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State of evidence on link of climate-nutrition in relation to food systems

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What is the Micronutrient Forum?

The Micronutrient Forum is ***the*** central global platform for evidence, collaboration, and advocacy to improve micronutrient health

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HEALTHY MOTHERS HEALTHY BABIES

Standing Together for Nutrition

DInA
Micronutrient Data Innovation Alliance

MNC
MIGHTY NUTRIENTS COALITION

MICRONUTRIENT FORUM
Global Conference

Outline

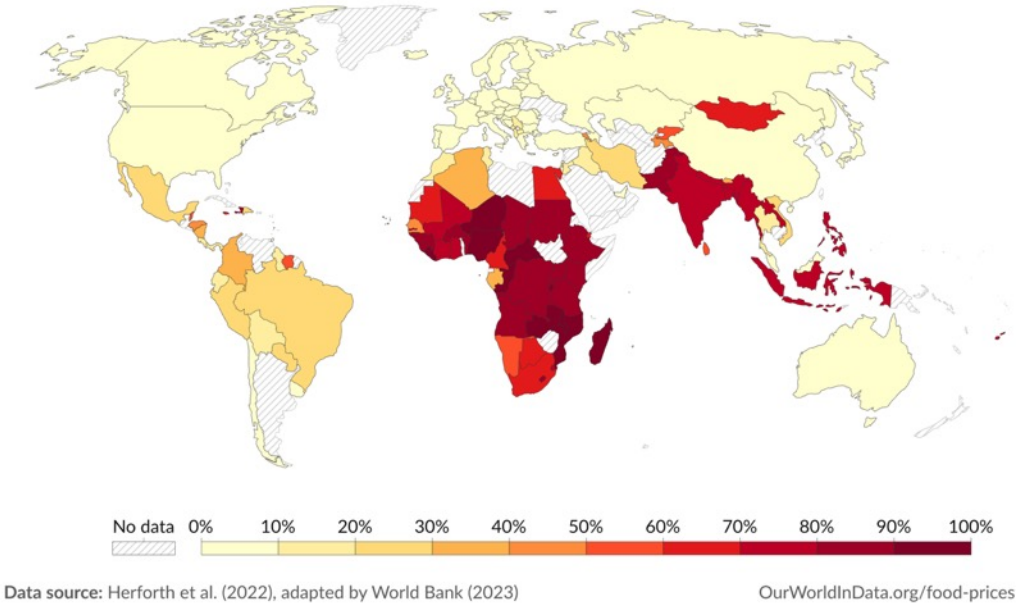
1. **The climate change and nutrition crises** are intertwined with substantial consequences for future nutrition, health, development and social capital
2. Limited evidence suggests that **pathways are complex, bi-directional and highly context specific**
3. **Solutions require holistic and context-specific approaches** across agro-food, water, health and social protection systems
4. **Evidence for policy is needed**
    1. Lack of inclusion of nutrition objectives in climate plans or climate objectives in nutrition plans
    2. Consensus is needed on the current state of the evidence and for prioritized evidence gaps

The climate and nutrition crises are intertwined

with substantial consequences for future nutrition, health, development and human capital

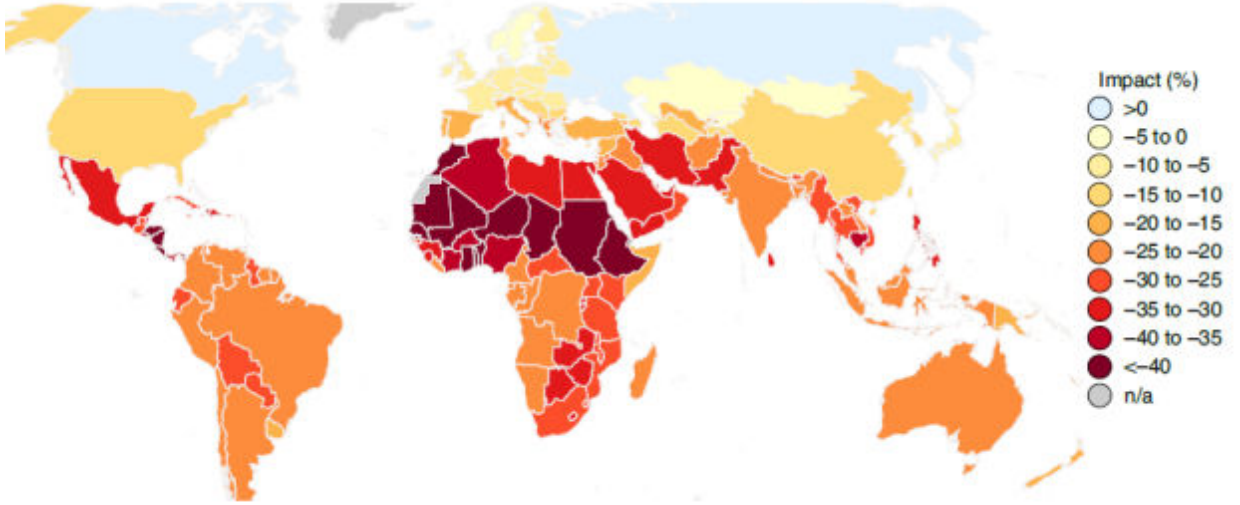
Negative impacts coincide geographically

Share of population that cannot afford a healthy diet, 2021



An estimated three billion people suffer from micronutrient deficiencies

Effects of climate change on agricultural productivity



Productivity declines mean lower food availability, higher prices, lower incomes for farm families

Source: Ritchie & Roser 202.

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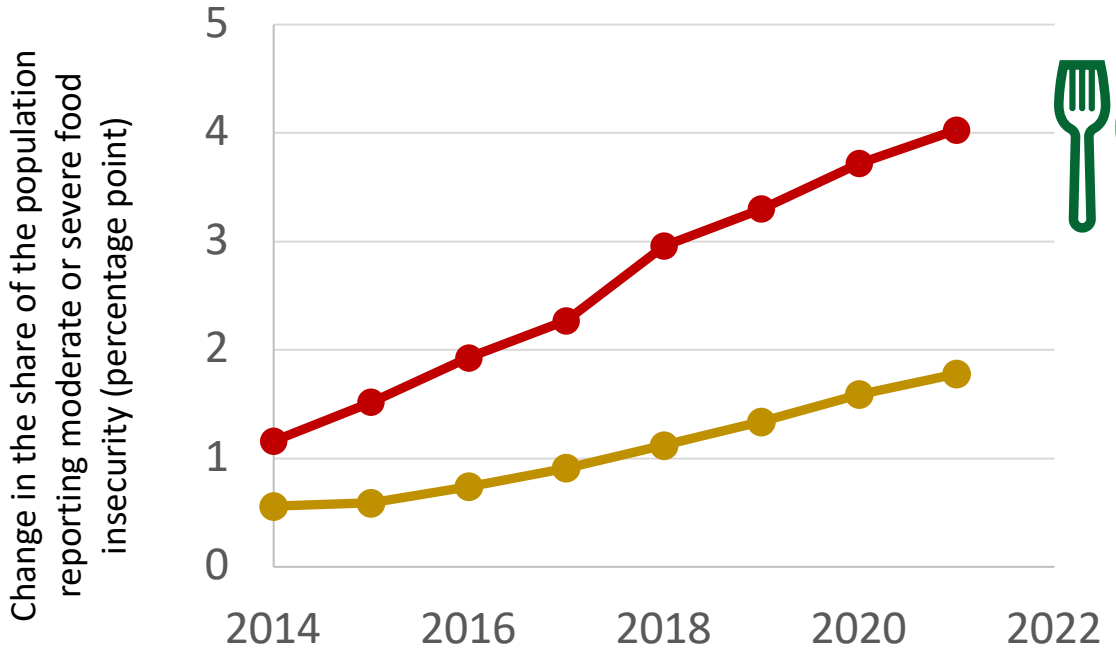
Extreme heat and drought increase food insecurity



Compared with 1981–2010, the higher frequency of heatwave days and drought months were associated with **127 million more people** reporting experiencing moderate or severe food insecurity in 2021.

