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# Economic sustainability of healthy diets

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# Agenda

1. Sustainability and **Sustainable development**
  - What are the main threats to food system sustainability?
2. Changing perspective: from Healthy to **Sustainable Diets**
  - What are the interdependence and the implications?
3. Framework for a **Great Food Transformation**
  - How shall we intervene to promote more sustainable diets?





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# Sustainability and sustainable development





# From sustainable development towards sustainability

- A **sustainable development** is defined as *“development that meets the needs of the present without compromising the ability of future generations to meet their own needs”* (UN, 1987)
- The concept of **sustainability** is based on the recognition of the supposedly separate existence of the **natural, economic, and social systems**
- **Sustainable development** is the process or journey by which **we move towards sustainability**



# From sustainable development towards sustainability: the **triple bottom line**

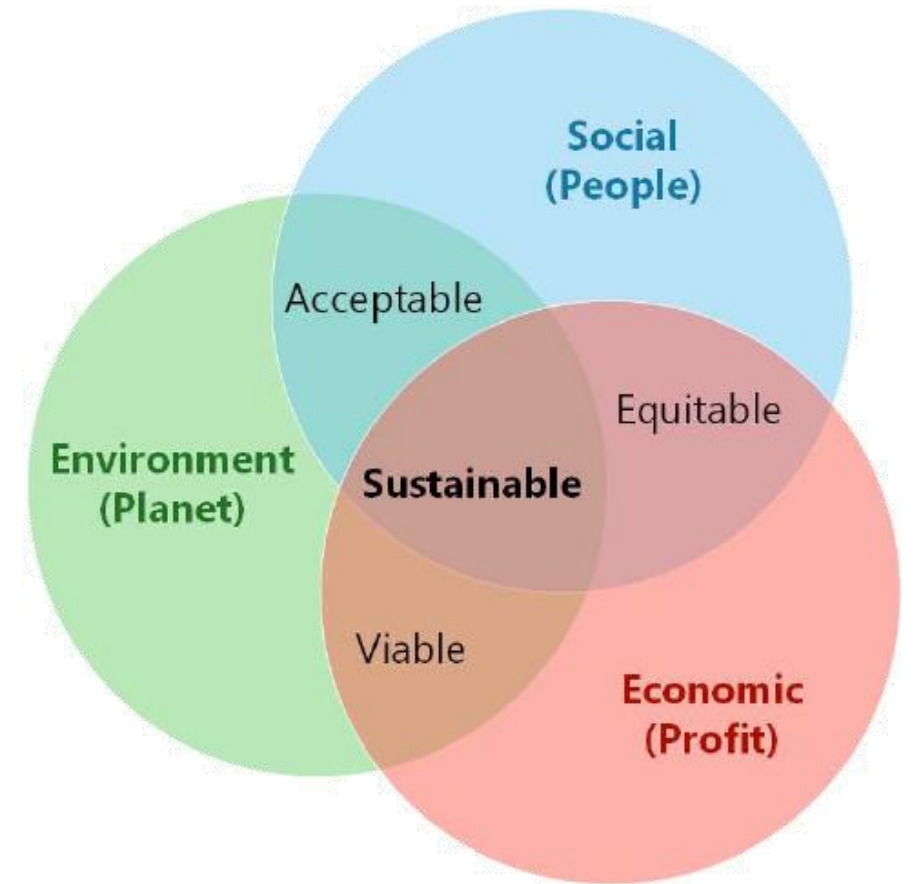
- Easy to graphically represent and describe...

...Difficult to measure and even more difficult to put in practice!

## Why?

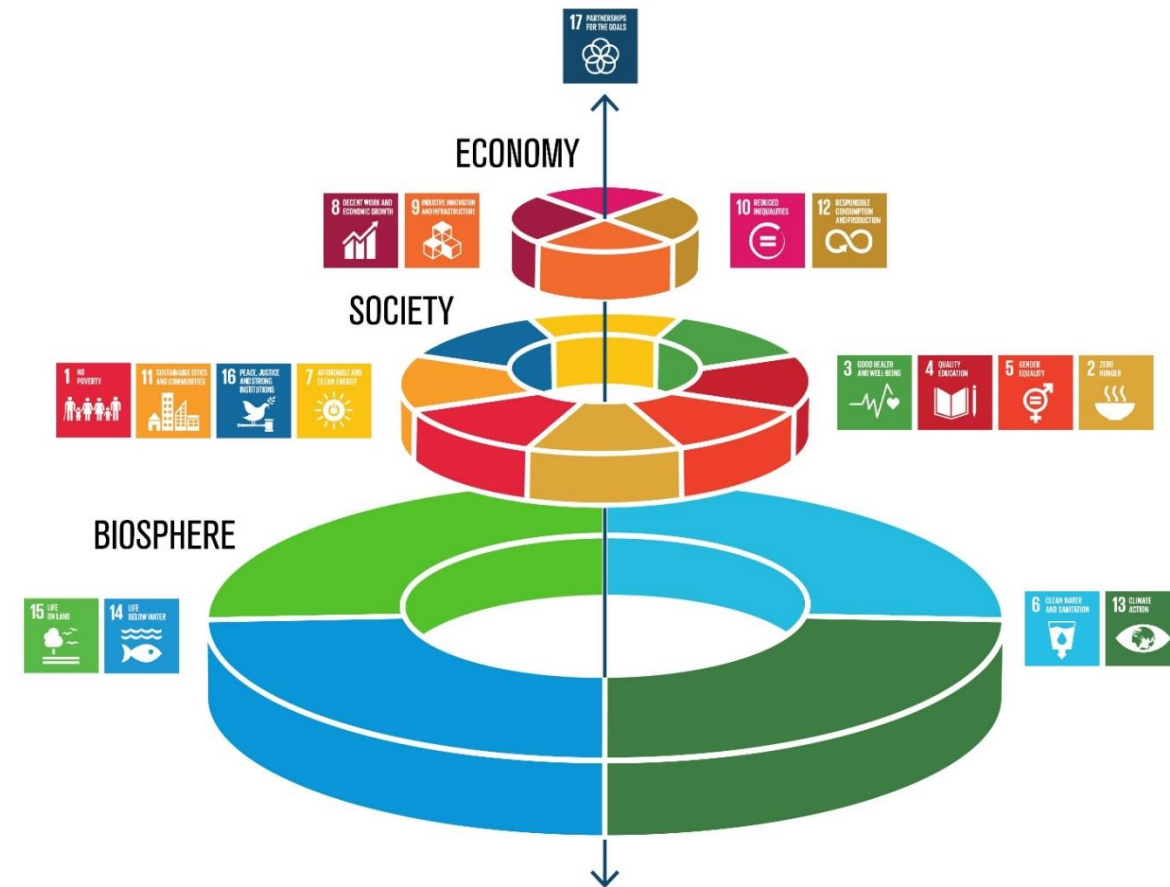
Economic, environmental and social performance measures have:

- **Large number of indicators**
- **Changing over time**
- **Subject to tough debate**



# From sustainable development towards sustainability: Agenda 2030

- **Agenda 2030 & Sustainable Development Goals (SDGs)**, adopted by UN Member States in 2015
- The 2030 Agenda is a composition of **social**, **economic** and **environmental** goals and targets (17) requiring a new way of thinking about **development**
- A **mechanism for the implementation** of the Agenda for Sustainable Development (more than 200 **indicators** and **statistical data** to monitor progress, and inform policy and stakeholders)

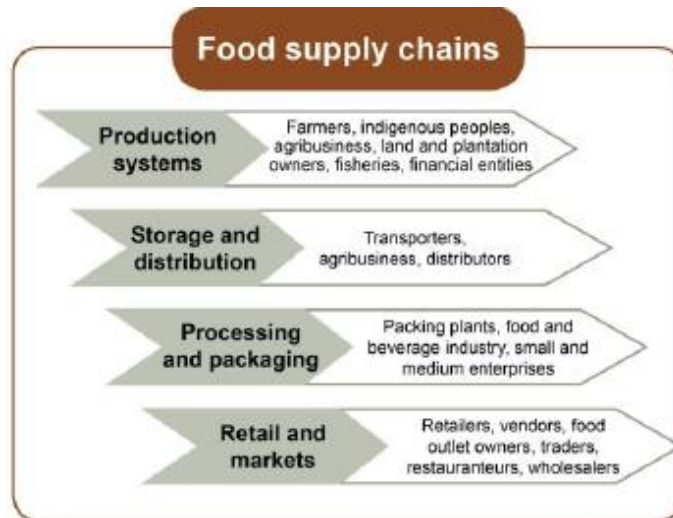


# From sustainable development towards sustainability: Agenda 2030



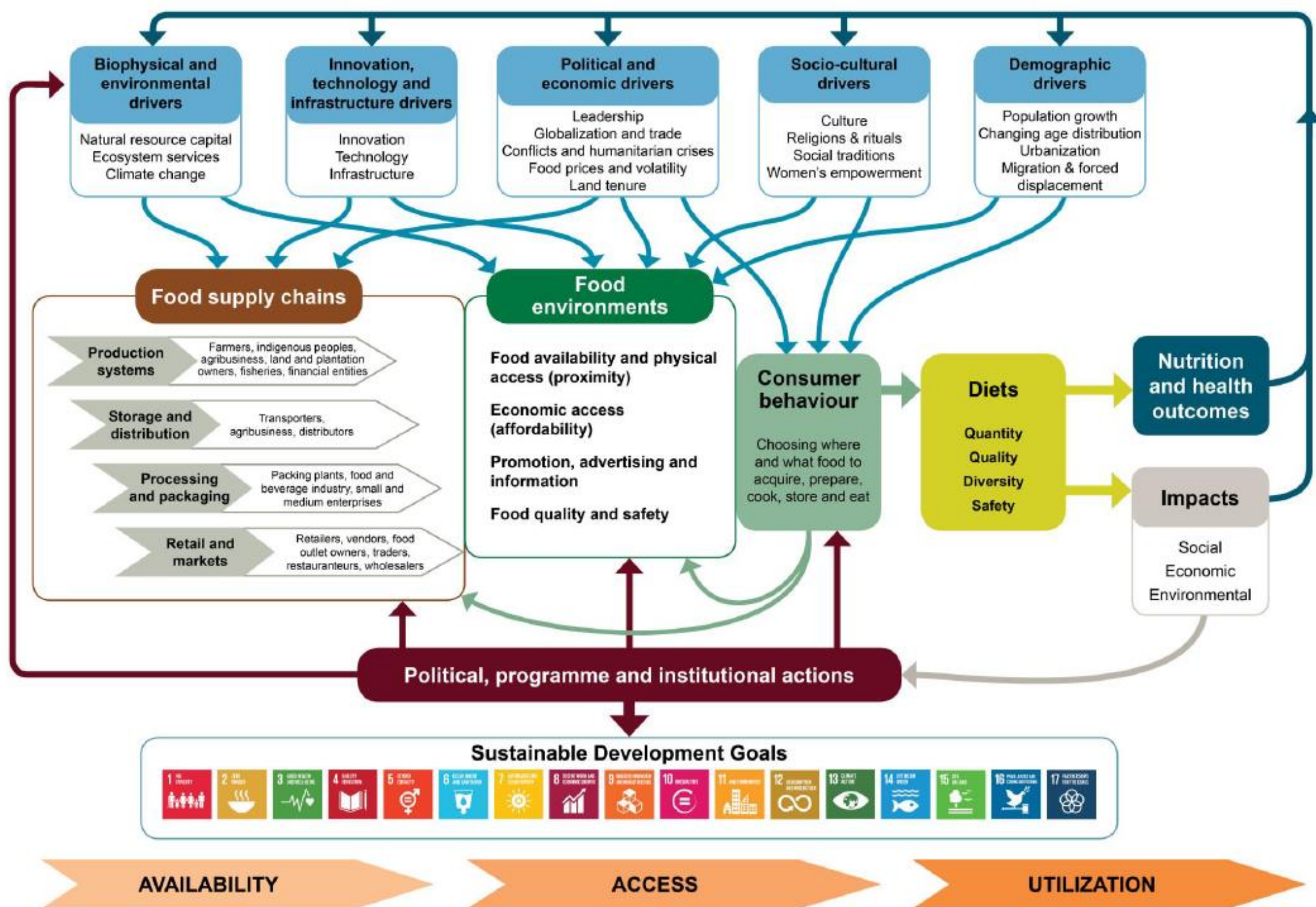
# Food system and Food supply chains

(Malassis, 1973)



