billion affected by hidden hunger
- 2 billion adults are overweight
- 150 million children are stunted (low height for age)
- Nearly half of deaths of children < 5 yrs are linked to undernutrition.
- 571 million women & girls are anemic

Global Nutrition Report, 2021

Inadequate intake of essential micronutrients is a global problem



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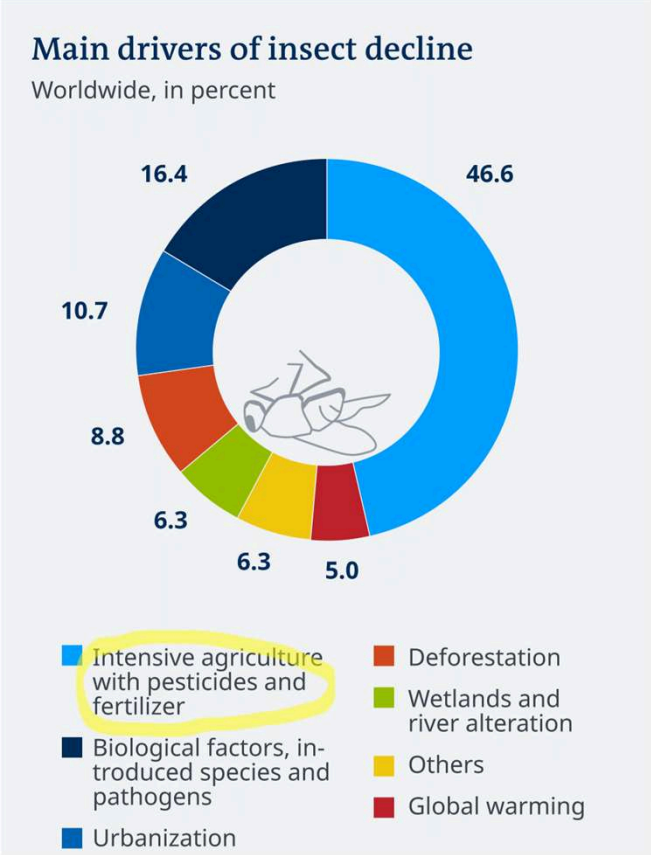
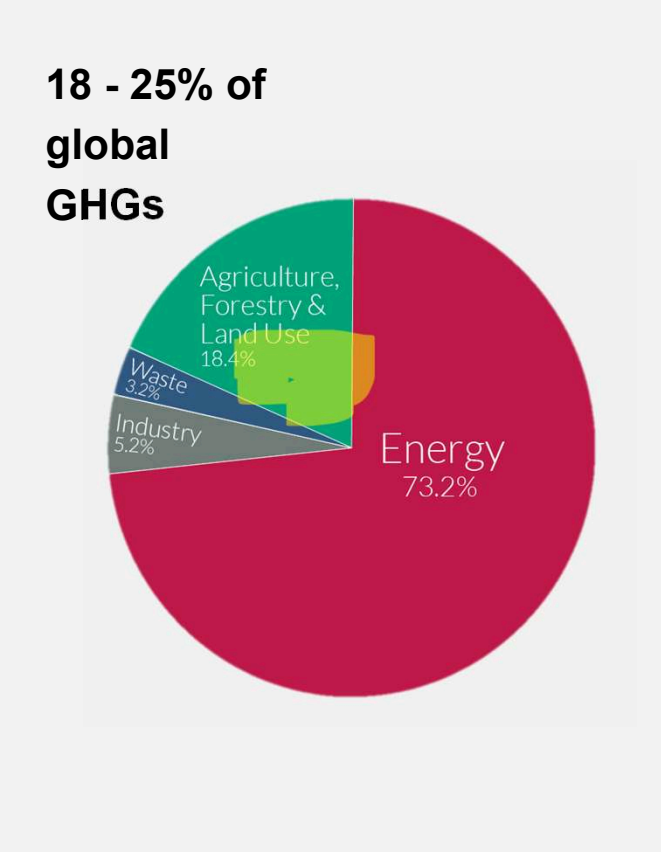
Global estimation of dietary micronutrient inadequacies: a modelling analysis, Passarelli et al, Lancet Global Health Oct 2024