Even if temperature rise is limited to 2°C, **525 million** additional people could experience moderate or severe food insecurity linked to heatwaves by mid-century

Percentage point change in the share of people reporting moderate or severe food insecurity due to heatwave drought months

Source: Romanello et al. 2023

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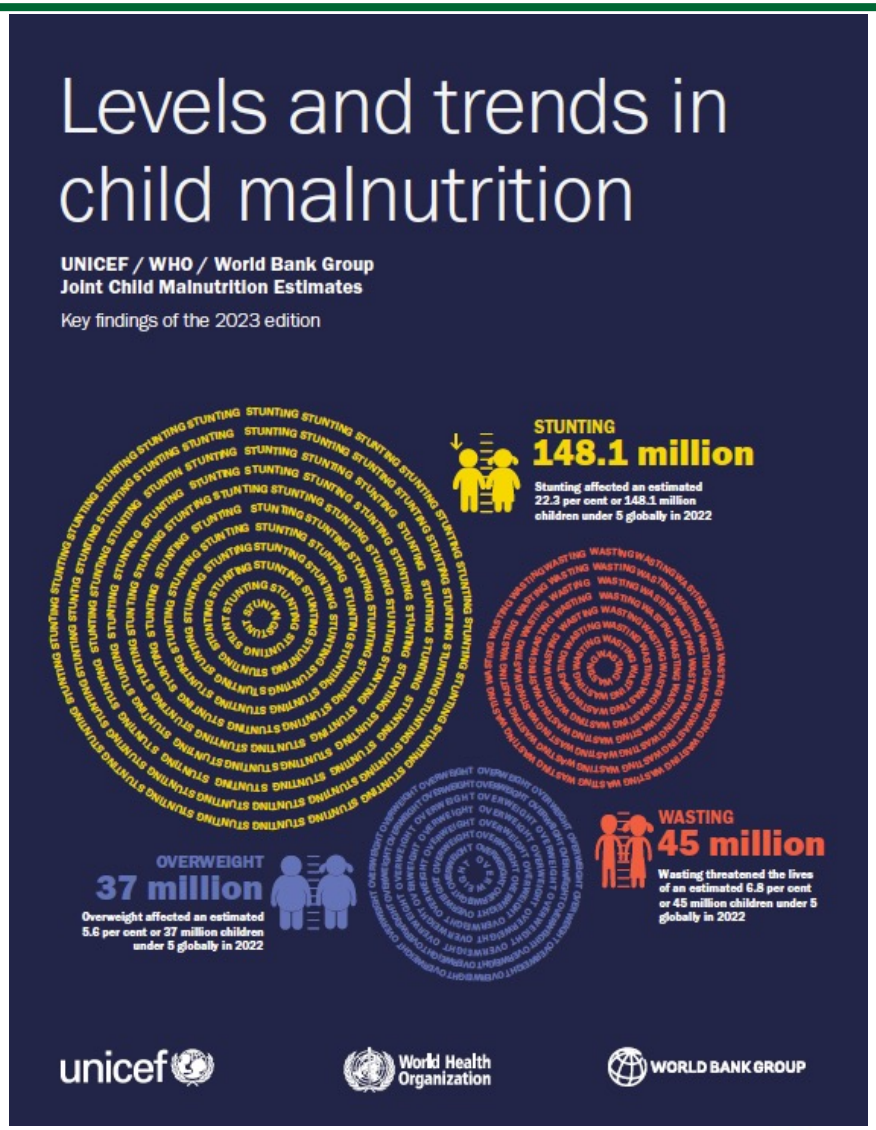
Leading to soaring hunger and malnutrition figures

122 million more people pushed into hunger since 2019 due to multiple crises, reveals UN report

Latest research shows around 735 million people currently facing hunger, compared to 613 million in 2019

12 July 2023 | Joint News Release | Rome/New York/Geneva |Reading time: 6 min (1741 words)



Sources: FAO 2023a; WHO 2023

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Increasing poverty and human capital loss

Climate change will drive an estimated **68 to 135 million additional people** into poverty by 2030

Loss of livelihoods, displacement, and reduced access to services contribute to furthering social inequalities and **eroding human capital**

Sources: World Bank 2020; World Bank 2023; FAO 2024

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Limited evidence suggests that pathways are complex, bi-directional and highly context specific

Climate change negatively impacts nutrition

Climate change—higher temperatures, atmospheric carbon dioxide, and ground-level ozone, among other factors—**will reduce the nutrient value of many nutritious crops** as well as staple crops and animal source foods.

↓ nutrient content

An increasing number of **extreme weather events**— including droughts, floods, heat waves, and storms—**are reducing yields and pushing down food production.**

↓ food availability

Climate change is decreasing the number and diversity of pollinators, which are essential for production of nutritious foods like fruits, vegetables, nuts, and seeds.

↓ food diversity

Rising sea levels will threaten agricultural land coastal zone. and reduce rice production in the low-elevation

Ocean and freshwater warming, ocean hypoxia, destruction of coral reefs, and loss of mangrove forests **are reducing ocean and inland fisheries catch.**

↓ food quality

Climate change-induced rises in the prevalence of waterborne diseases and other health conditions will **increase the micronutrient needs of individuals.**