- **Food system:** the set of functions that contribute to the satisfaction of an alimentary need
- **Food supply chains:** the process being a chain of events from production to processing, trading, distribution and consumption, literally “from field to fork”

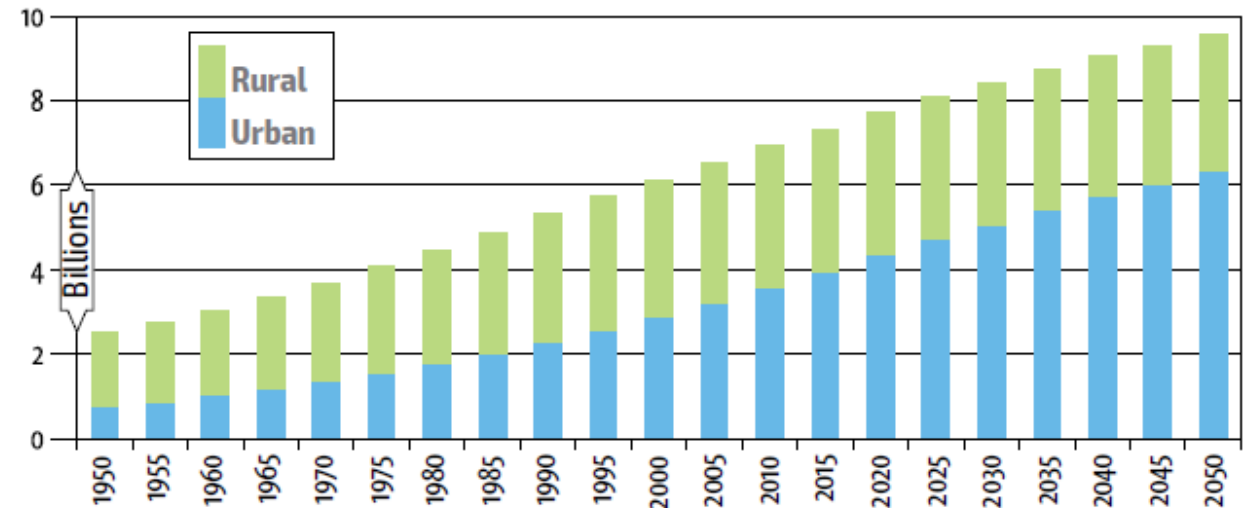




# Threats to food system sustainability: growth in world population and changing diets

- Urbanization impacts **food consumption patterns**
- **Higher urban wages** favour food products that have a large amount of labour embedded
- The **nutrient content** of diets is changing
- **Shift in employment** within the food system (*FAO, 2018*)

**Figure 1.3** Growth in global urban and rural populations to 2050



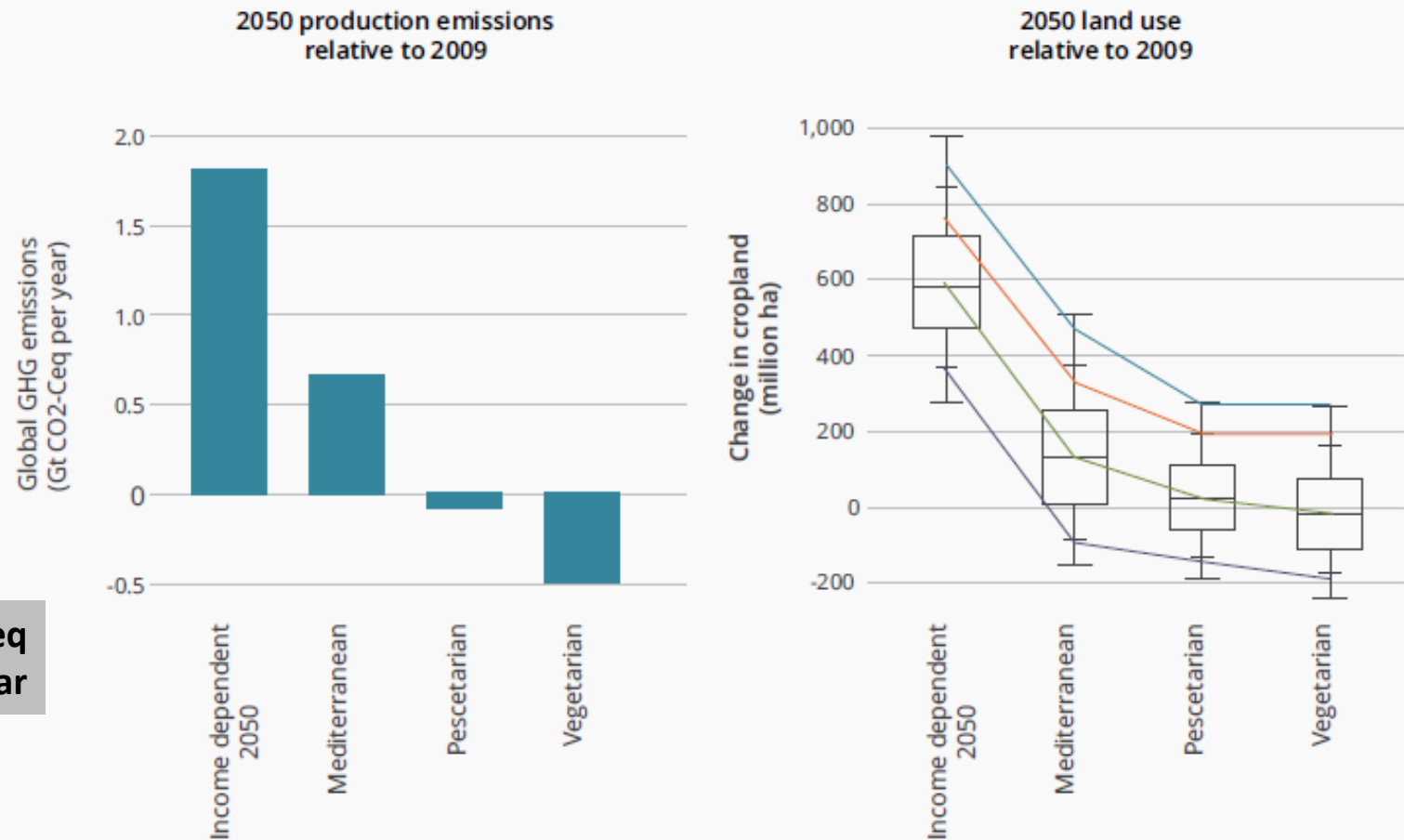
Source: UN, 2015.

# Threats to food system sustainability: GHGs emissions and climate change

- Global **agriculture and food production** release more than **25% of all greenhouse gases (GHGs)** (*FAO, 2014*)
- Projected dietary changes for 2050 are causing globally **significant increases in GHGs emissions** and contributing to **land clearing** (*Tilman and Clark, 2014*)

Current global CO<sub>2</sub>eq emissions: 36 Gt/year

**Figure 3.1** Effects of diets on GHG emissions (Source: Tilman and Clark 2014)





# Drought




Photo credit : Bob Nichols, 2013. Texas drought affecting corn crops. USDA. Creative Commons CC BY 2.0.



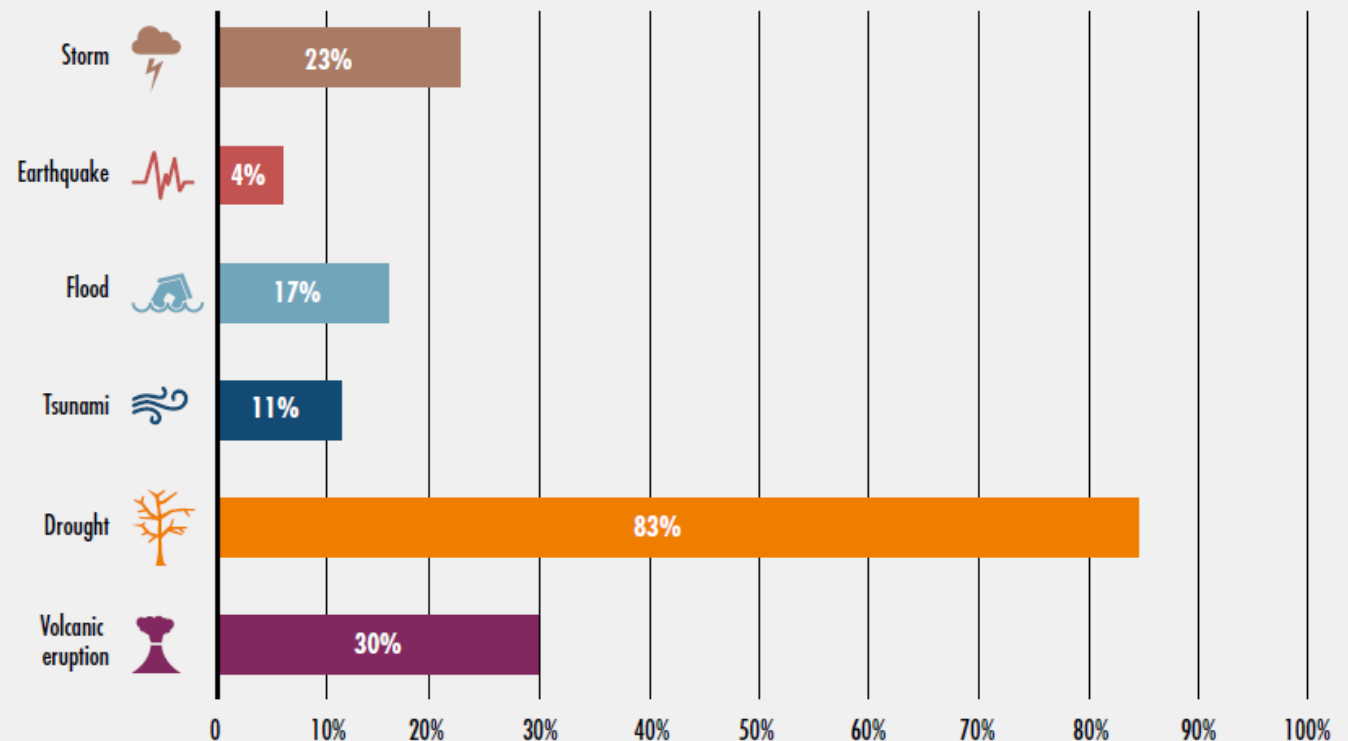


# RESILIENT

Climate resilience is one solution. It is important to strengthen food systems and people's livelihoods to anticipate and adapt to the effects of climate variability and extremes.