Environmental impacts of agriculture





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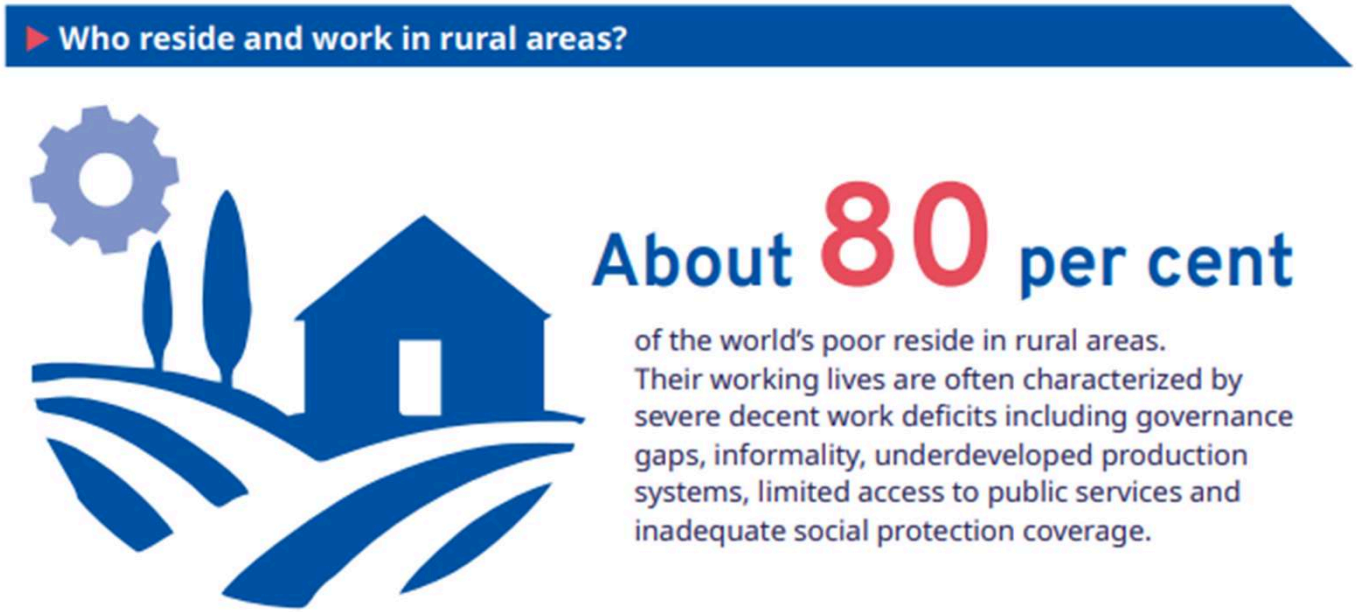
West et al, Leverage Points for Improving Global Food Security and the Environment, Science, 2014
Sanchez-Bayo & Wyckhuys, Biological Conservation, 2019
Our World in Data

Globally, the vast majority of those working in agri-food systems are poor

Across countries, regardless of income level - people working in primary agriculture are likely to be poorer than those working in e.g., food processing or non-food manufacturing.



ESTIMATING GLOBAL AND COUNTRY-LEVEL EMPLOYMENT IN AGRIFOOD SYSTEMS, FAO Working Paper, 2023
Decent work deficits among rural workers: Key findings and recommendations for trade unions

Levers of Change

So, what needs to change?

"…it is biophysically possible to feed 10 billion people **a healthy diet within planetary boundaries…**

Success hinges on triple action at a global scale:

- shifting towards **healthy diets**
- increasing **productivity** while transitioning to **regenerative** production **practices**;
- and reducing **food waste** and **loss** by 50%."

Planet-proofing the global food system, Johan Rockström, Ottmar Edenhofer, Juliana Gaertner, and Fabrice DeClerck, Nature Food, 2020

Why are policies for dietary change crucial?

- Diet is the biggest driver of food-system impacts. Production improvements alone are insufficient to meet our human and planetary health goals.