↑ nutrient needs

Sources: Micronutrient Forum 2022; Owino et al. 2022

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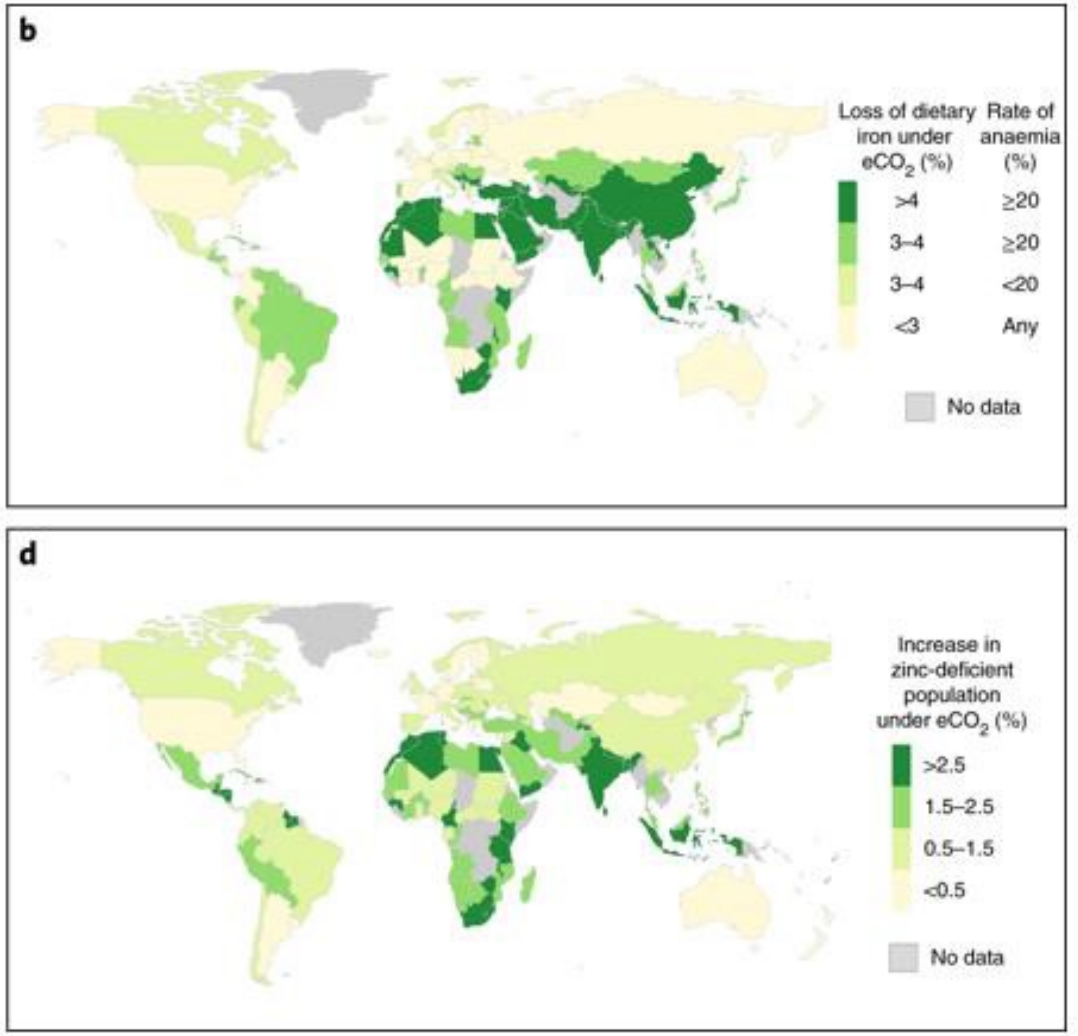
CO2 emissions impacts nutritional quality of crops

Rising CO_2 levels will likely cause plants to lose nutritional value

- Under rising CO_2 levels, many food crops have iron and zinc contents that are reduced by 3-17% compared with current conditions
- Elevated CO_2 could cause an additional 175 million people to be zinc deficient
- 1.4 billion women of childbearing age and children under 5 live in countries with greater than 20% of anemia prevalence and would lose >4% of dietary iron



Source: Smith & Myers 2018

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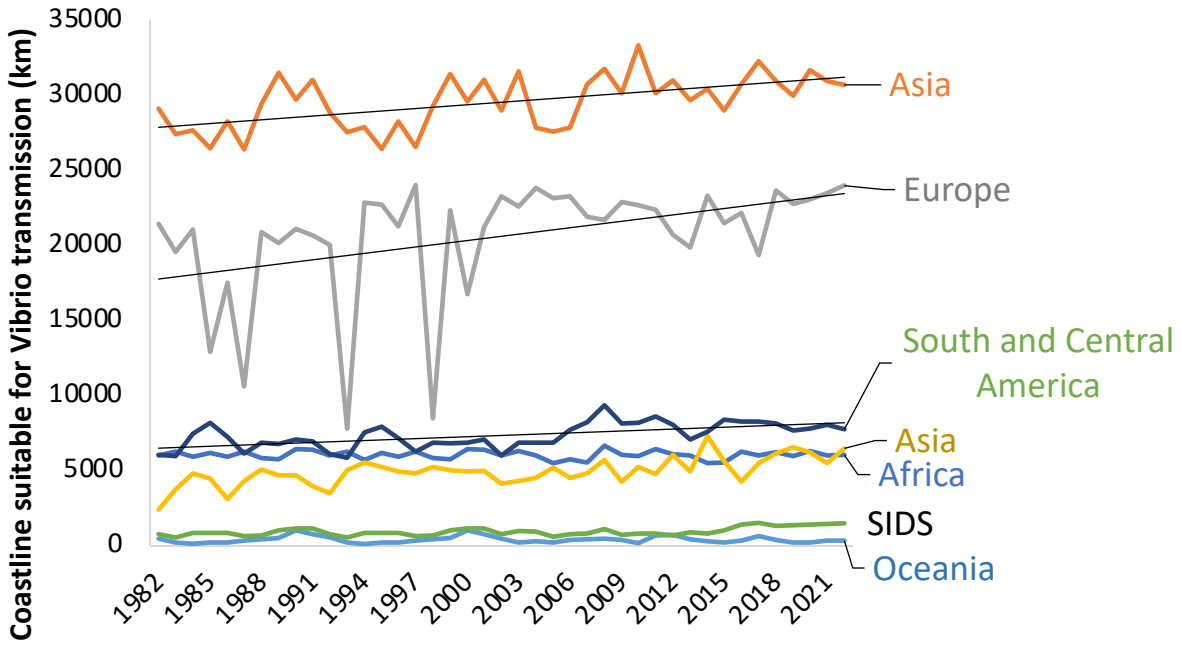
And increases the risk of infectious diseases

Climate change is altering the environmental distribution of food, water, air, and vector-borne infectious diseases – many of which threaten nutrient utilization

In 2022, a record 10% of the global coastline showed conditions suitable for vibrio transmission (12.7% more than in 1982–2010), putting 1·4 billion people at risk, and leading to a record 610,000 estimated vibriosis cases

