

Towards healthy and sustainable diets

Mario Herrero and Michael Robertson

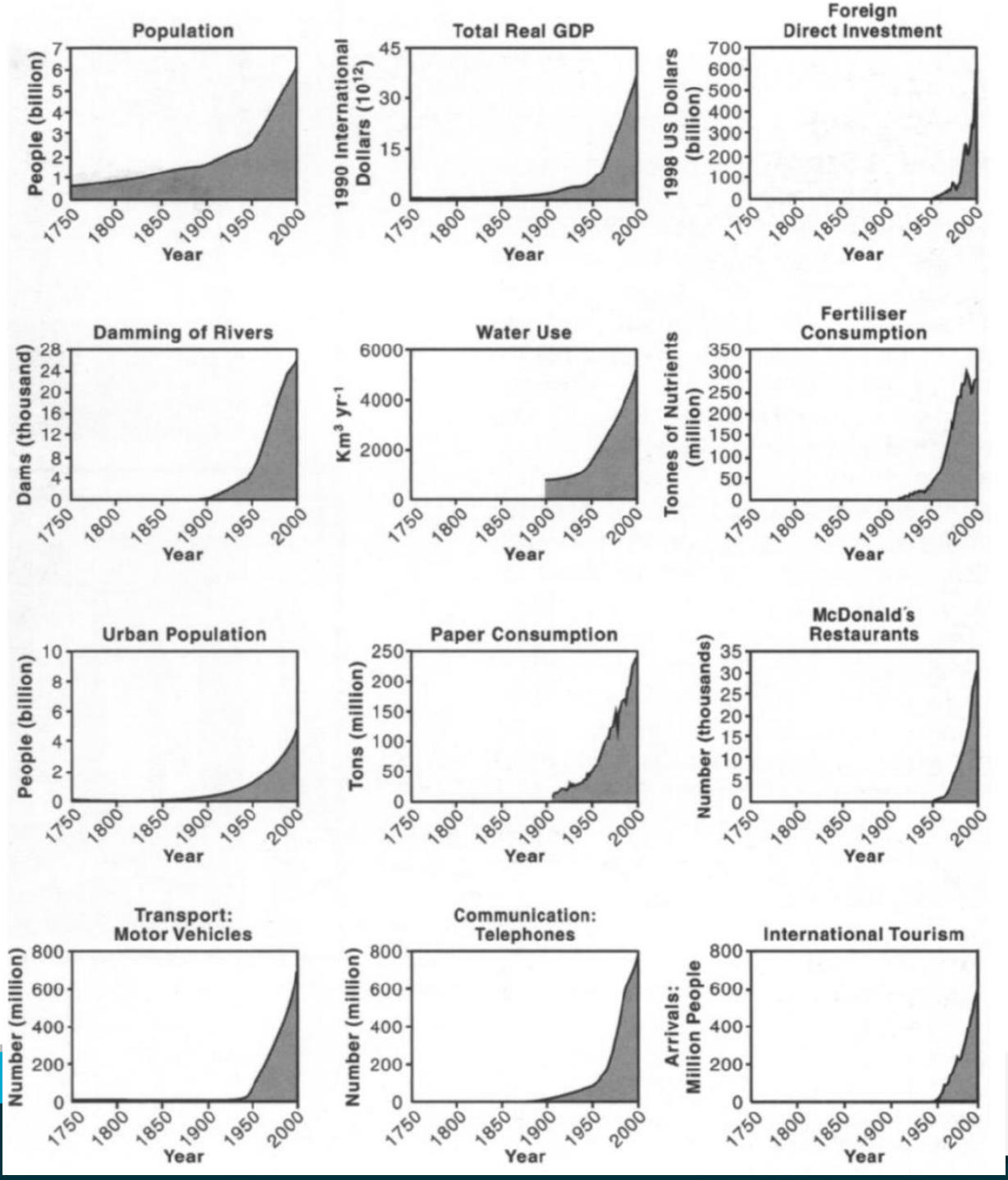
Talk structure

1. Agrifood systems and their environmental impact
2. What we eat has an impact on the environment
3. Healthy diets, planetary boundaries and food production
4. How we produce food matters

