

FiBL

Forschungsinstitut für biologischen Landbau FiBL
info.suisse@fibl.org | www.fibl.org



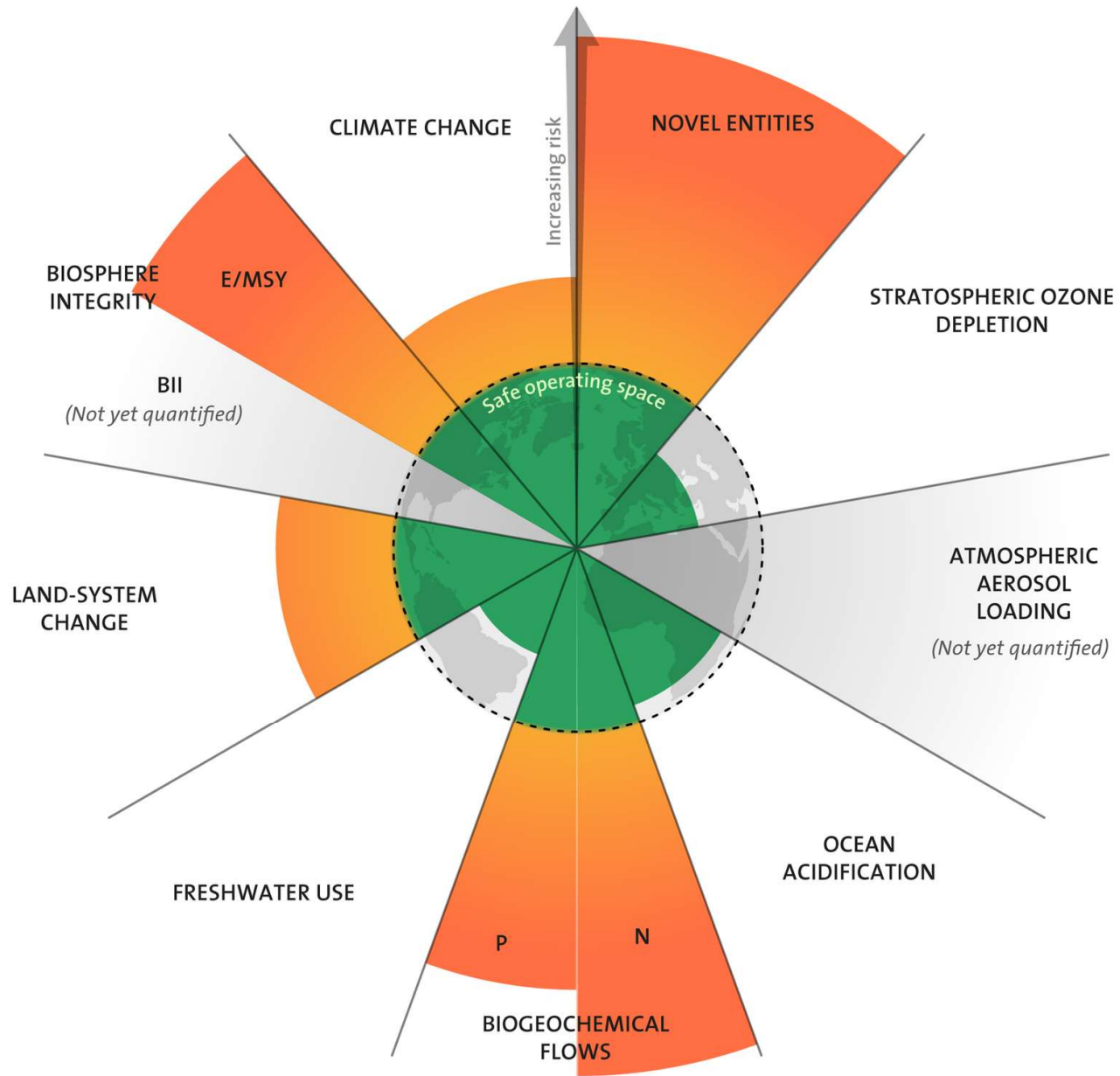
Welternährung ökologisch!

Eine Utopie oder realistische Notwendigkeit?

