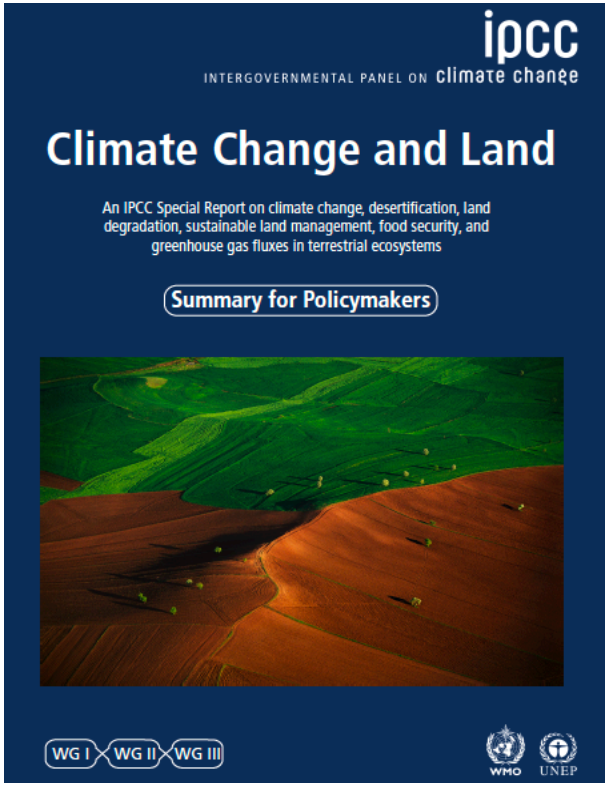
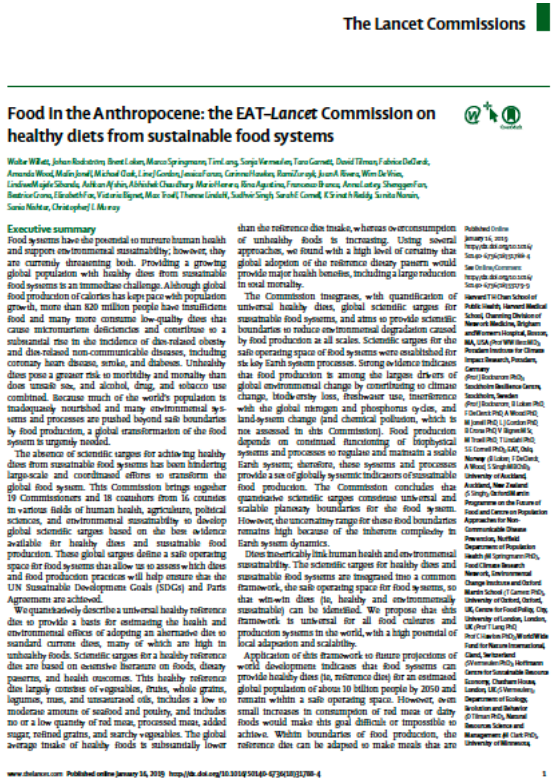