Production efficiencies can reduce negative environmental impacts by **10–20%**, while dietary shift reduces them by **up to 80%**

“Dietary change can deliver environmental benefits on a scale not achievable by producers.”
— *Poore & Nemecek, Science (2018)*

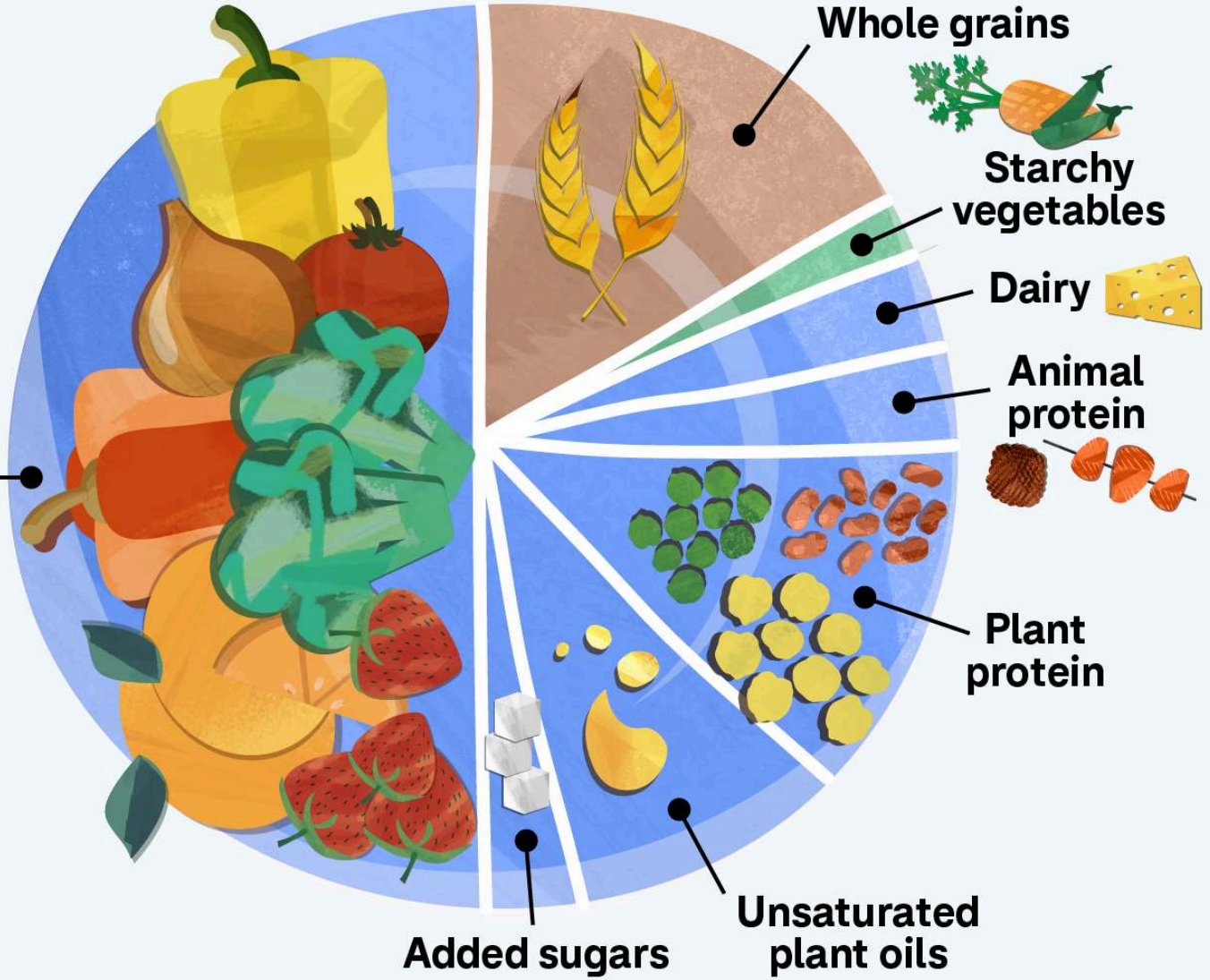
- Demand shapes supply. Without dietary change, producers have little incentive to change.