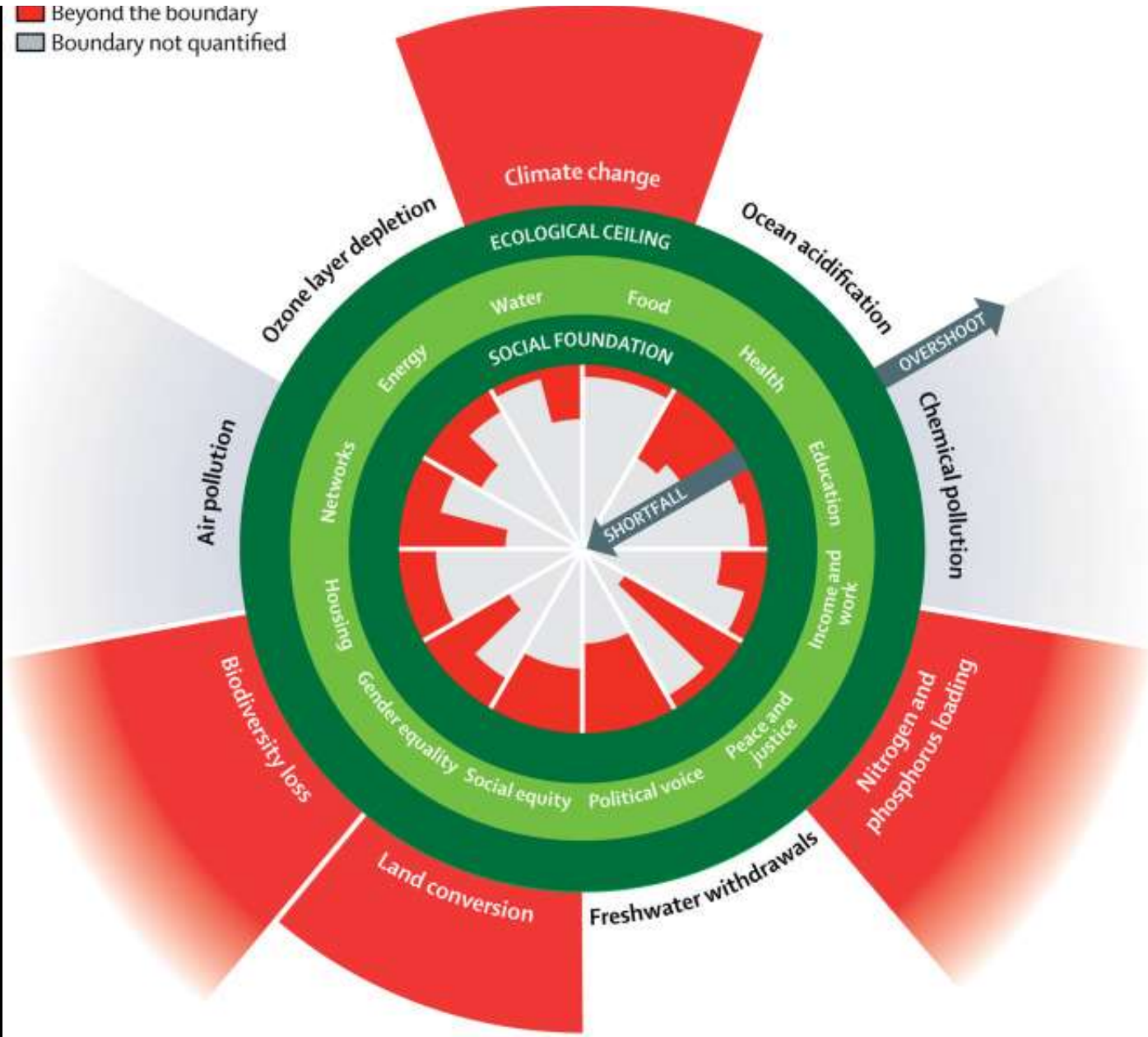
Adrian Müller

adrian.mueller@fibl.org