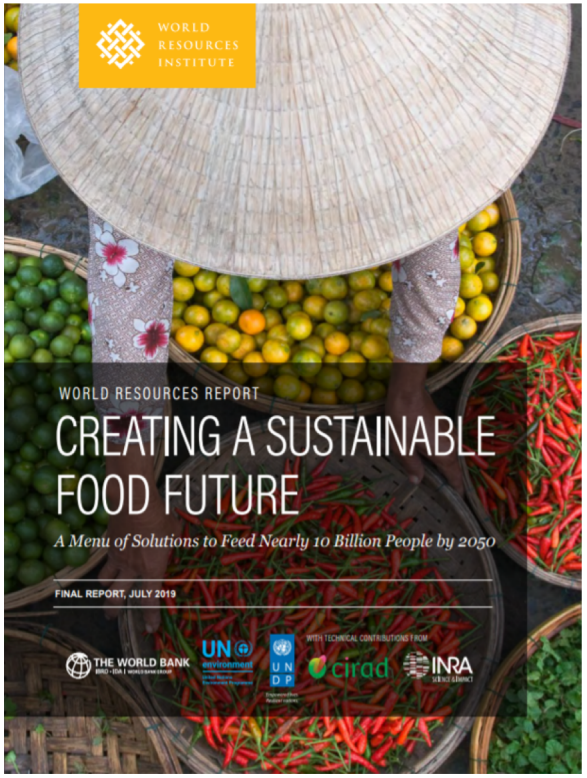
Livestock projections and trends

Mario Herrero and Daniel Mason-D'Croz

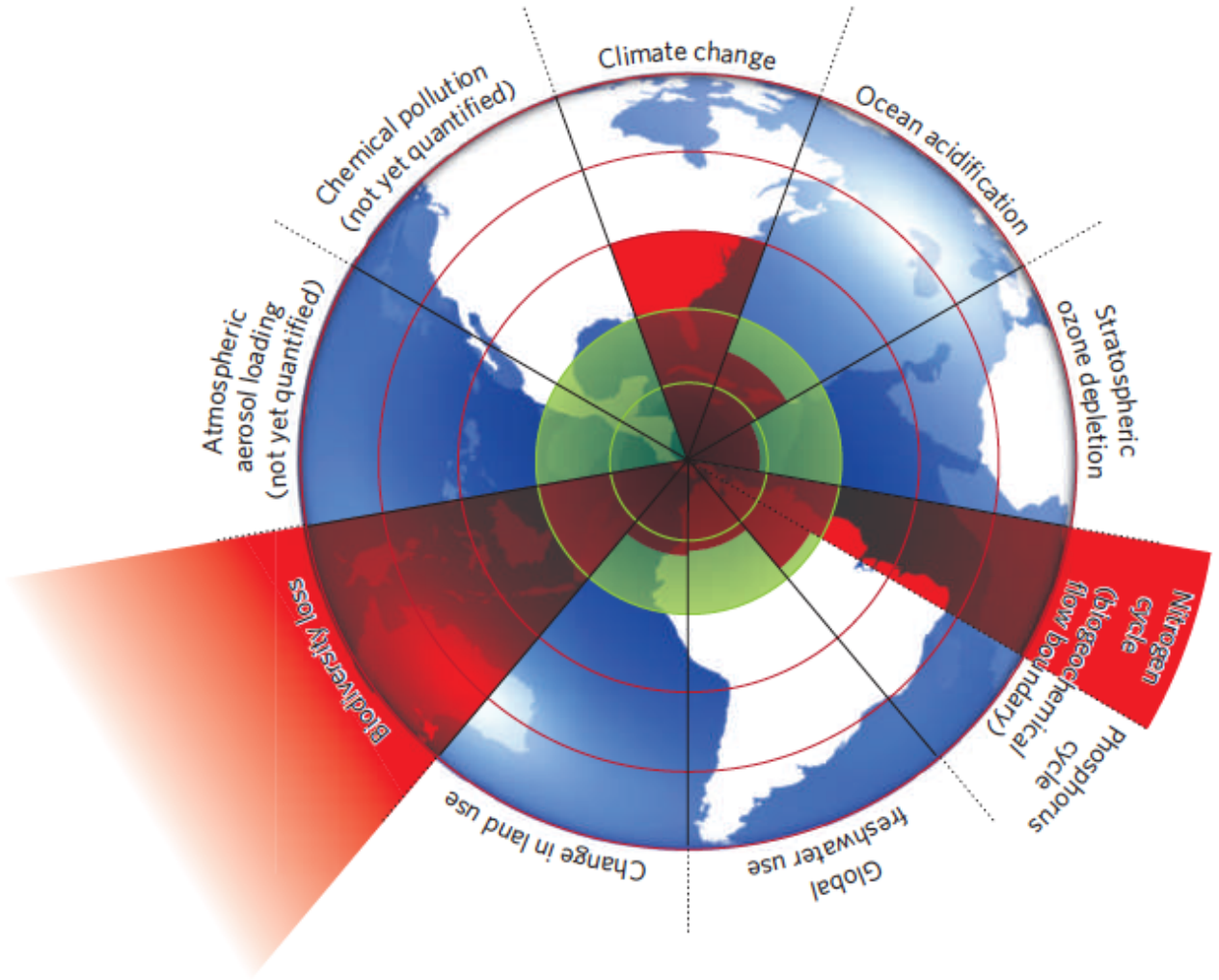
Global convergence on the need for more sustainable food systems







Planetary boundaries



Rockstrom et al. Nature (2009)