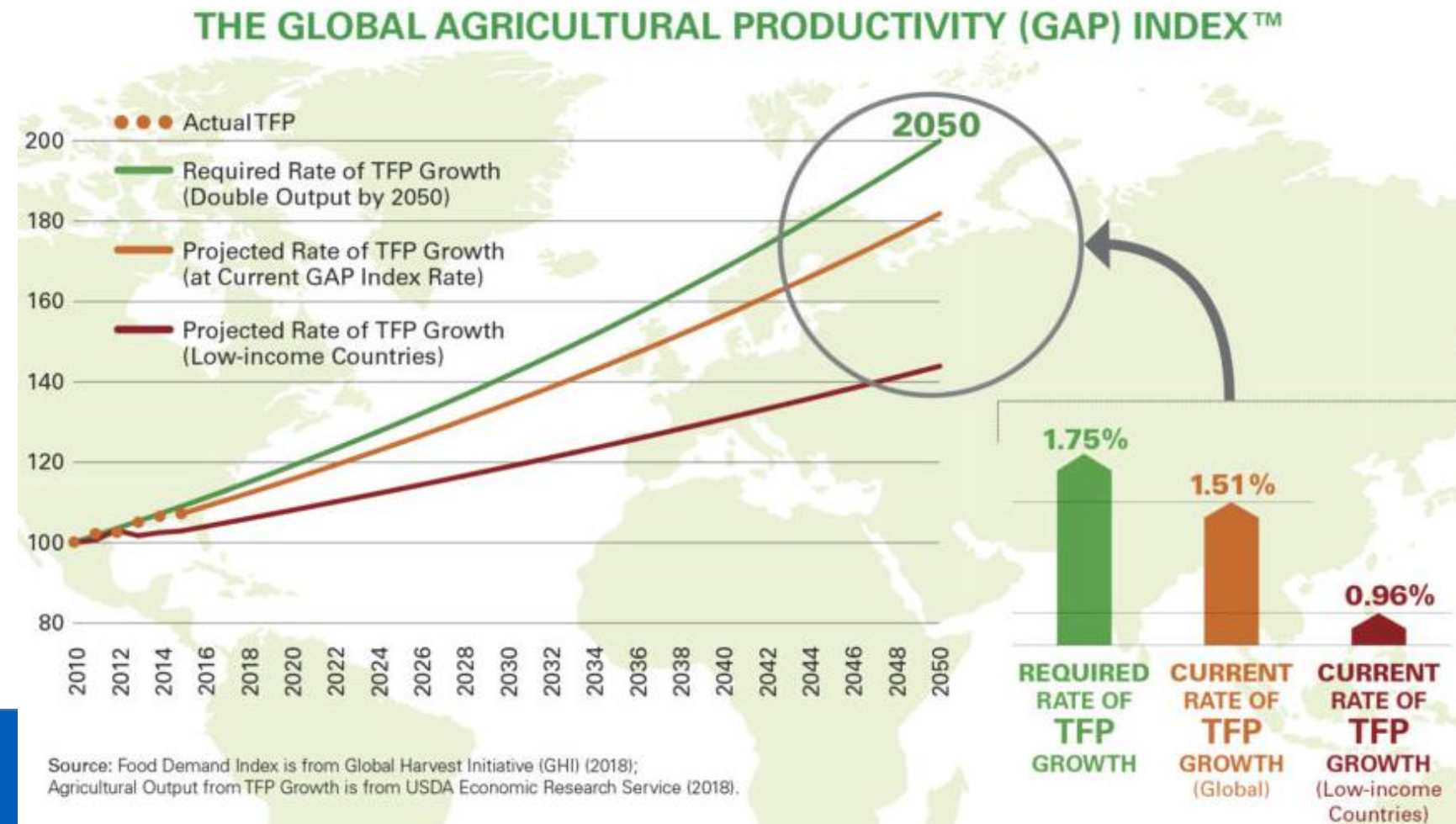
Crop and livestock sub-sectors incur the highest damages and losses in agriculture due to **climate-related disasters**, of which **drought** is the most destructive, 2006–2016

A) DAMAGE AND LOSS IN AGRICULTURE AS SHARE OF TOTAL DAMAGE AND LOSS ACROSS ALL SECTORS BY TYPE OF HAZARD

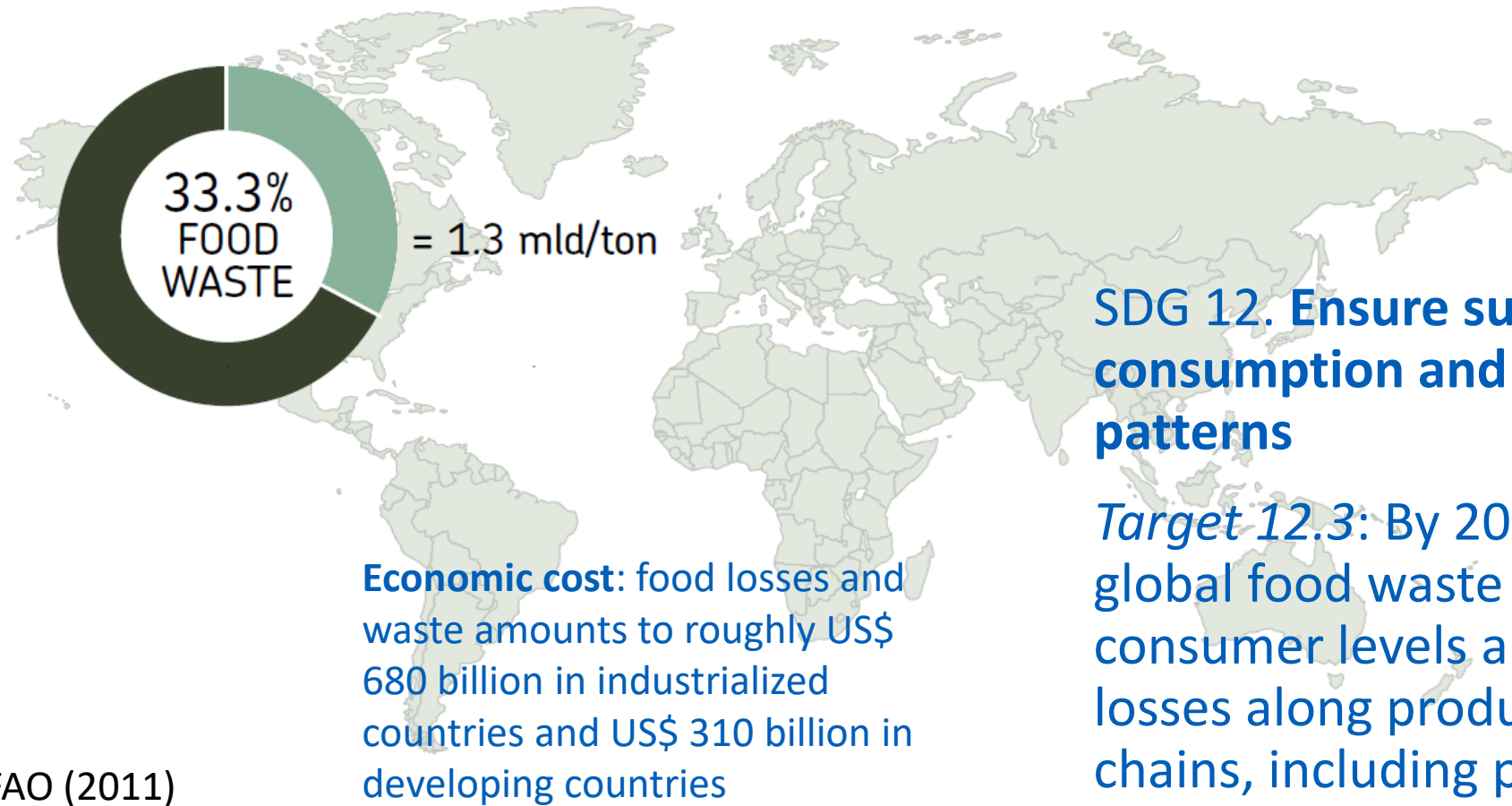


# Threats to food system sustainability: growth in agriculture productivity

- **Global agricultural productivity** growth (measured by Total Factor Productivity – TFP) is not accelerating fast enough to sustainably meet the food, feed, fiber and fuel needs in 2050



# Threats to food system sustainability: food waste



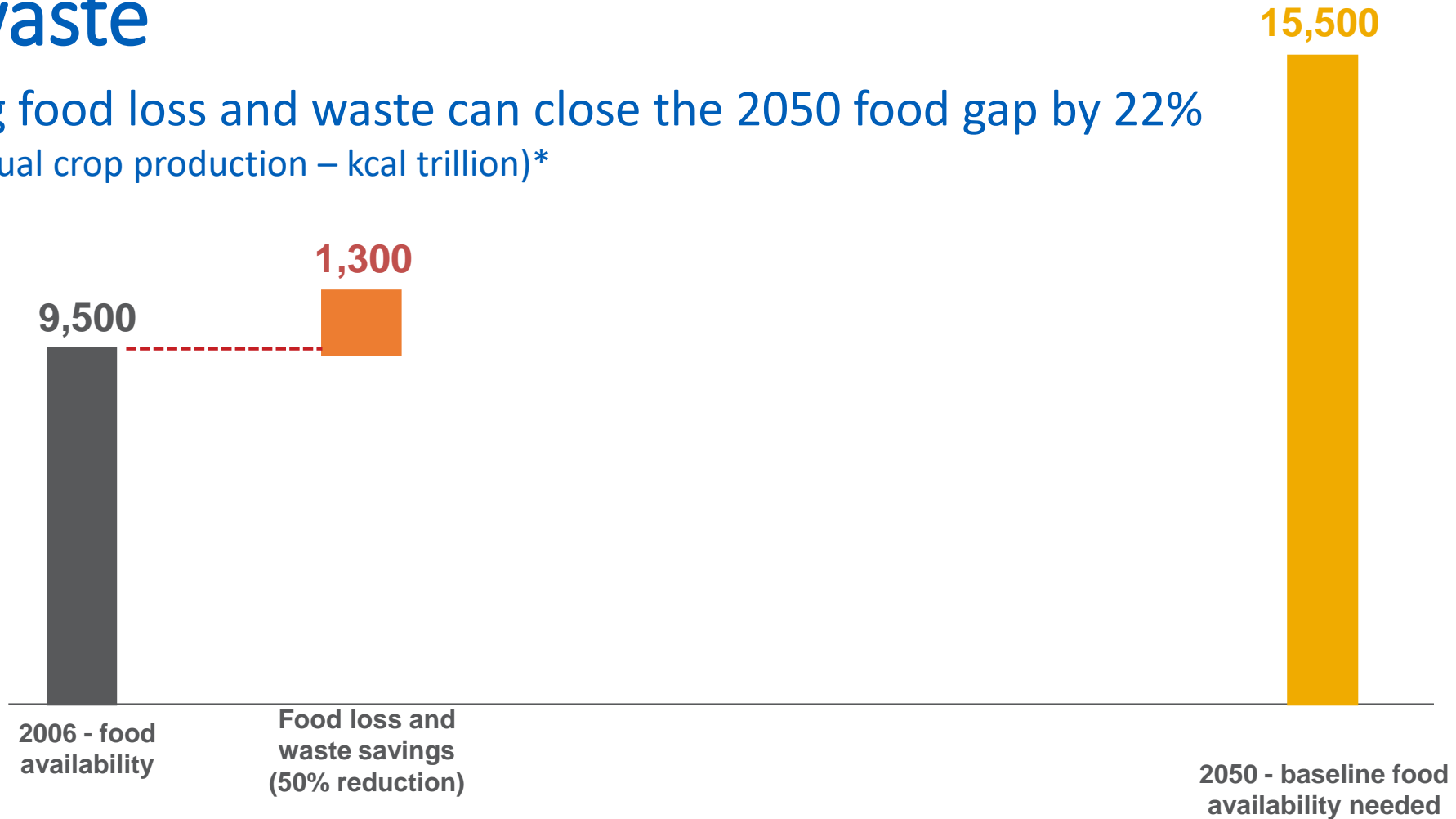
## SDG 12. Ensure sustainable consumption and production patterns

*Target 12.3:* By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses



# Threats to food system sustainability: food waste

- Reducing food loss and waste can close the 2050 food gap by 22%  
(Global annual crop production – kcal trillion)\*



Source: WRI analysis based on Bruinsma (2009) and Alexandratos and Bruinsma (2012).

