



Livestock projections and trends

Mario Herrero and Daniel Mason-D'Croz

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Global convergence on the need for more sustainable food systems

ipcc
INTERGOVERNMENTAL PANEL ON climate change

Climate Change and Land

An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems

Summary for Policymakers



WG I | WG II | WG III

WHO | UNEP

The Lancet Commissions

Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems

Walter Willett, John Rockström, Bruce Larson, Marco Springmann, Tim Lang, Veronique Tittel, David Tilman, David Trueman, Fabrice Chalard, Amanda Blood, Michael Clark, Louise Collins, Jonathan Crane, Corinna Doolan, Rana El Ghazal, Joseph E. Hill, Wafa El-Dokki, Lindawati Apriyanti, Ankit Anand, Abhishek Choudhary, Marjolaine A. Riva Aguiar, Francesco Biondi, Aron Anand, Longyue Sheng, Feng, Barbara Gross, J. Garthwaite, Vladimir Byrdov, Marc Tardif, Thomas Lindahl, Sushant Singh, Sarah K. Cornell, K. S. Reddy, Sumit Nandan, Suman Nishita, Christopher J. Murray

Executive summary

Food systems have the potential to nurture human health and support environmental sustainability, however, they are currently threatening both. Providing a growing global population with healthy diets from sustainable food systems is an immense challenge. Although global food production of calories has kept pace with population growth, more than 820 million people have insufficient food and many more consume low-quality diets that cause micronutrient deficiencies and contribute to a substantial rise in the incidence of diet-related obesity and diet-related non-communicable diseases, including coronary heart disease, stroke, and diabetes. Unhealthy diets pose a greater risk to mortality and morbidity than does tobacco use, and alcohol, drug, and violence use combined. Because much of the world's population is inadequately nourished and many environmental systems and processes are pushed beyond safe boundaries by food production, a global transformation of the food system is urgently needed.

The absence of scientific targets for achieving healthy diets from sustainable food systems has been hindering large-scale and coordinated efforts to transform the global food system. This Commission brings together 19 Commissioners and 18 coauthors from 16 countries to assess fields of human health, agriculture, political sciences, and environmental sustainability to develop global scientific targets based on the best evidence available for healthy diets and sustainable food production. These global targets define a safe operating space for food systems that allow us to assess which diets and food production practices will help ensure that the UN Sustainable Development Goals (SDGs) and Paris Agreements are achieved.

We quantitatively describe a universal healthy reference diet to provide a basis for estimating the health and environmental effects of adopting an alternative diet to sustainable current diets, many of which are high in unhealthy foods. Scientific targets for a healthy reference diet are based on extensive literature on foods, dietary patterns, and health outcomes. This healthy reference diet largely consists of vegetables, fruits, whole grains, legumes, nuts, and unsaturated oils, includes a low to moderate amount of seafood and poultry, and includes no or a low quantity of red meat, processed meat, added sugar, refined grains, and starchy vegetables. The global average intake of healthy foods is substantially lower than the reference diet intake, whereas overconsumption of unhealthy foods is increasing. Using several approaches, we found with a high level of certainty that global adoption of the reference dietary pattern would provide major health benefits, including a large reduction in total mortality.

The Commission integrates, with quantification of universal healthy diets, global scientific targets for sustainable food systems, and aims to provide scientific boundaries to reduce environmental degradation caused by food production at all scales. Scientific targets for the safe operating space of food systems were established for six key food system processes. Strong evidence indicates that food production is among the largest drivers of global environmental change by contributing to climate change, biodiversity loss, freshwater use, insecticides with the global nitrogen and phosphorus cycles, and land-system change (and chemical pollution, which is not assessed in this Commission). Food production depends on continued functioning of biophysical systems and processes to regulate and maintain a stable Earth system. Therefore, those systems and processes provide a set of globally systemic indicators of sustainable food production. The Commission concludes that quantitative scientific targets combine universal and scalable planetary boundaries for the food system. However, the uncertainty ranges for these food boundaries remains high because of the inherent complexity by Earth system dynamics.