A shifting, more integrated agenda of increased complexity

Food security, trade and poverty reduction

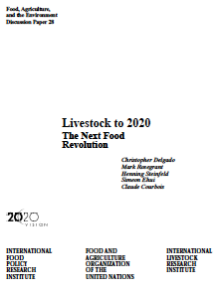
Environmental concerns

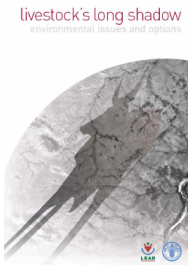
GHG
Land use
Nutrients
biodiversity

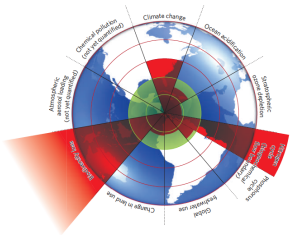
Diets and health

Disruptive innovation

Multi-model ensembles







now

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

The demand for livestock products 1990 - 2015

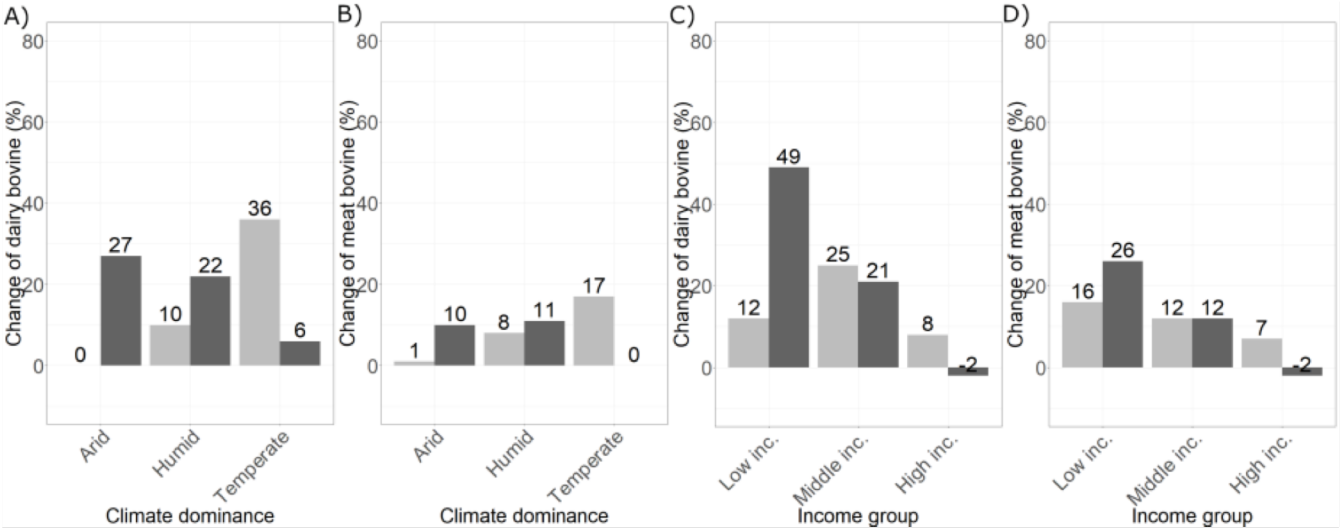
	Fish, Seafood	Milk - Excluding Butter	Eggs	Meat	Bovine Meat	Mutton & Goat Meat	Pigmeat	Poultry Meat
Europe	4.5	25.2	0.6	1.8	-8.8	-1.4	0.8	10.6
Northern Africa	8.7	47.8	1.3	12.2	3.3	1.9	0.0	6.5
Western Africa	6.8	6.6	0.3	2.8	0.2	1.2	0.4	1.6
Eastern Africa	-0.9	17.3	-0.1	0.5	-0.2	-0.1	0.4	0.4
Middle Africa	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

