

Combining low climate impact with high nutritional quality

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The Netherlands Nutrition Centre

The Future is Green: The Protein Transition

DSM Delft, May 16th, 2019



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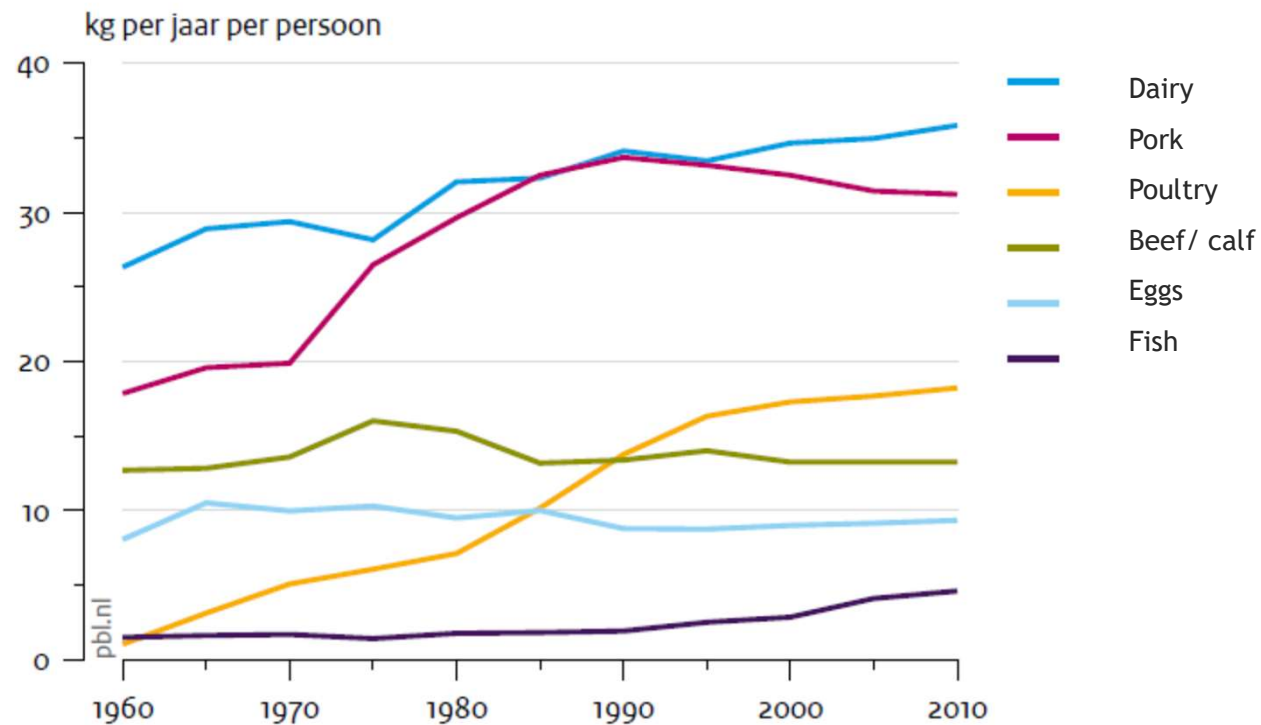
Once upon a time
in Delft...

Johannes Vermeer (1658)

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I. The Problem

Growth in consumption of animal products (1960-2010)

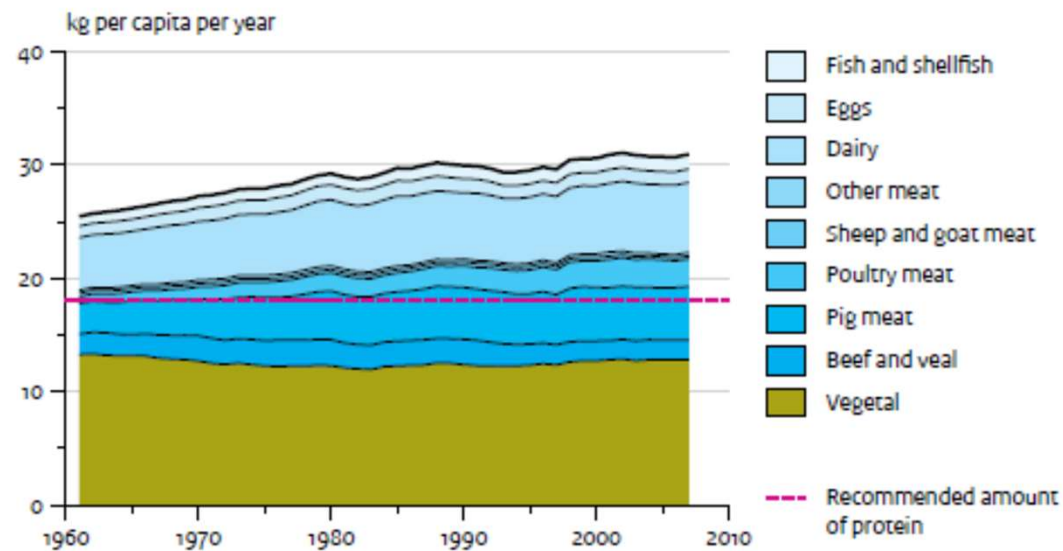


Bron: CBS, 2009; LEI, 2008; bewerking PBL

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...and protein: >1.5 x recommendation

Intake of protein in EU27



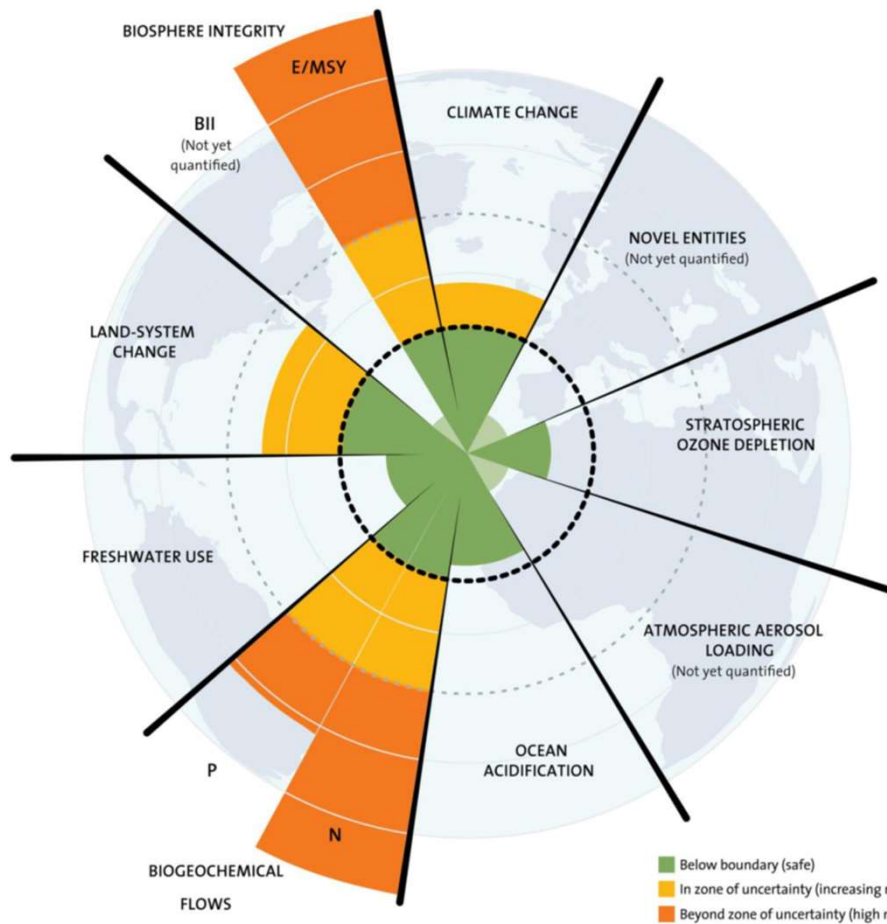
Source: PBL analysis, based on FAO (2010), Gezondheidsraad (2001), NEVO (2010), Schmidhuber (2007), Voedingscentrum (2008), WHO (2003b, 2007)

Protein consumption is currently significantly higher than the recommended amount (70% more than the recommended 18 kilograms per capita, per year).

