



Protein and sustainable food – The global dimension

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The Protein Plan(et) Summit – 17 October 2019 – Wageningen

Business as usual?

What will world food supply look like by 2050?

- Increasing population + income will double demand
- Oil/phosphate/water will inhibit production by 2030
- Food prices will increase by 2030 (KPMG, IPCC)
- Increasing impacts on ecology / economy / health
- Production/consumption: NL is not representative!

Yield increases are slowing down

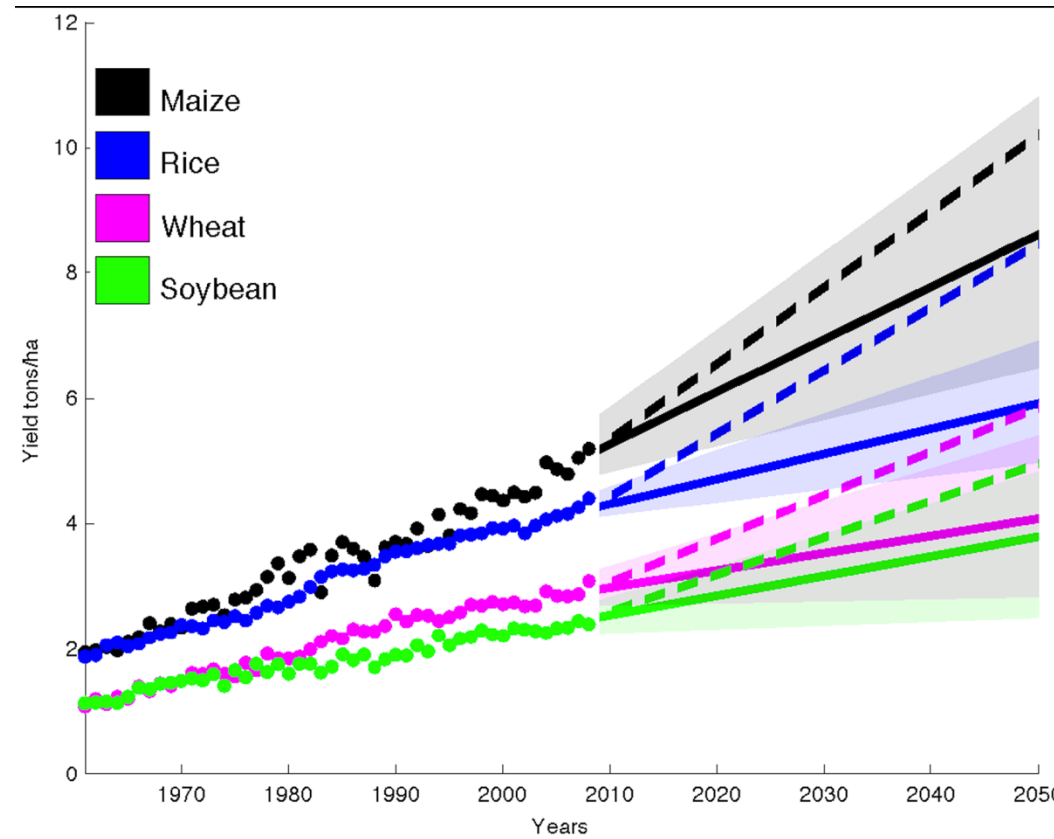
1.6% per year

1.0%

0.9%

1.3%

(2.4% needed)