- Historically (and still), the majority of agriculture & food-related public spending is supply-side focused. E.g., majority of EU CAP spending is direct payments allocated based on amount of agricultural land use

- The contribution of dietary change to sustainable food systems has been downplayed. The «nutrition transition» theory was been interpreted as an inevitable outcome of rising incomes

Planetary Health Diet

EAT Lancet Commission



The Planetary Health Plate,
EAT – LANCET, 2019

A scientific guideline for a diet that is **healthy** for both **people** and **planet**. Based on recommendations from 40 international scientists.

Examples

Drivers of low vegetable consumption in Africa

Africans consume 54% fewer vegetables than recommended by the WHO. Key drivers:

- Low incomes
- High cost of vegetables
  - Low productivity
  - Infrastructure
  - Labour-intensive
- Food safety concerns
- Traditional customs
- Lack of knowledge / education

On average, cereal crops experience **pest & disease losses of 10 - 20%** per harvest.

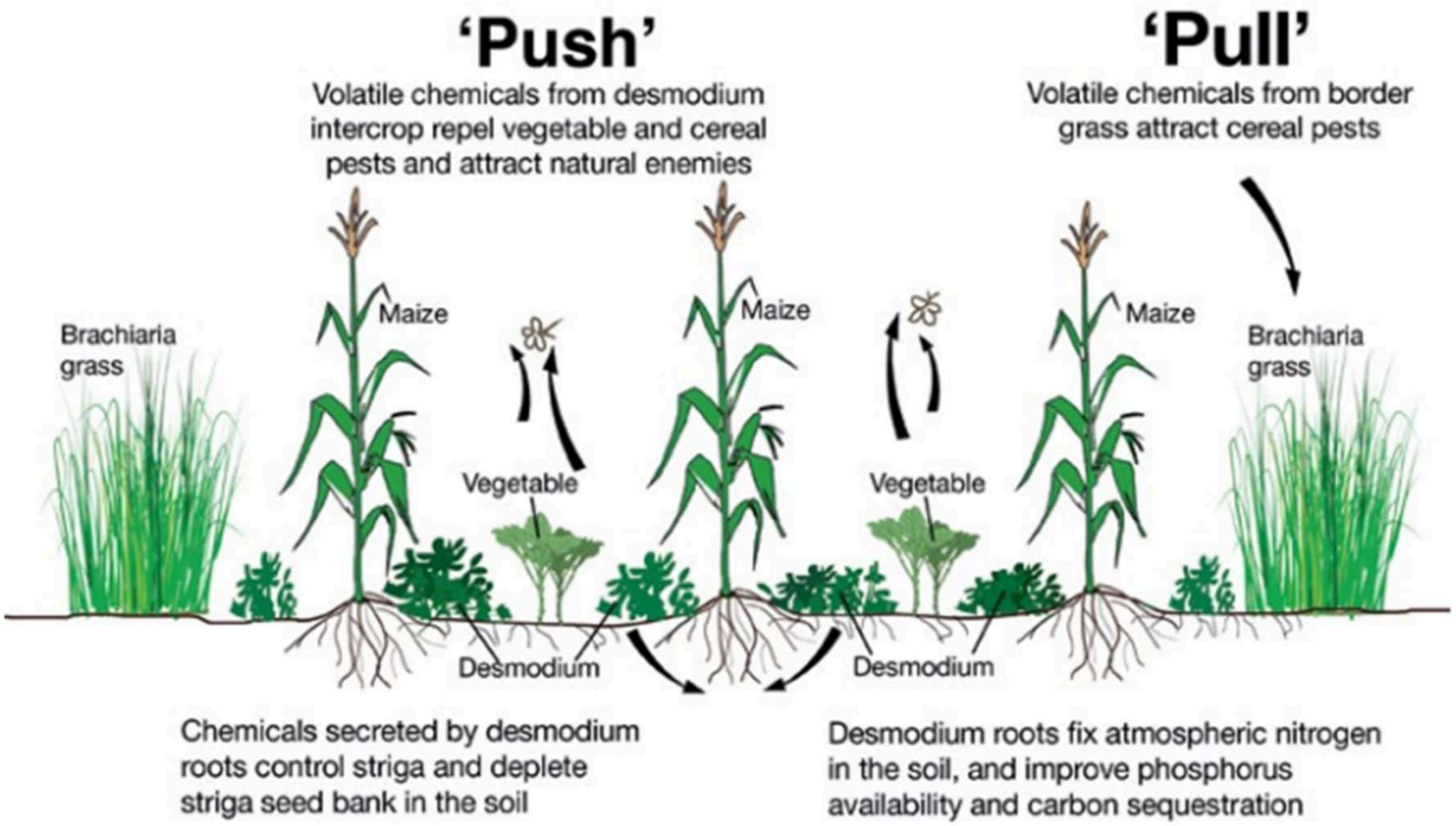
Vegetables are more susceptible to pests and diseases due to:

- Humid conditions
- Short growth cycles
- Intensive cultivation

On average, **20 - 50%, and in certain cases up to 80 - 100% of vegetable crop is lost due to pests & diseases.** As a result, the use of pesticides in vegetable production is high.

Farmers are aware of the negative impacts of synthetic pesticides but keep using them due to a lack of alternative solutions.

Reducing vegetable crop losses due to pests and diseases



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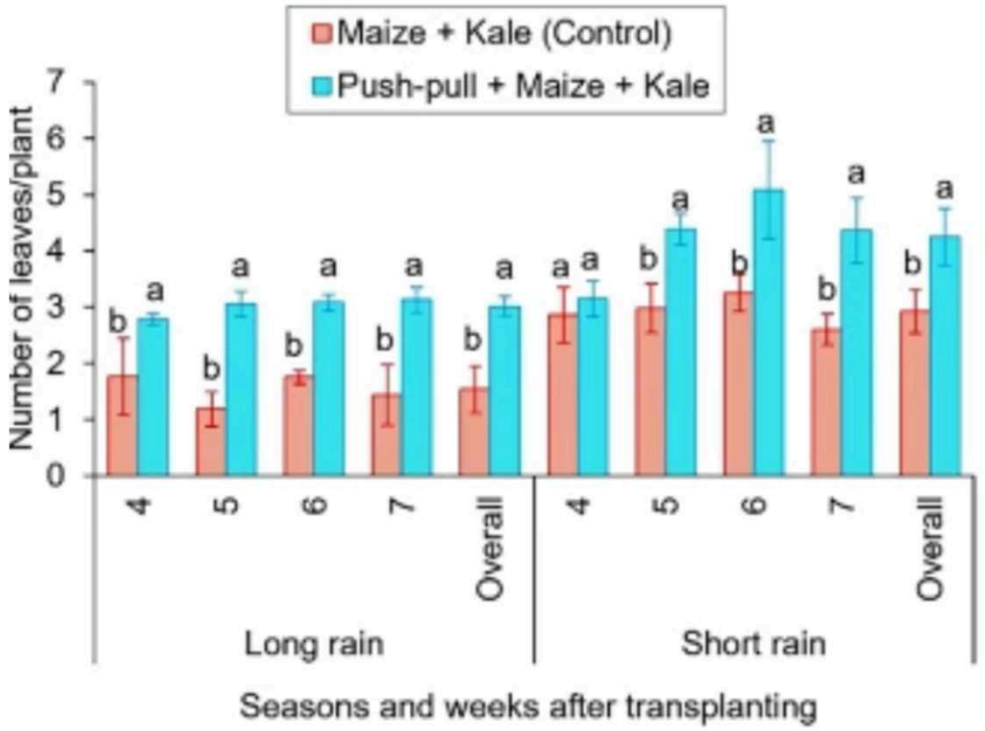
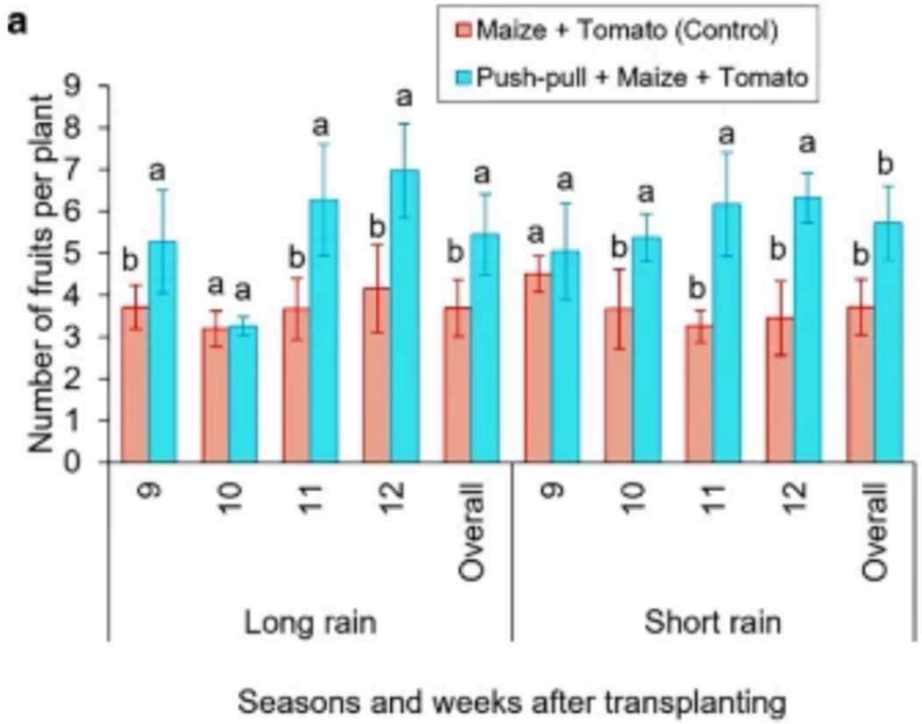
Reducing Losses through the Integrated Push–Pull Approach for Kale and Tomatoes

