zef
Center for
Development Research
University of Bonn

Food and Agriculture
Organization of the
United Nations

Investment Costs and Policy Action for Reaching a World without Hunger (SDG 2)

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Bonn and Rome, March 17th 2021

Overview

1. Progress of the Scientific Group for the Food Systems Summit

2. Cost of ending hunger

3. Understanding the true cost of food

4. Advanced modelling of options and opportunities

5. Outlook

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Scientific Group for the UN Food Systems Summit

TOR of Scientific Group

1. **Mobilizing Science for the FSS, and in FSS Dialogues** at national and regional levels and partnerships
2. **Engaging in Action Tracks of FSS**
3. **Evidence-based assessments of action propositions**, drawing on science, and diverse knowledge, peer review
4. **Contributing to the FSS agenda** and to **follow-up** after the Summit.

Scientific Group‘s Papers address key FSS issues

revised after peer review

Food Systems – Definition, Concept and Application for the UN Food Systems Summit
Healthy diet: A definition for the United Nations Food Systems Summit
AT1 - Ensure Safe and Nutritious Food for All
AT2 - Shift to Sustainable Consumption Patterns
AT3 - Boost Nature Positive Production
AT4 - Advance Equitable Livelihoods
AT5 - Build Resilience to Vulnerabilities, Shocks and Stress
See at https://sc-fss2021.org/materials/scientific-group-reports-and-briefs/

Scientific Group partnering with science communities to addresses key FSS issues … Emphasis on science opportunities for FS change

Briefs from Partners & ca. 20 more to come
In the age of pandemics, connecting food systems and health
Reduction of Food Loss and Waste
A New Paradigm for Plant Nutrition
The Bioeconomy and Food Systems Transformation (LAC)
Ending Hunger by 2030 – policy actions and costs
To come: **Briefs on trade, finance, gender, youth, R&D, urban, indigenous fs, farms, oceans, livestock, nexus agro-ecolog, biodiversity…; countries and regions Africa, LAC, Asia; Modelling the food systems changes** **https://sc-fss2021.org/materials/fss-briefs-by-partners-of-scientific-group/**

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How Much Will it Cost to End Hunger by 2030? Actions at marginal costs

- Using the **Marginal Abatement Costs Curve (MACC)** approach, the **22 interventions** were assessed to identify least-cost investment options with the highest potential for reducing POU (hunger)

- Information about the interventions was drawn from best available evidence-based literature, including **modelling studies and impact assessments**.

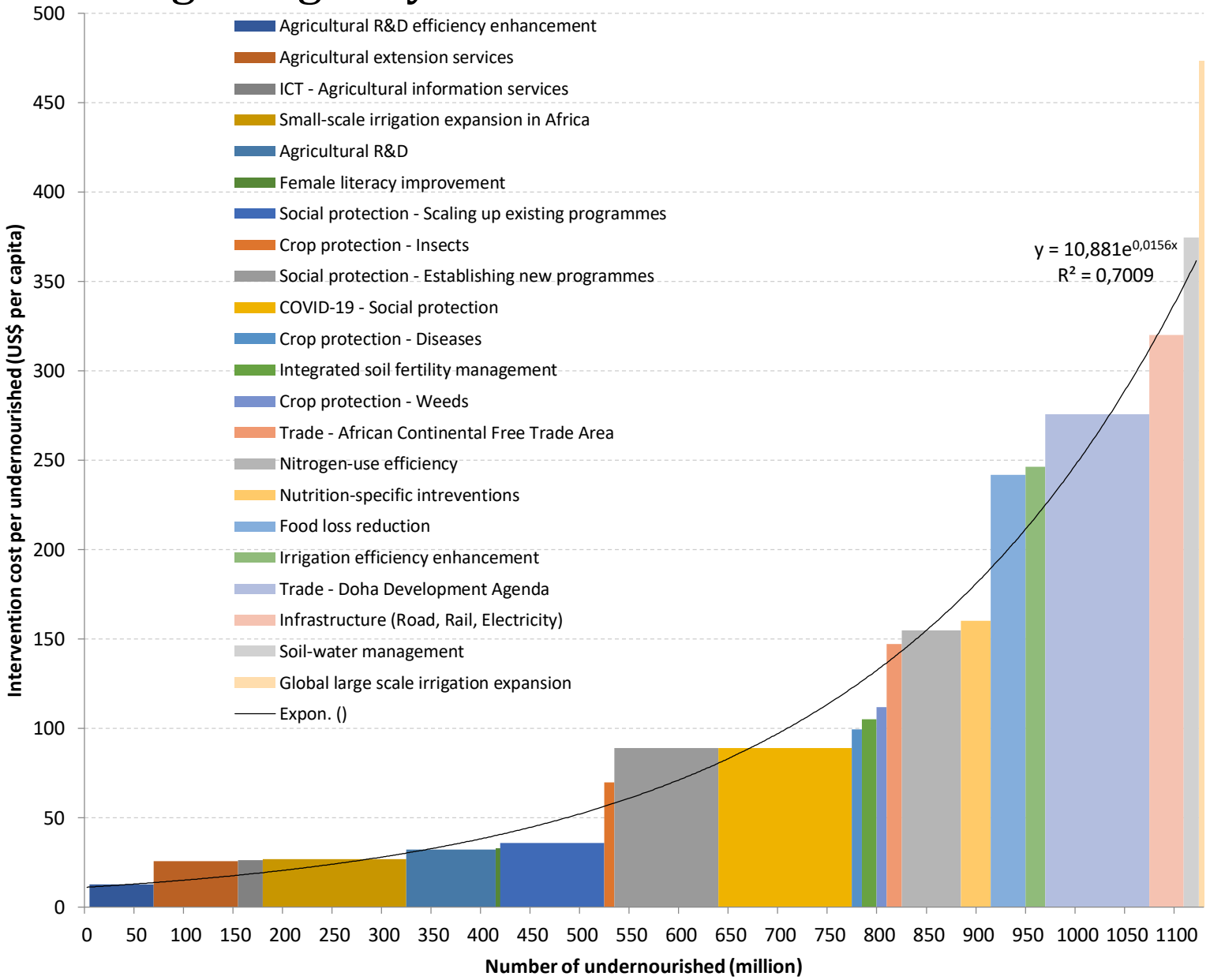
Bezawit Chichaibelu, Joachim von Braun, Maximo Torero Cullen, Jose Rosero
https://www.zef.de/fileadmin/downloads/ZEF_FAO_SDG2.pdf 2020