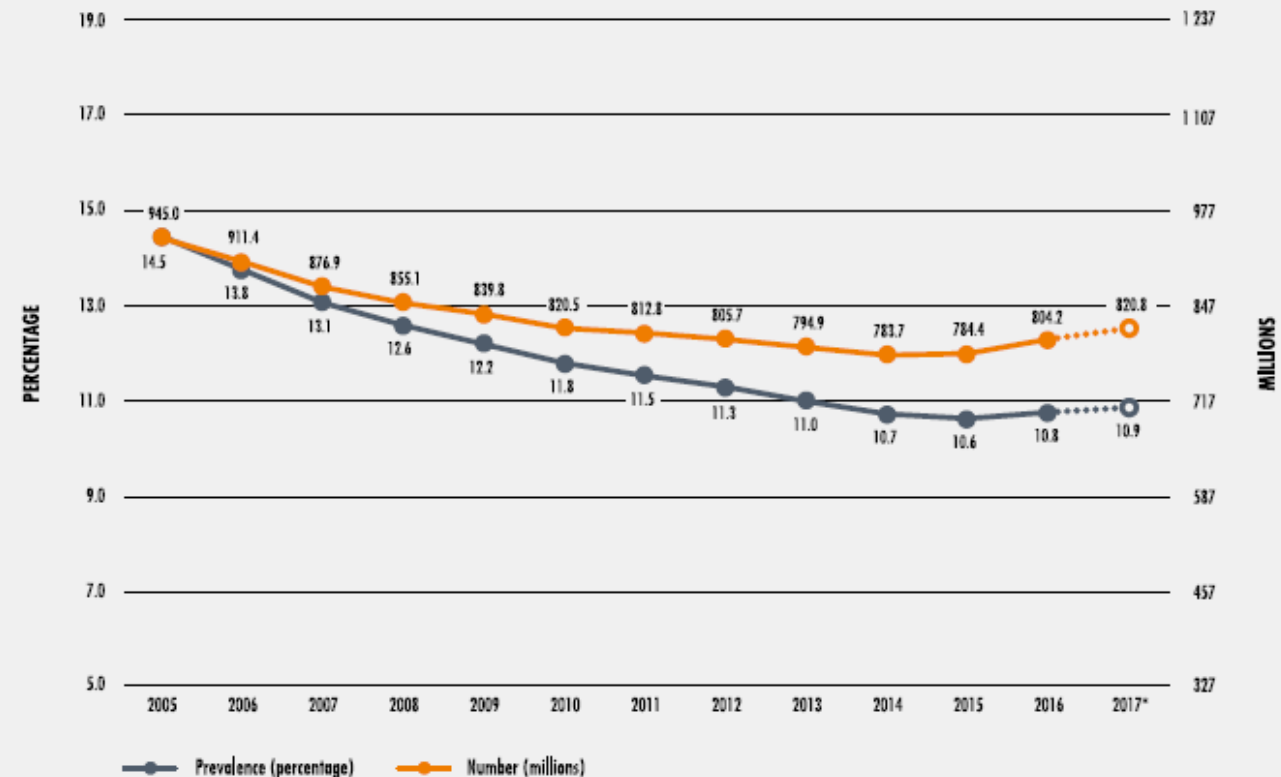
\* Includes all crops intended for direct human consumption, animal feed, industrial uses, seeds, and biofuels



# Threats to food system sustainability: malnutrition

- Increase in the absolute number of **undernourished** people in the world (FAO, 2018)
- Paradox: **undernutrition** and **overweight** and **obesity** coexist in many countries
- The global **costs of malnutrition** (undernutrition and diet-related NCDs associated with obesity) reach **5% of global GDP**, but in Low-Income Countries can reach **16% of GDP** (FAO, 2013)

FIGURE 1  
THE NUMBER OF UNDERNOURISHED PEOPLE IN THE WORLD HAS BEEN ON THE RISE SINCE 2014, REACHING AN ESTIMATED 821 MILLION IN 2017



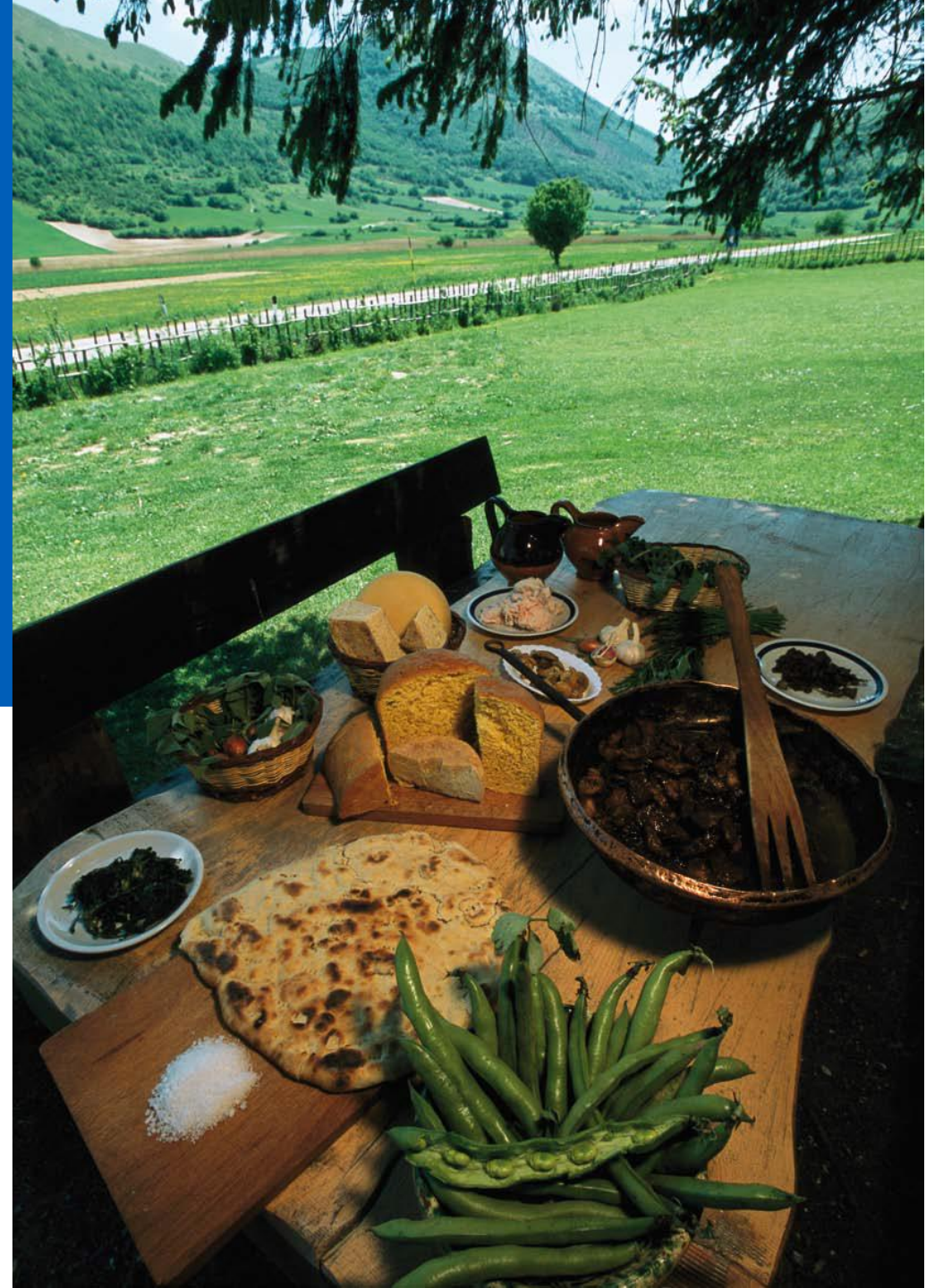
\* Projected values, illustrated by dotted lines and empty circles.  
SOURCE: FAO.

Source: FAO (2018)



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# Changing perspective: from Healthy to Sustainable Diets



# Healthy diets

- Diets should meet **energy needs**, provide a **diversity** of foods of **high nutritional quality** and be **safe** to consume



FAO/WHO (2014). Declaration on Nutrition.





# From healthy to sustainable diets

“Sustainable diets are those diets with **low environmental impacts** which contribute to **food and nutrition security** and to **healthy life** for present and future generations. Sustainable diets are protective and respectful of **biodiversity** and **ecosystems**, **culturally acceptable**, **accessible**, **economically fair and affordable**; **nutritionally adequate**, **safe and healthy**; while optimizing **natural and human resources**” (FAO, 2010)