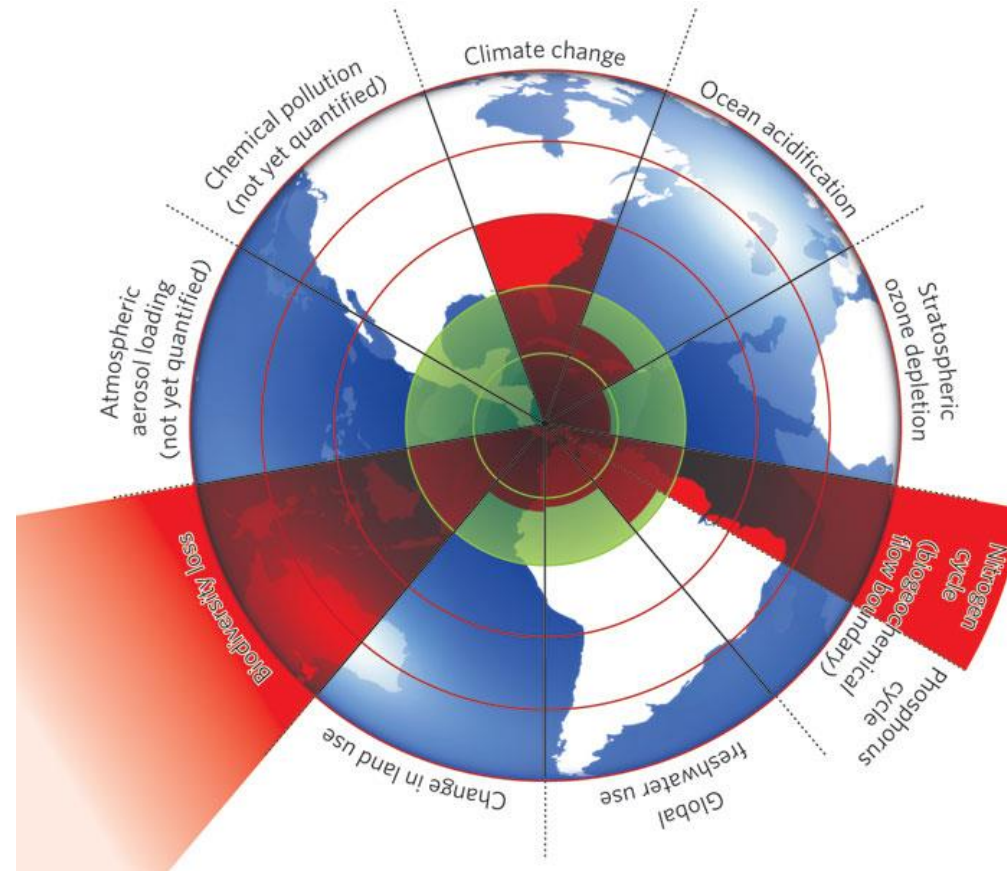


Source:

Ray et al. (2013)

PLOSone e66428

Planetary boundaries



Source:
Rockström et al.
(2009) Nature
461, 472-475

Prioritizing impacts

(safe boundary = 1)

1. Biodiversity loss	>10
2. Nitrogen cycle	3.45
3. Climate change	1.1-1.5
4. Phosphate cycle	0.77-0.86
5. Ocean acidification	0.81
6. Land-use change	0.78
7. Freshwater use	0.65
8. Ozone depletion	0.50