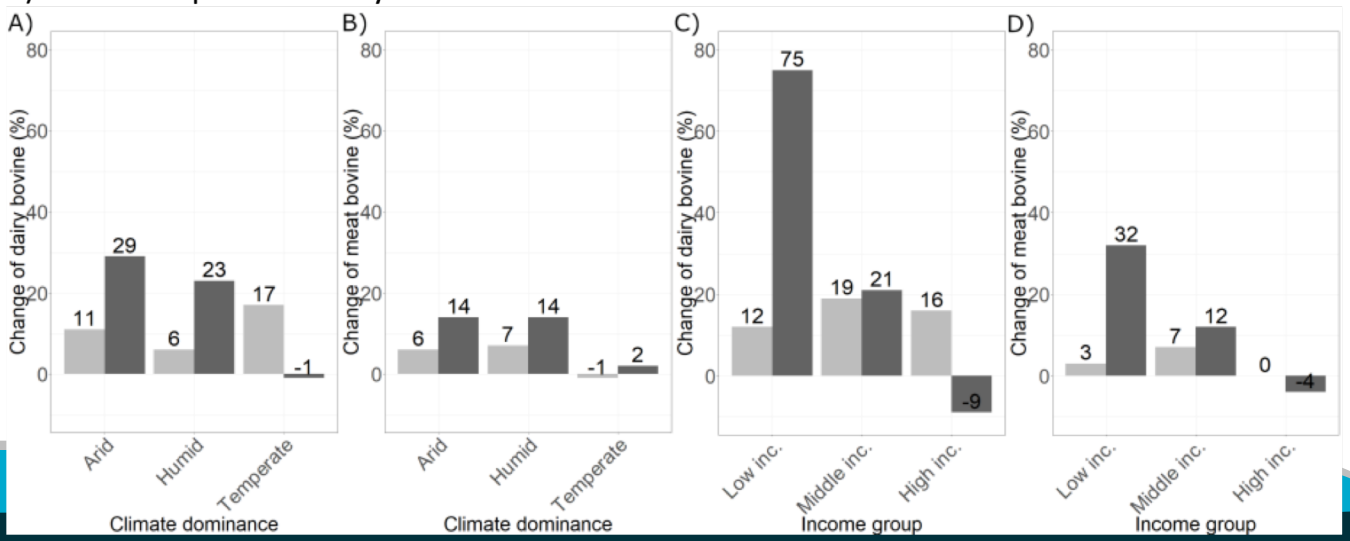
-60.0 60.0

Herrero et al 2019

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



2) Mixed crop-livestock systems



Herrero et al 2019

Global integrated assessment models

A range of techniques implemented:

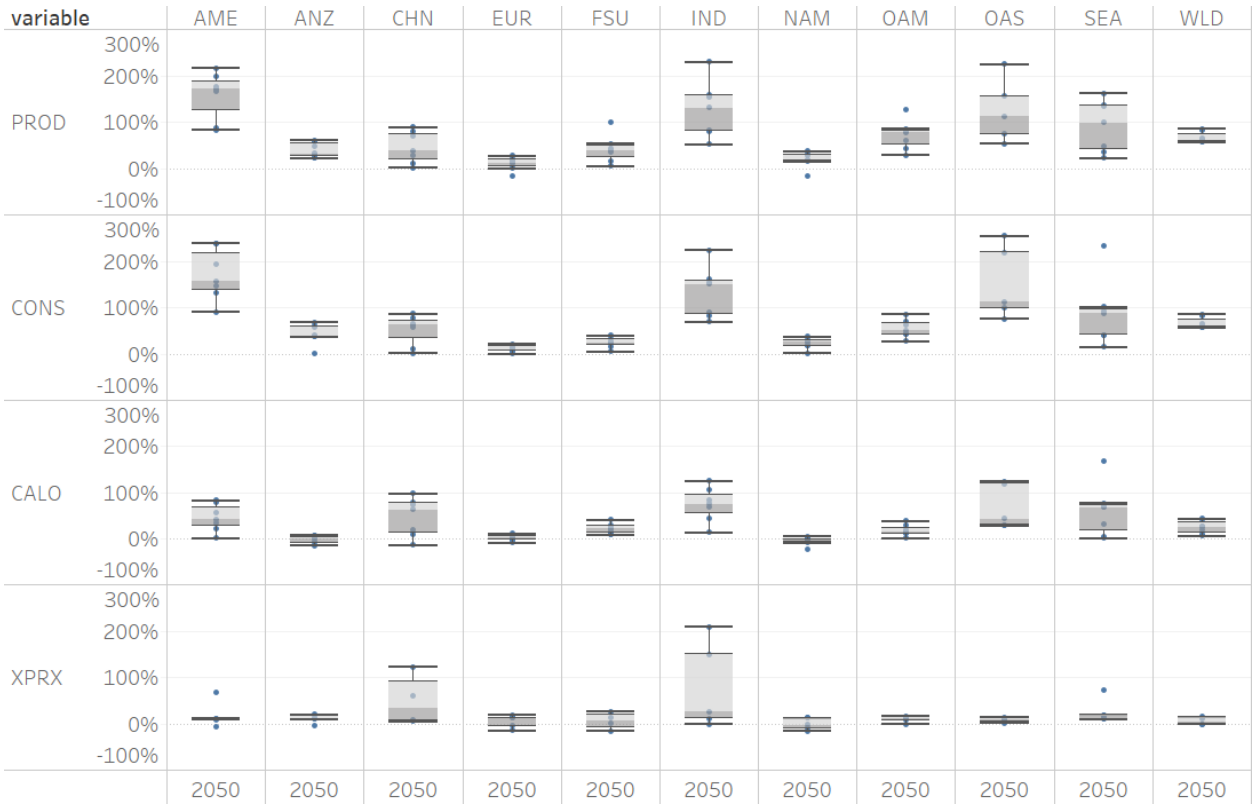
- Partial equilibrium models (Globiom, MagPIE, IMPACT, Agrimonde, Globagri, IMAGE)
- CGE models (GTAP, MAGNET, CAPRI, Leitap, GTEM)
- Spreadsheet and systems dynamic models (Foley, Bajzejl, Hedenus, Wirsenius)