How Much Will it Cost to End Hunger by 2030? Actions at marginal costs – top 12

Rank	Interventions	Reduction in NoU (Million)	Average annual investment cost (US$ Million)	Average annual investment costs per capita (US$)
1	Agricultural R&D efficiency enhancement	69.9	888	12.7
2	Agricultural extension services	81.5	2096	25.7
3	ICT - Agricultural information services	26.6	698	26.2
4	Small-scale irrigation expansion in Africa	142.3	3790	26.6
5	Agricultural R&D	92.0	2960	32.2
6	Female literacy improvement	2.6	87	33.1
7	Social protection - Scaling up existing programmes	103.1	3676	35.7
8	Crop protection - Insects	10.1	700	69.7
9	Social protection - Establishing new programmes	103.1	9158	88.9
10	COVID-19 - Social protection	137.9	12255	88.9
11	Crop protection - Diseases	8.8	875	99.4
12	Integrated soil fertility management	16.6	1750	105.1

Bezawit Chichaibelu, Joachim von Braun, Maximo Torero Cullen, Jose Rosero
https://www.zef.de/fileadmin/downloads/ZEF_FAO_SDG2.pdf 2020

Ending Hunger by 2030 – The Investment Actions



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Bezawit Chichaibelu, Joachim von Braun, Maximo Torero Cullen, Jose Rosero
https://www.zef.de/fileadmin/downloads/ZEF_FAO_SDG2.pdf 2020

Learning From Progressing Countries

Low- and middle-income countries that reduced hunger (PoU) by more than 50 percent 2001-18, had high…

- **Economic growth (6%)**
- **Agricultural growth (4.5%).**
- **Gov. capital investment growth (9%)**
- **Education; health exp. growth (8%)**
- **Crop yields (80% higher than others)**

→Hunger reduction goes hand in hand with improvements in policy on sectoral, human and macro-econ. development

Bezawit Chichaibelu, Joachim von Braun, Maximo Torero Cullen, Jose Rosero
https://www.zef.de/fileadmin/downloads/ZEF_FAO_SDG2.pdf 2020

Ending Hunger can be Achieved

1. Donors and affected partner countries must **double their investments** from now until 2030 - by about **USD 14 billion more per annum**, low and middle income countries by about **25 billion per annum**
2. In countries with hunger problems, **agriculture** must be a focus; donors and partner countries should agree on, and implement **efficient packages of investment and policy measures.**
3. Bring forward investments in **social security** to address acute hunger; and in research and training, because that takes time to take effect.
4. Scientific Group and partners - research on innovative **financing**

Source: Ending Hunger by 2030 – policy actions and costs. Joachim von Braun (ZEF), Bezawit Beyene Chichaibelu (ZEF), Maximo Torero Cullen (FAO), David Laborde (IFPRI), Carin Smaller (IISD, CERES). Policy Brief, Oct 13, 2020

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The hidden costs of food

What impacts are hidden behind current food prices?

Nowadays, there is a **difference between the market price of food and its comprehensive cost to society**

Environmental Costs:

- Climate Change
- Biodiversity Loss
- Degradation of Land and Freshwater pollution

Social Costs:

- Nutricional insecurity
- Social inequality

These hidden costs propagate **failures within the food system**:

Poor production and distribution practices:

- Reductions in crop diversity and resiliency
- Food loss

Promotion of convenience and throw-away culture:

- Food waste
- Pollution
- Consumption-production dissociation

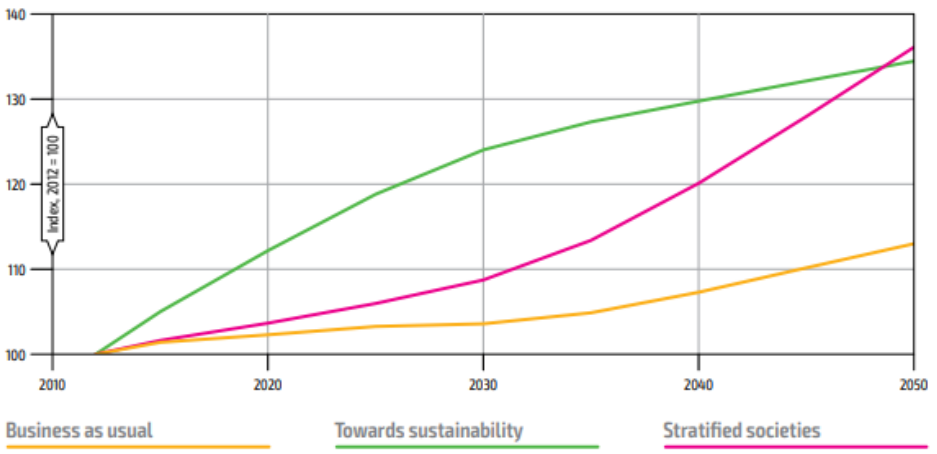
The true cost of food

Is sustainable food more expensive?

An effort to price food based on the principle of true cost could:

- Minimize the mismatch between who causes pollution and who pays for it.
- Promote more sustainable means of production.
- Empower actors at the end of the chain to make choices in line with SDG 12: Responsible Production & Consumption

Figure 4.3 Projected agricultural producer price index



Note: This index is calculated by dividing the value of a set of agricultural commodities at current-year prices by the value of the same set at base year (2012) prices (Paasche agricultural producer price index).

Source: FAO Global Perspectives Studies, based on simulations with the FAO GAPS model.

Based on FAO's long term projection:

- overall, food prices are likely to be higher in the future (mainly due to increase of demand)
- sustainable production drives prices down (less demand for meat, reduction of FLW,) and up (less yield enhancing technologies, sustainable intensification) with an **overall higher prices** over a longer period of time -> but no externalities are accounted for in BAU that gives a false picture!