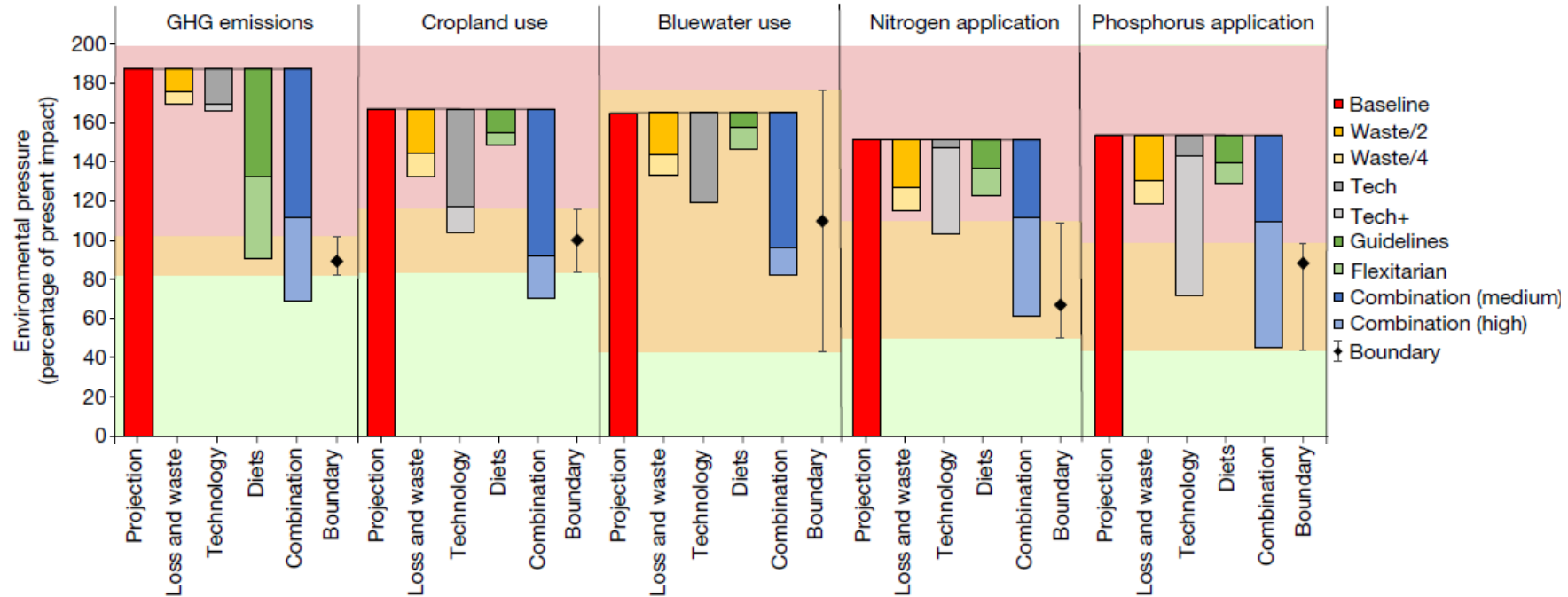
Source:

Aiking (2014)
American Journal of
Clinical Nutrition 100,
483S-489S

Nitrogen and protein are pivotal

- Human contribution to C cycle 1-2%; N 100-200%
- Nitrogen fertilizer (100 Mtons/year) embodies:
 - 37% of **all** energy input in US agriculture (Lang, 2009)
 - 43% GHG emissions in a loaf of bread (Goucher, 2017)
- Emissions harm terrestrial **plus** aquatic biodiversity (from manure degradation and fertilizer, respectively)
- Land vertebrates by weight (Zalasiewicz, 2016):
5% wild; 30% humans; 65% livestock