+12.7%



Length of coastline suitable for Vibrio transmission

Source: Romanello et al. 2023

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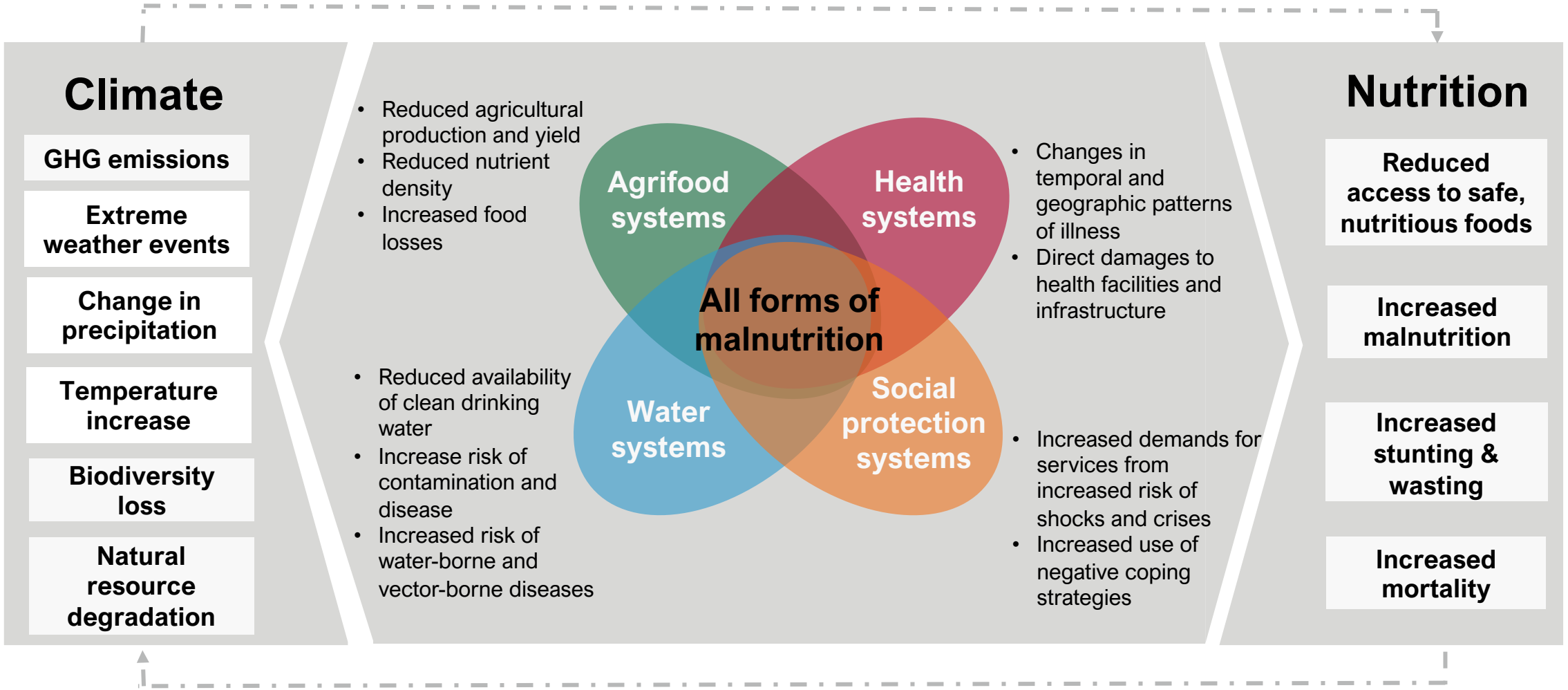
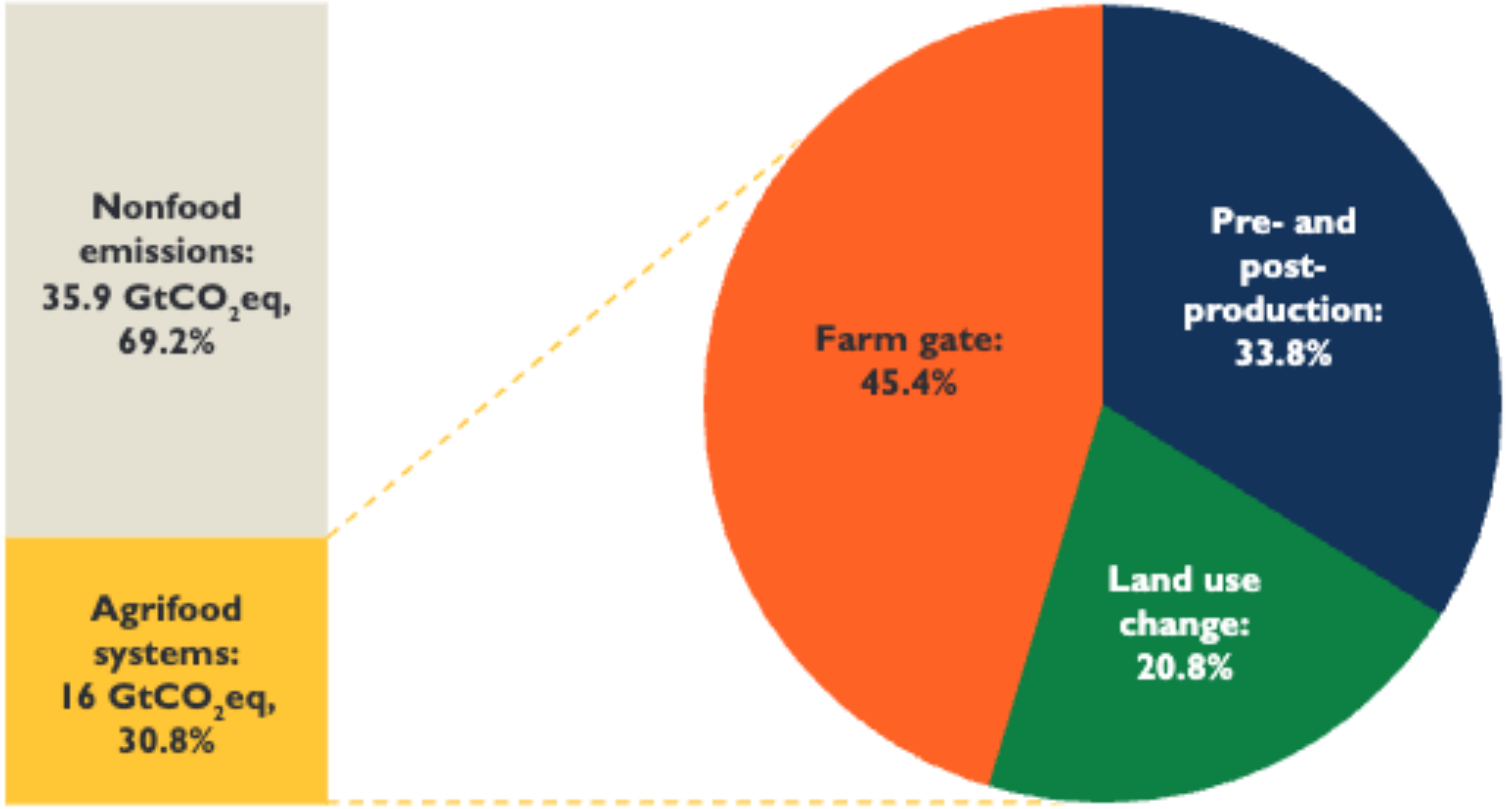
Interactions between food, health, water and social protection systems mediate climate change and nutrition linkages



Adapted from: FAO 2024; FAO 2023b

Our food system emits ~30% of all greenhouse gases

Greenhouse gas emissions from the global agrifood system



Source: Sutton et al. 2024

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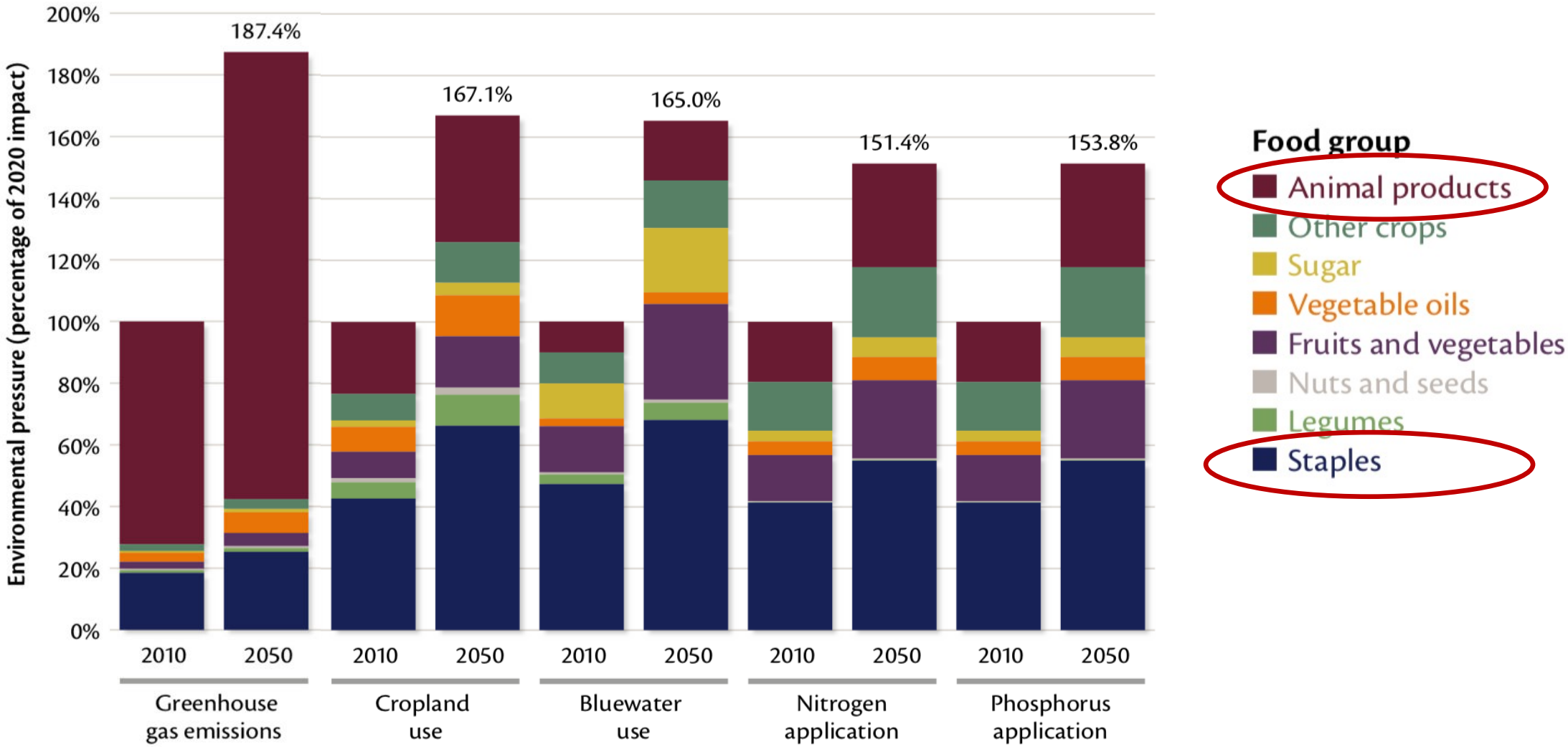
With impacts across multiple environmental dimensions