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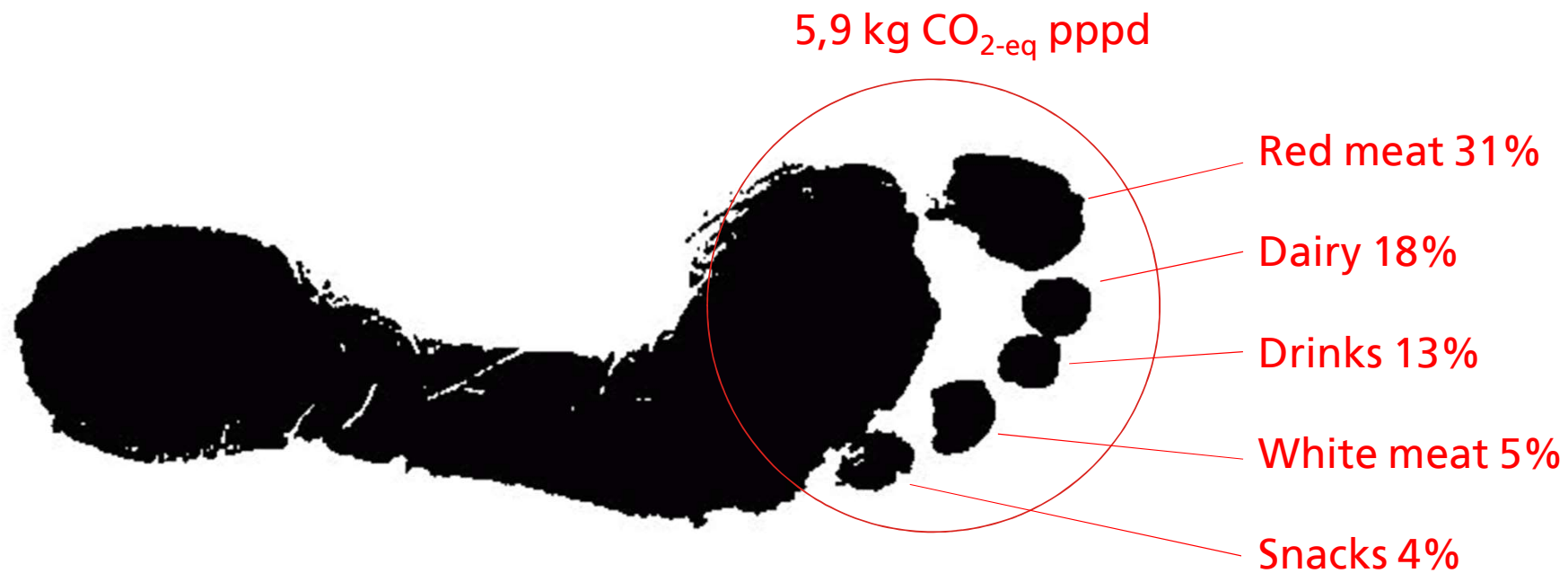
We exceed the safe operating space of the earth

(Steffen et al. 2015)



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Food represents 25 to 30% of our carbon-footprint



Greenhouse gas emissions of the current diet,
males 19-30 year (RIVM, 2017)

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	FOOD	IMPACT (GHG emissions per gram of protein)	COST (Retail price per gram of protein)
LOW	Wheat		\$
	Corn		\$
	Beans, chickpeas, lentils		\$
	Rice		\$
	Fish		\$\$\$
	Soy		\$
	Nuts		\$\$\$
	Eggs		\$\$
MEDIUM	Poultry		\$\$
	Pork		\$\$
	Dairy (milk, cheese)		\$\$
HIGH	Beef		\$\$\$
	Lamb & goat		\$\$\$

Lighter shade shows emissions from agricultural production, darker shade shows emissions from land-use change.

Sources: GlobAgri-WRR model developed by CIRAD, Princeton University, INRA, and WRI (GHG data); USDA and BLS (2016) (US retail price data).