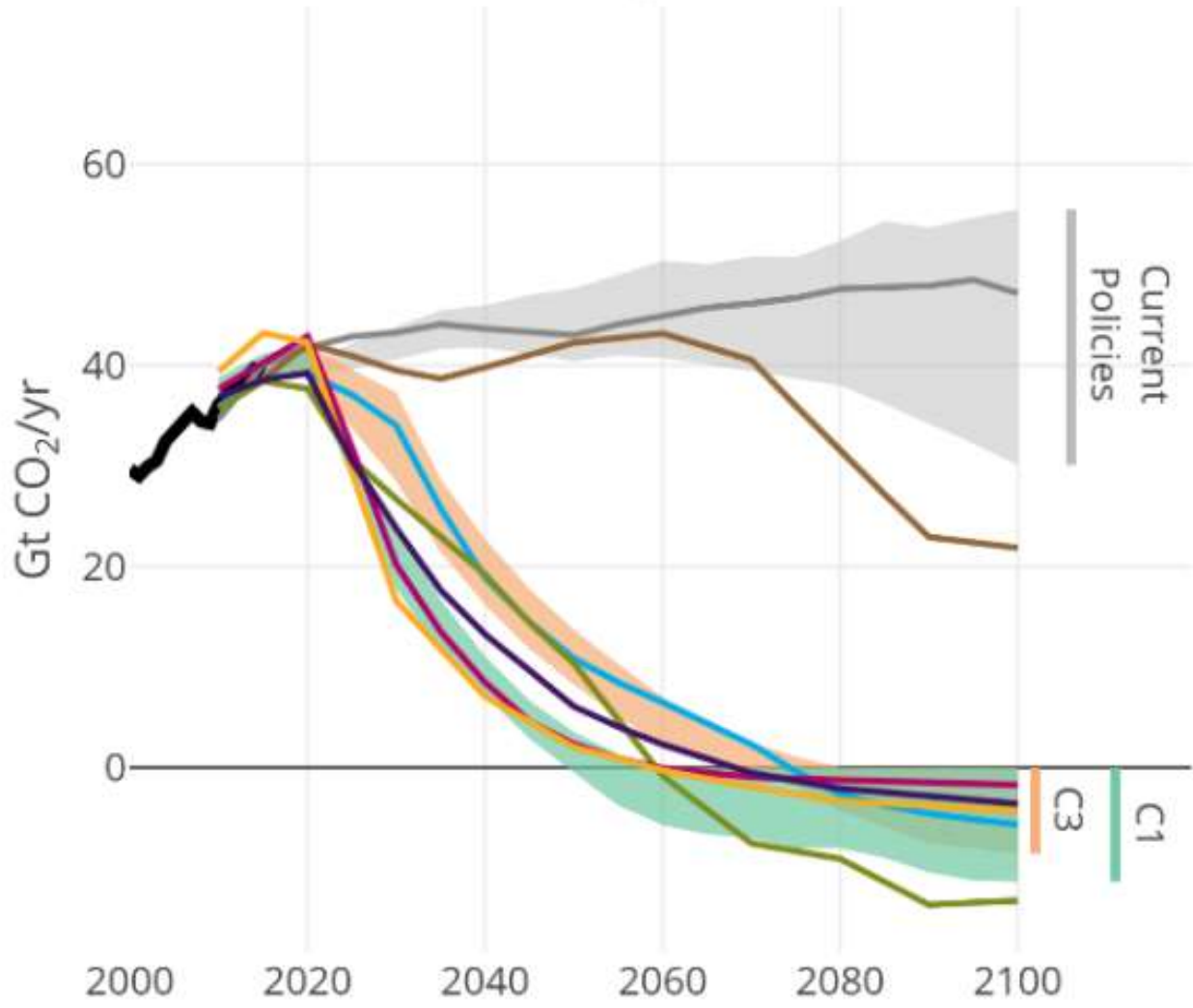
Öko-Junglandwirte-Tagung, Fulda, 13. November 2022