Source: GLOPAN 2020

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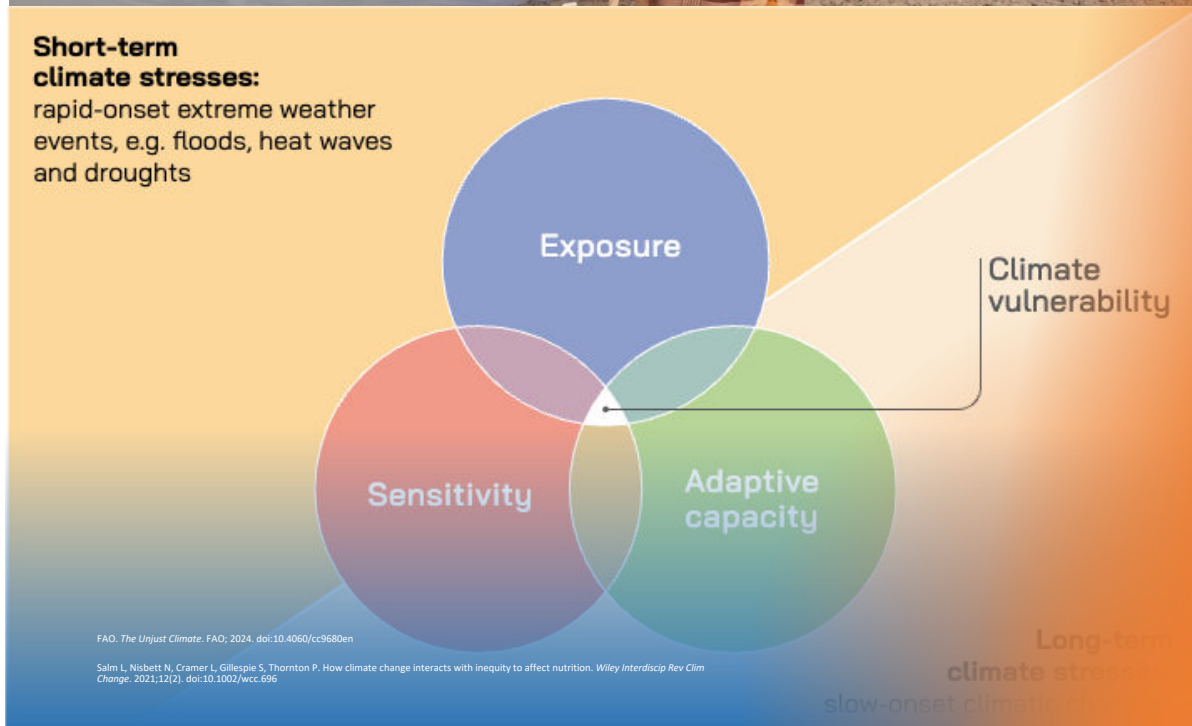
Gender-related climate vulnerabilities

Women and girls require more nutrient-dense diets, which are more likely to be impacted by a changing climate.

A 1 °C increase in long-term average temperatures is associated with a 34% reduction in incomes of female-headed households.

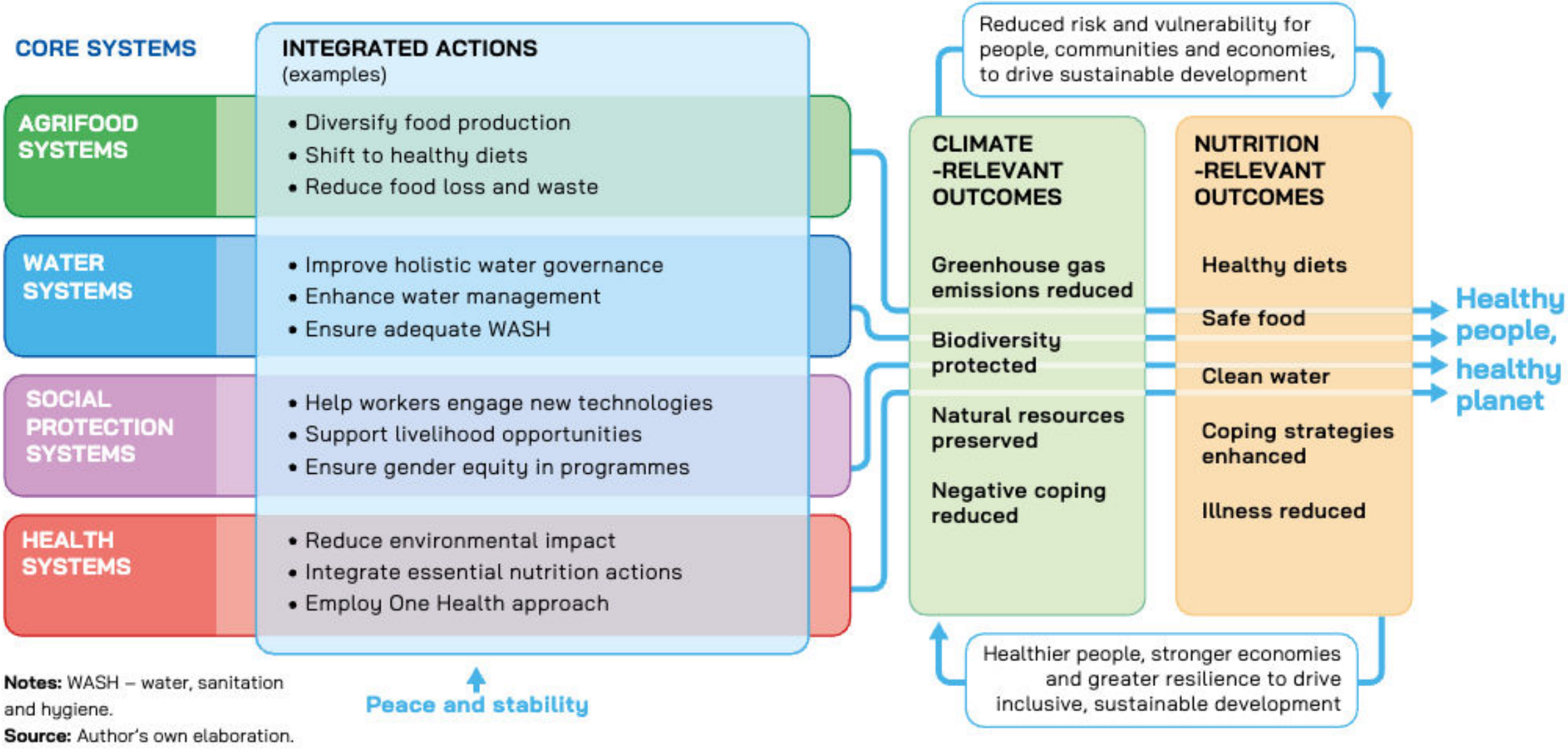
Increased sensitivity (e.g.: higher nutrient needs), **lower adaptive capacity** (e.g.: lower control over assets) **contribute to higher vulnerability** when exposed to short- and long-term stresses.