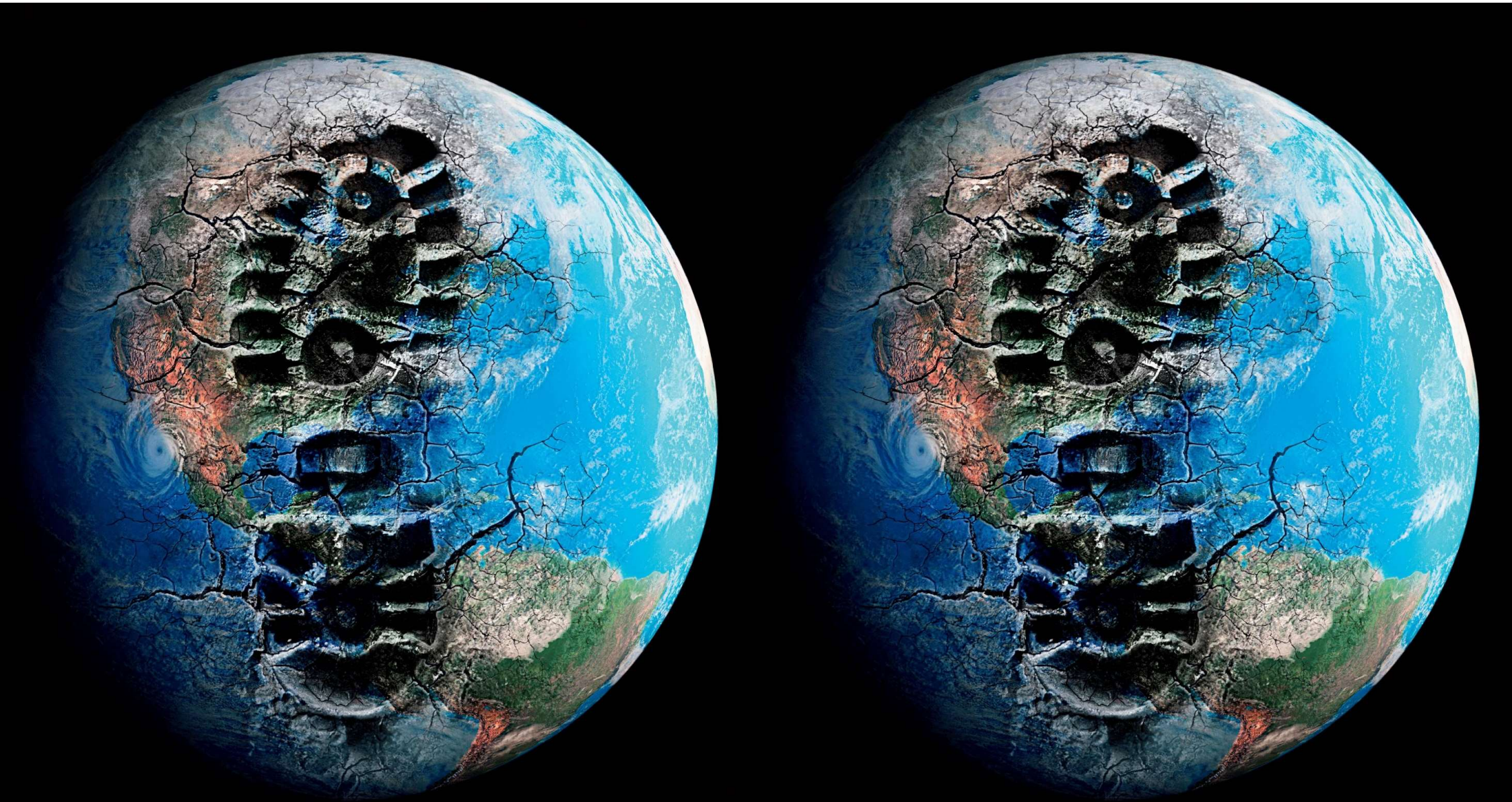
www.wri.org/proteinscorecard



WORLD RESOURCES INSTITUTE

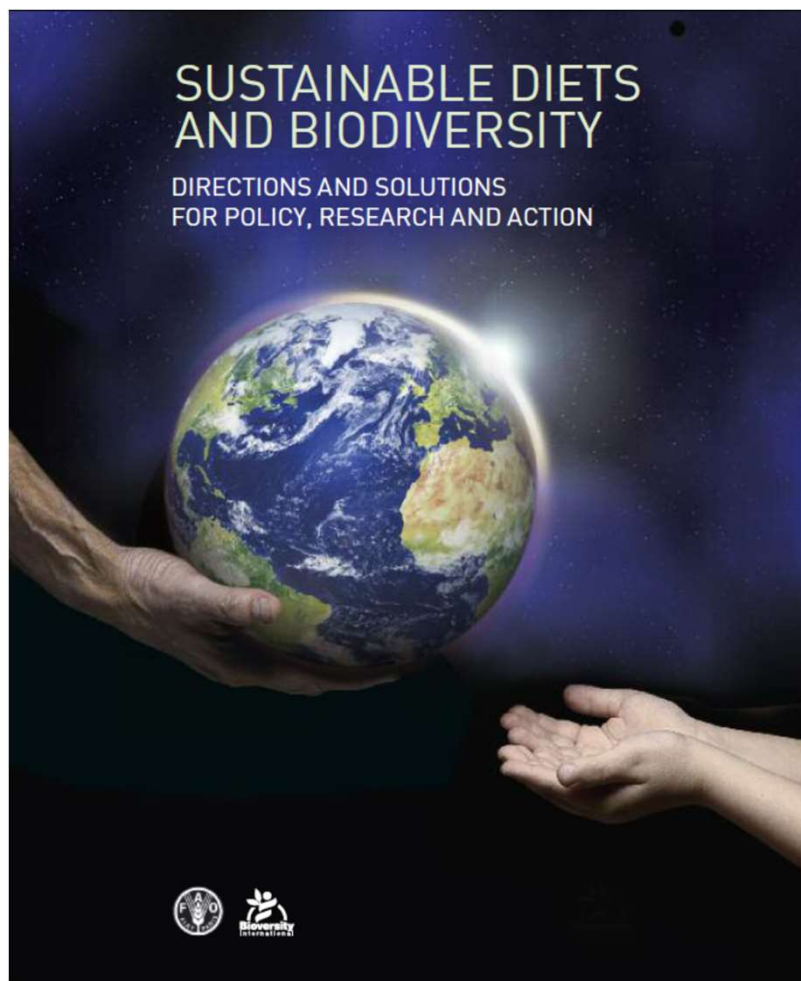
Protein scorecard (WRI, 2016)

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II. Defining Sustainable Diets

What is a sustainable diet?



FAO (2010):

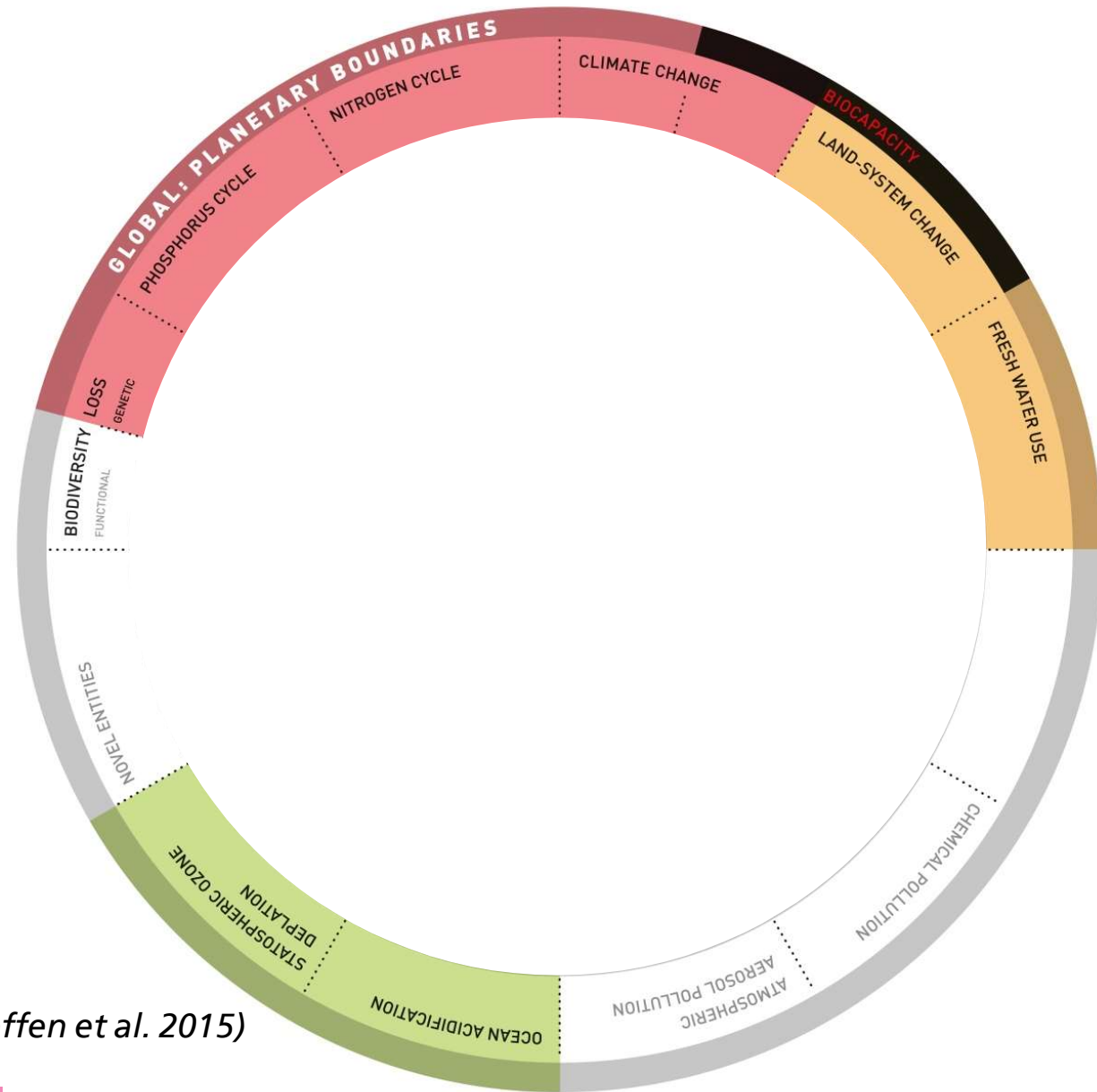
- *“Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations....*
- *...Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.”*