Diets inevitably link human health and environmental sustainability. The scientific targets for healthy diets and sustainable food systems are integrated into a common framework, the safe operating space for food systems, so that win-win diets (ie, healthy and environmentally sustainable) can be identified. We propose that this framework is universal for all food cultures and production systems in the world, with a high potential of local adaptation and scalability.

Application of this framework to future projections of world development indicates that food systems can provide healthy diets (ie, reference diets) for an estimated global population of about 10 billion people by 2050 and remain within a safe operating space. However, even small increases in consumption of red meat or dairy foods would make this goal difficult or impossible to achieve. Within boundaries of food production, the reference diet can be adapted to make meals that are

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WORLD RESOURCES INSTITUTE

WORLD RESOURCES REPORT

CREATING A SUSTAINABLE FOOD FUTURE

A Menu of Solutions to Feed Nearly 10 Billion People by 2050

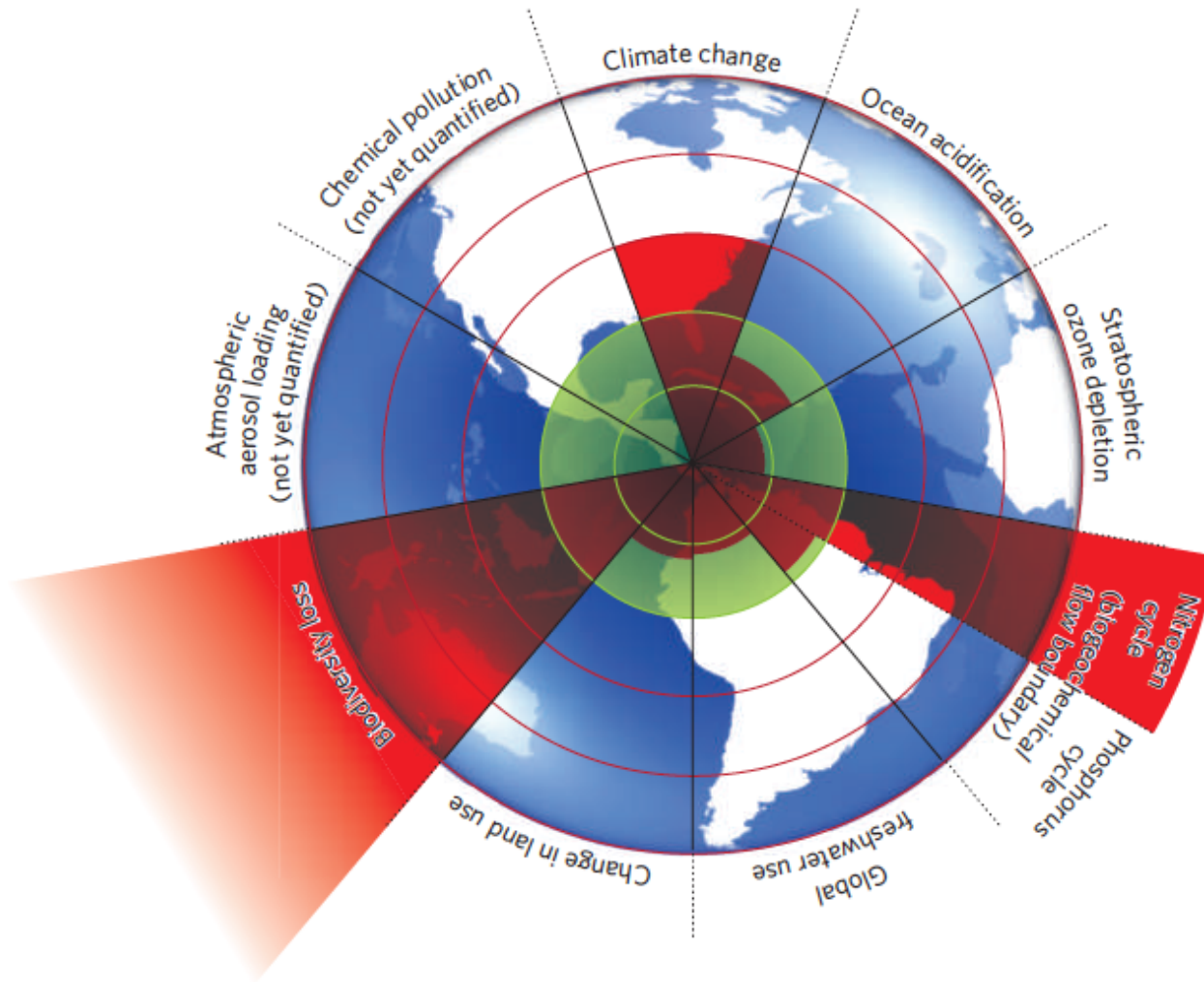
FINAL REPORT, JULY 2019

WITH TECHNICAL CONTRIBUTIONS FROM

THE WORLD BANK | UN | UNDP | citad | INRA



Planetary boundaries



A shifting, more integrated agenda of increased complexity

Food security,
trade and
poverty
reduction

Environmental
concerns

GHG
Land use
Nutrients
biodiversity

Diets and
health

Disruptive
innovation

Multi-model
ensembles

Food, Agriculture,
and the Environment
Thematic Page 28

**Livestock to 2020
The Next Food
Revolution**

Christopher Delgado
Mark Roseboom
Shuning Song
Shengde Fan
Claudia Córdova

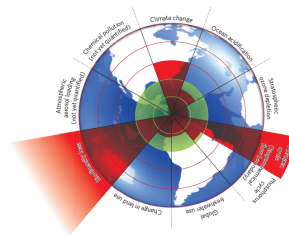
2020
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UNITED NATIONS

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LIVESTOCK
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livestock's long shadow
environmental issues and options



now

We need to be responsive to the fast dynamics of the sector

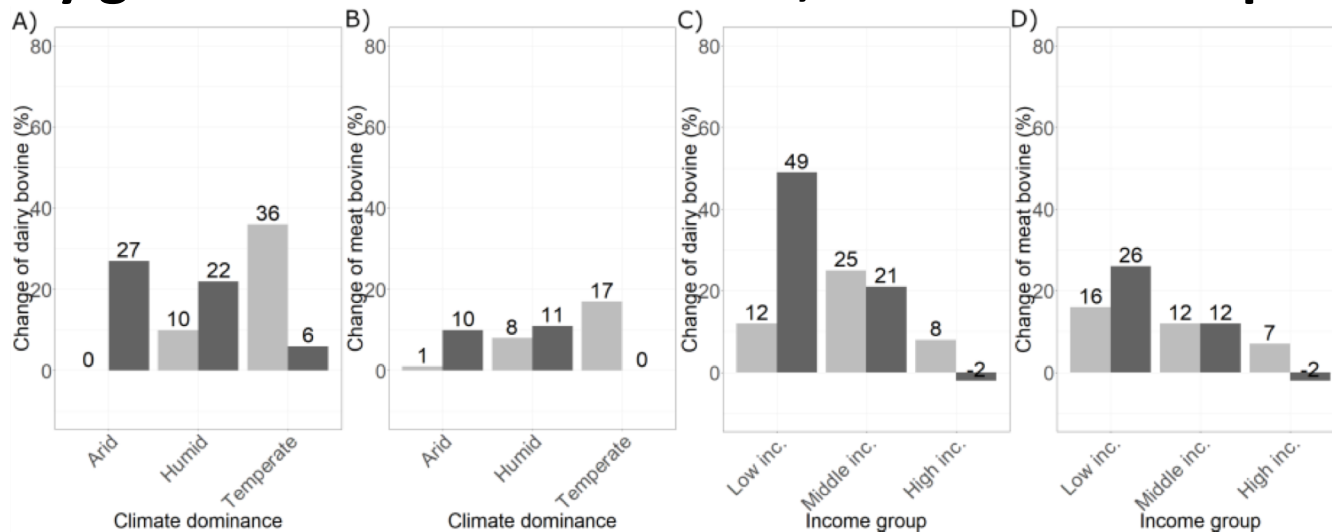
The demand for livestock products 1990 - 2015