The true cost of food

How to successfully price the true cost of food?

What is needed:

- Agreed methodologies to understand the price gap between current and "true" price
- Policies to propose effective pricing mechanisms and assess the impacts of true pricing (e.g. taking RCPs into account) on different regions and societal groups
  - Investigating possible effects on sensitive groups
  - Exploring policies that could ensure true pricing leads to less pollution, less waste, and a positive restructuring of the food chain
- Exploratory studies to highlight ways to operationalize true cost successfully and steer the debate in a constructive direction

FIGURE 2 (A–C) Global variation in the RCPs of vitamin A–rich fruits and vegetables, pulses, and fortified infant cereals in 176 countries, 2011. The statistics reported are population-weighted means of the RCPs for each income or regional group, shaded according to the brackets described in the legend. RCP, relative caloric price; vA, vitamin A.

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Modeling a Transformative Agenda

Where we are

How we get to . . .

Where we want to be

Current Food Systems

- Choice of indicators
- Link with the data platform

Transformation Process

Choice of instruments

- Changing incentives through prices
- Changing income distribution

Transformed Food Systems

Choice of targets and the objective function

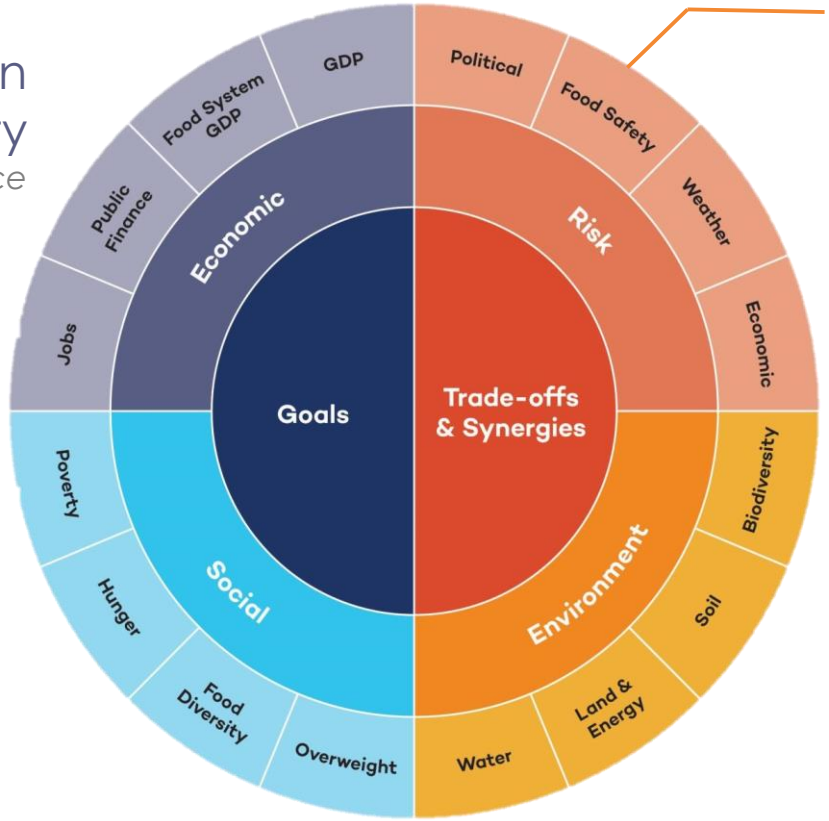
Quantification Framework for Food Systems

Food system as an economic activity

Impacts on jobs and finance

Impacts on human life

Impacts on inequalities and health



Extended concept:
One Health with zoonotic disease

Assessing systemic risk

Impacts on resilience

Nature and climate

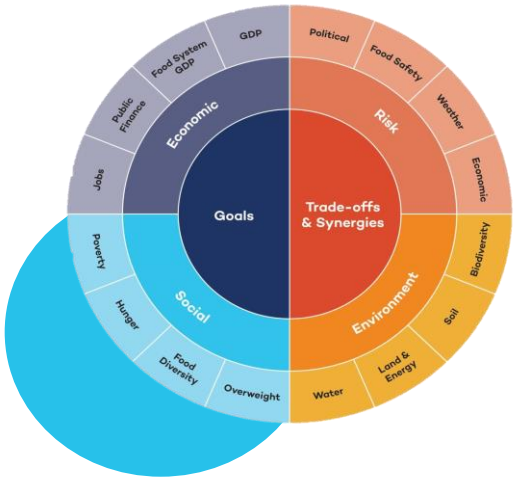
Impacts on the planet and the biosphere

Questions to be Addressed by the Model

The objective function 4 components for transformed food systems	Targets and Indicators
Sufficient calories for all	Calories availability per capital per household (consistent with PoU) above minimal energy requirement
Healthy diets for all	• Share of population we can afford a healthy diet (consistent with SOFI 2020) • Regionalized diet structure by food group
Adequate incomes for all to access healthy diets	As previously, but includes a set of income-oriented instrument (see next slide)
Sustainable environment	• Carbon credit for agriculture, based on NDC • Water constraint for agriculture • Land Use constraint for Biodiversity

What Types of Model Are Needed

- Criteria of selection
  - A structural & equilibrium model
  - A dynamic model
  - A multi-country model to capture international linkages and leakages
  - A clear set of constraints
- Role of households
  - Household representation should be relevant