■ Beyond the boundary
■ Boundary not quantified



a. Net CO₂ emissions





Grösse des Ernährungssystems

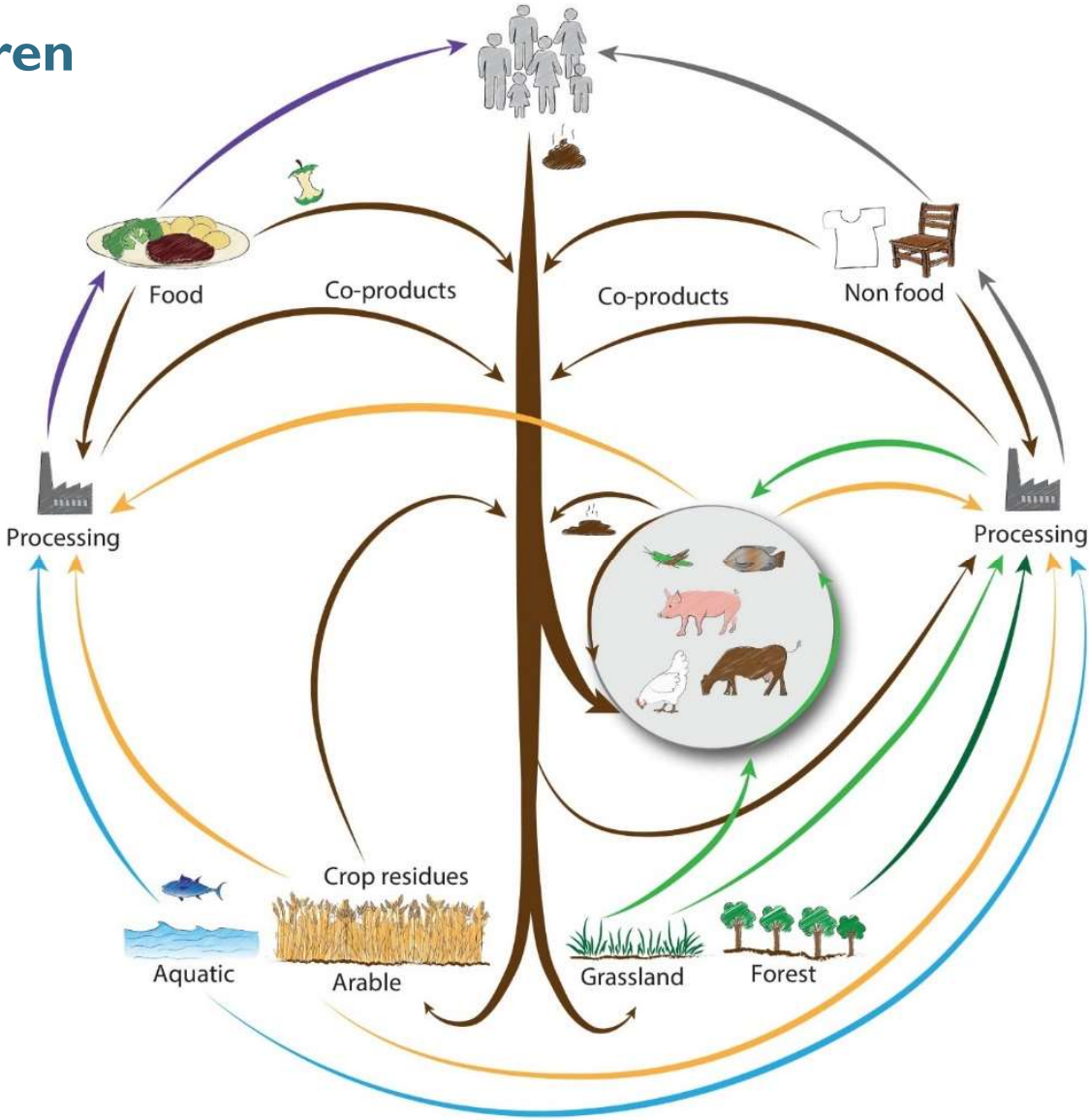


- 3000 kcal pro Kopf und Tag (global; DE: 3450kcal/cap/d)
- 30% Nahrungsmittelabfälle
- EU: 60% der Ackerflächen für Futtermittel

Wir wissen, was zu tun ist, nur nicht wie.