| | Fish, Seafood | Milk - Excluding Butter | Eggs | Meat | Bovine Meat | Mutton & Goat Meat | Pigmeat | Poultry Meat |
|--------------------------|---------------|-------------------------|------|------|-------------|--------------------|---------|--------------|
| Europe | 4.5 | 25.2 | 0.6 | 1.8 | -8.8 | -1.4 | 0.8 | 10.6 |
| Northern Africa | 8.7 | 47.8 | 1.3 | 12.2 | 3.3 | 1.9 | 0.0 | 6.5 |
| Western Africa | 6.8 | 6.6 | 0.3 | 2.8 | 0.2 | 1.2 | 0.4 | 1.6 |
| Eastern Africa | -0.9 | 17.3 | -0.1 | 0.5 | -0.2 | -0.1 | 0.4 | 0.4 |
| Middle Africa | 3.6 | -5.5 | 0.4 | 8.4 | -1.1 | 0.4 | 2.2 | 7.2 |
| Southern Africa | -1.9 | 8.4 | 3.3 | 23.2 | -1.2 | -1.1 | 2.4 | 22.3 |
| Eastern Asia | 19.0 | 29.7 | 11.2 | 35.7 | 3.9 | 2.2 | 18.2 | 10.4 |
| China | 24.1 | 35.6 | 13.0 | 38.8 | 4.6 | 2.6 | 19.5 | 11.1 |
| Central Asia | 0.7 | 44.1 | 2.2 | 9.2 | 1.7 | -0.5 | 2.0 | 5.4 |
| Southern Asia | 3.0 | 34.8 | 1.4 | 1.4 | -0.5 | -0.5 | -0.2 | 2.6 |
| India | 2.0 | 35.3 | 1.6 | 0.2 | -1.2 | -0.1 | -0.2 | 1.7 |
| South-Eastern Asia | 17.0 | 7.6 | 2.5 | 16.6 | 1.3 | 0.2 | 7.5 | 7.6 |
| Western Asia | 2.0 | 7.4 | 0.9 | 16.1 | 2.2 | -1.4 | 0.1 | 15.4 |
| Americas | 0.9 | 12.3 | 2.9 | 19.2 | -0.8 | -0.2 | 1.5 | 18.6 |
| United States of America | 0.5 | -3.6 | 1.1 | 5.8 | -5.8 | -0.3 | -1.6 | 13.4 |
| South America | 2.0 | 33.4 | 2.7 | 31.2 | 3.8 | -0.3 | 3.9 | 23.9 |
| Brazil | 4.7 | 57.0 | 1.1 | 44.0 | 11.8 | -0.2 | 4.2 | 28.1 |
| Oceania | 8.2 | -30.6 | -2.1 | 7.6 | -6.6 | -13.5 | 6.5 | 22.4 |
| Australia | 9.1 | -17.4 | -1.5 | 6.9 | -6.5 | -13.9 | 6.2 | 23.0 |
| World | 7.0 | 18.9 | 3.1 | 11.3 | -0.6 | 0.2 | 3.3 | 8.1 |

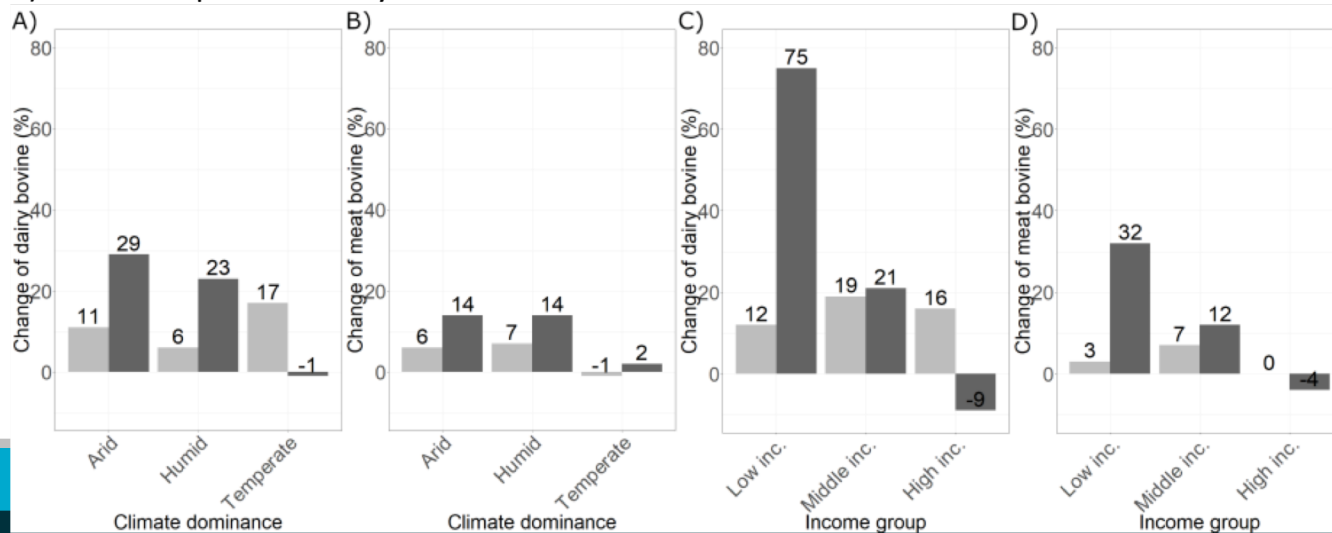
Change in kg/person/year between 1990-2015