Yield of kales (harvestable leaves) at different harvesting stages & seasons



Harvestable tomato fruits at different harvesting stages & seasons

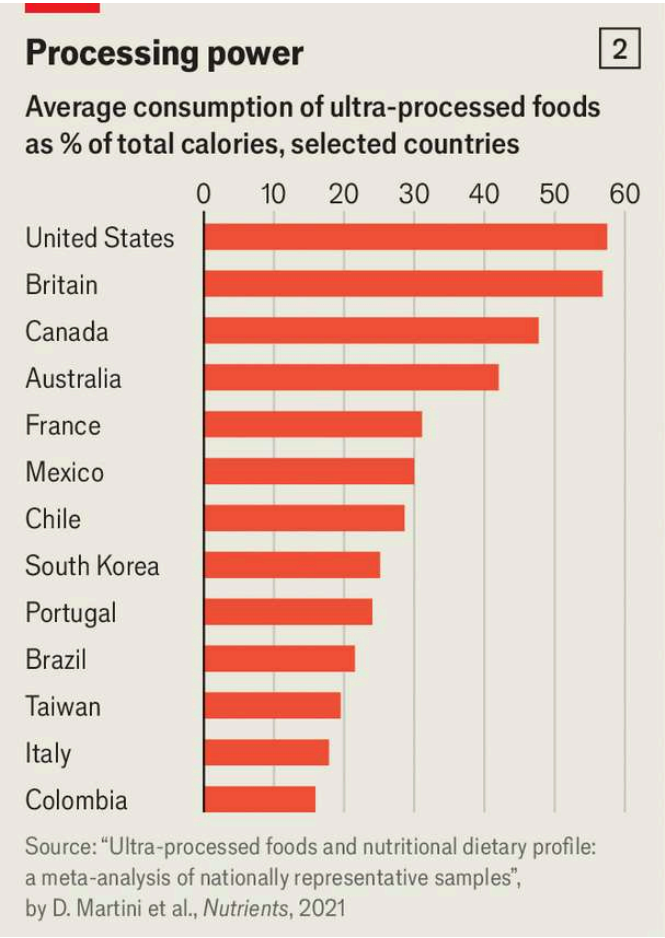


An Intensified Cereal Push-Pull System Reduces Pest Infestation and Confers Yield Advantages in High-Value Vegetables, Journal of Crop Health, Chidawanyika et al, 2025