Source: FAO 2024

Solutions will require context specific approaches across agri-food, water, health, and social protection systems

Integrated actions across systems



Notes: WASH – water, sanitation and hygiene.
Source: Author's own elaboration.

Source: FAO 2023b

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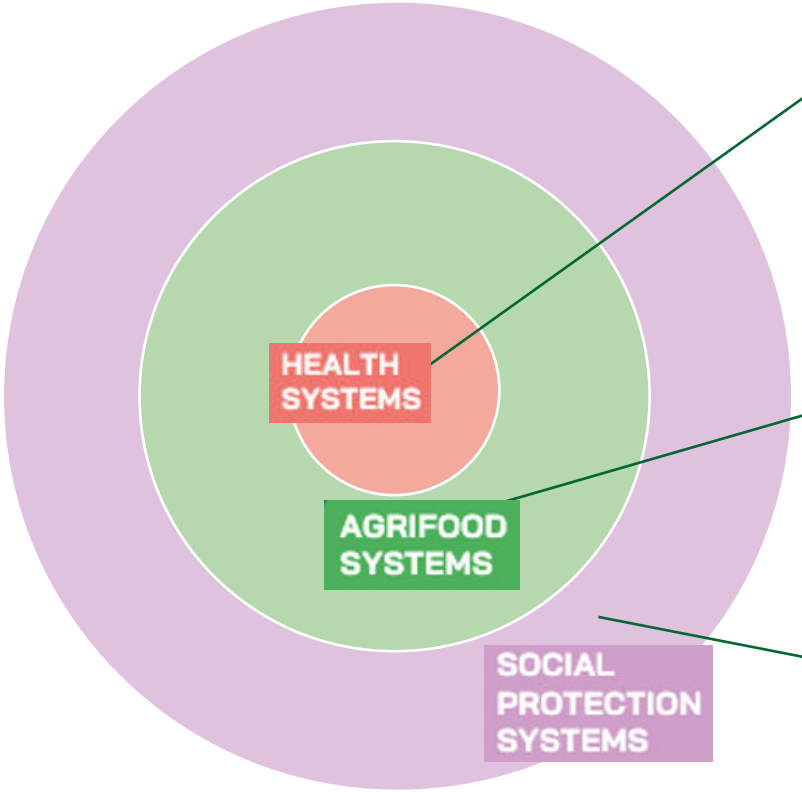
Integrated approaches to deliver nutrients sustainably



Promote **healthy, sustainable diets** and **breastfeeding.** Deliver **supplementation** to those in high needs

Crop diversification, Reducing Food Loss and Waste, Biofortification and **Food-fortification** can deliver micronutrients in a sustainable way

Social protection programs can ensure **access to nutritious foods** to those who cannot afford and ensure gender equity

Sources: Fatemi et al. 2023; Grasso et al. 2022

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Healthy and sustainable diets need integrated actions

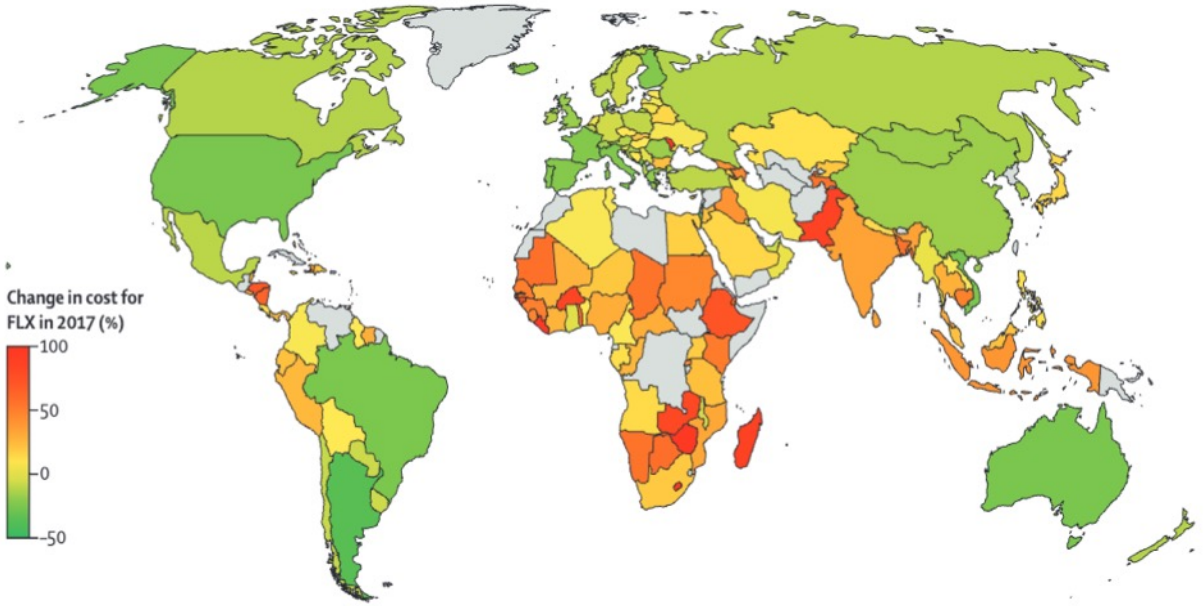
Global adoption of **food-based dietary guideline** can:

- ↓ GHGe from food by 13%
- ↓ premature mortality by 15%

Halving **food loss and waste** can:

- ↑ supply of key vitamins and minerals by as much as 50%
- ↓ global food systems cropland use by 14%
- ↓ water footprint by 12-13%
- ↓ GHGe by more than 8%