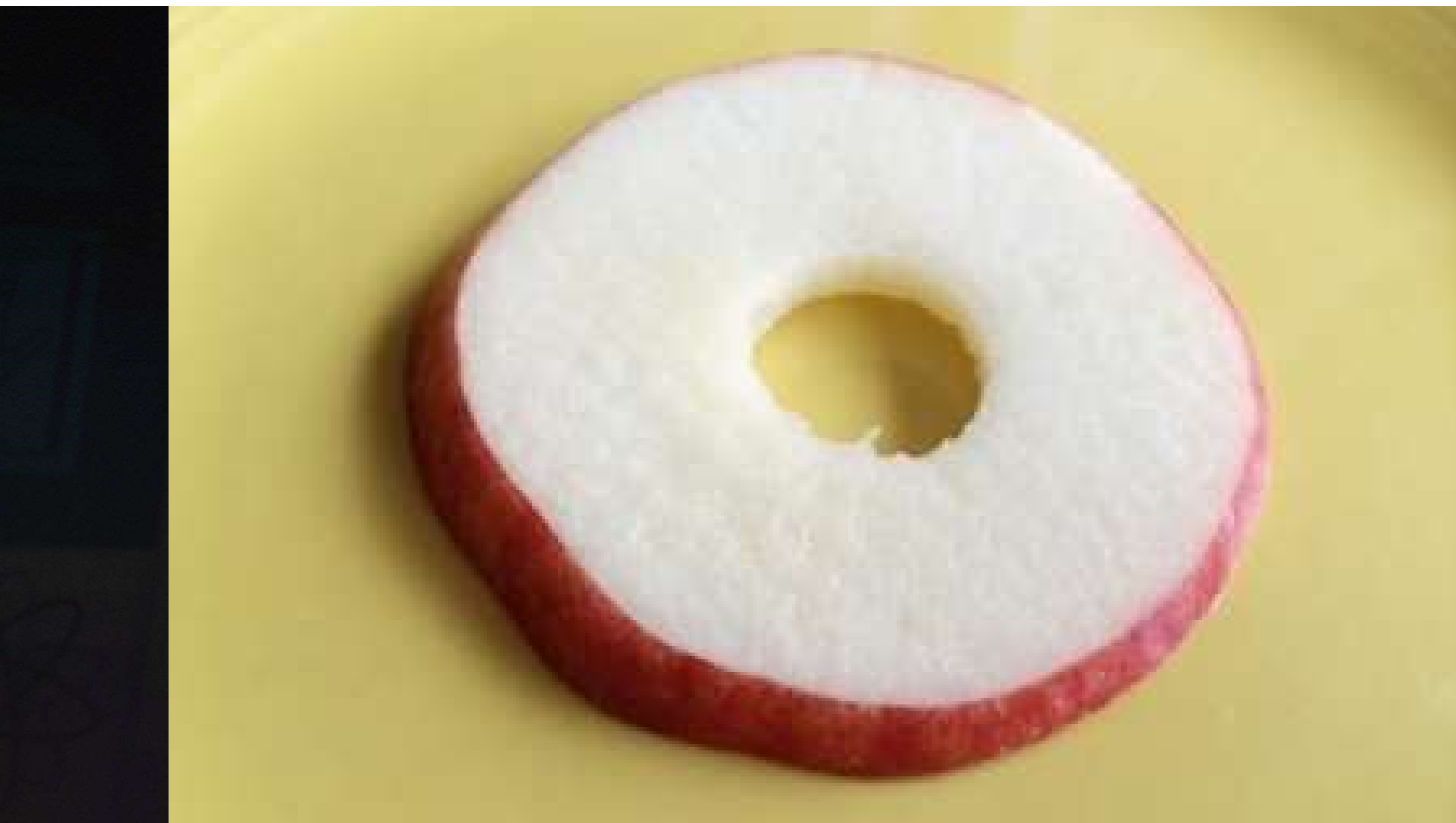
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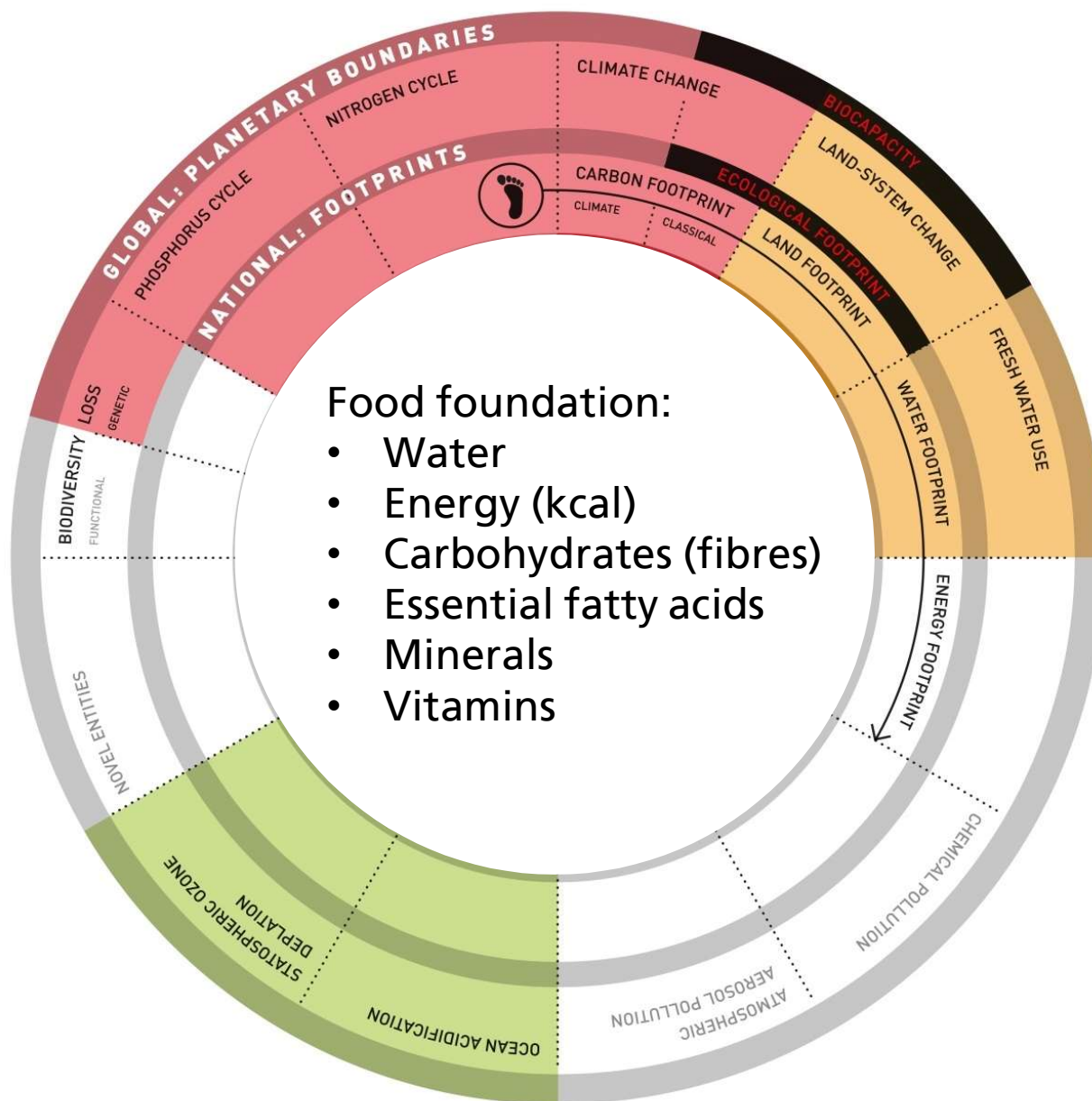
Planetary boundaries

Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are **protective and respectful of biodiversity and ecosystems**, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.