Agrifood systems and the environment

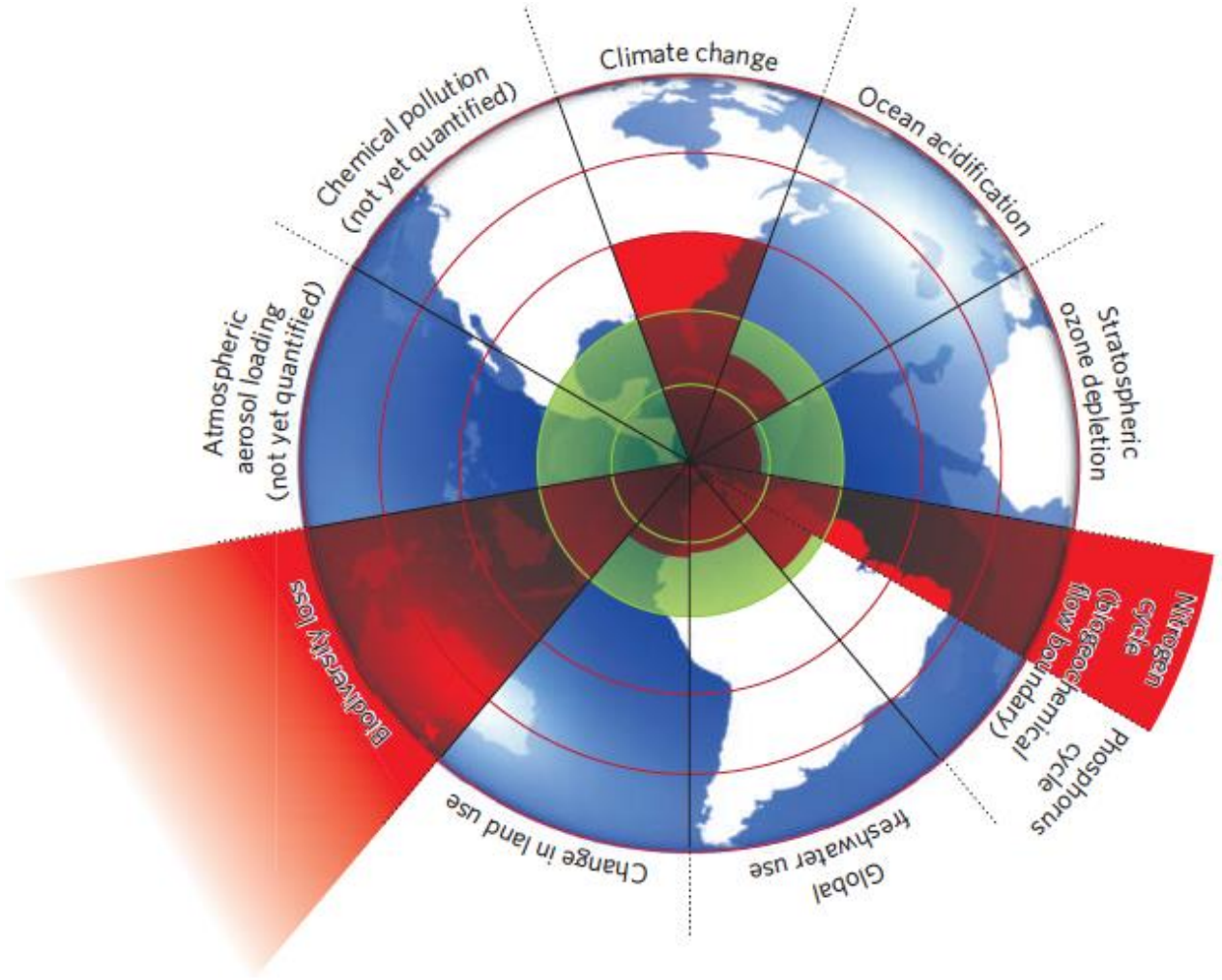
The Anthropocene…

…the age of human induced global change



Steffen et al. 2005)

Planetary boundaries



Rockstrom et al. Nature (2009)

The scale of the challenge

2 billion people lack key micronutrients like iron and vitamin A

155 million children are stunted

52 million children are wasted

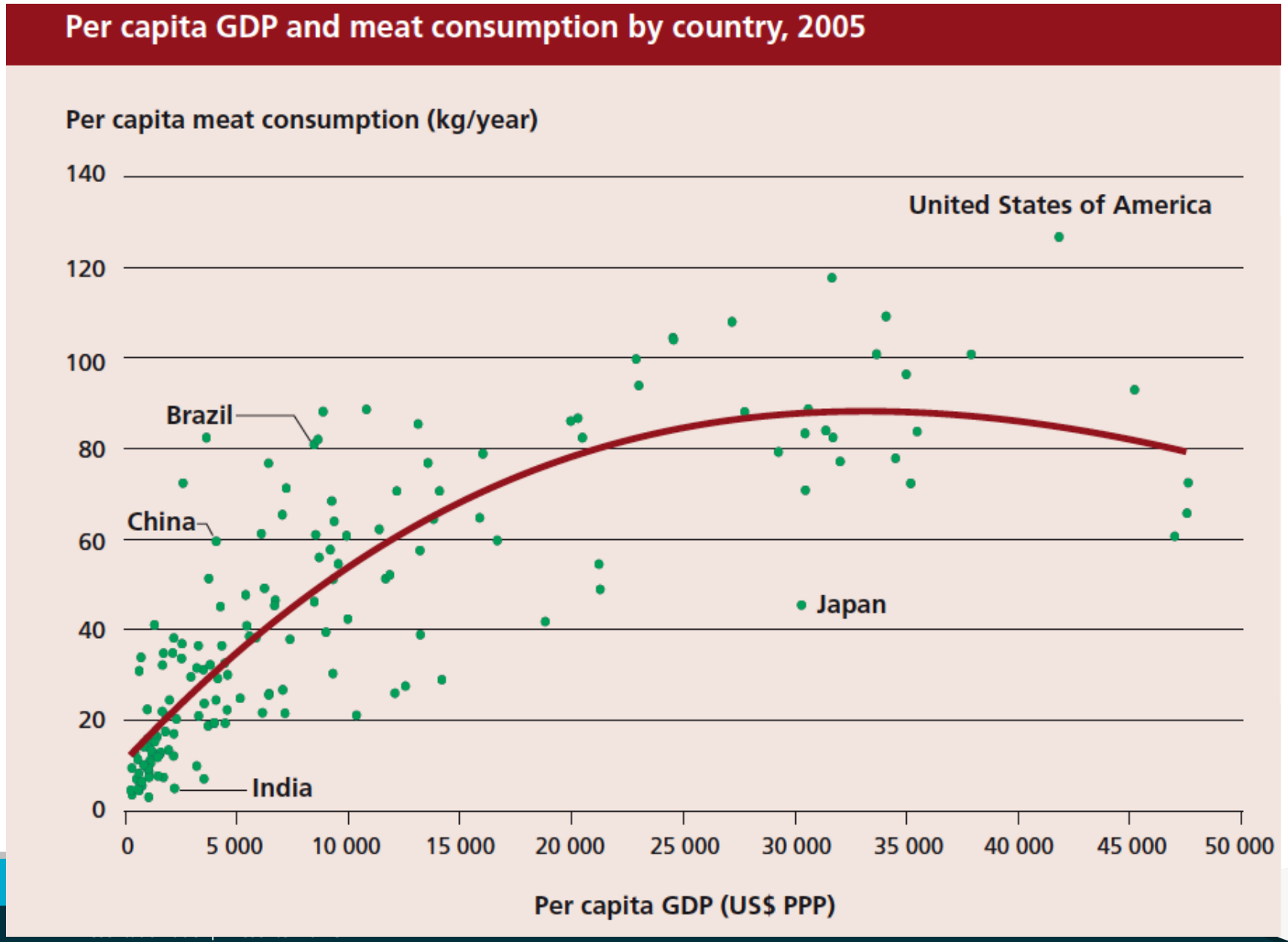
2 billion adults are overweight or obese

41 million children are overweight

88% of countries face a serious burden of either two or three forms of malnutrition