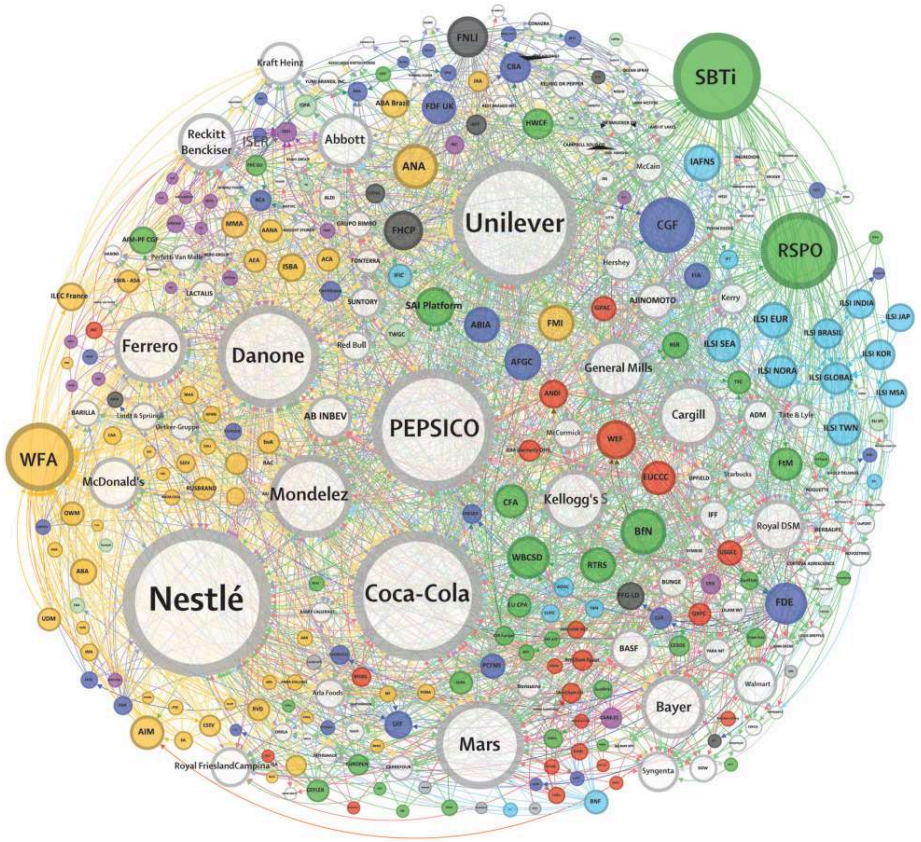
Behind the Innovation

- Emerged from **decades of applied research** combining entomology, plant chemistry & soil science
- **Participatory processes are central.** Continuous engagement with farmers shapes species choice (e.g., desmodium varieties) and facilitates adaptation to changing conditions
- **Context matters:** Push–pull works best where livestock, labour availability, and land access make it feasible; adoption is uneven and reflects social and economic constraints.
- **Not a silver bullet:** It addresses key pest and soil fertility challenges but cannot by itself overcome market failures, land pressure, or other structural challenges.
- **Knowledge-intensive practice:** Success relies on farmers' learning peer-to-peer, experimentation, and adaptation — all of which require financial support and social relationships.

Reducing consumption of ultra-processed foods in HMICs



In 2024, Coca-Cola, PepsiCo, and Mondelez spent a combined $13.2 billion on advertising, almost four times WHO's operating budget.