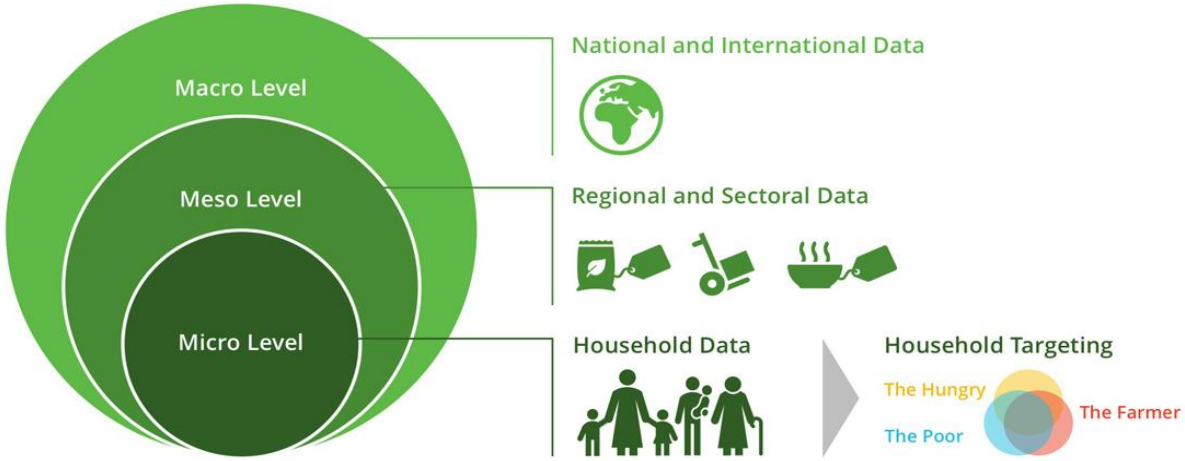


What Types of Model Are Needed

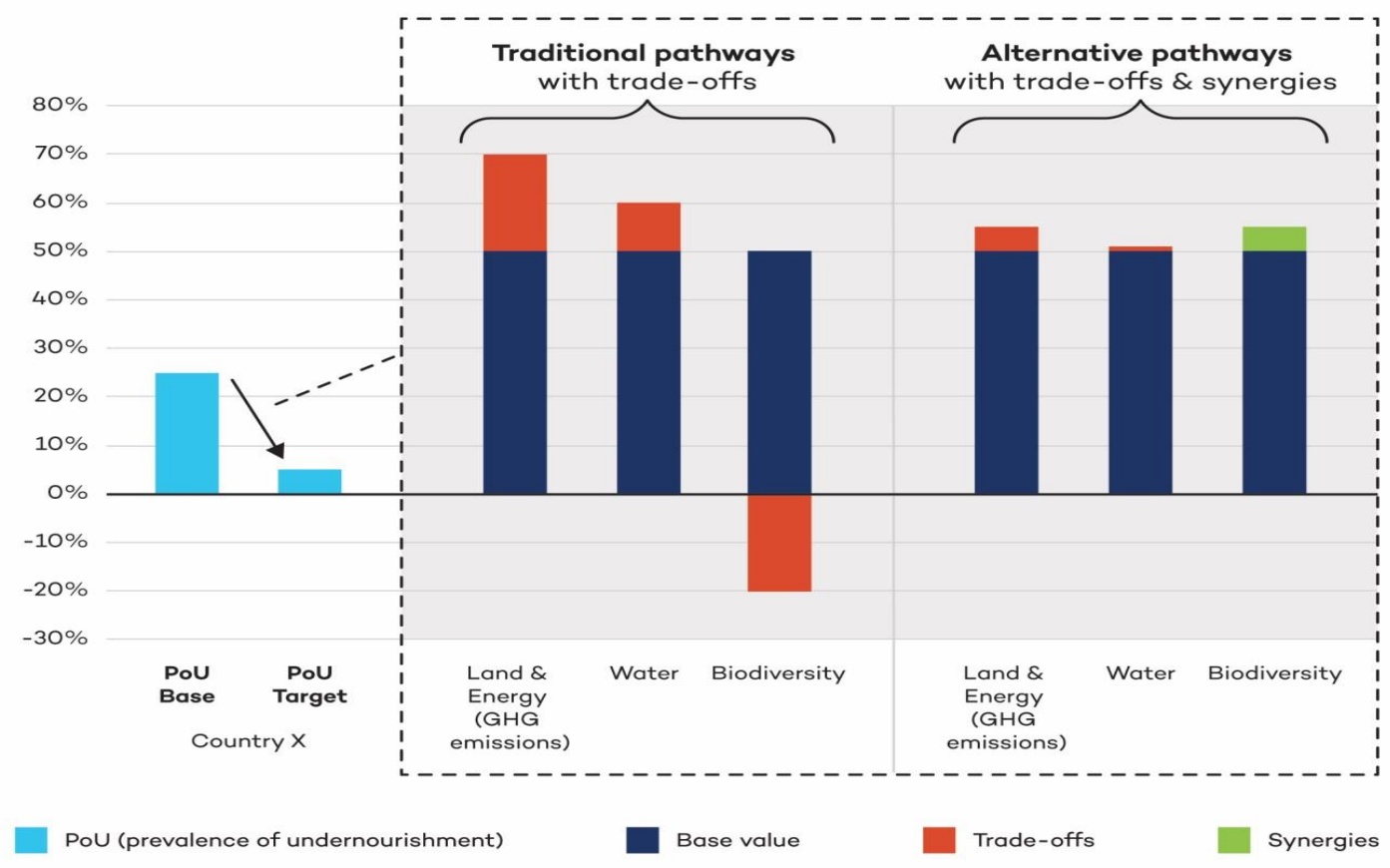
- Economic model is core

  Nexus of incentives and income generation → Dynamic General Equilibrium Model

- MIRAGRODEP with household representation



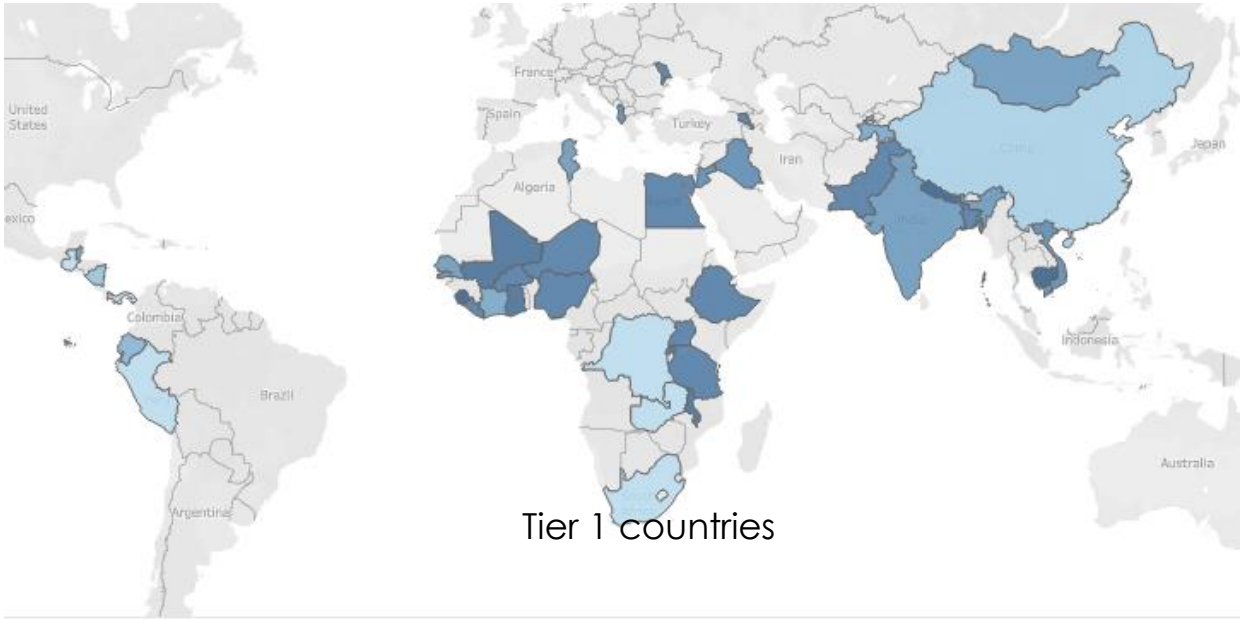