And the world is off track to meet all global nutrition targets

The ‘livestock revolution’: as people get richer they consume more meat



Projections of global food demand to 2050

	2005/2007	2050
Population (millions)	6584	9306
Cereals for food (kg per capita)	158	160
Cereals for all uses (kg per capita)	314	330
Meat consumption (kg per capita)	38.7	49.4
Oil crops for food (kg per capita)	12.1	16.2
Oil crops for all uses (kg per capita)	21.9	30.5
Meat production (million tonnes)	258	455
Cereal yields, rice paddy (t/ha)	3.32	4.30
Arable land area (million ha)	1592	1661

Projected consumption per capita: Cereals stable, meats and oils increasing

Alexandratos and Bruinsma 2012

Changes in the demand for livestock products 1990 - 2015 (kg/cap/yr)

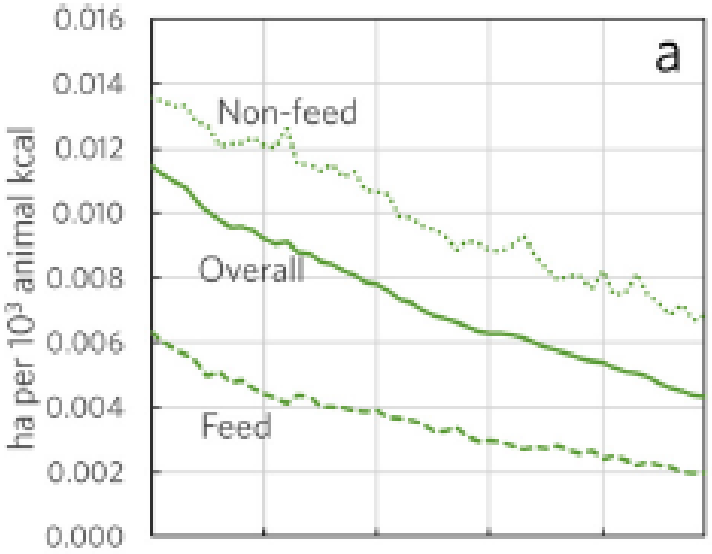
	Fish, Seafood	Milk - Excluding Butter	Eggs	Meat	Bovine Meat	Mutton & Goat Meat	Pigmeat	Poultry Meat
Europe	4.5	25.2	0.6	1.8	-8.8	-1.4	0.8	10.6
Northern Africa	8.7	47.8	1.3	12.2	3.3	1.9	0.0	6.5
Western Africa	6.8	6.6	0.3	2.8	0.2	1.2	0.4	1.6
Eastern Africa	-0.9	17.3	-0.1	0.5	-0.2	-0.1	0.4	0.4
Middle Africa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

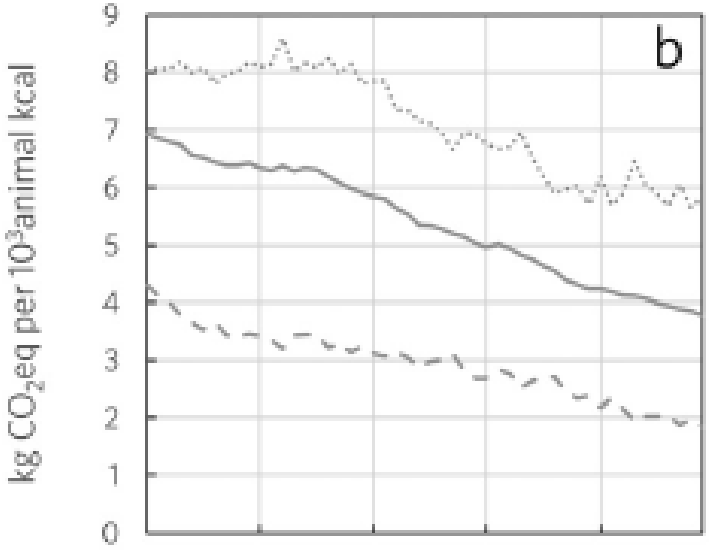
Change in kg/person/year between 1990-2015