(based on Rockström et al. 2009, Steffen et al. 2015)

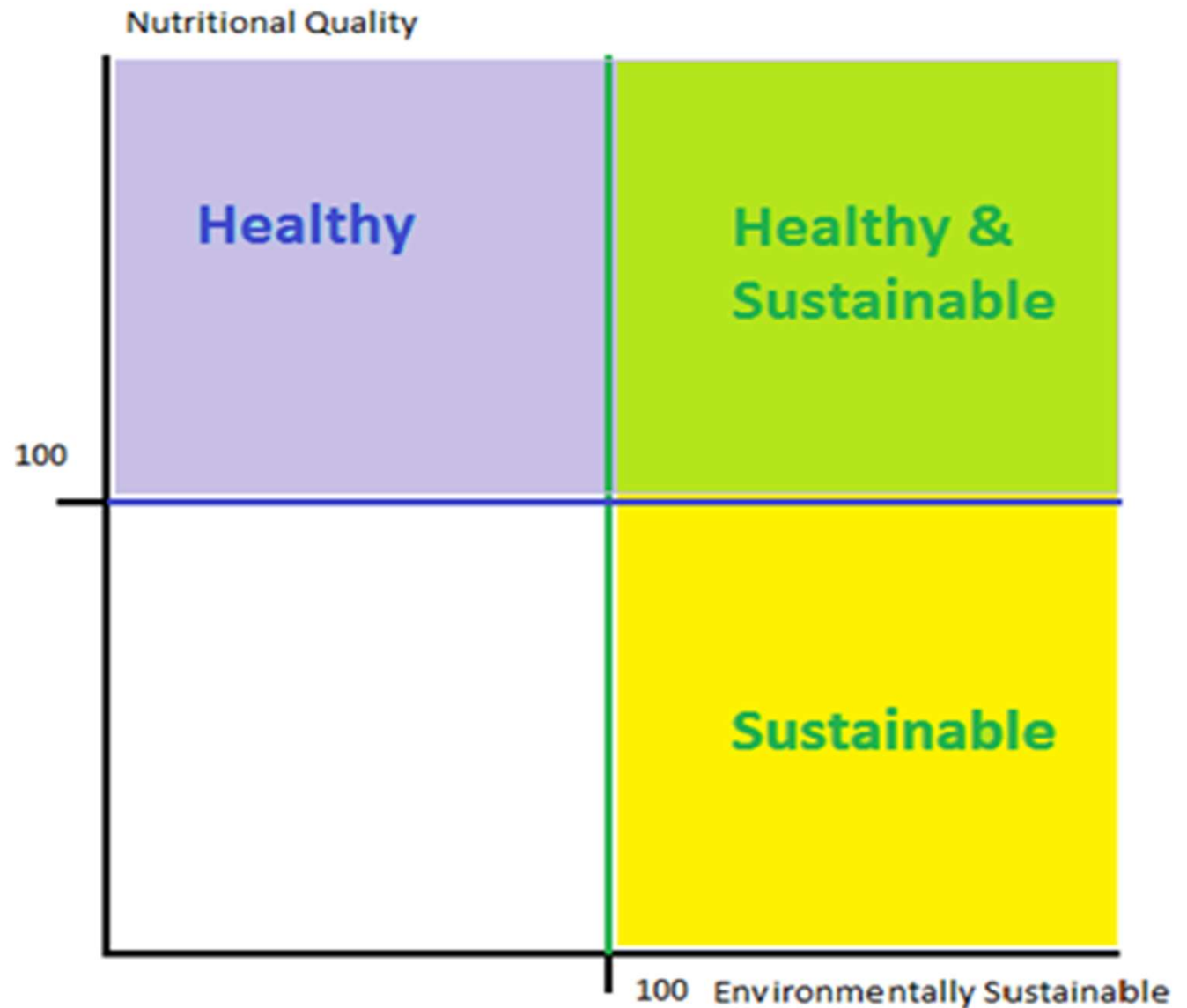






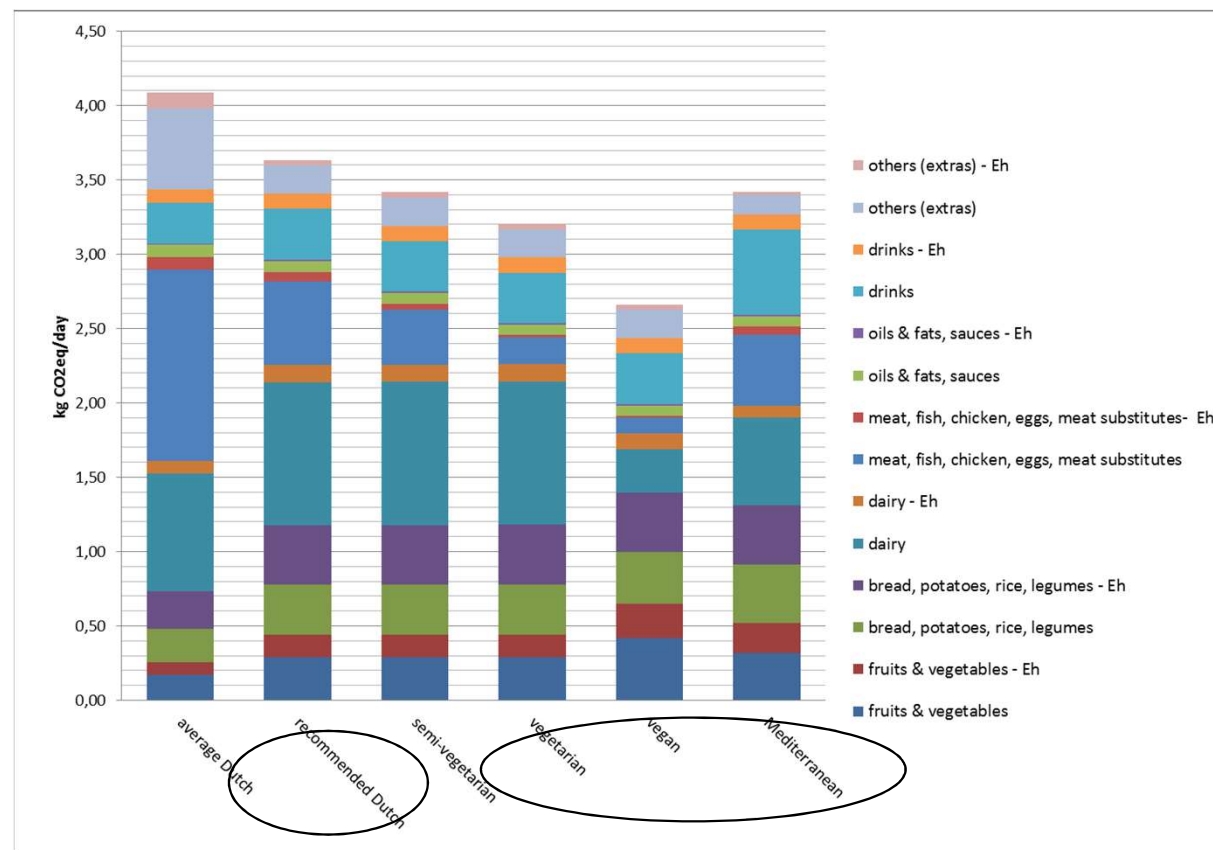
Looking for the 'green' solutions

Sustainable diets are those diets with low environmental impacts which **contribute** to food and nutrition security and **to healthy life** for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.