Production growth in ruminant meat and milk still driven largely by growth in animal numbers, with a few exceptions



2) Mixed crop-livestock systems



■ Bovine productivity ■ Bovine numbers

Global integrated assessment models

A range of techniques implemented:

- Partial equilibrium models (Globiom, MagPIE, IMPACT, Agrimonde, Globagri, IMAGE)
- CGE models (GTAP, MAGNET, CAPRI, Leitap, GTEM)
- Spreadsheet and systems dynamic models (Foley, Bajzejl, Hedenus, Wirsenius)

Some implementation of livestock production systems classifications

- Globiom,
- MagPIE (sometimes),
- IMAGE,
- GlobAgri (WRI)....and IMPACT

Broad range of resolutions (subnational, country, region)

Usually matched to FAOSTAT data

Usually rely on component models for simulating alternatives

Using multiple models to understand uncertainty



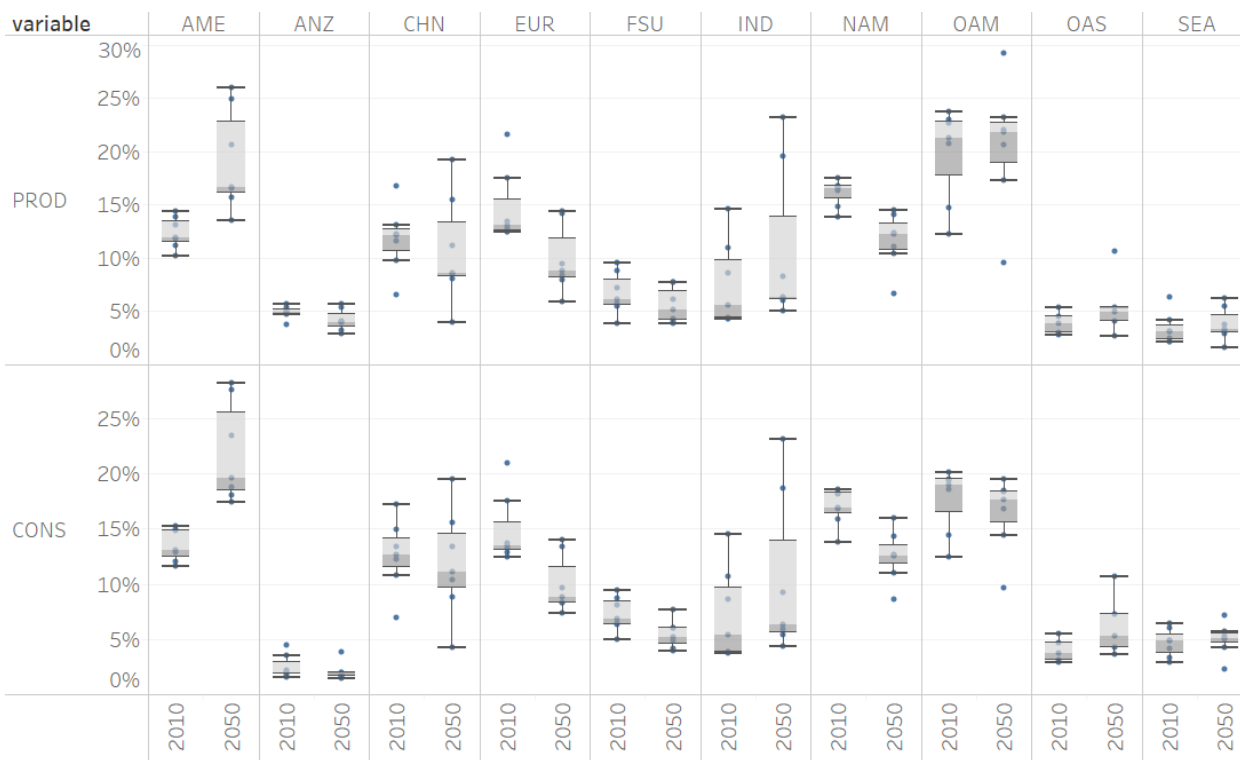
Regions

- AME – Africa and Middle East
- ANZ – Australia and New Zealand
- CHN – China
- EUR – Europe
- FSU – Former Soviet Union
- IND – India
- NAM – North America
- OAM – Latin America and Caribbean
- OAS – South and Central Asia (excl. IND)
- SEA – South and East Asia (excl. CHN)
- WLD – World

Variables

- PROD – Production (000 mt)
- CONS – Total Demand (000 mt)
- CALO – Per Capita Calorie (kcal/person/day)
- XPRX – Prices (USD)

2050 Ruminant production, demand, and prices percent change from 2010 under SSP2_NoCC



Regions

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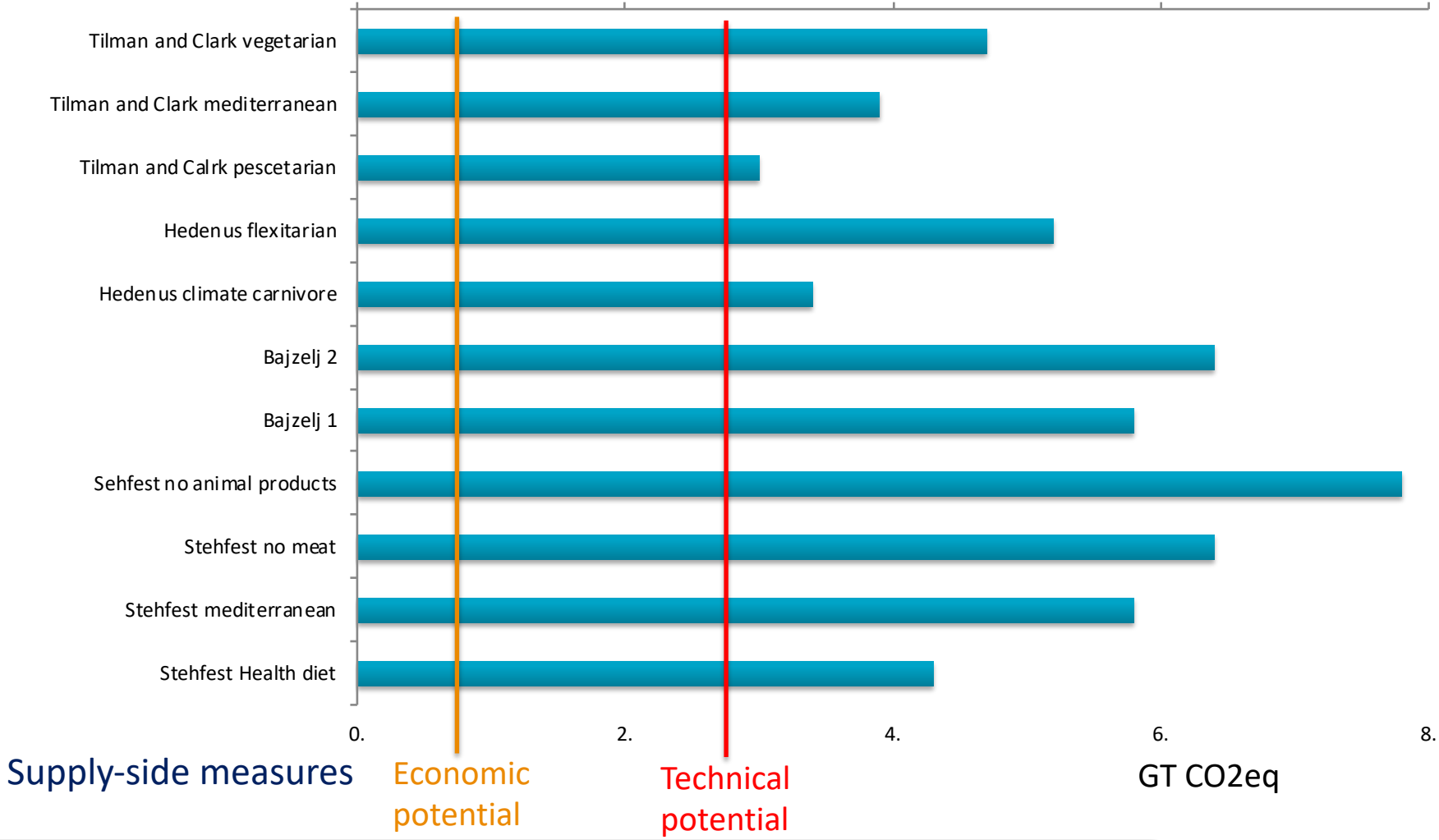
Regional share of global ruminant production and demand in 2010 and 2050