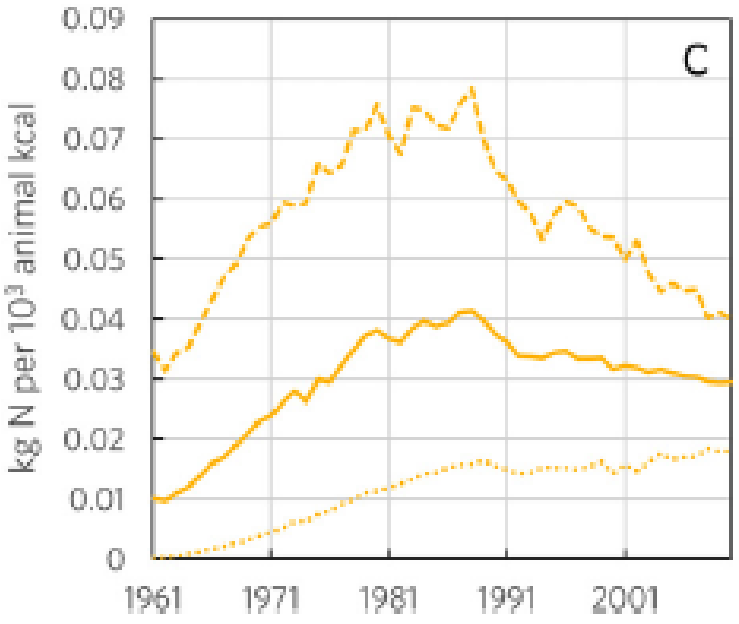
-60.0 60.0

The environmental efficiency of livestock has been improving…

…but we have traded lower land use and emissions for increased N use



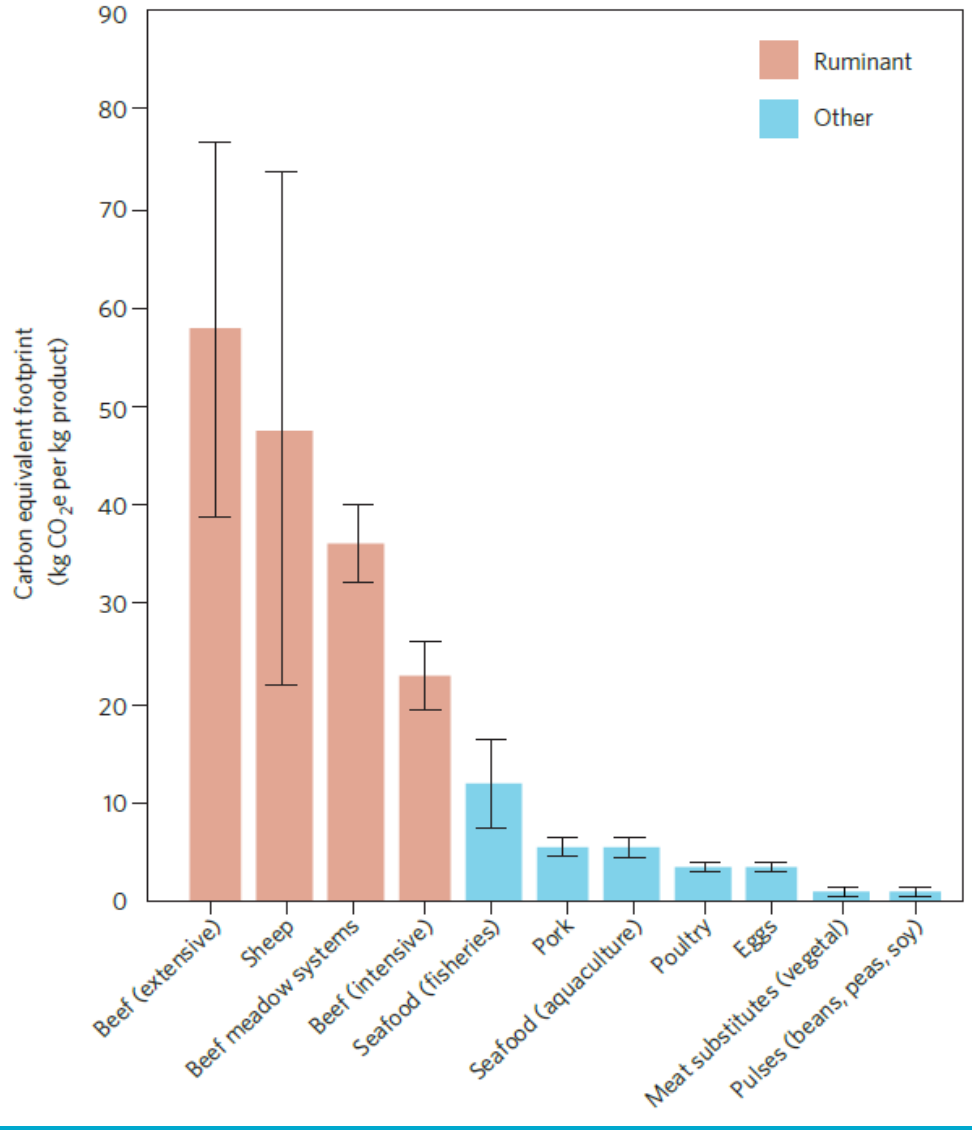




Davis et al 2015 ERL

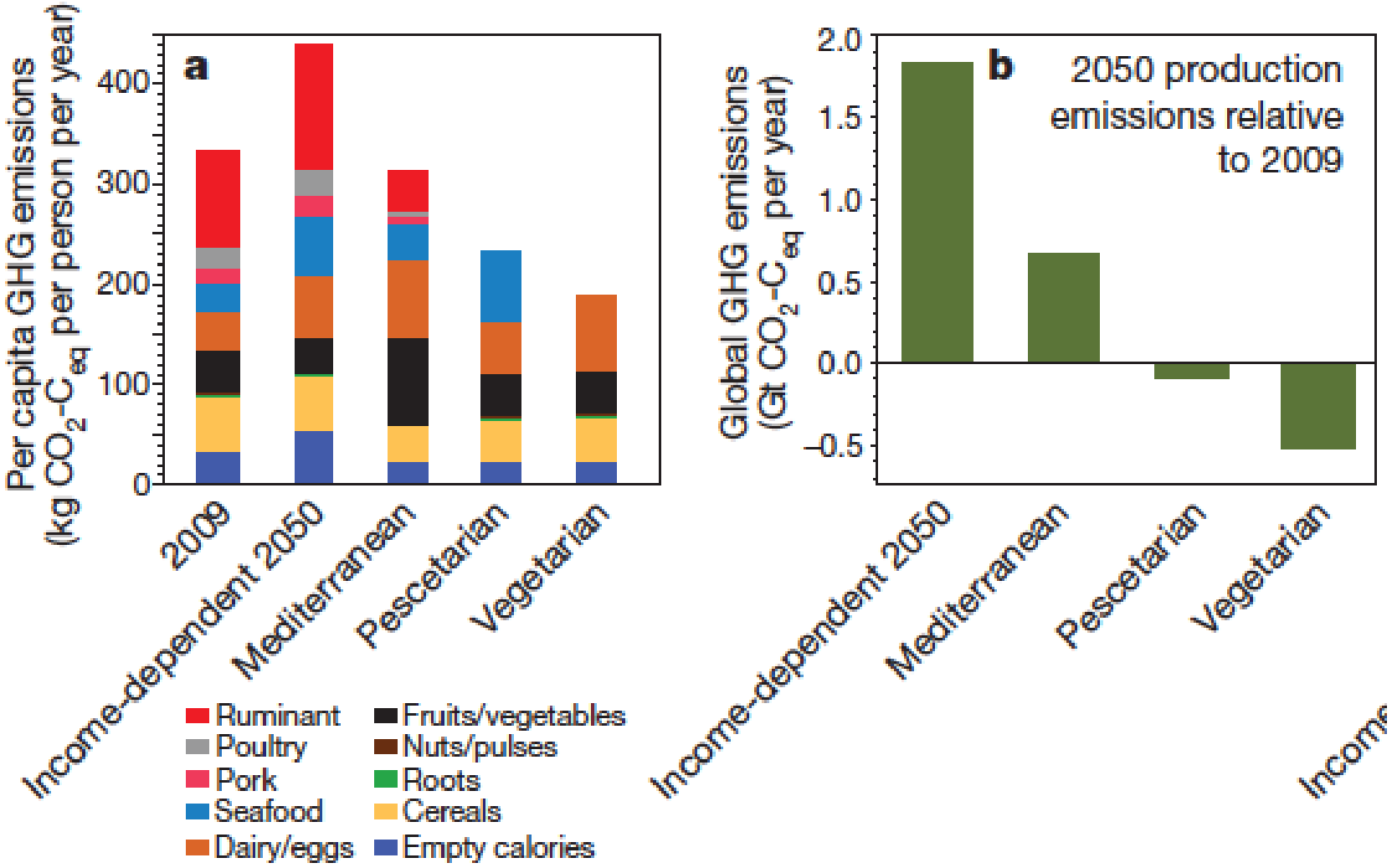
What we eat and the environment

Differences in the GHG intensity of foods