Simple Illustration



Country Coverage

3-tier approach

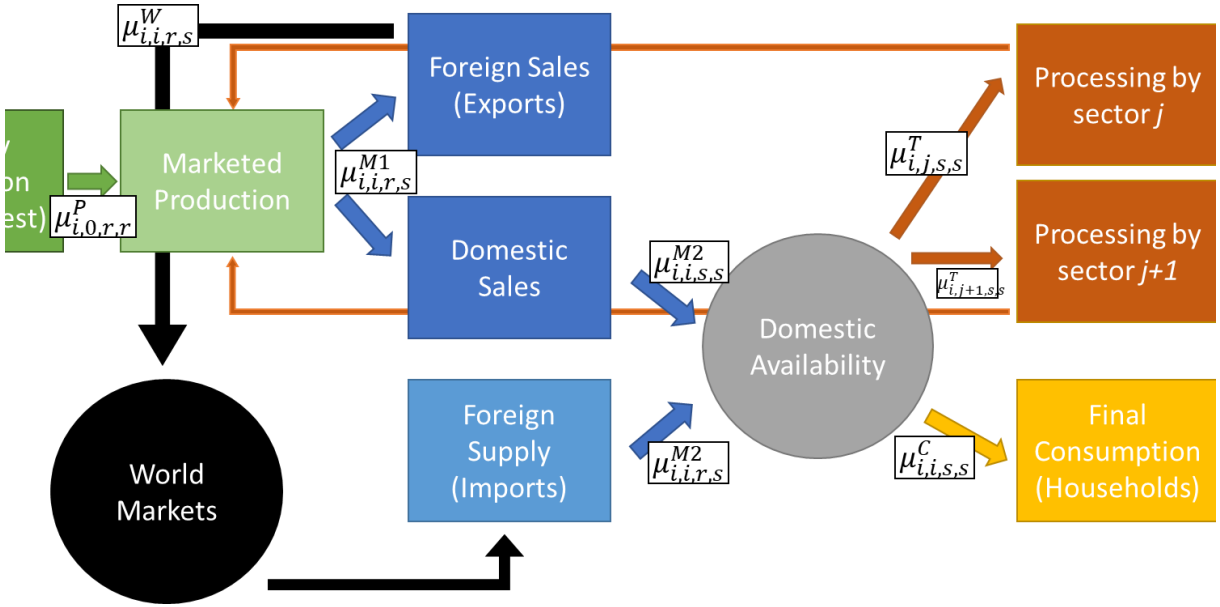
Tier 1.	Exhaustive household datasets (35 countries LMIC)
Tier 2.	Representative household distribution (36 countries, LMIC)
Tier 3.	Aggregated results (High income countries, rest of the world)