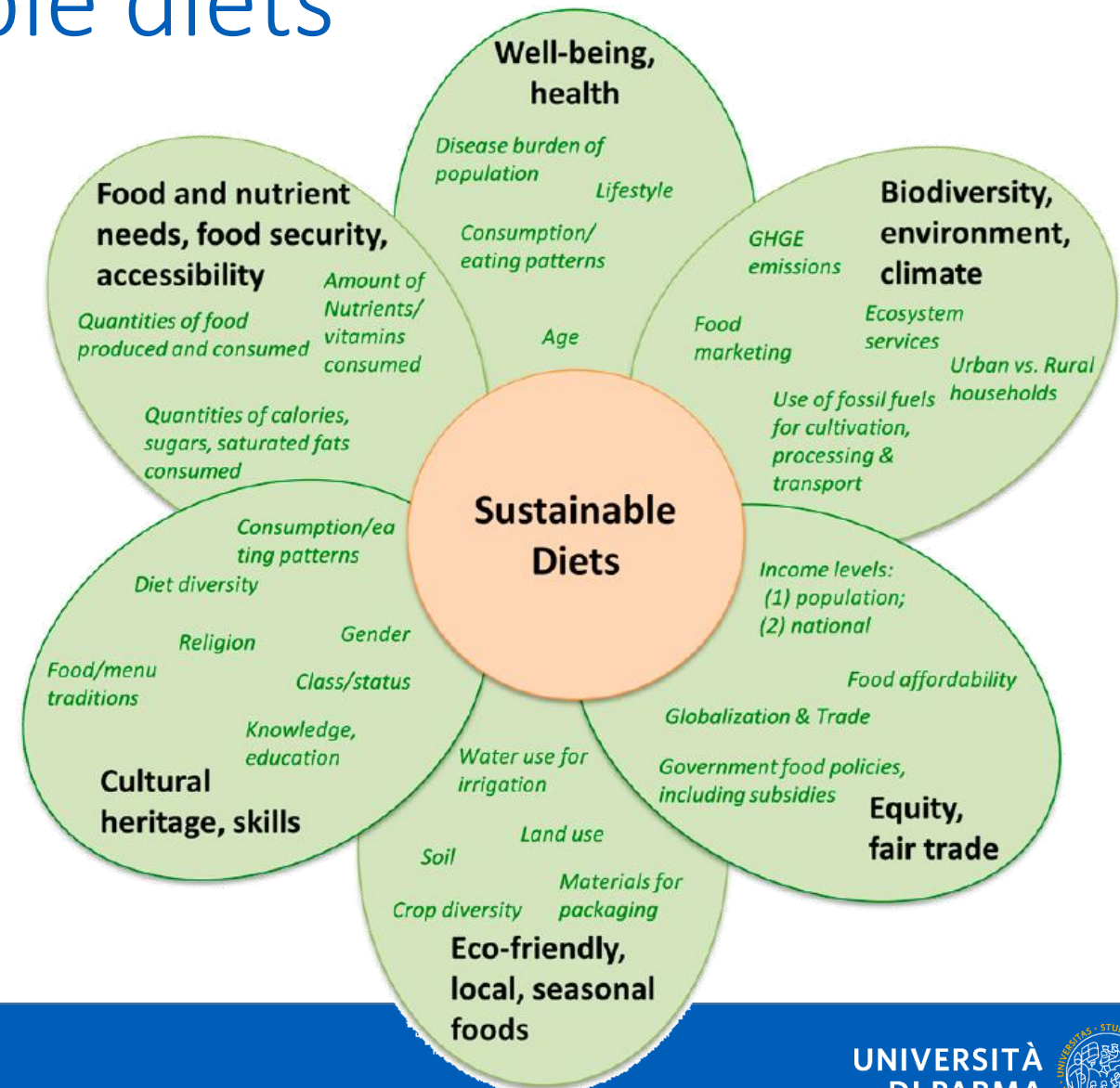


FAO (2010). Sustainable diets and biodiversity



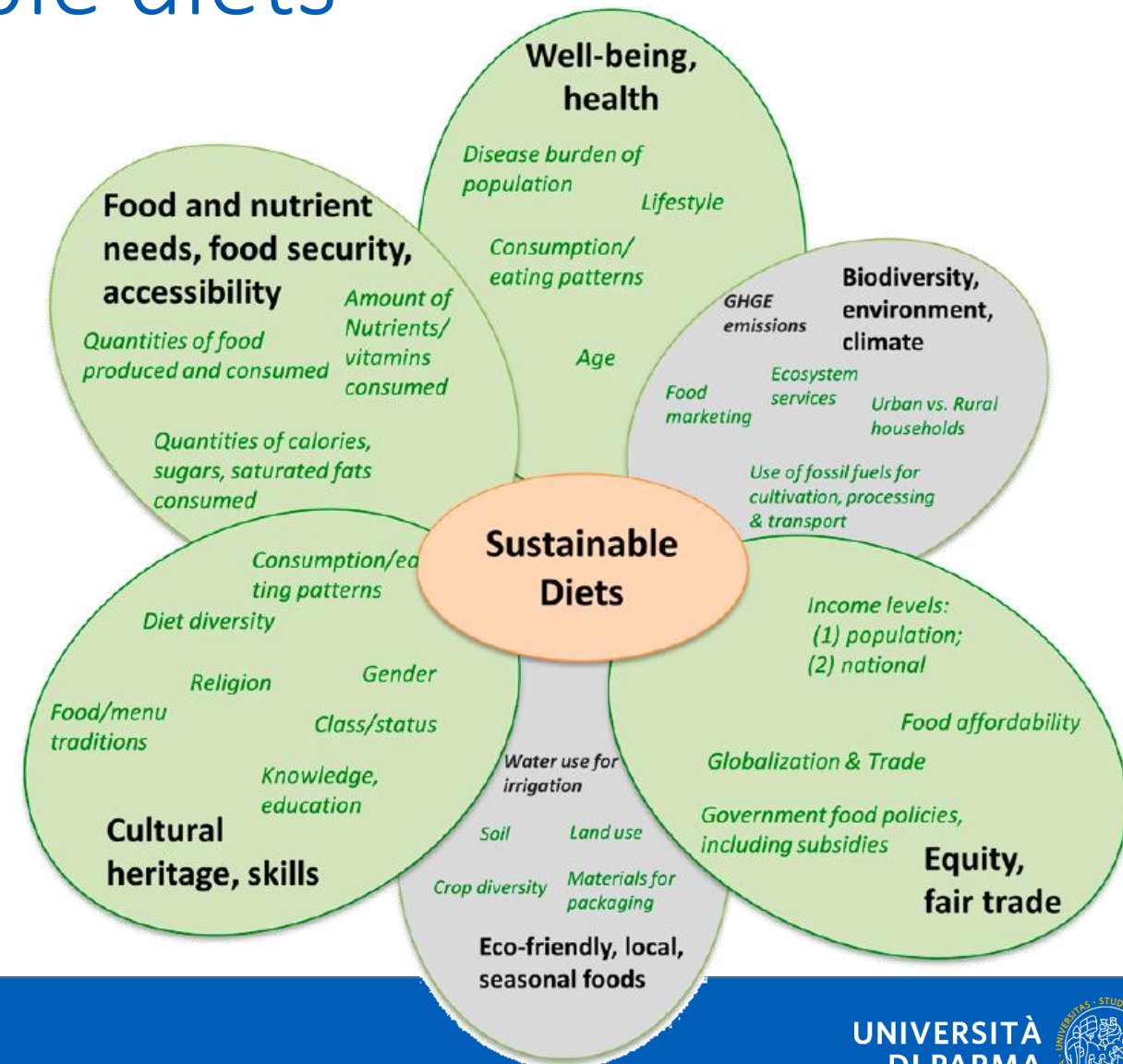
# Understanding sustainable diets

- Impacts of sustainable diet:
  - **Nutrition and health** outcomes (prevent malnutrition)
  - **Environmental** outcomes (water and land use, biodiversity, climate change)
  - **Economic** outcomes (income, employment, affordability, etc.)
  - **Social equity** outcomes (availability)



# Understanding sustainable diets

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  - **Environmental** outcomes (water and land use, biodiversity, climate change)
  - **Economic** outcomes (income, employment, affordability, etc.)
  - **Social equity** outcomes (availability)
- Interdependence and influences:
  - **Synergies** (win-win scenarios)
  - **Trade-offs** (unbalanced outcomes)





## Trade-offs or unintended effects

Increasing the consumption of fish – an important source of omega 3 fatty acids, iodine and vitamins A and D – to meet dietary guidelines might further deplete marine resources





## Trade-offs or unintended effects

Increasing the consumption of red meat (beef), which has high iron levels, may, in certain conditions, demonstrate significant environmental impacts, including on water and land use and greenhouse gas emissions (*FAO, 2018*)



## Trade-offs or unintended effects

The exports of natural mineral water from Italy to China to supply the *Freshippo Alibaba* retail chain will provide economic benefits to Italian companies (profits, wages), but definitely bad carbon footprint



## Trade-offs or unintended effects

**Yield gaps** of organic agriculture are in the magnitude of 19–25%

From an economic point of view, these yield gaps are balanced by higher prices (+30% on average), and therefore organic farming is 22–35% more profitable than conventional agriculture on average (Crowder & Reganold 2015)

The yield gaps imply that organic methods are not particularly indicated for food security objectives





## Trade-offs or unintended effects

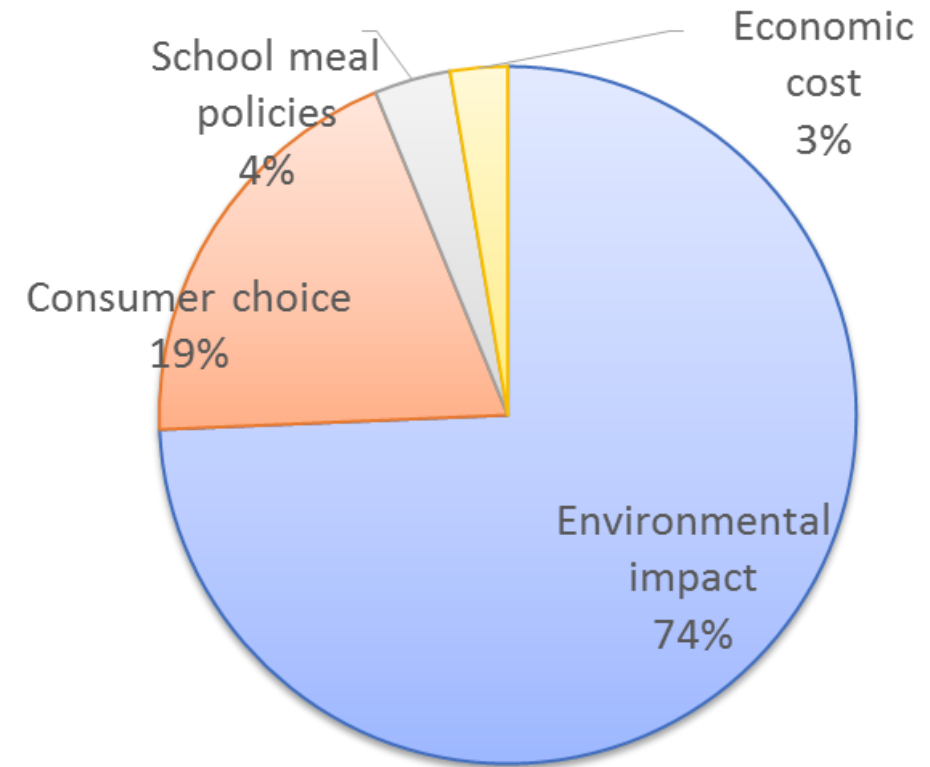
More extensive farming system (e.g. Cinta Senese) have socio-economic (e.g. value added) and environmental benefits (e.g. use of natural resources), but may have also bad performances (e.g. less affordable, more GHGs emissions per kg., etc.) (Schmitt et al. 2017)





# Understanding sustainable diets: how to measure sustainable diets?

- Jones et al. (2016) have reviewed 113 empirical studies, 92% of which centered in **high income countries**
- Most of them primarily analysed the **environmental impact** of the diets



Jones, A.D., et al. (2016). A Systematic Review of the Measurement of Sustainable Diets. *Advances in Nutrition* 7, 641–64.