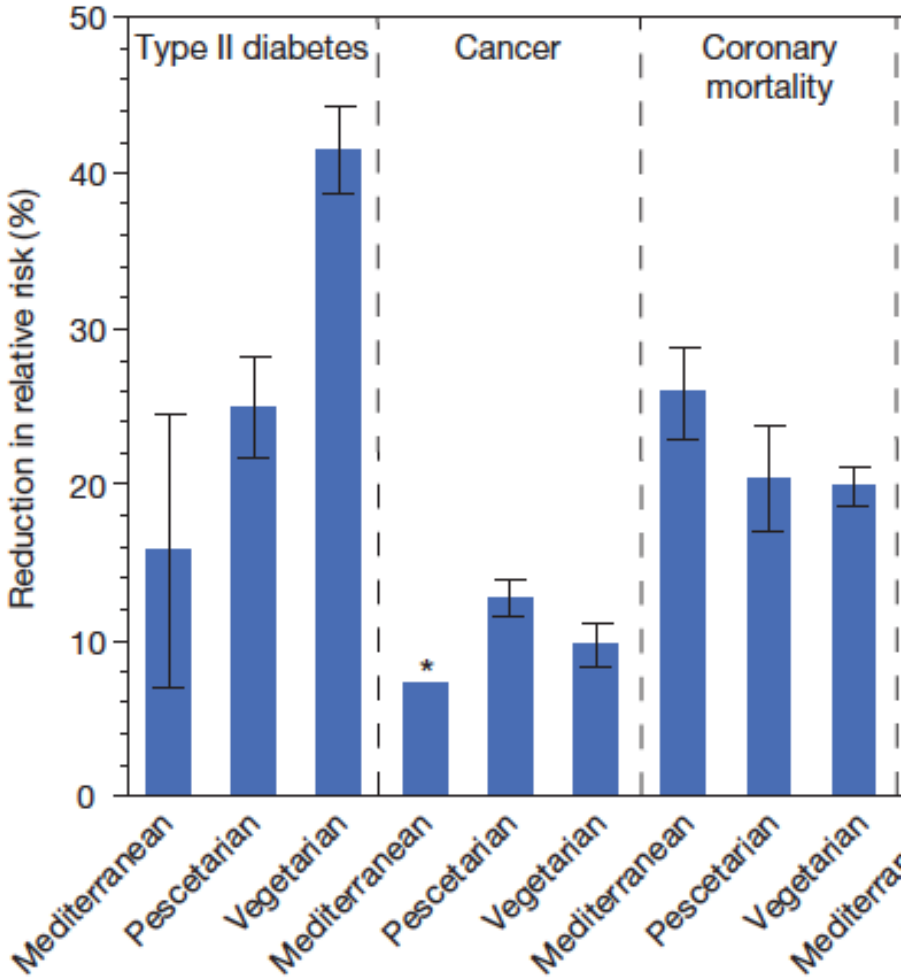
Ripple et al.(2014)

Diet impacts the environment

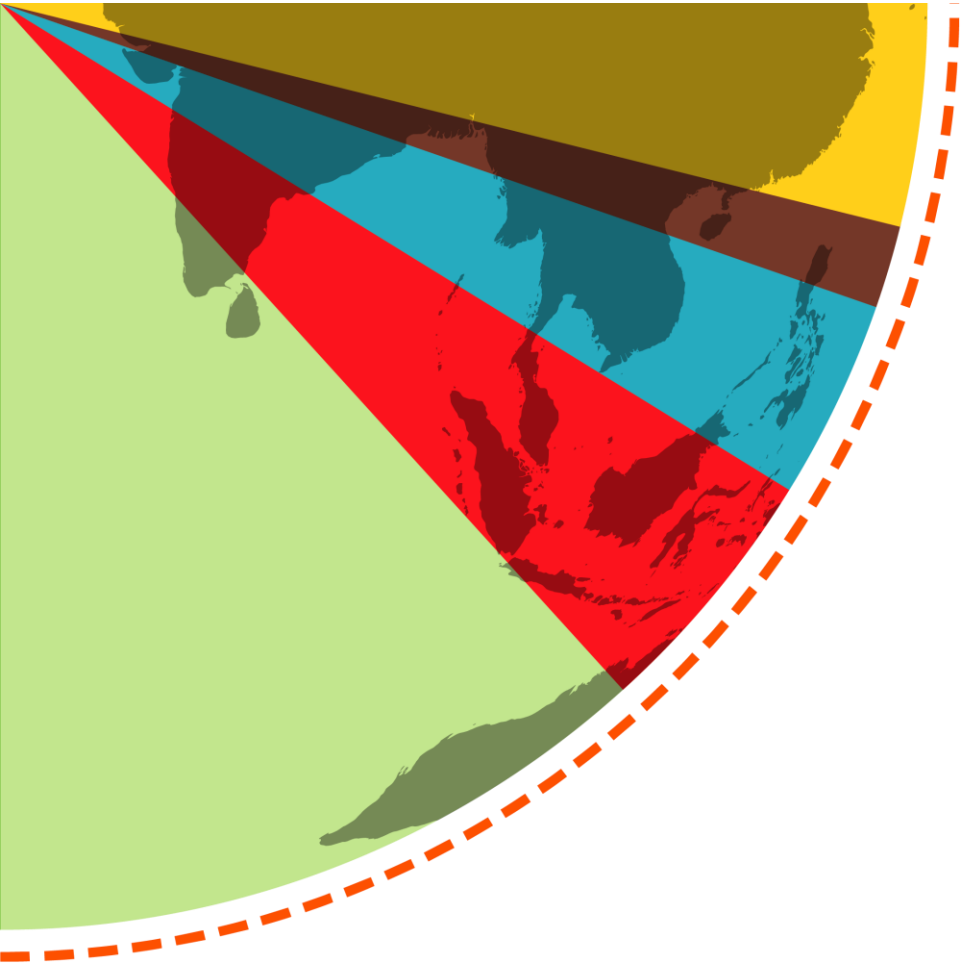


Tilman and Clark, Nature 2014

…..and health


Type II diabetes
Cancer
Coronary mortality
Reduction in relative risk (%)
50
40
30
20
10
0
*
Mediterranean
Pescetarian
Vegetarian
Mediterranean
Pescetarian
Vegetarian
Mediterranean
Pescetarian
Vegetarian
Mediterra