- **Klima**
- **Biodiversität**
- **...**
- **Landwirtschaft und Ernährung:
Grösse des Systems/Nährstoffumsatz vermindern**

Vision eines zirkulären Ernährungssystems

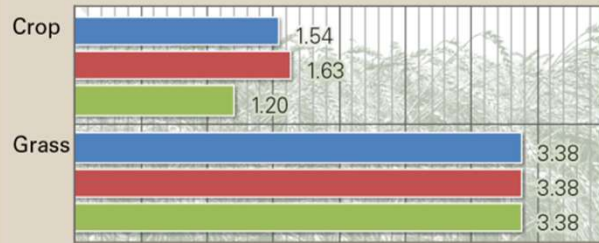


Land use

Billion hectares

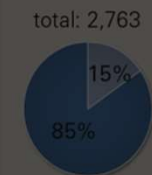
Land occupation:

- Current situation: Base year
- 2050: Reference scenario
- 2050: Food - not feed

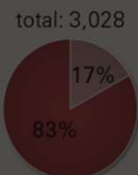


Diets

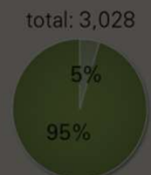
Energy intake
Kcal/cap/day



Current situation:
Base year

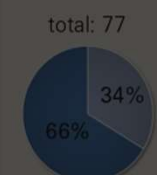


2050:
Reference Scenario

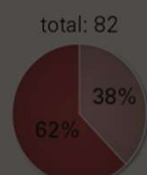


2050:
Food - not feed

Protein intake
G Protein/cap/day



Current situation:
Base year



2050:
Reference Scenario

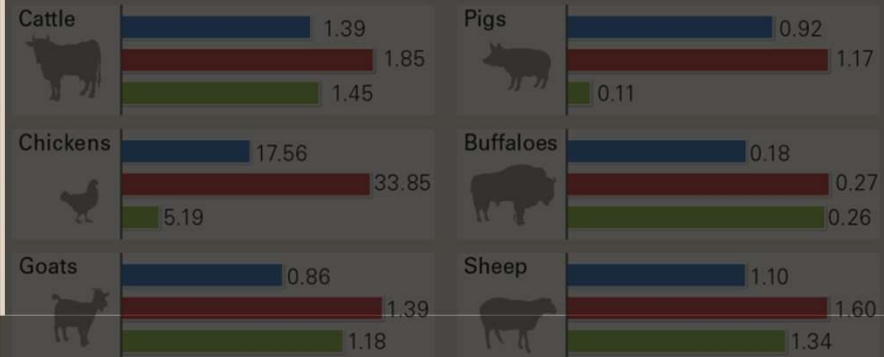


2050:
Food - not feed

Livestock

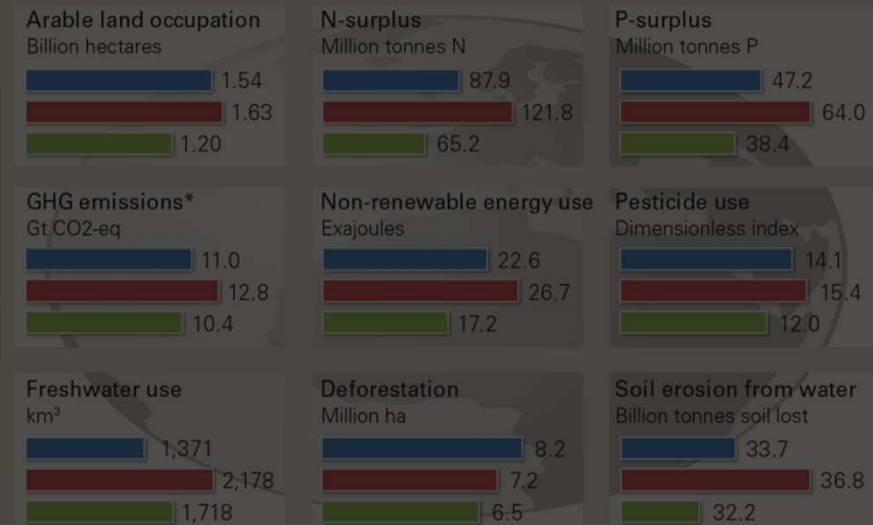
Billion animals

- Current situation: Base year
- 2050: Reference Scenario
- 2050: Food - not feed



Environment

- Current situation: Base year
- 2050: Reference Scenario
- 2050: Food - not feed



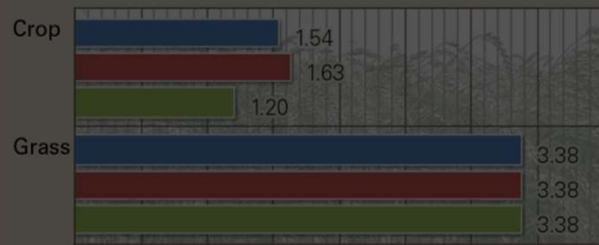
* GHG emissions include emissions from input provision, deforestation and organic soils.