Tier 1 countries

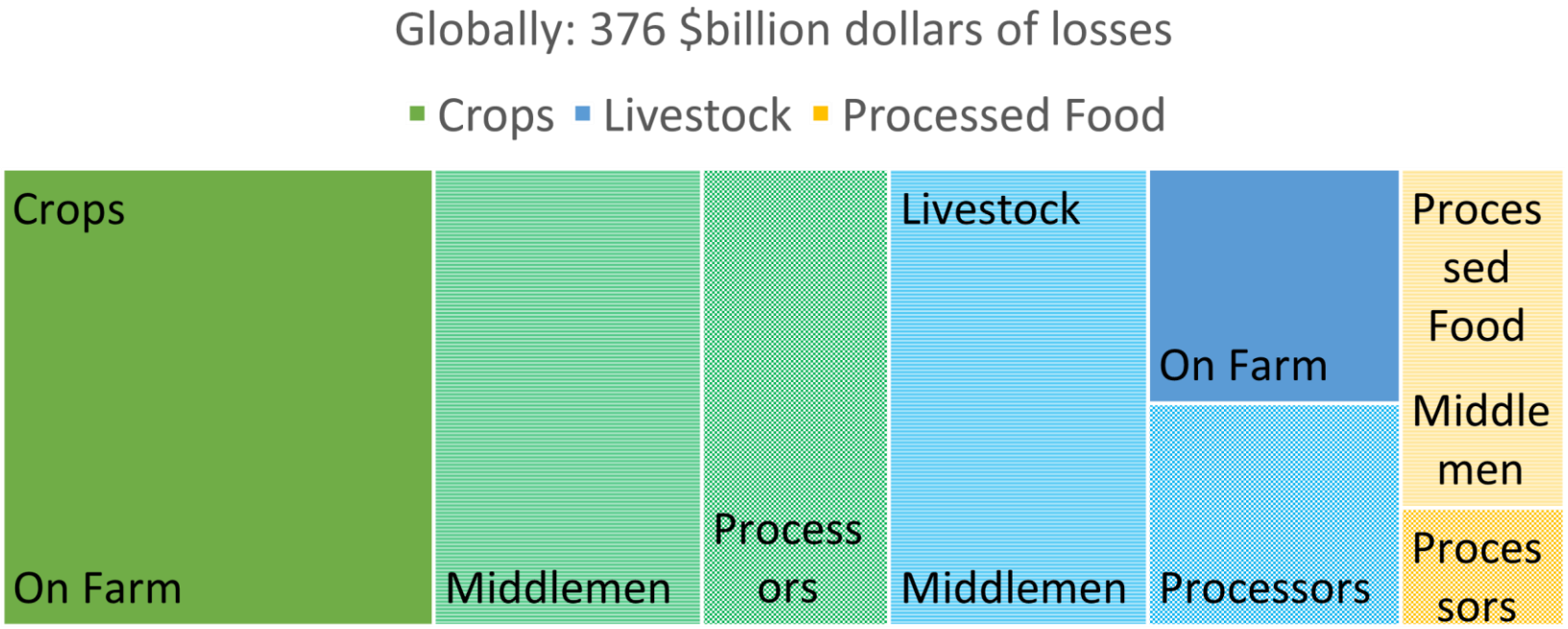
Modelling Food Loss reduction

A detailed representation of post harvest losses within the food system considering various nodes, internationalization of some value chains and complex input output relations



Reducing post harvest losses changes availability of food, modify cost structure within and across value chains, could reshuffle international comparative advantages, and provide new income opportunities by increasing the efficiency of the system. Still, complex interactions leads to unexpected trade-offs…

A consistent accounting framework to identify specific pattern and guide policy actions

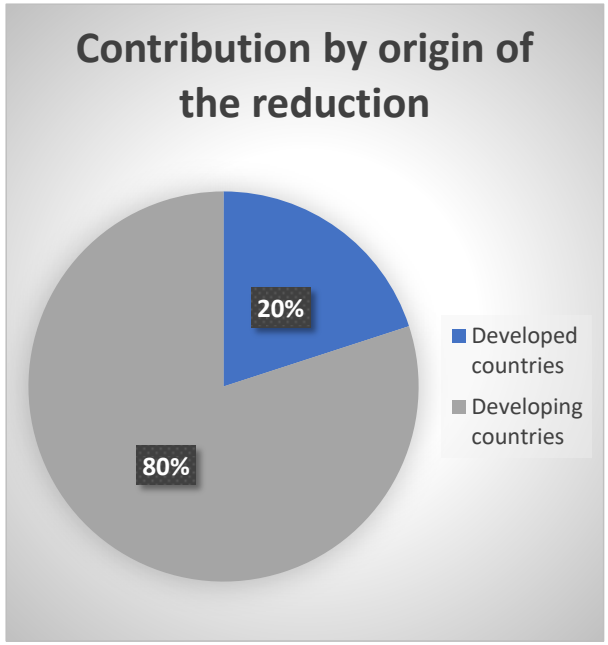


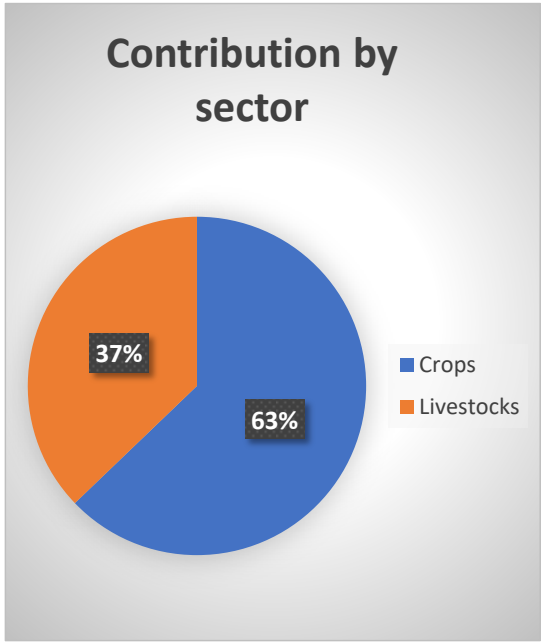
Source: MIRAGRODEP FSS dataset, Laborde and Torero (2021)

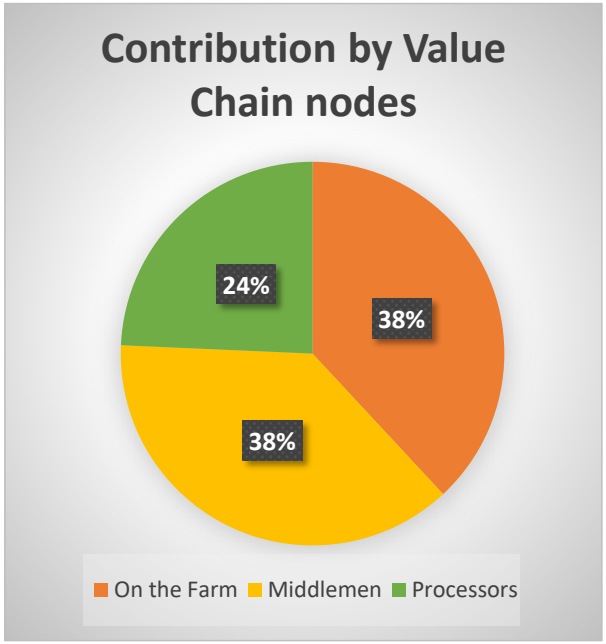
A central scenario and some variants to identify various contributions

Code	Description
PHL50	Reduction by 50% of PHL rates at all nodes
PHL50P	Reduction by 50% of PHL rates at the farm level
PHL50M	Reduction by 50% of PHL rates at the Middlemen level
PHL50T	Reduction by 50% of PHL rates at the Processors level
PHL50CRP	Reduction by 50% of PHL rates at all nodes for CROPS only
PHL50LVS	Reduction by 50% of PHL rates at all nodes for Livestocks only
PHL50DVG	Reduction by 50% of PHL rates at all nodes for developing countries only