# Understanding sustainable diets: health and environmental impacts

- Systematic review on 63 studies and 210 dietary scenarios:
  - Impacts of adopting sustainable diets on **GHG emissions**, agricultural **land requirement**, and **water use**
  - Compare the environmental and **health effects** between various types of sustainable dietary patterns



## RESEARCH ARTICLE

### The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review

Lukasz Aleksandrowicz<sup>1,2\*</sup>, Rosemary Green<sup>1,2</sup>, Edward J. M. Joy<sup>1,2</sup>, Pete Smith<sup>3</sup>,  
Andy Haines<sup>1,4</sup>

Open access:  
[doi:10.1371/journal.pone.0165797](https://doi.org/10.1371/journal.pone.0165797)



# Understanding sustainable diets: health and environmental impacts

- **Decreasing environmental impacts:**  
ruminant meat > other meat > dairy > plant-based food
- Studies showed a **positive health effect** of adopting a sustainable diet (either by all-cause or cause-specific **mortality**, e.g. CHD risk), ranging from <1% reduction for vegetarian diets, to 19% for vegan diets
- **Health and environmental priorities are not always converging**
  - For example, fruit or vegetables may have higher GHG emissions per calorie than dairy and non-ruminant meats

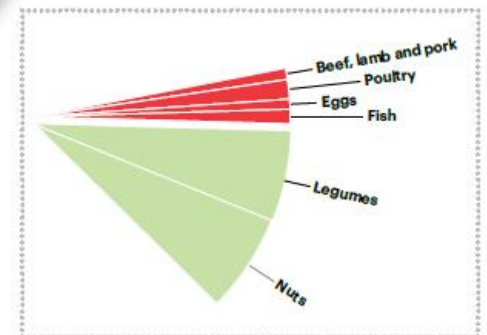


Aleksandrowicz et al. (2016)



# Understanding sustainable diets: health and environmental impacts

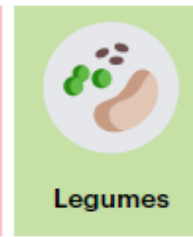
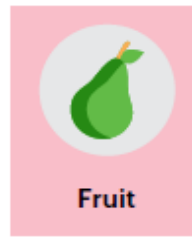
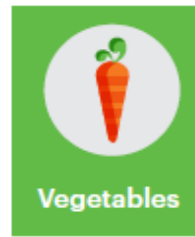
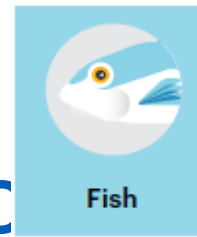
- “**Transformation to healthy diets** by 2050 will require substantial dietary shifts. [...] A diet rich in plant-based foods and with fewer animal source foods confers both **improved health and environmental benefits**” (*EAT-Lancet Commission on Healthy Diets From Sustainable Food Systems, 2019*)



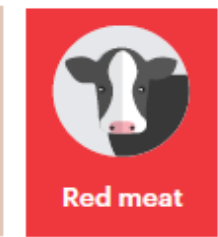
Willett et al. (2019), Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems.

# Understanding health and envirc

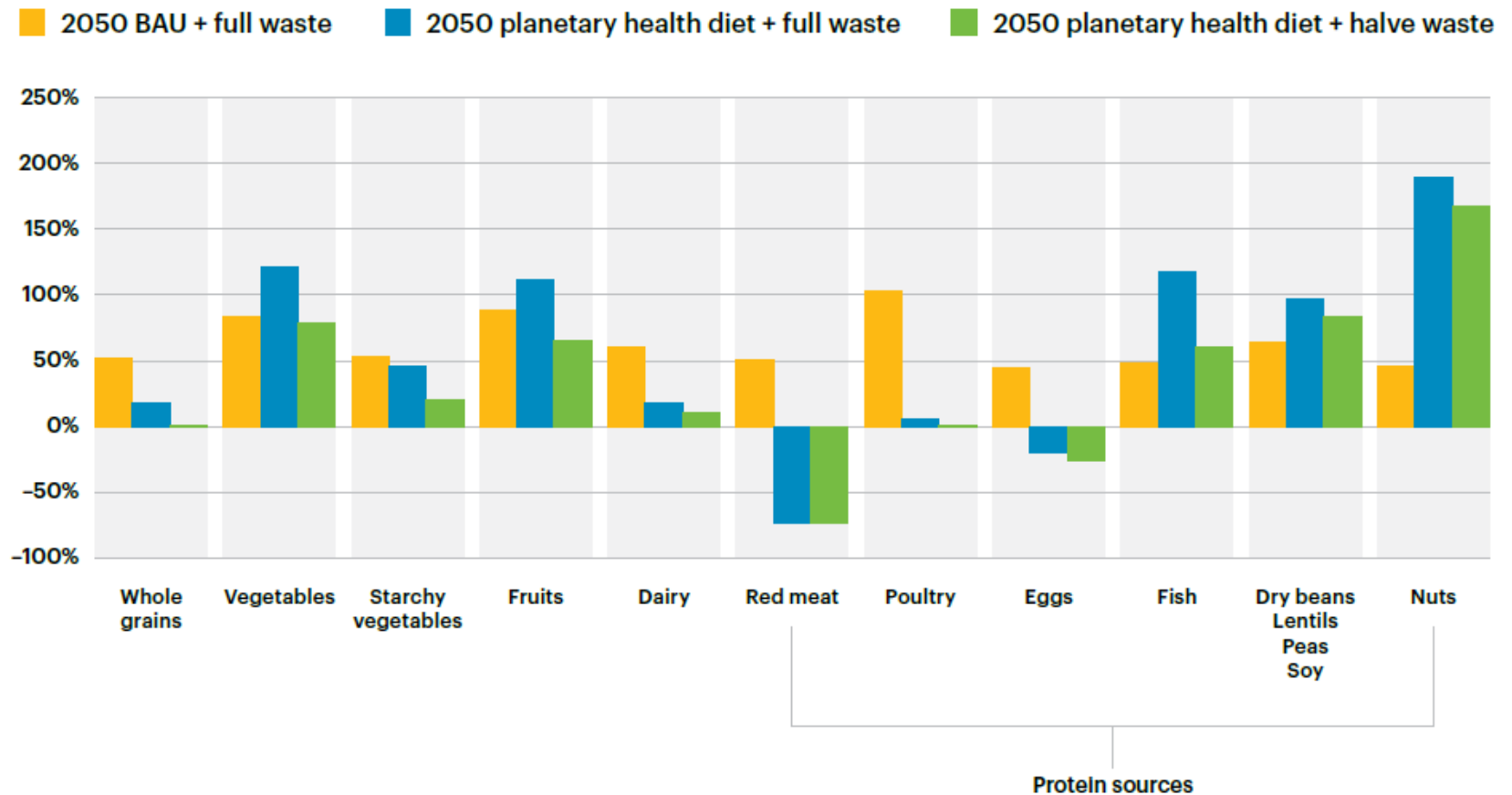
Emphasized foods



Limited intake



- **Dietary changes:** global consumption of fruits, vegetables, nuts and legumes will have to **double**, and consumption of foods such as red meat and sugar will have to be **reduced by more than 50%** (*EAT-Lancet Commission, 2019*)



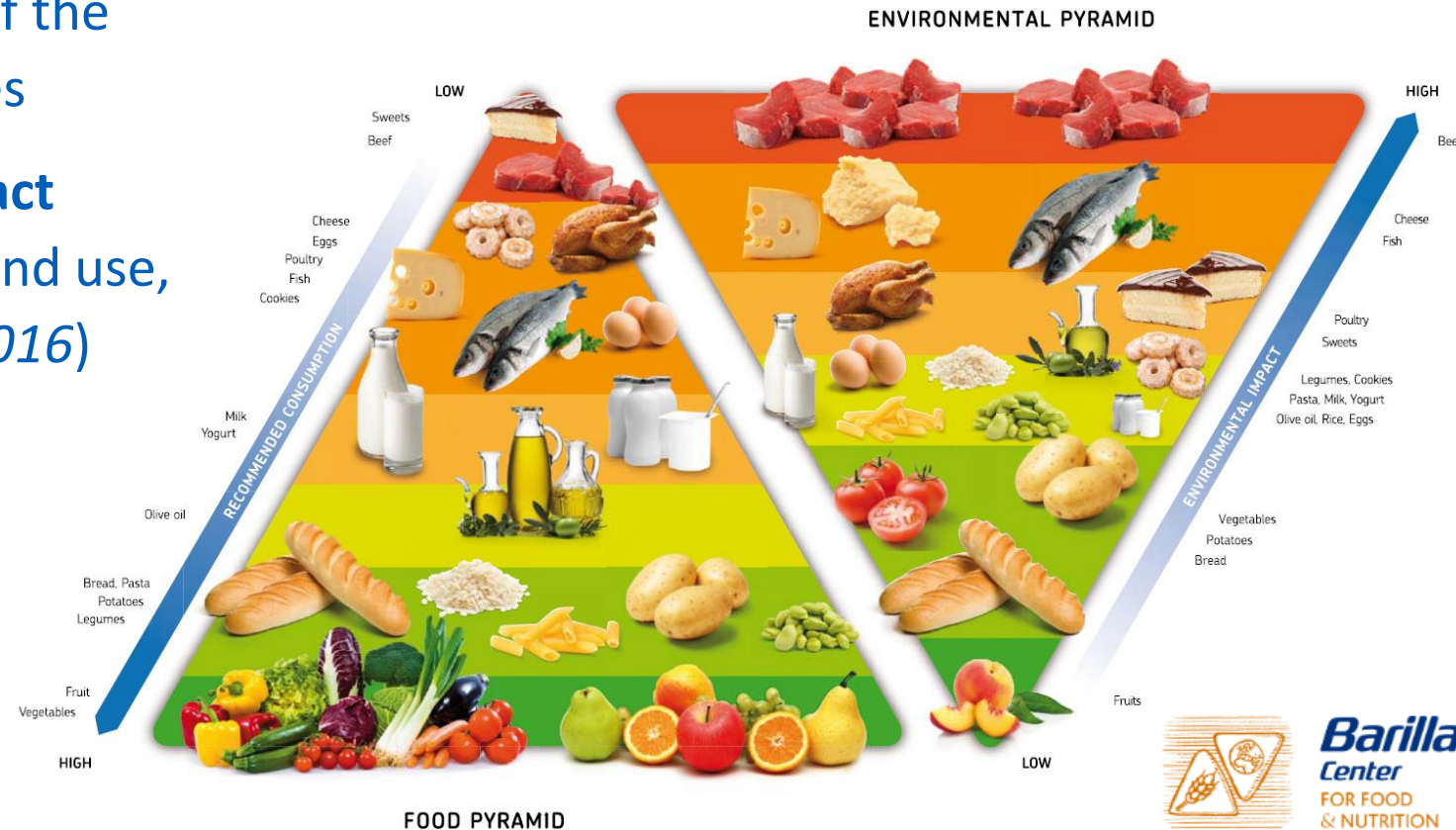
Willett et al. (2019)

Economic sustainability of healthy diets

Predicted change in food production from 2010 to 2050 (% from 2010 scenario) for the business as usual (BAU) with full waste, the planetary health diet with full waste, and the planetary health diet with halve waste scenarios.