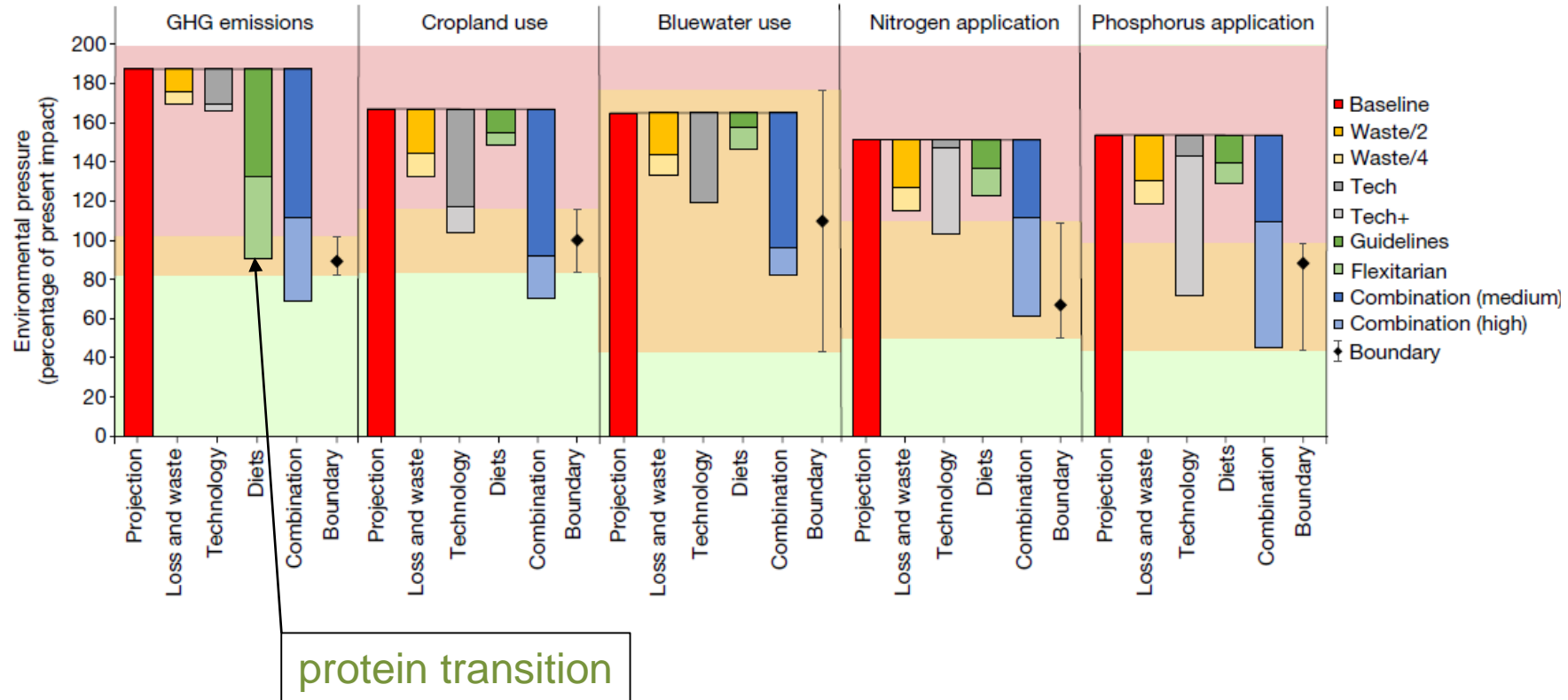
Options to reduce the 2050 impacts



Source: Springmann et al. (2018) Nature 562, 519-525 [black diamond ◆ = 2010; red bar ■ = 2050 SSP2 scenario]

Options for keeping the food system within environmental limits [based on Rockström et al.'s Planetary Boundaries]