percent of global total production and demand under SSP2_NoCC

The critical points

- Feed
- Integration with land use and other activities
- Resource-use efficiencies
- Biological realism (in yields, reproduction, stocking rates, etc)
- Poor handling of climate variability

Why also focus on demand and not only on making the supply of ASF more efficient?









Herrero et al 2016 Nature Climate Change

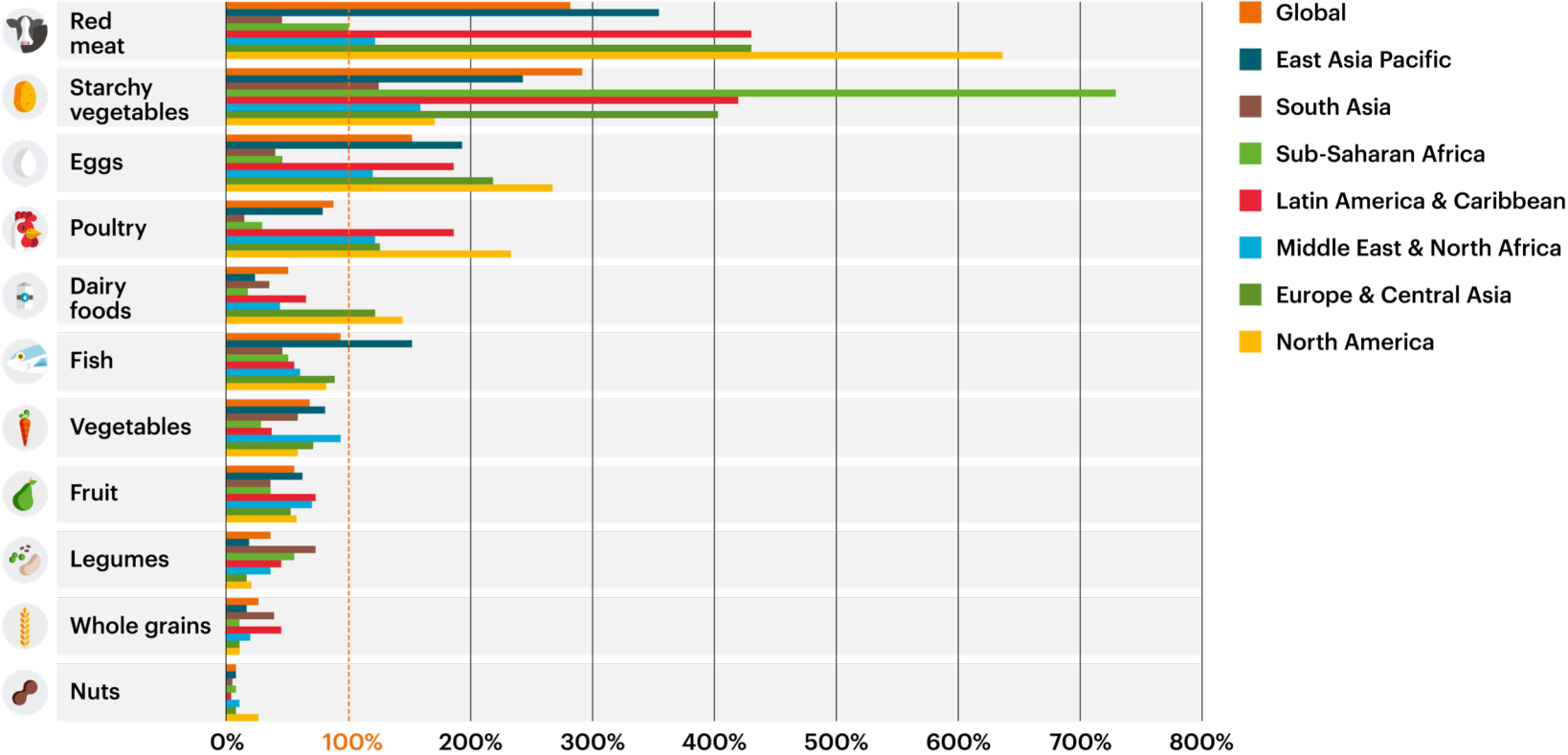


The EAT-Lancet Scenarios reveal that healthy and sustainable diets have a big impact on emissions, but increases in productivity and waste reduction are fundamental to achieving planet health

Scenarios

| | | |  |  |  |  |  |  |
|--------------------------|--------------|---------------|---|--|---|---|---|---|
| | | | GHG emissions | Cropland use | Water use | Nitrogen application | Phosphorus application | Biodiversity loss |
| Food production boundary | | | 5.0 (4.7–5.4) | 13 (11.0–15.0) | 2.5 (1.0–4.0) | 90 (65.0–140.0) | 8 (6.0–16.0) | 10 (1–80) |
| Baseline in 2010 | | | 5.2 | 12.6 | 1.8 | 131.8 | 17.9 | 100–1000 |
| Production (2050) | Waste (2050) | Diet (2050) | | | | | | |
| BAU | Full waste | BAU | 9.8 | 21.1 | 3.0 | 199.5 | 27.5 | 1,043 |
| BAU | Full waste | Dietary shift | 5.0 | 21.1 | 3.0 | 191.4 | 25.5 | 1,270 |