III. Exploring sustainable diets

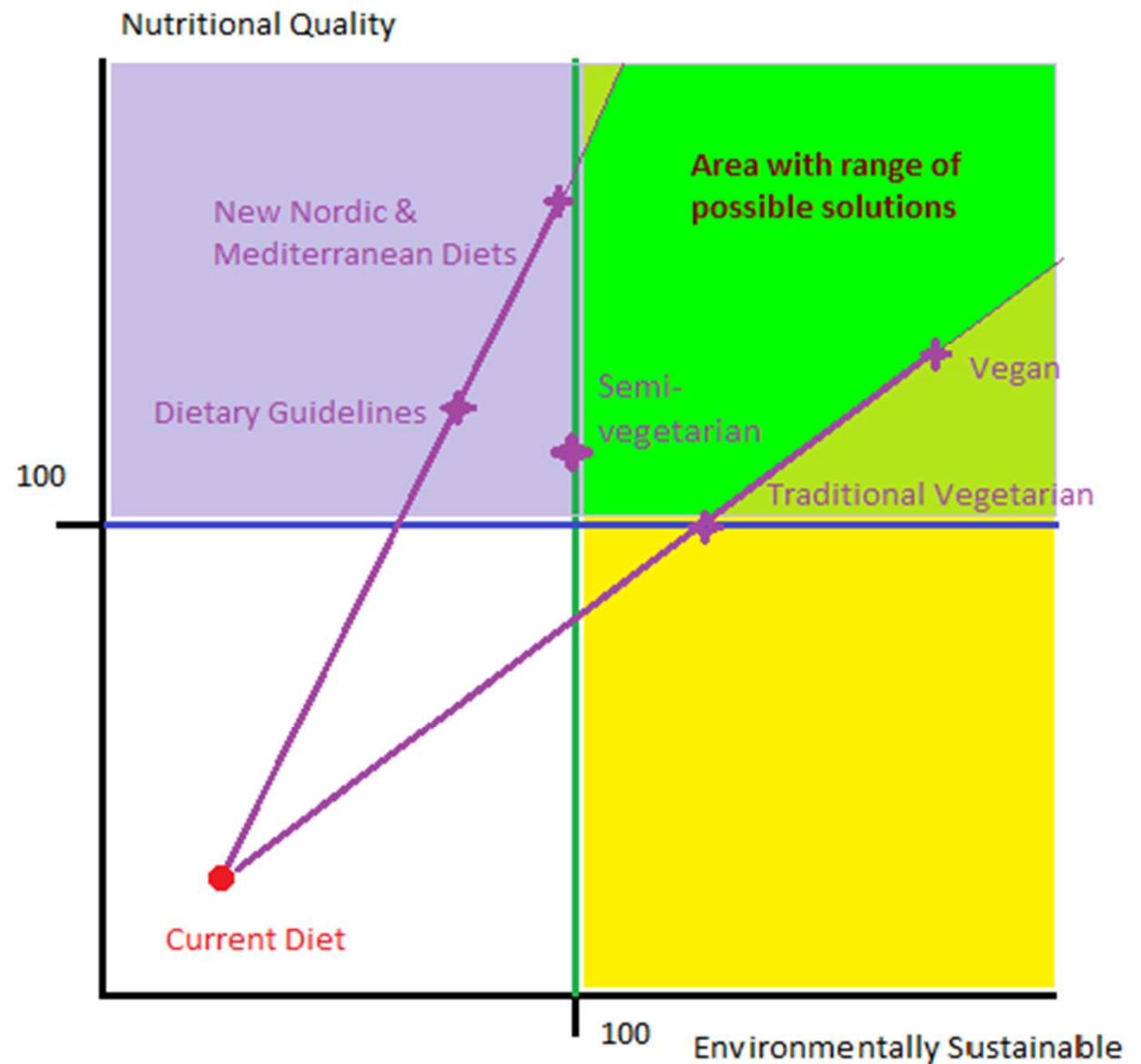
Sustainable diets: Environmental impact of some healthy patterns



Greenhouse gasses (kg CO₂ eq/dag) (Van Dooren et al., 2014)

Range of diets

Sustainable diets are those diets with low environmental impacts which **contribute** to food and nutrition security and **to healthy life** for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.



“Follow a dietary pattern that involves eating more plant-based and less animal-based food, as recommended in the guidelines.”



Traditional diets: healthy & sustainable Mediterranean, New Nordic, Low Lands *(van Dooren et al. 2015)*

- “All of the patterns include a lot of vegetables, fruit, wholegrain products, nuts, legumes, oils rich in cis-unsaturated fatty acids, reduced-fat and low-fat dairy products, poultry and fish;
- none include much red or processed meat, full-fat dairy products, hard fats, salt or drinks (or other products) with added sugar; all involve alcohol moderation.” *(Health Council, 2015)*



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Common ground in sustainable diets: High nutrient density and low energy density.

- From a health perspective WHO (2003) advise consuming nutrient dense foods within a total diet with low (metabolic) energy density.
- Nutrient density indexes summarize and aggregate densities of individual macro- and micronutrients.



Wheel of Five: protein sources



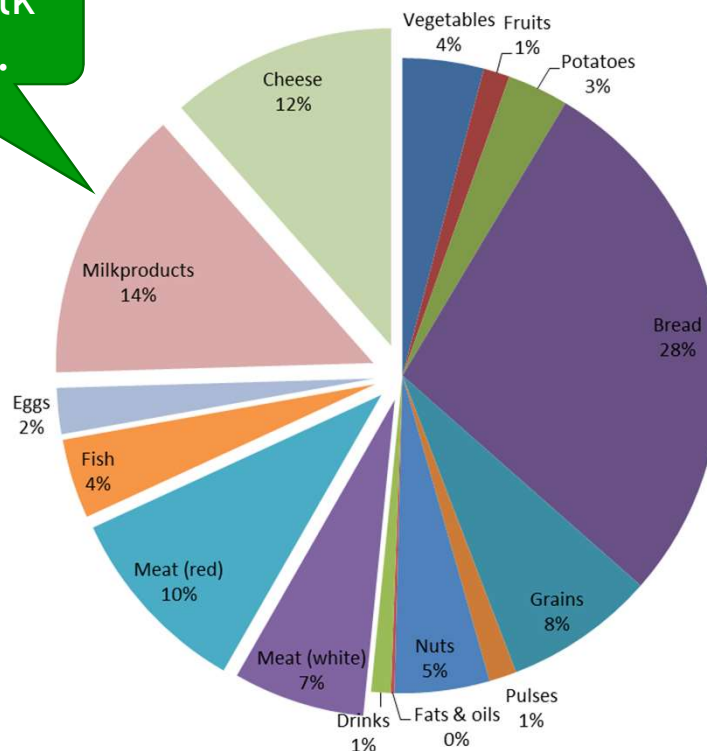
- Meat: max. 500 grams/week
- Red meat: max. 300 grams/week
- Fish: 1x/week from sustainable sources
- Milk: equal to actual consumption
- New: eat weekly a portion of pulses (135g).
- New: eat daily a handful of nuts (25 g).
- Good vegetarian meat alternatives as option.

Replacing meat is not just replacing protein!

1. More sustainable than meat.
2. Nutrients comparable with meat:
 1. - protein (20 en%)
 2. - iron ($>0,8$ mg/100g)
 3. - vitamine B1 ($>0,06$ mg/100g) and/or B12 ($>0,24$ µg/100g).
3. Not too much salt... (Na < 450 mg/100g)!