Land use

Billion hectares

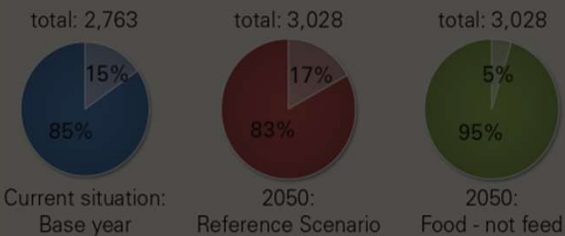
Land occupation:

- Current situation: Base year
- 2050: Reference scenario
- 2050: Food - not feed

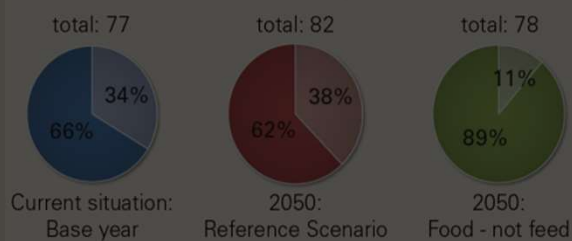


Diets

Energy intake
Kcal/cap/day



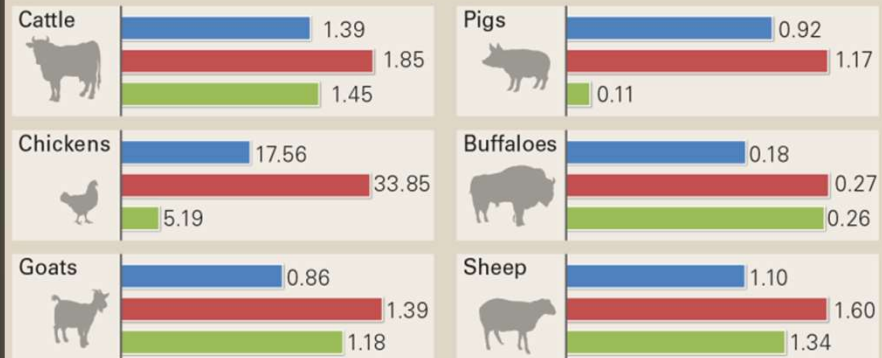
Protein intake
G Protein/cap/day



Livestock

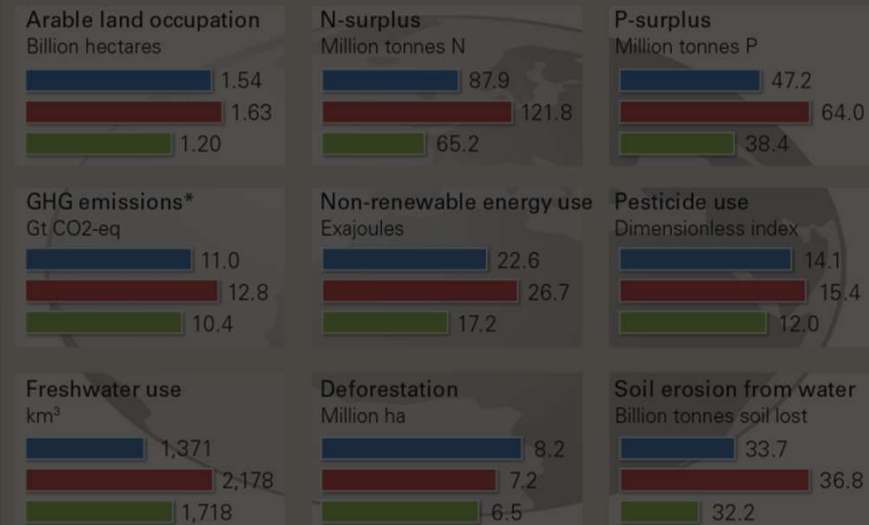
Billion animals

- Current situation: Base year
- 2050: Reference Scenario
- 2050: Food - not feed



Environment

- Current situation: Base year
- 2050: Reference Scenario
- 2050: Food - not feed



* GHG emissions include emissions from input provision, deforestation and organic soils.