Illustration on a **macroeconomic** indicator:
A 50% reduction in physical PHL will increase global welfare by 0.36%





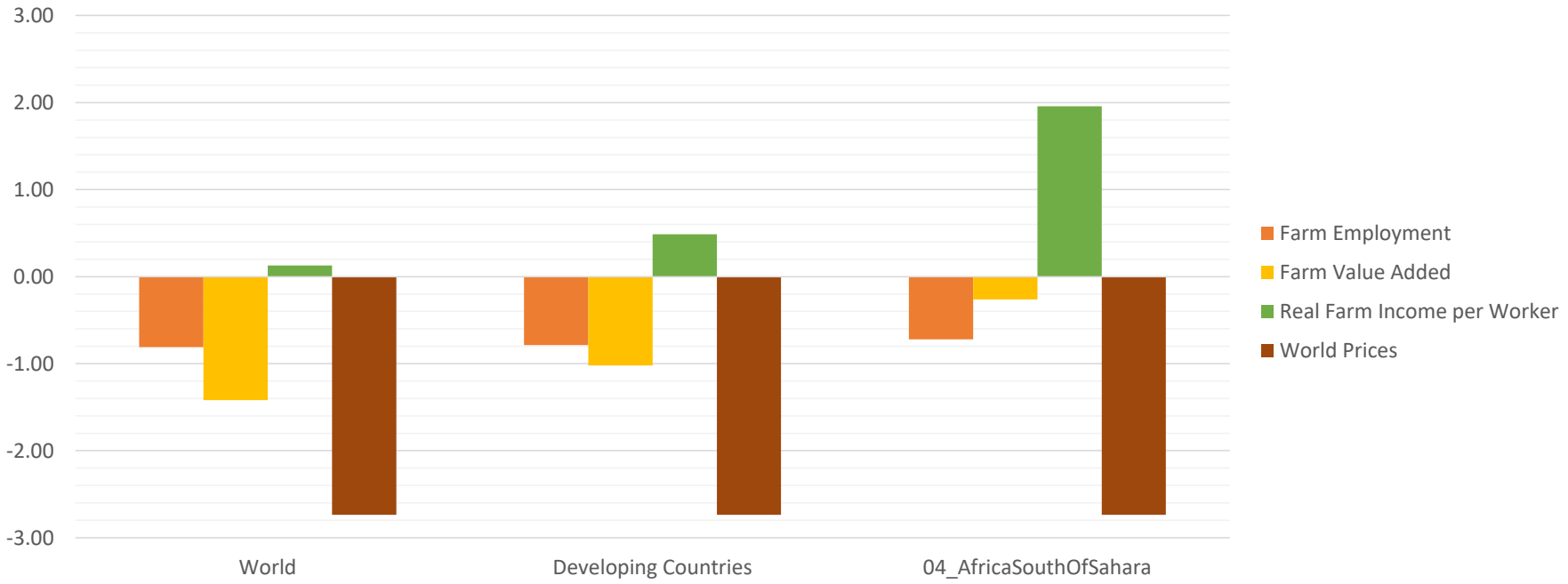


Source: MIRAGRODEP simulations, Laborde and Torero (2021)

Illustration on **agricultural sector** indicators:

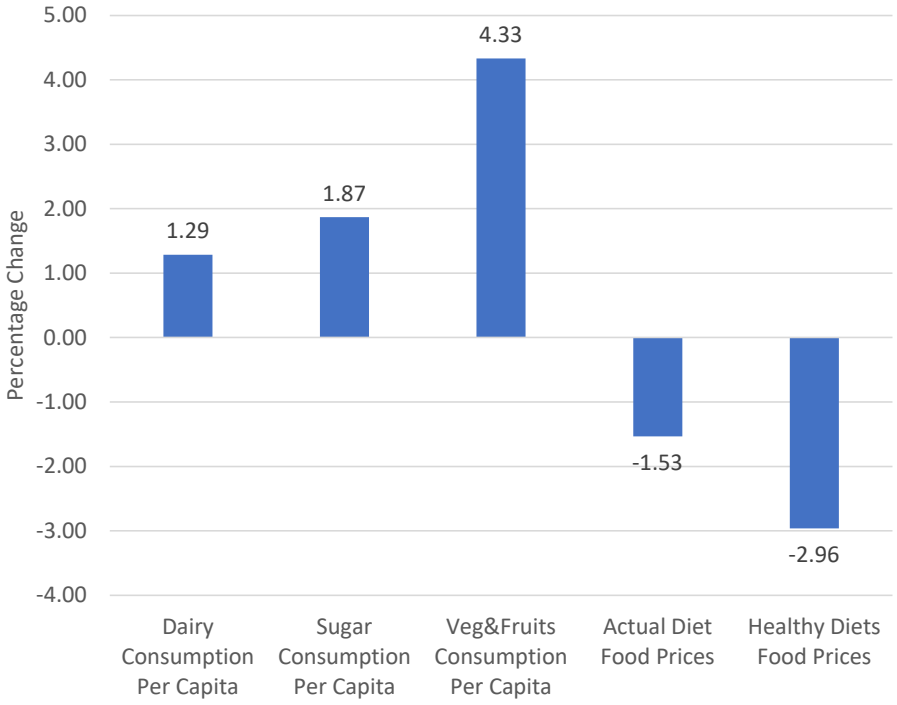
Less losses, more supply, lower prices and will free labor force