Wheel of Five (NL) recommends shift to 50% animal - 50% plant protein

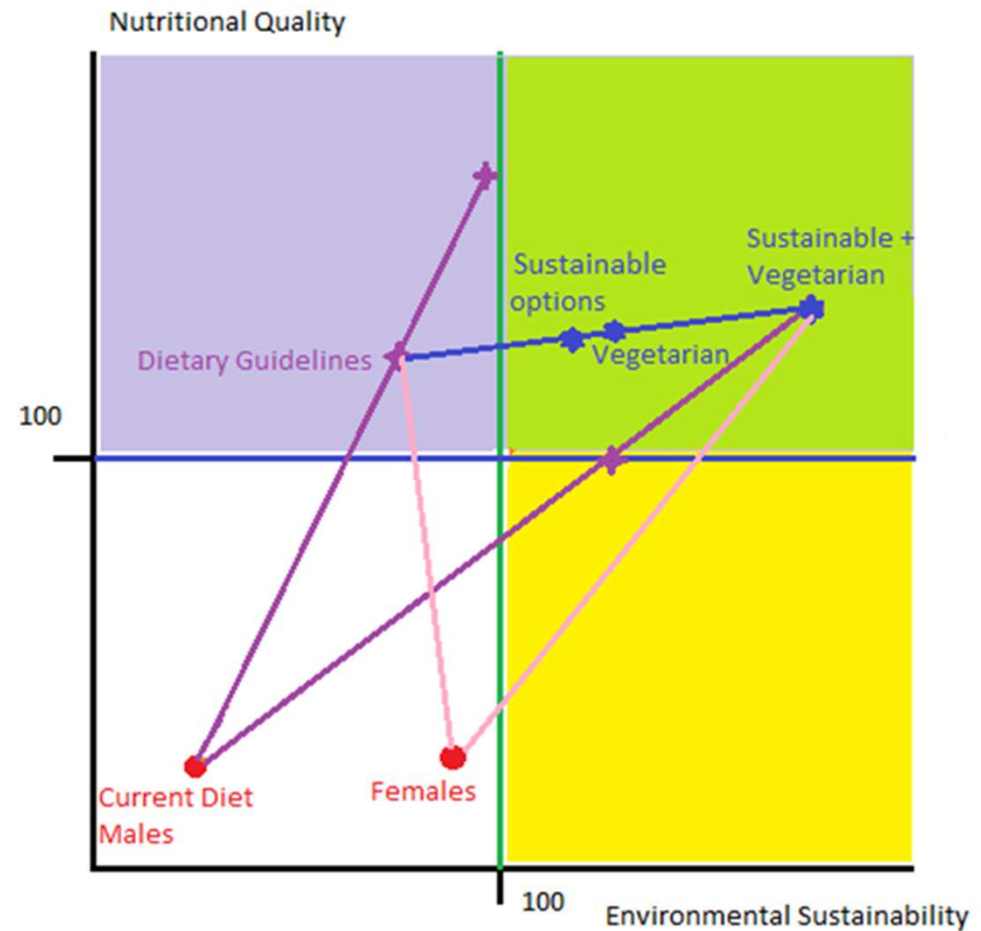
Bread and milk
main source.



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Most options within the scope of the dietary guidelines (blue line) are more environmentally sustainable than the current diet

(van de Kamp et al. 2018; Brink et al. 2016)



EAT Lancet diet 2050: feeding 10 billion people within planetary boundaries



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

Compared to Wheel of Five:

- Less red meat
- More fish
- Less dairy
- Less potatoes



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IV. Sustainability related to Nutrient & Energy Density

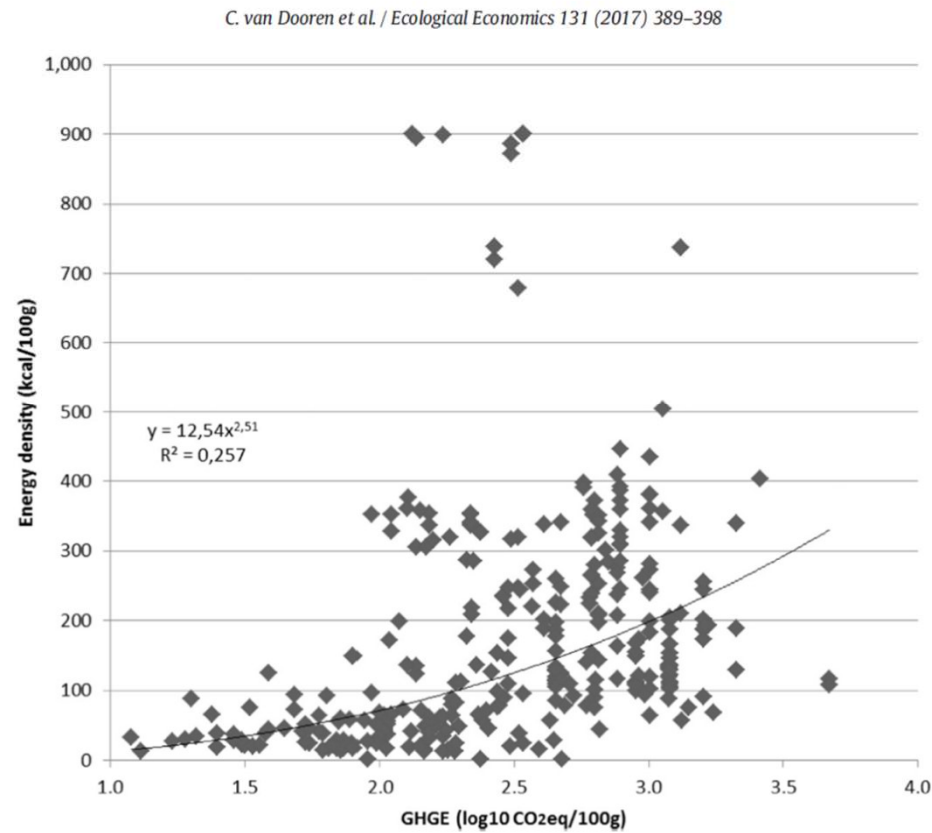
Lowest environmental impact?



(Smedman et al. 2010)

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Energy dense = higher GHGE



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Nutrient dense = lower GHGE

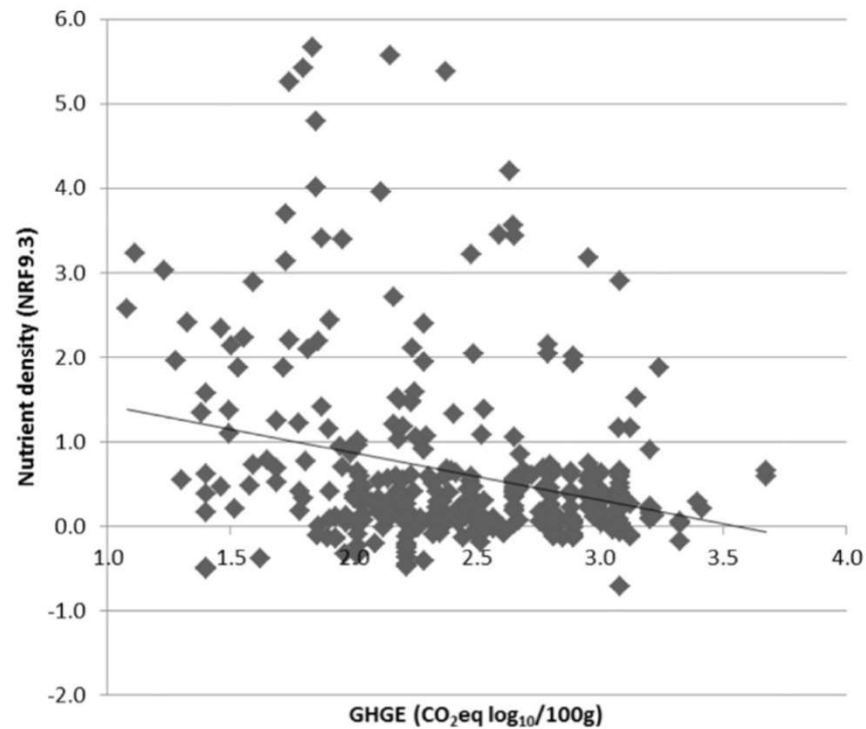


Fig. 3. Negative correlation between GHGEs (\log_{10} CO₂eq/100 g) and nutritional density (NRF9.3). $R^2 = 0.074$.