| BAU | Halve waste | BAU | 9.2 | 18.2 | 2.6 | 171.0 | 23.2 | 684 |
| BAU | Halve waste | Dietary shift | 4.5 | 18.1 | 2.6 | 162.6 | 21.2 | 885 |
| PROD | Full waste | BAU | 8.9 | 14.8 | 2.2 | 187.3 | 25.5 | 206 |
| PROD | Full waste | Dietary shift | 4.5 | 14.8 | 2.2 | 179.5 | 24.1 | 351 |
| PROD | Halve waste | BAU | 8.3 | 12.7 | 1.9 | 160.1 | 21.5 | 50 |
| PROD | Halve waste | Dietary shift | 4.1 | 12.7 | 1.9 | 151.7 | 20.0 | 102 |
| PROD+ | Full waste | BAU | 8.7 | 13.1 | 2.2 | 147.6 | 16.5 | 37 |
| PROD+ | Full waste | Dietary shift | 4.4 | 12.8 | 2.1 | 140.8 | 15.4 | 34 |
| PROD+ | Halve waste | BAU | 8.1 | 11.3 | 1.9 | 128.2 | 14.2 | 21 |
| PROD+ | Halve waste | Dietary shift | 4.0 | 11.0 | 1.9 | 121.3 | 13.1 | 19 |

Wide variation in over and under consumption of ASF in different regions



Next steps

- More multi-model ensembles and integration
- Some level of harmonisation, but not complete. Diversity is a strength
- Better integration of supply and demand options
- Endogenise diets
- Include socio-economic impacts (income effects, employment, others)
- Farm sizes and structure

Thank you

Mario.Herrero@csiro.au

Twitter: @GlobalFoodTeam

Website: <https://research.csiro.au/foodglobalsecurity/>