Change in the cost for adoption of the *EAT-Lancet* diet



Source: FAO 2019; Springmann et al. 2020; Springmann et al. 2023

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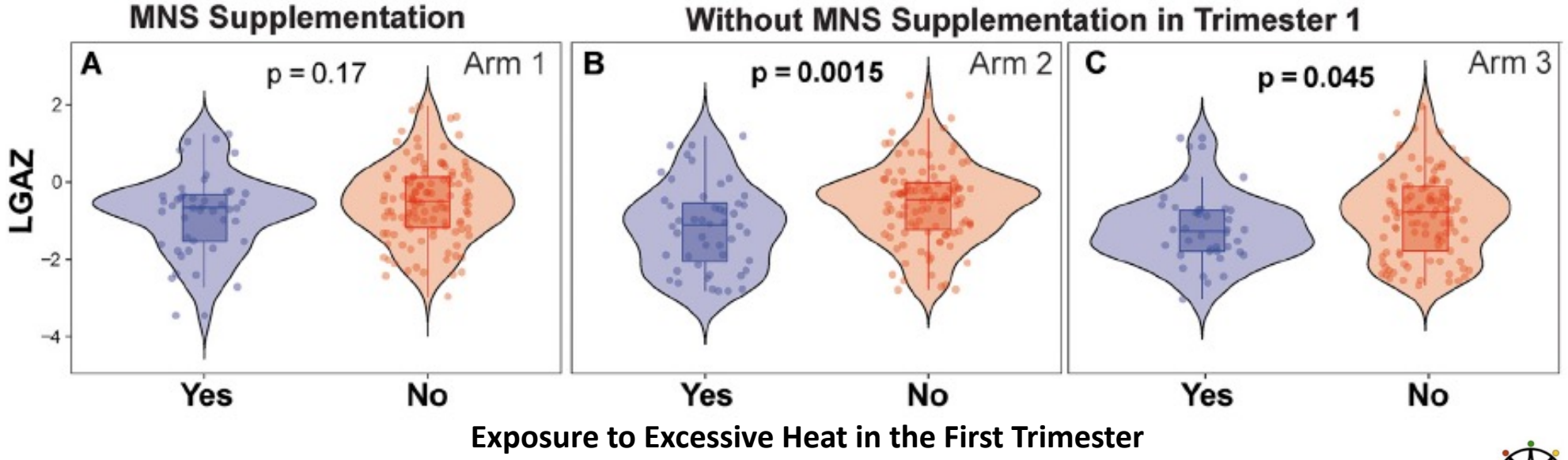
Improving nutrition as a climate adaptation mechanism

A recent study shows that exposure to **excessive heat in early pregnancy** is associated with **negative birth outcomes**

However, these negative effects were **not apparent** in women exposed to heat receiving a multiple micronutrient intervention, **administered from 3 months pre-conception until birth**

Improving women's nutritional status may **promote resilience against the effects of heat stress on intrauterine development**



Source: Shankar et al. 2023

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Women can be climate and nutrition actors

Work of GCAN shows that when women have resources and agency, they contribute to climate resilience:

- Reaching women farmers in SSA with extension reduces climate change impacts on income
- Informing women on climate-smart agriculture increases uptake
- Women's agency diversifies farming away from rice in Bangladesh

More research is needed to assess the role of gendered responses in accelerating climate adaptation with co-benefits for nutrition

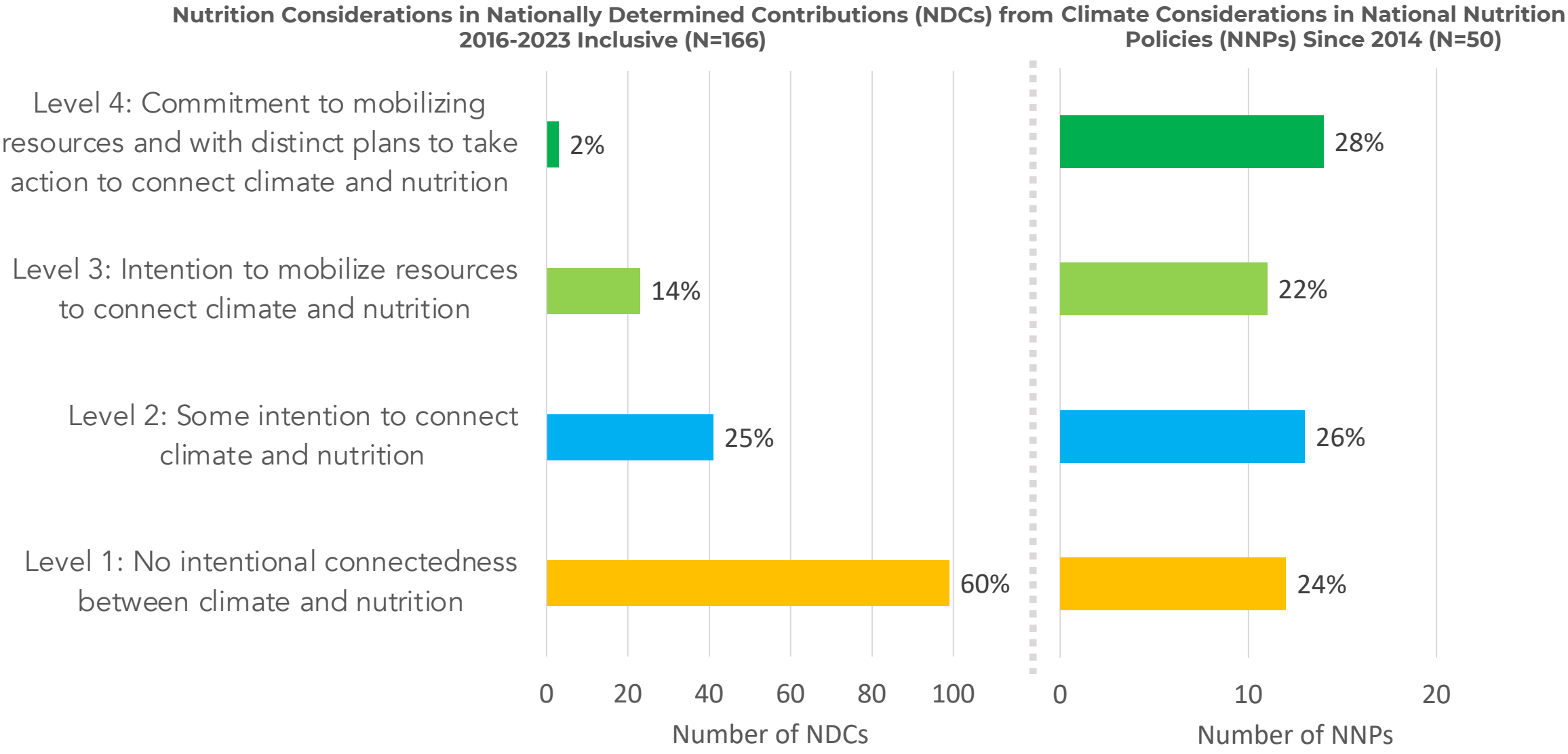
Sources: Azzarri & Nico 2022; Bryan et al. 2021; De Pinto et al. 2020

Evidence for policy is needed

Lack of inclusion of nutrition objectives in climate plans or climate objectives in nutrition plans

Consensus is needed on the current state of the evidence and for prioritized evidence gaps