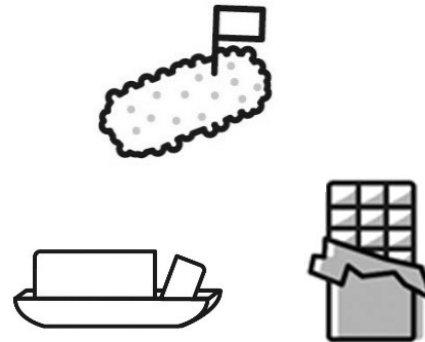
SNRF-index

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Sustainable Nutrient-Rich Foods =

$$\frac{\left(\frac{g \text{ EFA}}{12.4 \text{ g}} - \frac{g \text{ SFA}}{20 \text{ g}}\right) + \left(\frac{g \text{ plant protein}}{50 \text{ g}} - \frac{g \text{ sodium}}{2.4 \text{ g}}\right) + \left(\frac{g \text{ dietary fibre}}{25 \text{ g}} - \frac{g \text{ added sugars}}{50 \text{ g}}\right)}{3 \times \left(\frac{kcal \text{ energy}}{2000 \text{ kcal}}\right)}$$

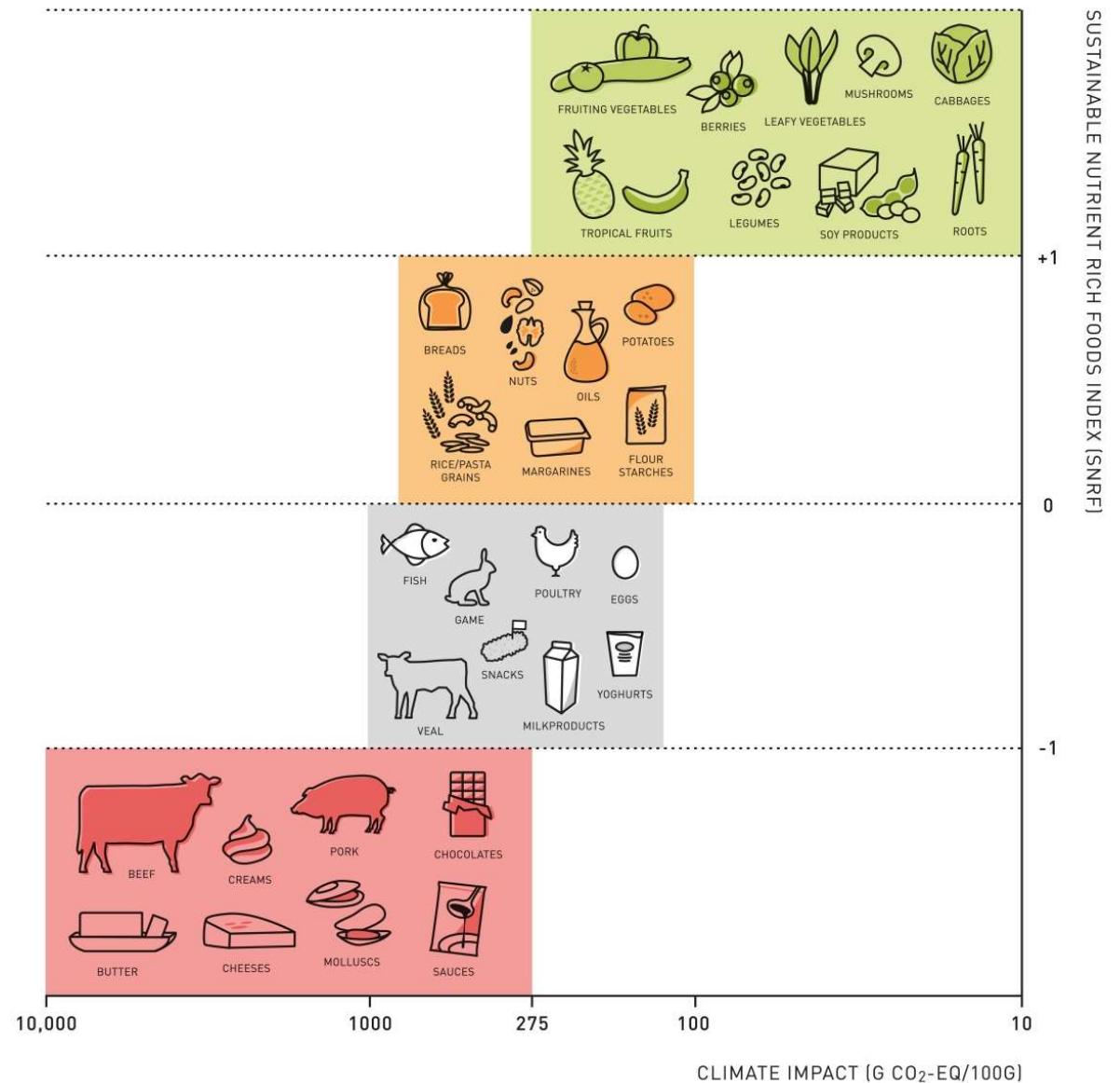


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SNRF-index

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ONTENT: CORNÉ VAN DOOREN / DESIGN: FRAAIE ZAKEN



Nutrition Triangle Belgium (VIGL, 2017)



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High nutrient dense (SNRF) protein sources

Product name (in Dutch)	group	SNRF
Melk halfvolle	milk	-0,98
Melk soja- diverse smaken	soy products	-0,38
Noten para- ongezouten	nuts and seeds	0,55
Rijst zilvervlies- rauw	rice pasta other grains	0,59
Brood tarwe-	bread crisp and rusks	0,62
Aardappelen rauw	potatoes	0,69
Noten cashew- ongezouten	nuts and seeds	0,73
Noten hazel- ongezouten	nuts and seeds	0,78
Couscous rauw	rice pasta other grains	0,80
Noten pecan- ongezouten	nuts and seeds	0,94
Brood volkoren- gem v fijn en grof	bread crisp and rusks	0,95
Noten wal- ongezouten	nuts and seeds	1,07
Noten pinda's ongezouten	nuts and seeds	1,12
Pasta volkoren rauw	rice pasta other grains	1,35
Noten amandelen z vliesje ongezouten	nuts and seeds	1,47
Kapucijners blik/glas	legumes	1,60
Bonen bruine blik/glas	legumes	1,83
Tempe	soy products	2,83
Tahoe	soy products	2,87
Bonen witte/bruine gedroogd	legumes	2,95



Bread and Grains: important protein source (23%)
& lowest environmental impact per kcal



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Combining new protein sources
with traditional ones, does not
change the protein quality of the
total diet substantially.
The quality stays high.
(Seves et al. 2015: RIVM)





Apple slice model:

High nutritional quality
within planetary boundaries.



Pieter de Hooch
(1663)

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