Healthy diets, planetary boundaries and food production



The EAT-*Lancet* Commission on Healthy Diets From Sustainable Food Systems

Food Planet Health

EAT-*Lancet* Commission Approach

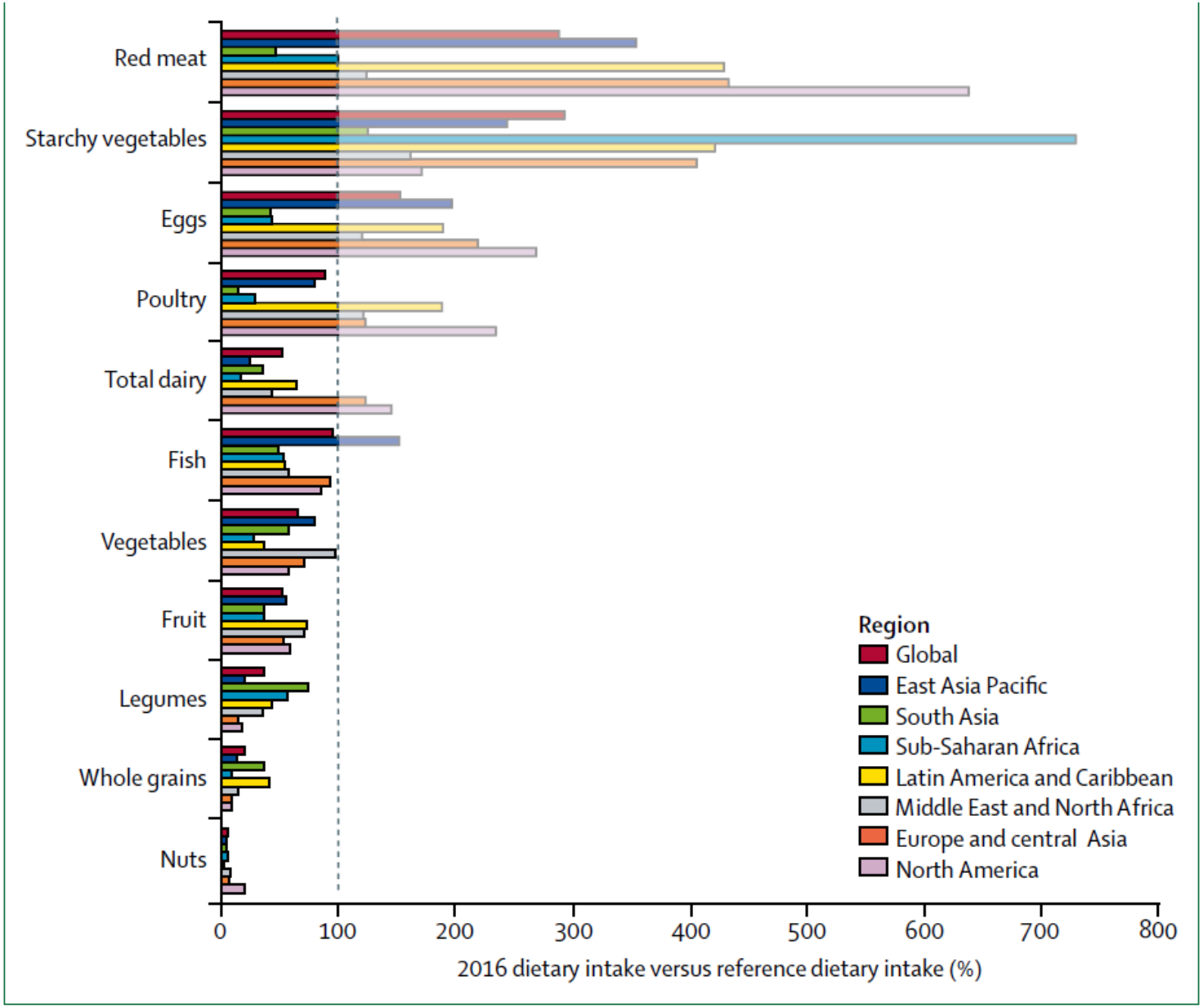
1. Define a healthy reference diet using the best available evidence
2. Define planetary boundaries for 6 key environmental measures
3. Analyze what measures (diet, production practices, reducing waste) are needed to stay within food production boundaries while delivering healthy diets by 2050.
4. Outline Strategies to achieve the changes needed to meet the goal

Healthy Reference Diet

2500 kcal/day

	Macronutrient intake grams per day (possible range)	Caloric intake kcal per day
Whole grains		
Rice, wheat, corn and other	**232**	**811**
Tubers or starchy vegetables		
Potatoes and cassava	**50** (0–100)	**39**
Vegetables		
All vegetables	**300** (200–600)	**78**
Fruits		
All fruits	**200** (100–300)	**126**
Dairy foods		
Whole milk or equivalents	**250** (0–500)	**153**
Protein sources		
Beef, lamb and pork	**14** (0–28)	**30**
Chicken and other poultry	**29** (0–58)	**62**
Eggs	**13** (0–25)	**19**
Fish	**28** (0–100)	**40**
Legumes	**75** (0–100)	**284**
Nuts	**50** (0–75)	**291**
Added fats		
Unsaturated oils	**40** (20–80)	**354**
Saturated oils	**11.8** (0-11.8)	**96**
Added sugars		
All sugars	**31** (0–31)	**120**