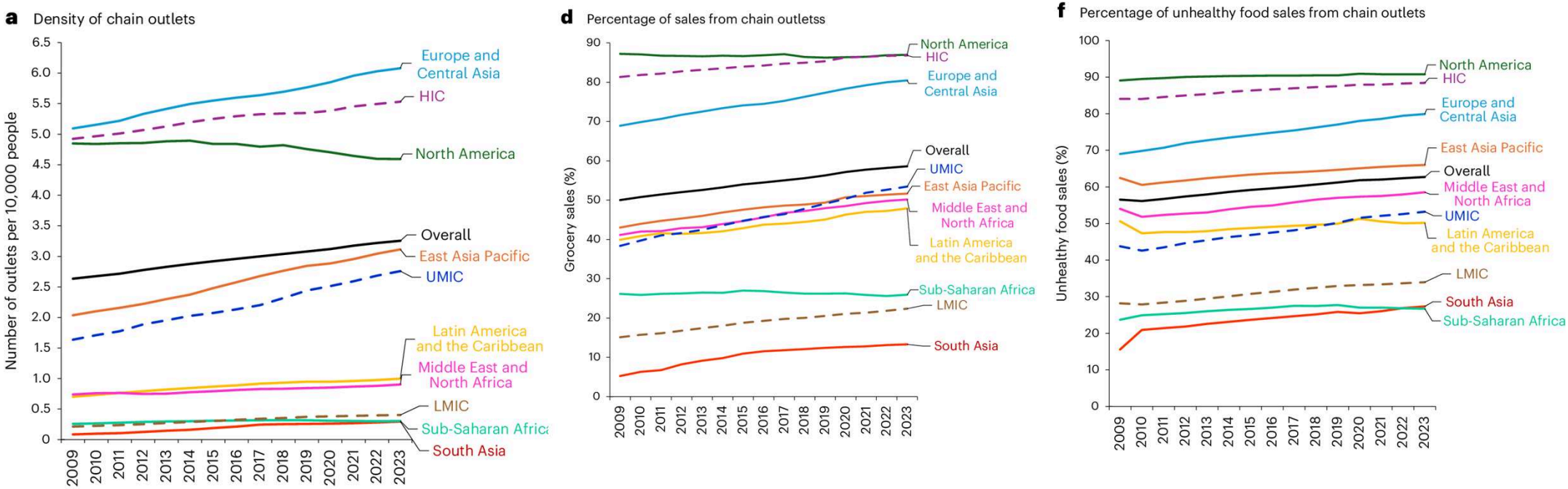
Towards unified global action on ultra-processed foods: understanding commercial determinants, countering corporate power, and mobilising a public health response
Baker, Phillip et al. The Lancet, Volume 0, Issue 0

Changing the Food Environment

“Food environments comprise the foods available to people in their surroundings as they go about their everyday lives and the nutritional quality, safety, price, convenience, and desirability of these goods.”

FAO 2016, Global Panel on Agriculture and Food Systems for Nutrition 2016

Large chains dominate retail food environments



Chain outlets: include convenience store retailers, supermarkets, and hypermarkets which > 10 linked stores, sell a wide range of products, typically offer extended opening hours, offer prepared take-aways, made-to-order, and hot foods, and fresh produce.

Non-chain outlets: small local grocers, mostly independent retail outlets with a small selling space including kiosks, market stalls or fixed street vendors, primarily selling food/beverages/ groceries.

Scapin et al, Nature Food 6, 2025

Bite Back 2030, UK

Bite Back 2023

Bite Back is a youth-led UK movement, founded in 2019, to transform the food system so that all young people have access to nutritious food and are protected from the manipulative practices of large food corporations.

The movement campaigns for shaping food environments through:

healthy schools

healthy streets

healthy screens

Bite Back 2030, UK

Key Campaigns & Actions:

Advocacy for Policy Changes: Campaigning for the extension of free school meals during holidays, as well as improving their quality.

Restricting Junk Food Advertising: Bite Back advocates for legislation restricting the marketing of unhealthy food and drinks (high in fat, sugar, or salt) to children, online, on TV, and in public spaces.

Public Awareness: Using powerful campaigns, such as placing their own billboards to block junk food ads and releasing reports on food industry tactics, to raise awareness and pressure decision-makers.

Impact: The movement is supported by over 75,000 people and has driven significant national attention and action on food environments.

Nourishing the world sustainably requires a multi-pronged approach

Demand Management
- Awareness of sustainable & healthy diets
- Reduce food waste

Research, Technology & Infrastructure
- Fortification, ecology
- Storage, Packaging
- Transportation

Production Methods
- Diversity, nutrient content
- Climate resilience
- Yield

Enabling Environment
- Reform of agric. trade rules
- Health systems
- Water & Sanitation

Regulation & Education:
- Financial incentives
- Labelling
- Advertising