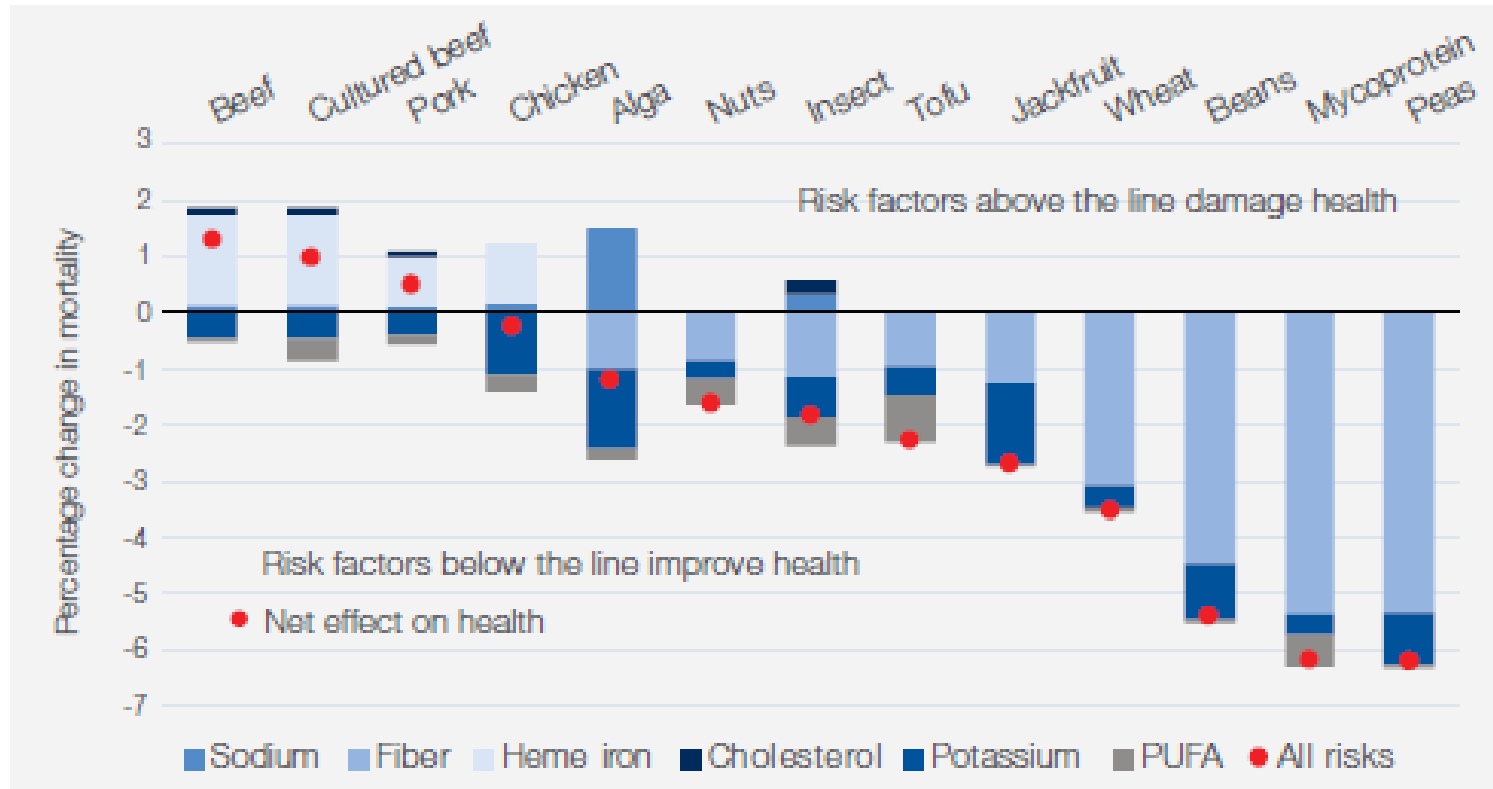
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Options for keeping the food system within environmental limits [based on Rockström et al.'s Planetary Boundaries]

Health impacts of protein sources



Source: World Economic Forum (2019) White Paper on Alternative Proteins

Improving environment *plus* health

1. Reduce protein consumption* (170% DRI)
2. Reduce caloric consumption (Alexander, 2017)
3. Reduce food waste (30% consumer)
4. Replace animal with plant protein

* primarily animal protein; today's animal / plant protein ratio of 60 : 40 should *return* to 40 : 60

Source: Aiking & De Boer (2019) Trends in Food Science & Technology (in press, online since July 2018)

Conclusions

- Double food production & quarter impacts by 2050?
- The *urgency* requires a *diet transition* towards more sustainable, plant-based nutrition (from 60:40 to 40:60)
- Sustainable *protein* supply is crucial to food security, human health and the planet's carrying capacity
- *Plant-based* diets are both *more sustainable* and *healthier* so we can have our cake and eat it! (using margarine 😊)

*Thank you for
your attention!*

Reading more:

Aiking & De Boer (2019) Trends
in Food Science & Technology
DOI:10.1016/j.tifs.2018.07.008.