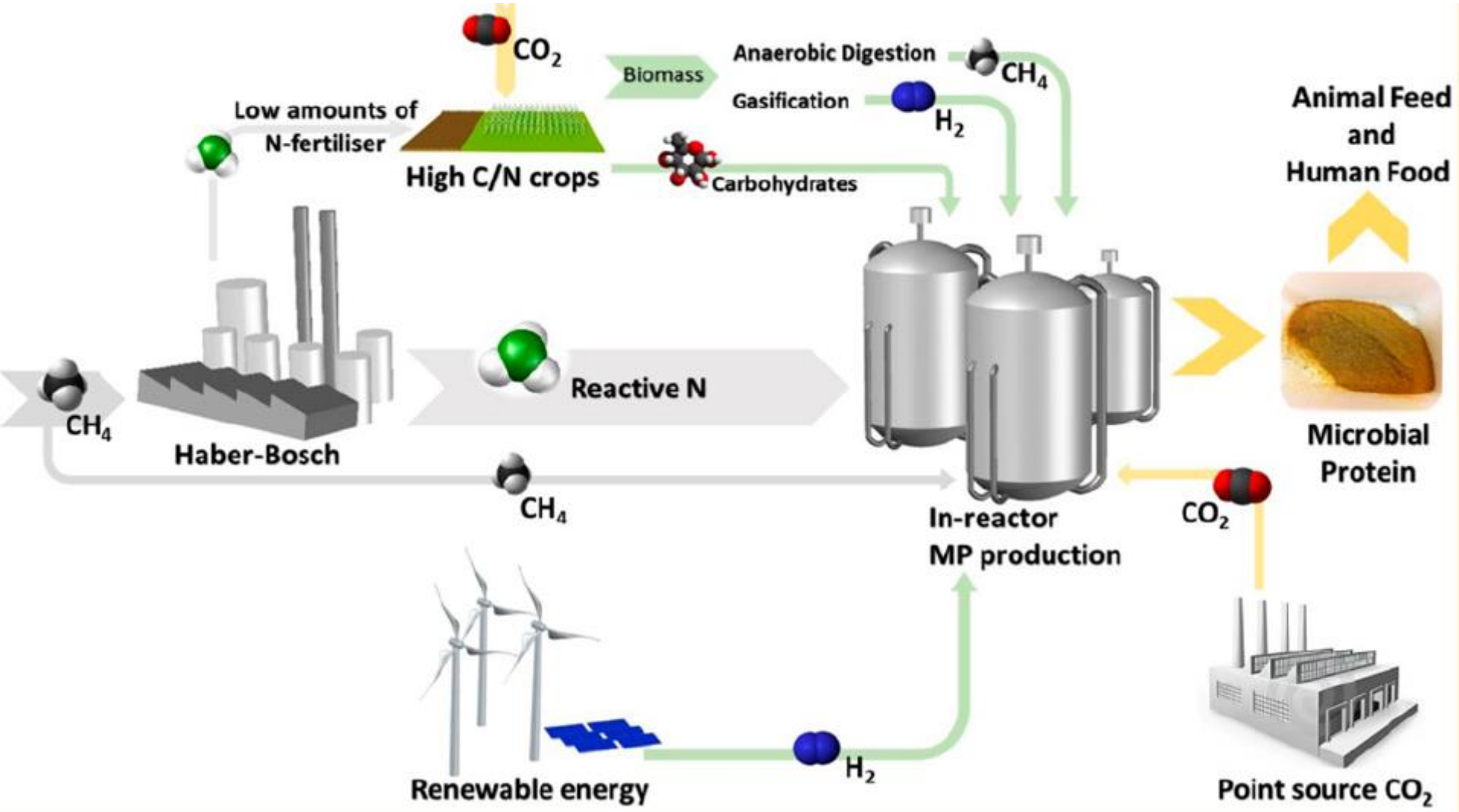
Gap between current and reference diet



How important are diet, production practices and waste reduction?

			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

Turning waste into high quality feed



Pikaar et al. 2017 Env Sci Tech

How we produce food matters

How we produce food matters a lot for the environment and nutritional diversity

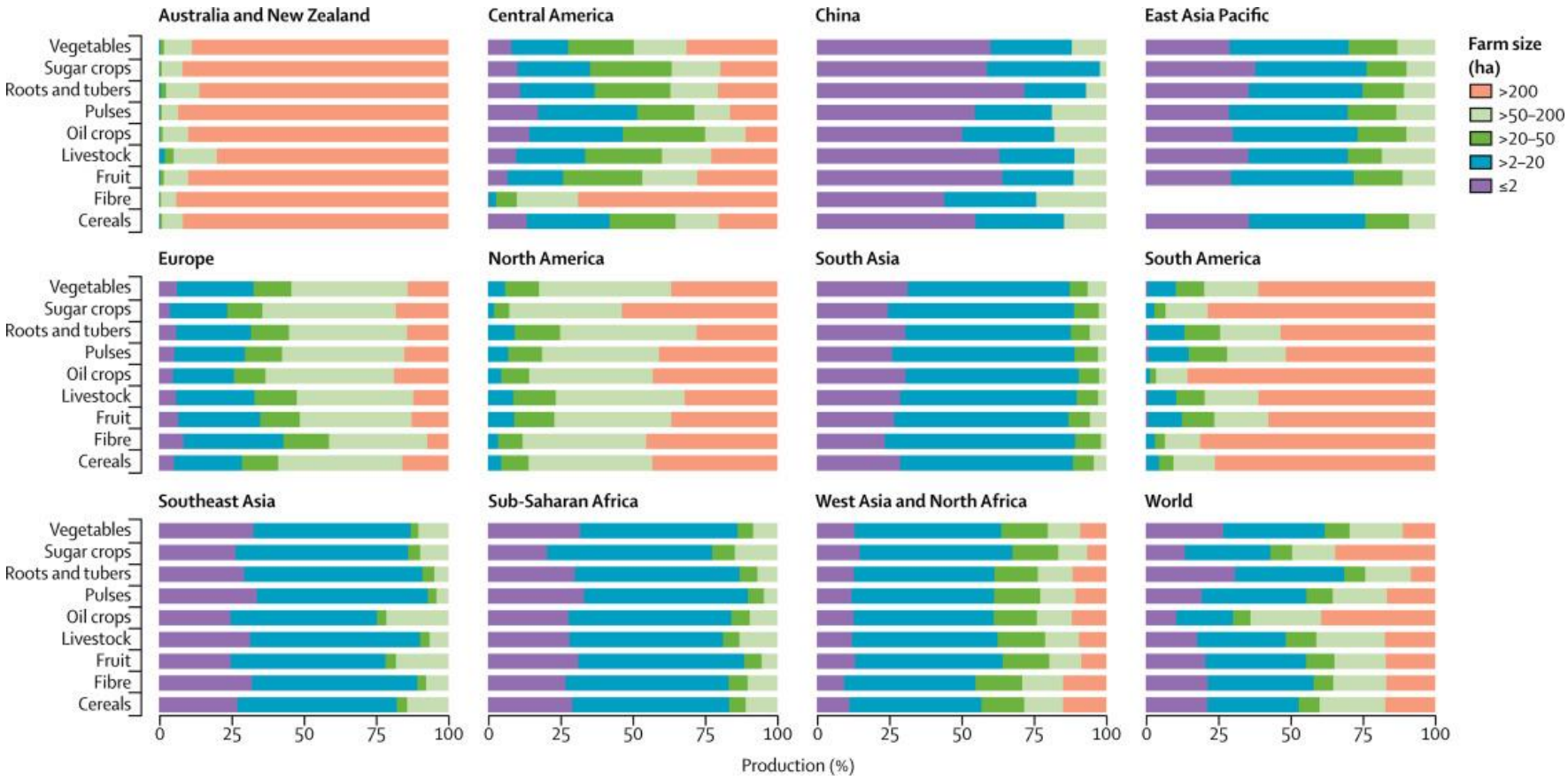
Nutritional security
Agro-ecosystems health
Risk management