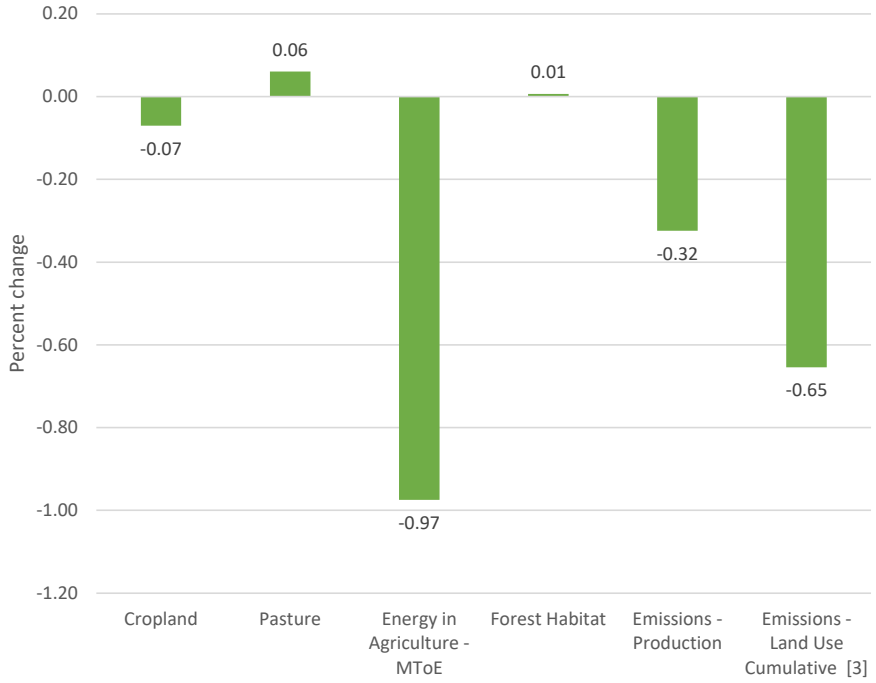
But volume effects will still benefit African farmers



Source: MIRAGRODEP simulations, Laborde and Torero (2021)

Illustration on **Diets,** and **Nature** and **Environment** related indicators



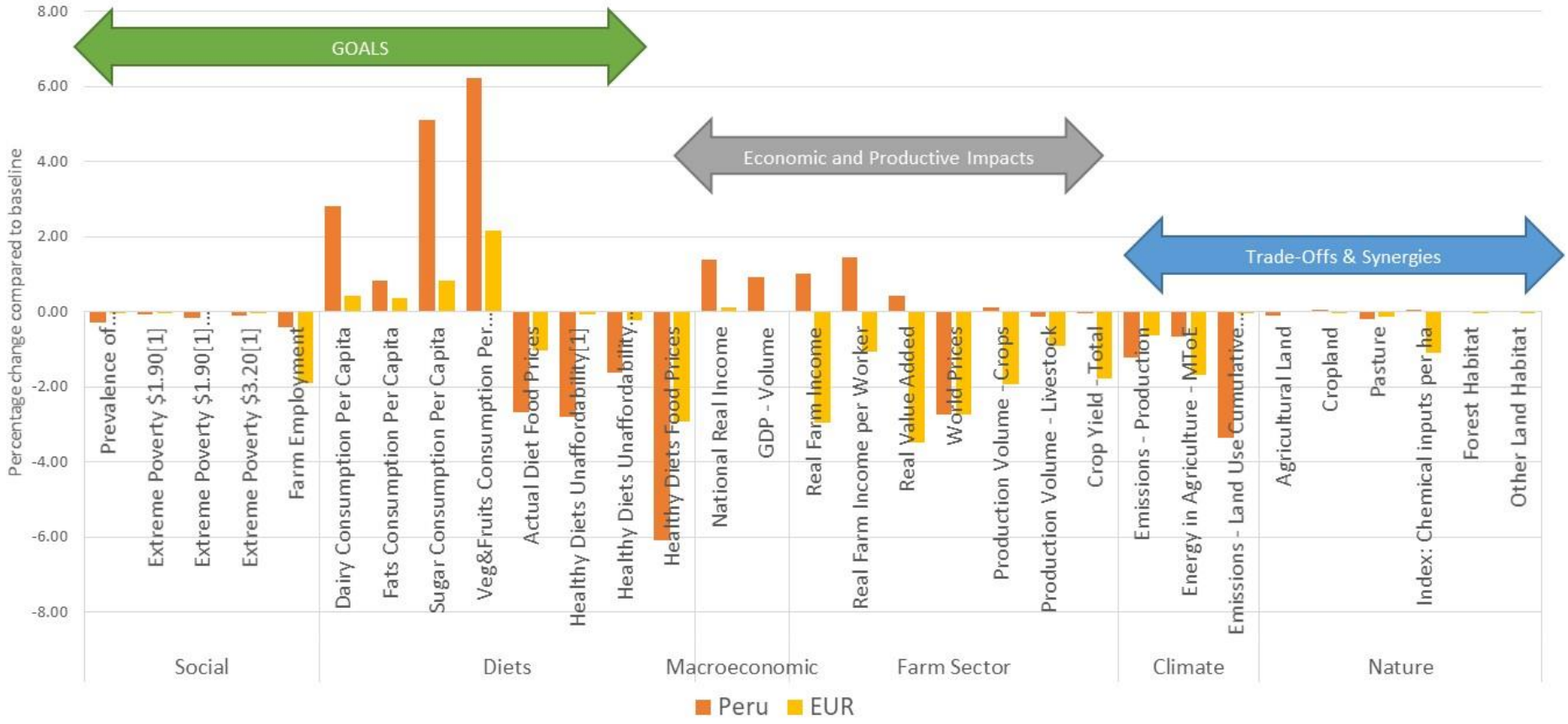


The price of healthy diets are falling globally, and in larger proportion than current diets price index, boosting consumption

Contrasted effects on land use, but net emissions gains (6 Megatons CO2eq per year)

Source: MIRAGRODEP simulations, Laborde and Torero (2021)

Country level analysis show various interactions between goals, market responses and trade-offs and synergies
(selected indicators)



Source: MIRAGRODEP simulations, Laborde and Torero (2021)

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Outlook: What next to expect from Scientific Group

A. An Agenda Paper for the Pre-Summit and Summit

i) Role of Important science and innovation breakthroughs for food systems (e.g. genomics, plant nutrition, animal production and health, biosciences, earth sciences, remote sensing, AI & robotics, digitization, remotes sensing, big data, health and nutrition science, behavioral research, etc.)

ii) Identifying and evaluating promising propositions for actions in support of desired food systems transformations

B. Scientific Days July 8/9 with all stakeholders