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

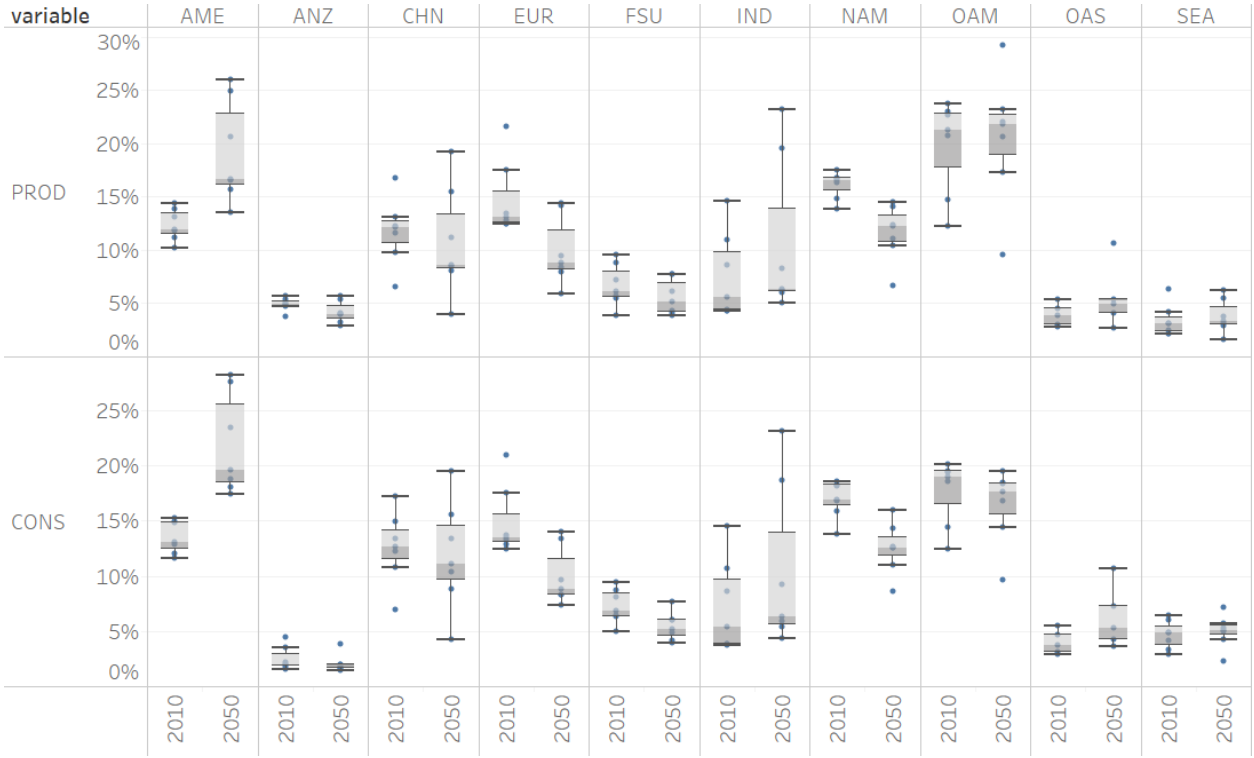
- AME – Africa and Middle East
- ANZ – Australia and New Zealand
- CHN – China
- EUR – Europe
- FSU – Former Soviet Union
- IND – India
- NAM – North America
- OAM – Latin America and Caribbean
- OAS – South and Central Asia (excl. IND)
- SEA – South and East Asia (excl. CHN)
- WLD – World