Resource use and emissions
Value chains and zoonosis
Income and employment

Iowa, USA

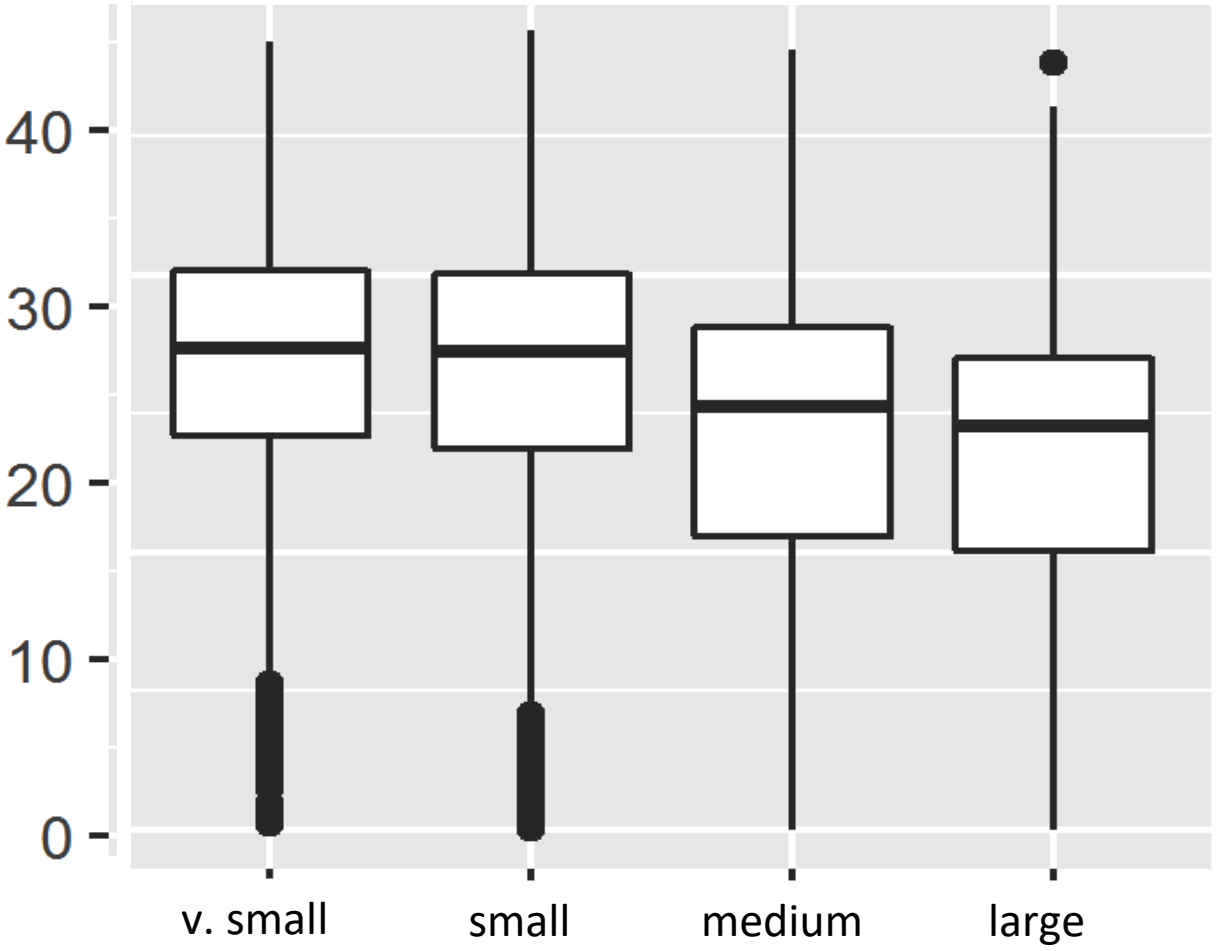
Northern India

Small and medium farms produce between 50-75% of the world's food



Herrero et al. 2017 The Lancet PH

H-index
As farm sizes increase, agricultural diversity decreases



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Conclusions

- Diets link the environment, consumption and health
- What we eat has significant outcomes for planetary boundaries
- Environmental footprints of food products and production systems vary widely
- Reductions in consumption, especially red meat, in many parts would benefit health and the environment
- Need to maintain nutrition diversity as we aim to intensify food production
- Social impacts are the next big frontier

Thank you

Mario.herrero@csiro.au

Follow our teams research on twitter @GlobalFoodTeam

http://www.thelancet.com/journals/lanplh/issue/current