# Understanding sustainable diets: the sustainability of **Mediterranean Diet**

- Health and environmental benefits of the **Mediterranean Diet (MD)** – synergies
- MD has a **lower environmental impact** (median values: -8% CO<sub>2</sub>-eq, -27% land use, -10% water; *Aleksandrowicz et al., 2016*)





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- There are **no significant differences in the total budget** (*Germani et al., 2014*)

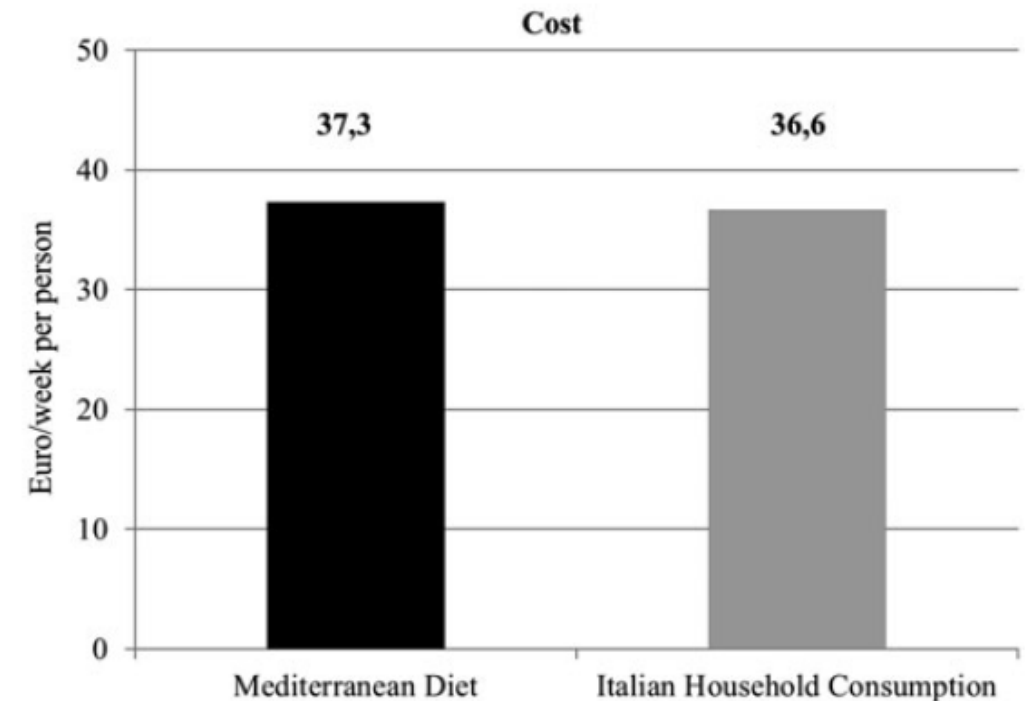
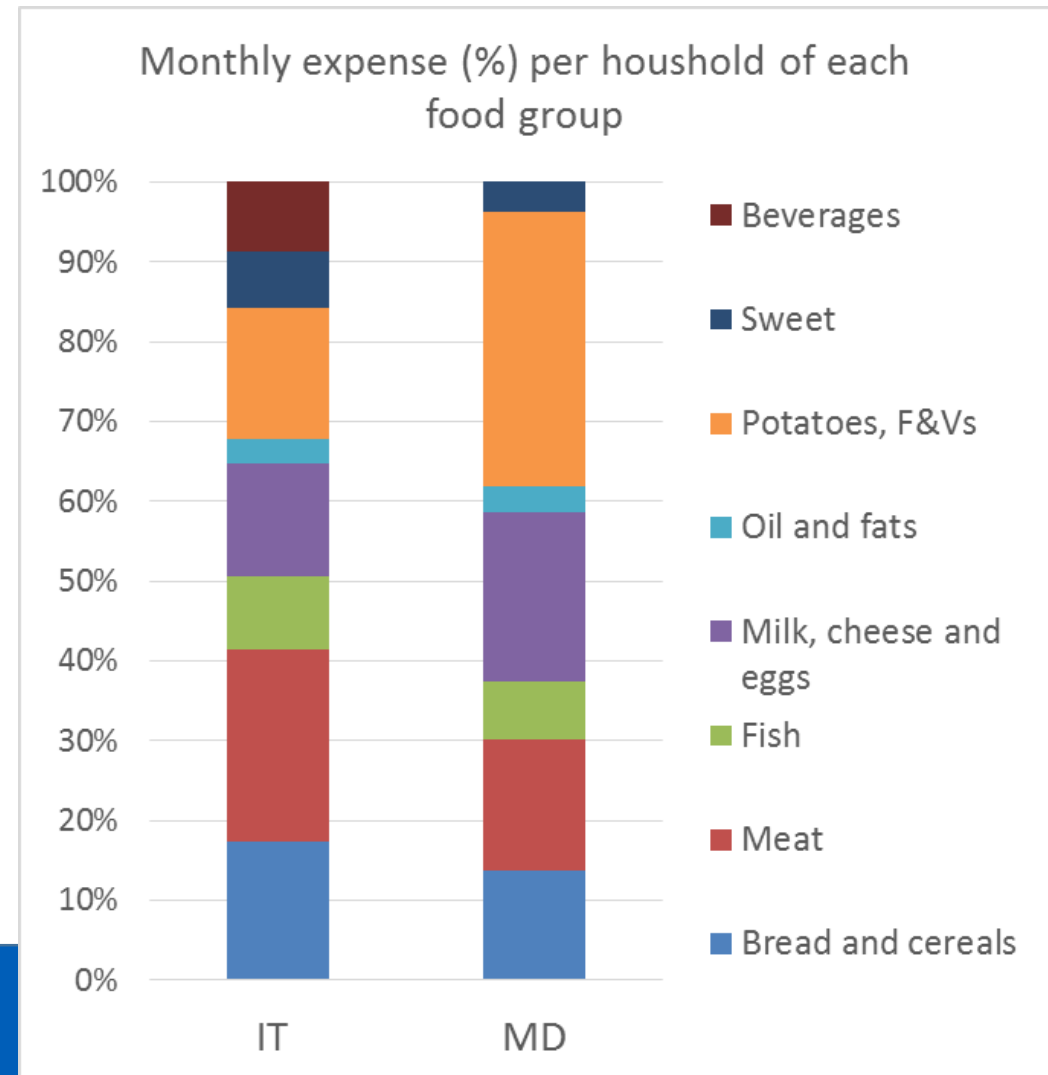


Figure 2. Costs of Mediterranean Diet and Italian Household consumption per person for week.

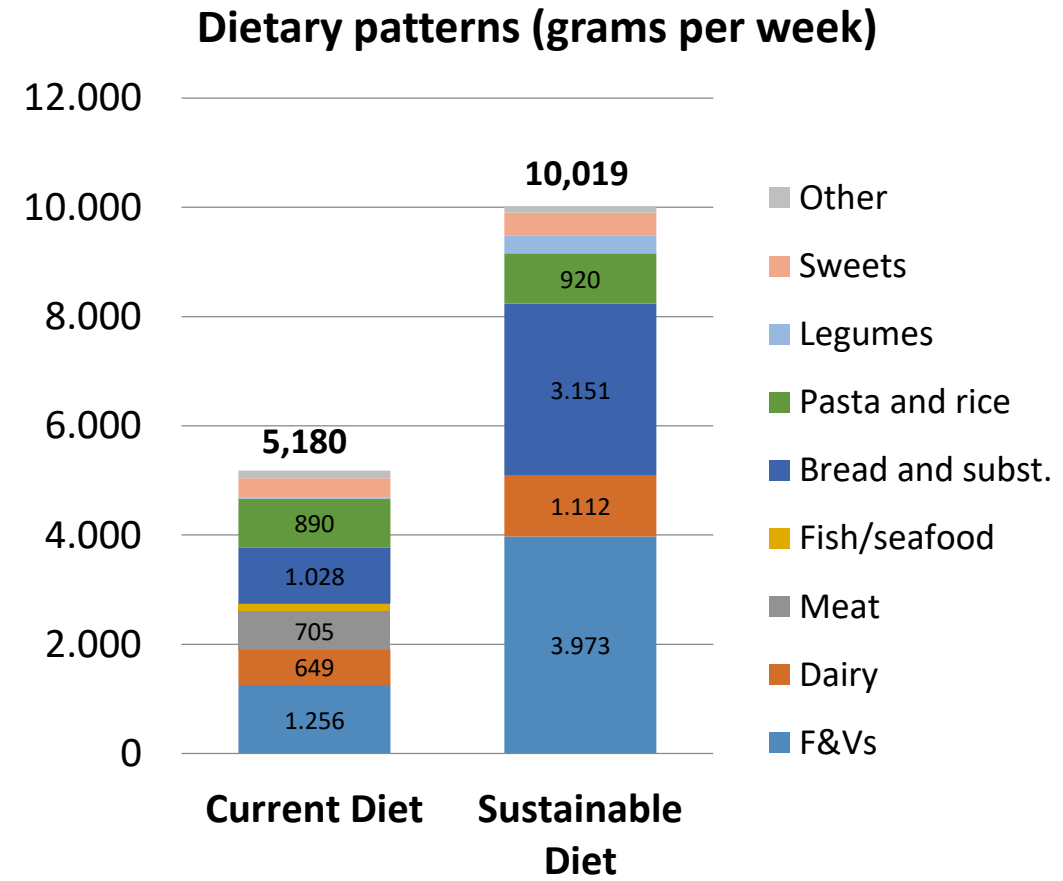
# Understanding sustainable diets: the sustainability of **Mediterranean Diet**

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- There are **no significant differences in the total budget** (*Germani et al., 2014*)
- **Changes needed:** different allocation of the budget to the different food groups



# Understanding sustainable diets: economic, environmental and nutritional objectives

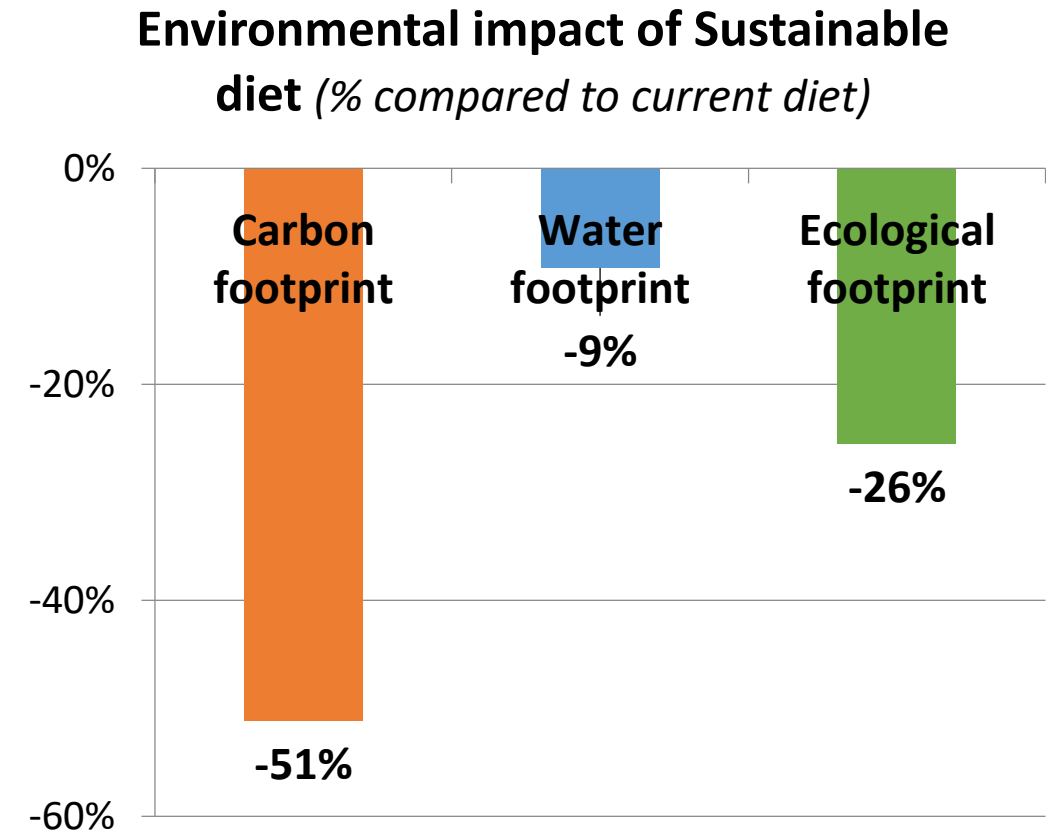
- A mathematical linear programming model was applied to identify a Sustainable Diet (SD)
- Three dimensions: **nutrition/health** (macronutrients), **environmental** (carbon, water, ecological footprint), and **affordability** (cost)
- Dietary information were collected from students attending the last year of eight classes of high schools in Parma (Italy)
- Modelled **dietary shift towards sustainable diet**