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



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Variable

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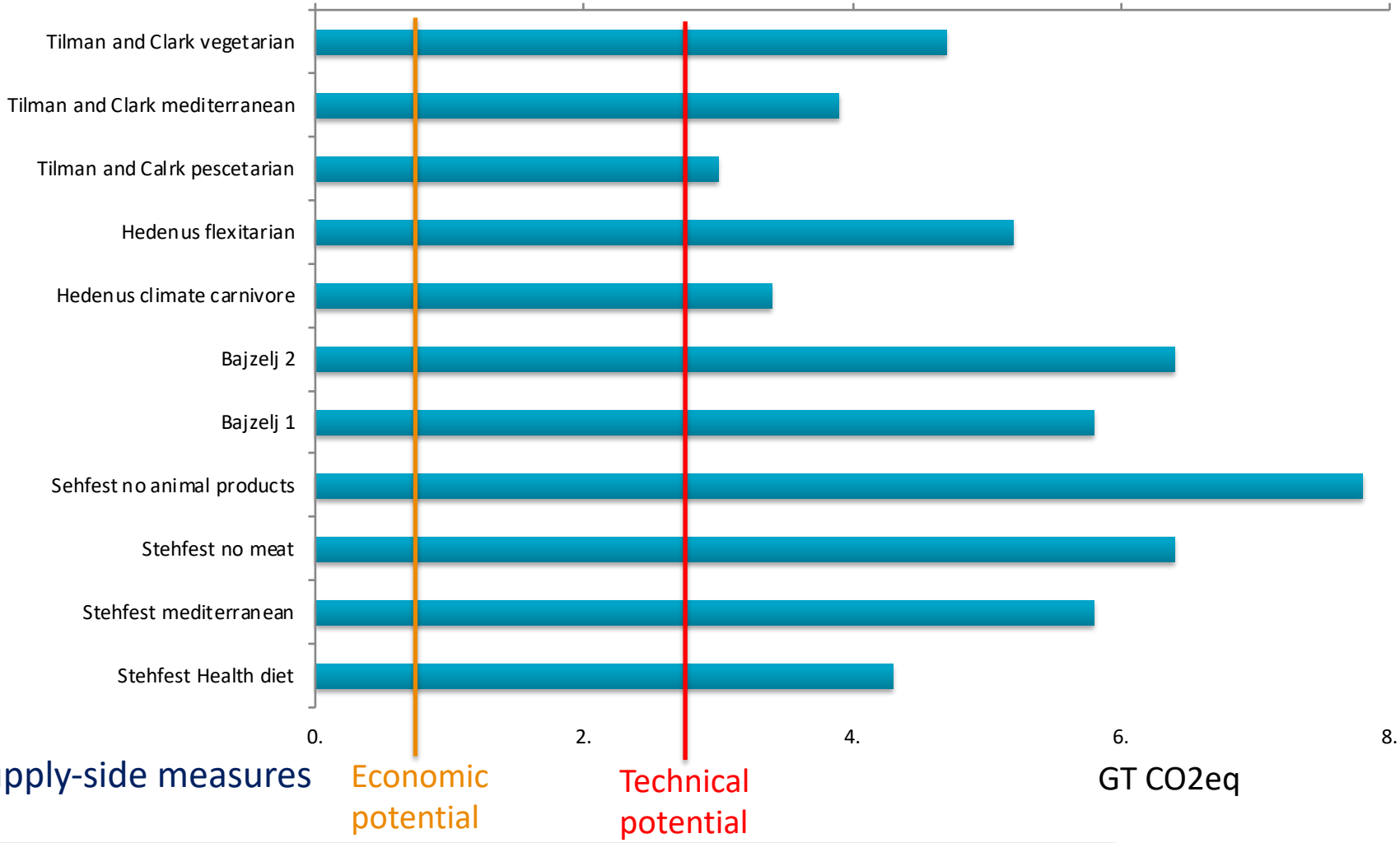
Regional share of global ruminant production and demand in 2010 and 2050