Low levels of policy co-inclusion across climate and nutrition



Source: GAIN 2023

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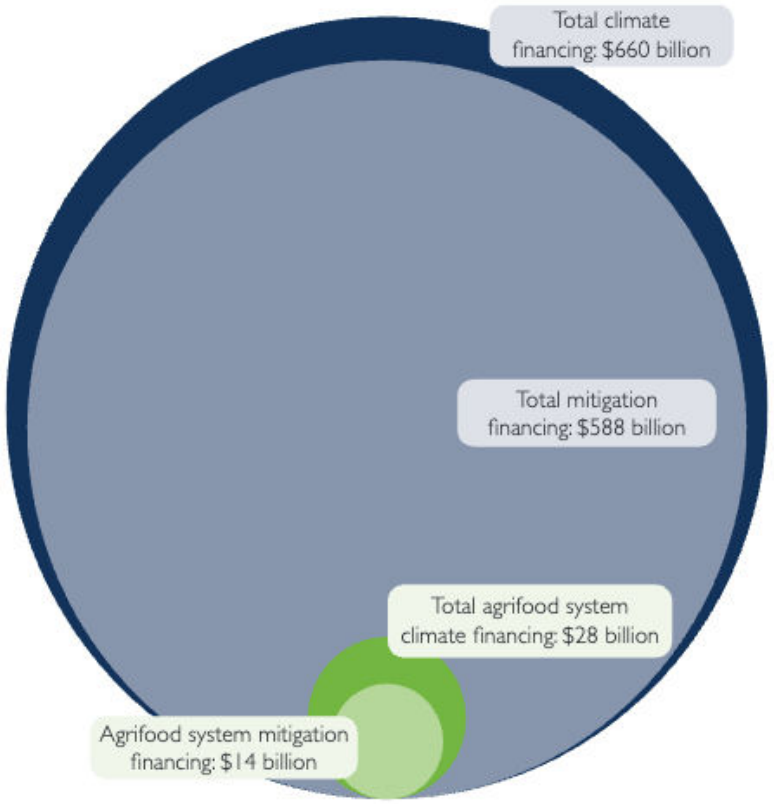
Climate financing for nutrition is very low

FIGURE O.5 **Finance for Mitigation in the Agrifood System Is Strikingly Low Relative to Its Importance**



Sources: World Bank analysis based on data from CPI 2023 and Naran et al. 2022.
Note: Figure shows for 2019/20 global tracked project-level climate finance ($, billions) for adaptation, mitigation, and dual-purpose action economywide and for the agrifood system.

Only **1%** of official development assistance funding to climate in 2019-2021 **explicitly mentioned nutrition**. That is 4x less than the agrifood system climate financing

Global food and agricultural subsidies account for nearly **$630 billion** per year. These largely target staple foods (rice, sugar), dairy, and other animal source foods (meat), especially in HIC and UMIC

Repurposing agricultural subsidies towards nutritious foods can increase availability and affordability of healthy and sustainable diets

Sources: Sutton et al. 2024; GAIN 2023; FAO, IFAD, WFP, WHO 2022

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Growing literature on climate change and nutrition

A 'Climate change, Food Systems, Nutrition and Health' meta-review of 844 synthesis reports found:

- A minority of reports assessed climate change relationships to diets and nutrition-related health
- "Within this proliferation [of research], it is unclear which evidence to prioritise for action, and which research gaps (…) would catalyse most impact"

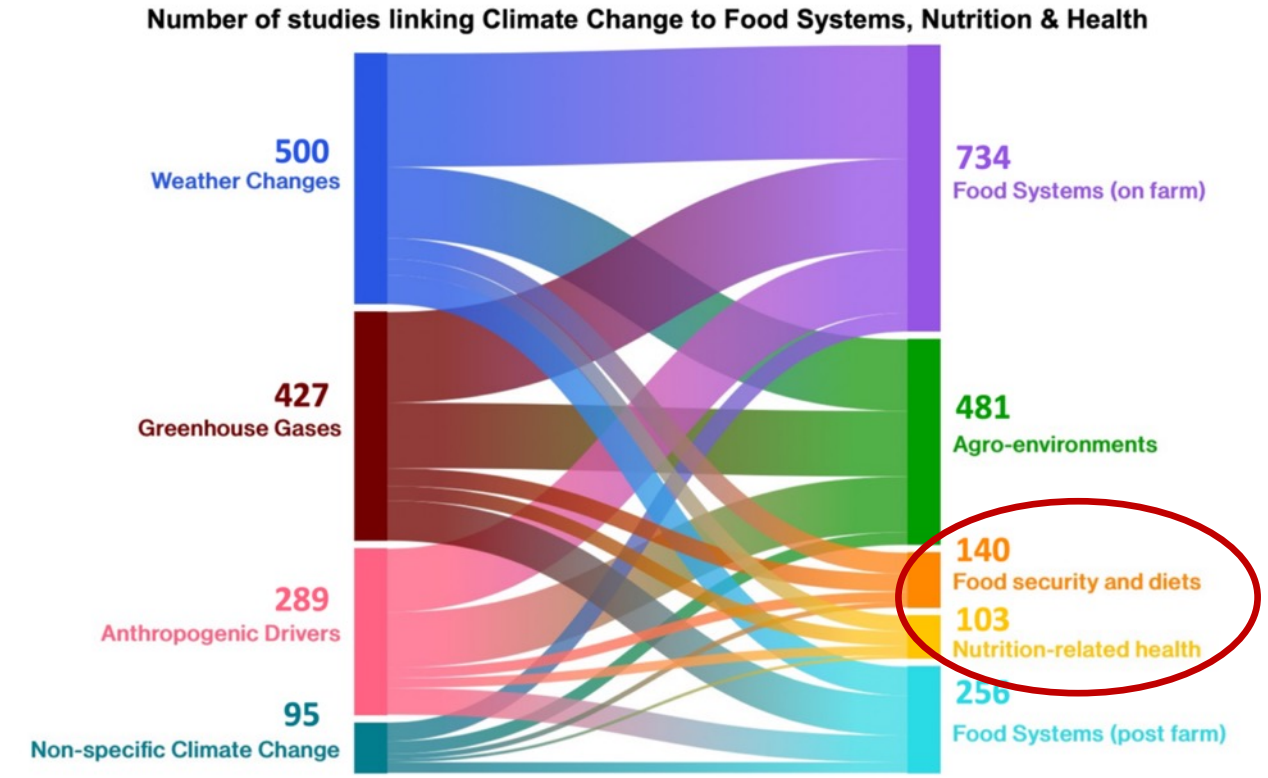

Figure 2

Sankey diagram of the number of studies linking climate change to Food Systems, Nutrition & Nutrition-related Health (FSNH). Major categories of climate change on the left are proportionally linked to corresponding major groups of FSNH on the right.

Source: Sparling et al 2024

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Nonetheless, evidence gaps remain

Both in describing and quantifying the negative impacts

- Impacts of short-term climate variability and repeated extreme weather events on diet quality, micronutrient adequacy, malnutrition, and nutrition-related health and associated economic losses.
- Impacts of diets on climate related outcomes.
- Impacts of a changing climate on the 'middle of the food system' (including on food environments, processing, transportation, prices, safety).
- Gender-related climate vulnerabilities and nutrition consequences.

Sources: Bush et al. 2022; Bryan et al. 2023; Headey & Venkat 2024; Sparling et al. 2024; Romanello et al. 2023

Nonetheless, evidence gaps remain (cont.)

and on interventions to prevent those negative impacts

- Quantifying benefits of interventions on both climate and nutrition, particularly for LMIC, to support for prioritization.
- Understanding complex relationships, trade-offs, enablers and pathways for action across major systems.
- Gender-responsive approaches that contribute to the effectiveness of climate change and nutrition responses.

Research gaps must be prioritized to respond to the needs of nutritionally vulnerable populations who are most affected by a changing climate

Sources: Bush et al. 2022; Bryan et al. 2023; Headey & Venkat 2024; Sparling et al. 2024; Romanello et al. 2023

Key Messages

1. **The climate change and nutrition crises** are intertwined with substantial consequences for future nutrition, health, development and social capital
2. Limited evidence suggests that **pathways are complex, bi-directional and highly context specific**
3. **Solutions require holistic and context-specific approaches** across agro-food, water, health and social protection systems
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