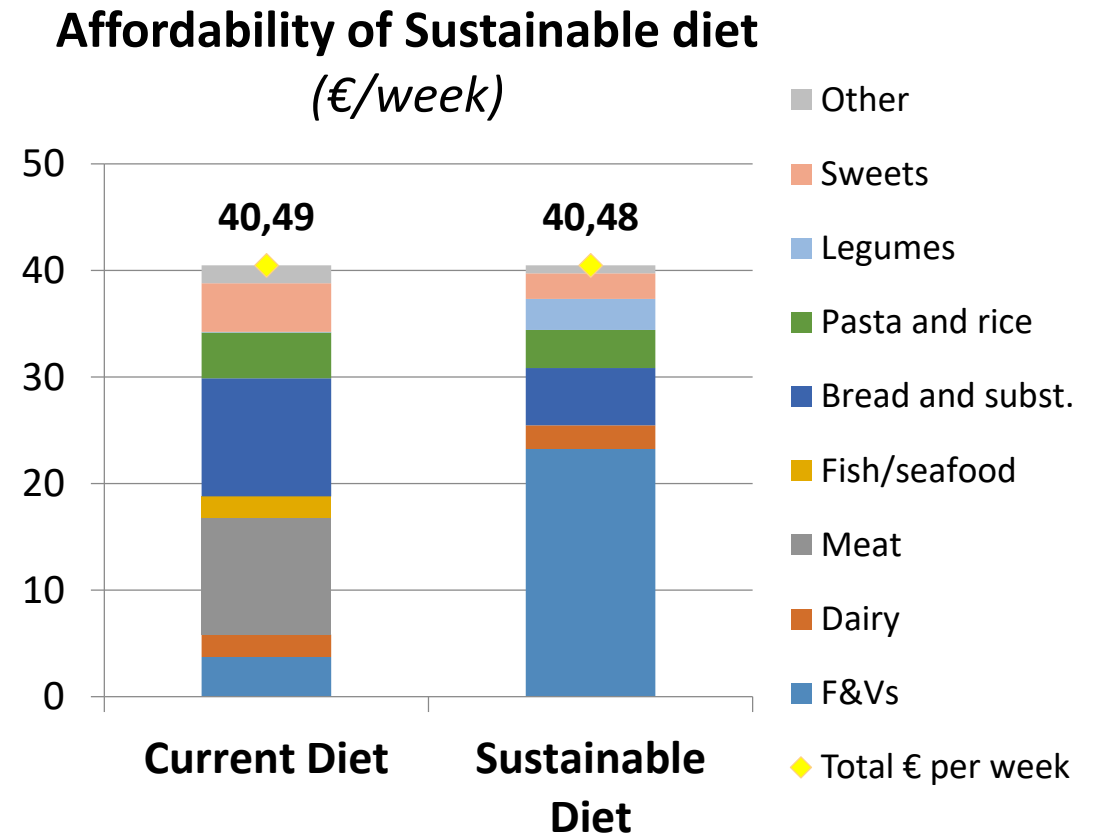
# Understanding sustainable diets: economic, environmental and nutritional objectives

- The **Sustainable Diet**, according to the mathematical model, may lead to a **51% cut in CO<sub>2</sub>e emissions**, **9% reduction in water** consumption and **26% less land** needed to regenerate the resources compared to the current diet



# Understanding sustainable diets: economic, environmental and nutritional objectives

- The modelled **sustainable diet is not more expensive** than the current diet, therefore **fully affordable** for the population under study





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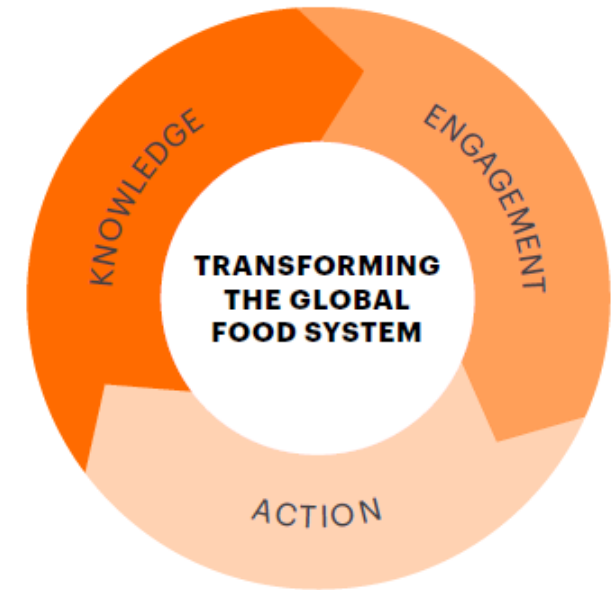
# Framework for a Great Food Transformation





# Great Food Transformation

- Scientific evidence shows the need for a **Great Food Transformation** (*EAT-Lancet Commission, 2019*)
- Need for widespread, multi-sector, multi-level action to change **what food is eaten, how it is produced**, and its **effects on the environment and health**, while providing healthy diets for the global population
- **Engagement of all actors** at all scales working towards a shared set of goals
- **Scientific research** is essential to change the global food system



# Policy levers

- Applying the **Nuffield Ladder of Policy Intervention** to Health Diets from Sustainable Food Systems
- Wide range of **policy levers for multiple-actors** (governments, industries, civil society)
- **Interventions** are hard to soft from top to bottom

Hard  
Intervention



Soft  
Intervention

Policy Lever	Description
Restrict or eliminate choices	Remove inappropriate choice options Channel actions only to the desired end and isolate inappropriate actions
Guide choices through incentives and disincentives	Use regulations or financial incentives Apply taxes or charges
Guide and enabling choices	Enable individuals change behaviour Provide better options, by changing default policy
Provide information	Inform or educate the public
Do nothing	No action or only monitor situation

# Policy levers



## Policy Lever

## Description

Restrict or eliminate choices

Remove inappropriate choice options

the desired  
appropriate

ial

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**SUSTAINABLE  
DEVELOPMENT  
GOALS**

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# Policy levers



diets



choice  
to the desired  
appropriate  
financial

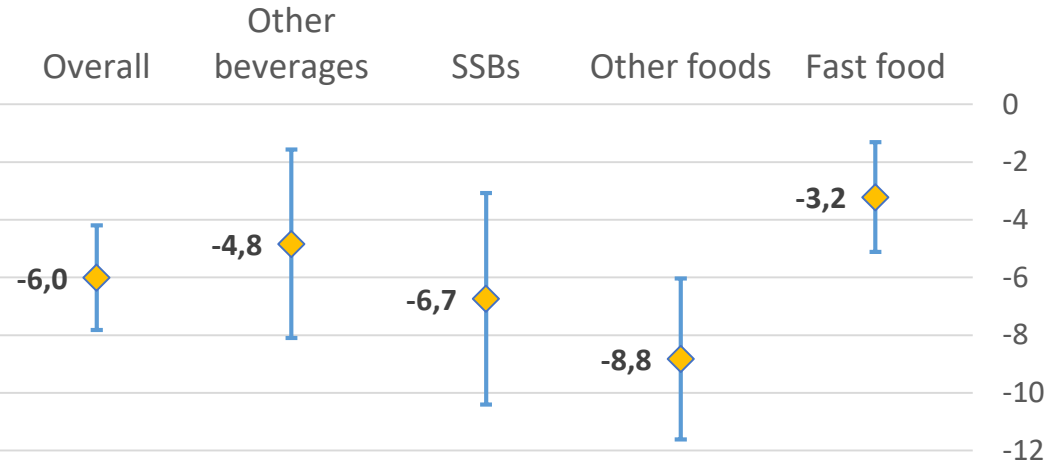
Guide and enabling choices    Enable individuals change behavior  
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# Policy levers

## Effect of the “unhealthy food” taxes

(% change in intake per 10% increase in price)

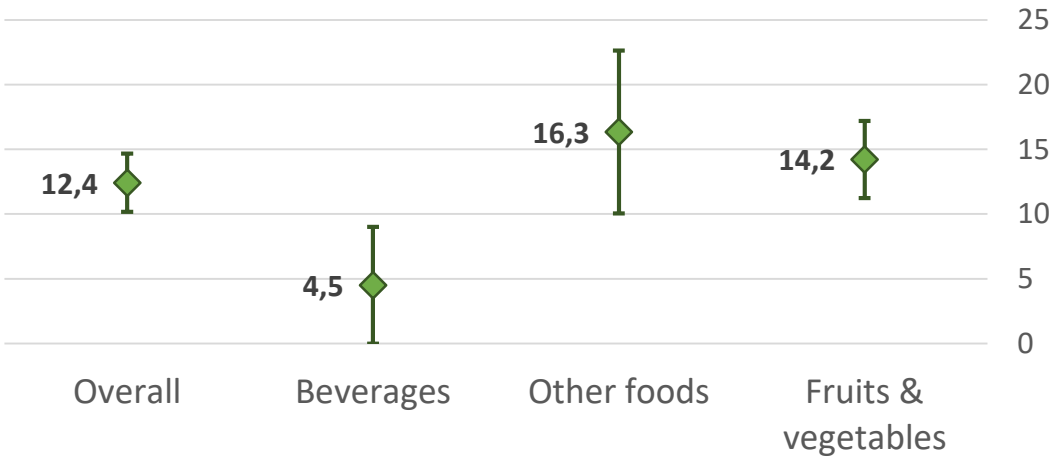


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# Policy levers

Effect of the “healthy food” subsidies  
(% change in intake per 10% decrease in price)



Policy Lever	Description
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# Policy levers



**Sodium** Reduction  
in Communities

## Policy Lever

## Description

**Restrict or  
eliminate choices**

**Remove inappropriate choice  
options**  
  
**Channel actions only to the desired  
end and isolate inappropriate  
actions**

Guide choices  
through incentives  
and disincentives

Use regulations or financial  
incentives  
  
Apply taxes or charges

# Conclusions and take home message

- Need for more studies of **social** and **economic** dimensions of diets
- Transition towards a more **sustainable diet** (less meat, more seasonal legumes and vegetables, proteins from vegetables and novel sources)
- **Different actors** involved (agriculture, industries, retailers, food services, policy makers, scientists, etc.)
- **Behavioural shift** is required (issues: waste reduction commitment, smarter food design, policy tools, etc.)



# GRAZIE



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