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

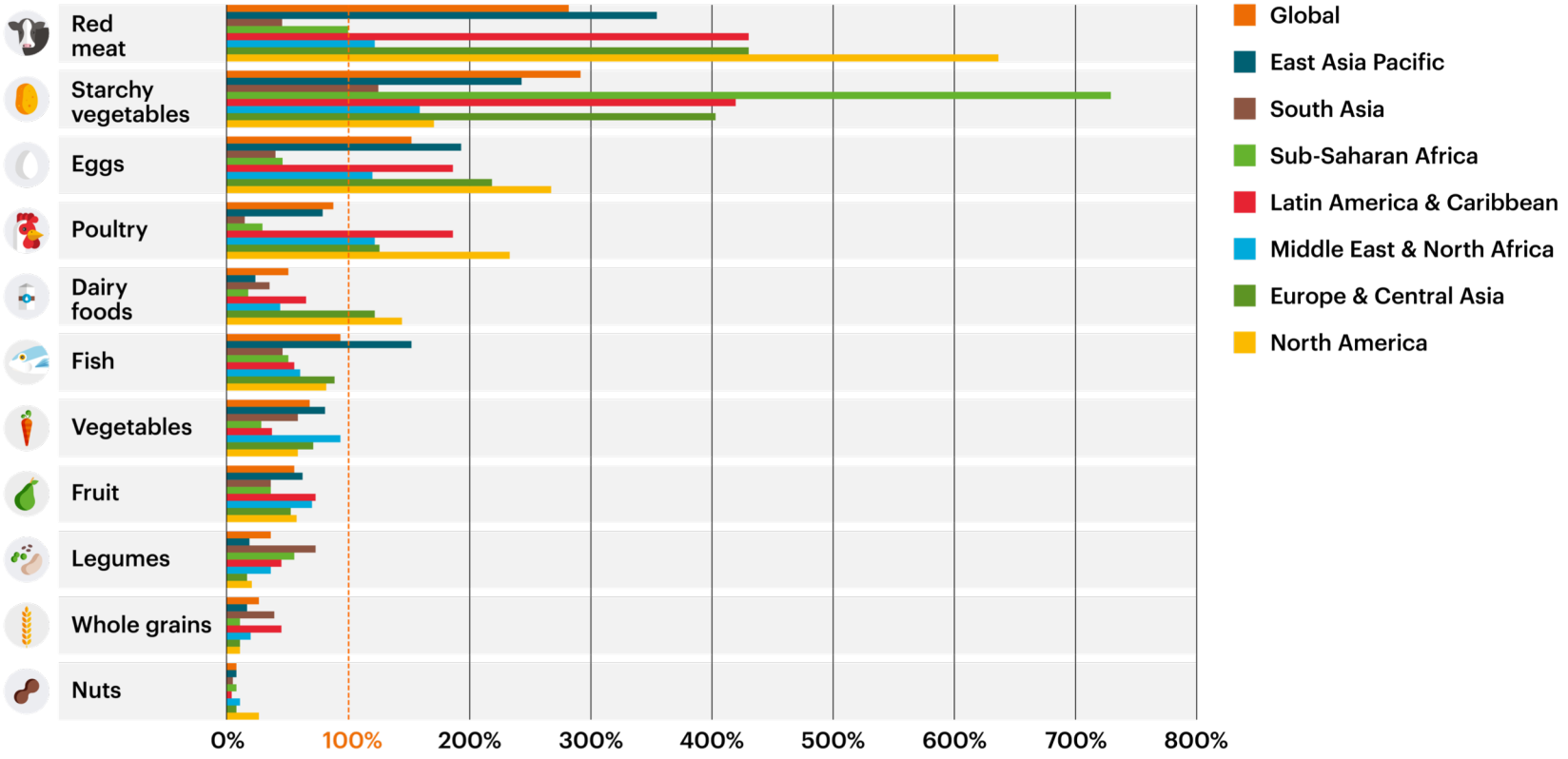
The EAT-Lancet Scenarios reveal that healthy and sustainable diets have a big impact on emissions, but increases in productivity and waste reduction are fundamental to achieving planet health

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

Willett et al 2019, The Lancet

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



Willett et al 2019, The Lancet

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

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