Land use

Billion hectares

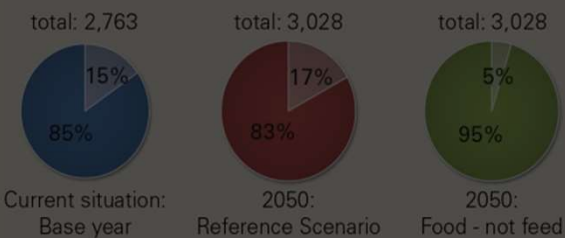
Land occupation:

- Current situation: Base year
- 2050: Reference scenario
- 2050: Food - not feed

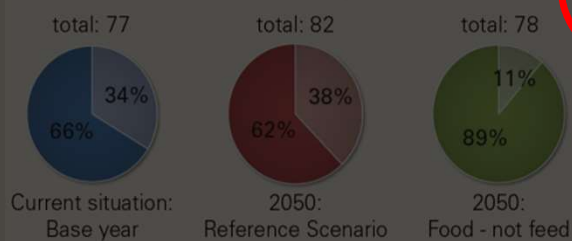


Diets

Energy intake
Kcal/cap/day



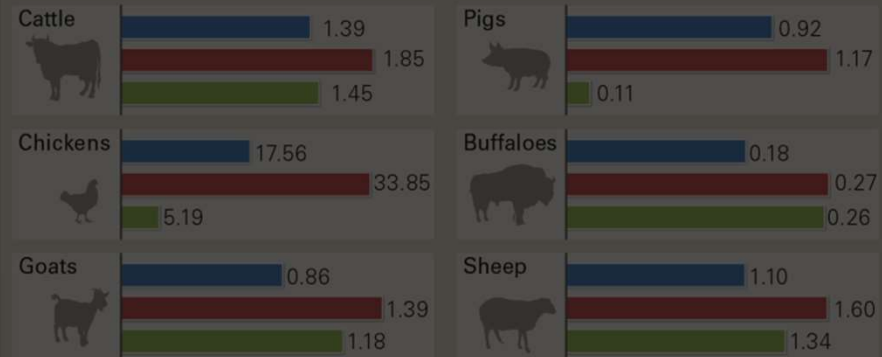
Protein intake
G Protein/cap/day



Livestock

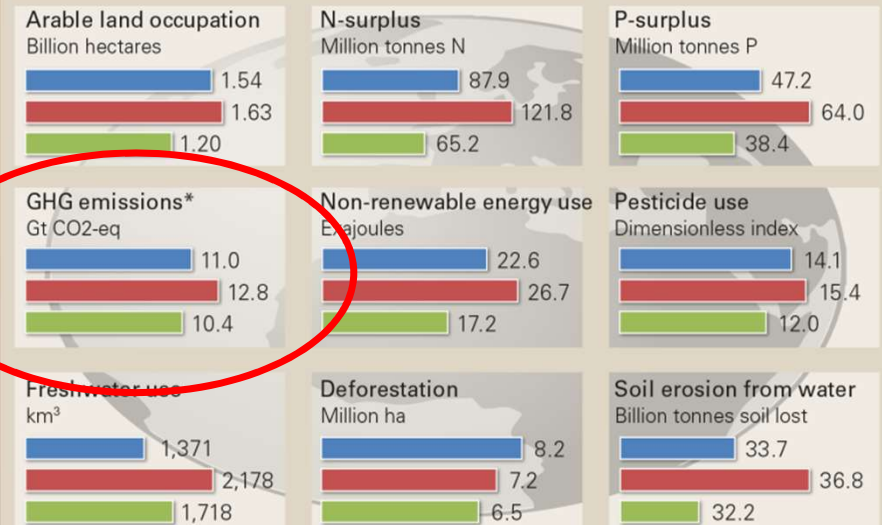
Billion animals

- Current situation: Base year
- 2050: Reference Scenario
- 2050: Food - not feed



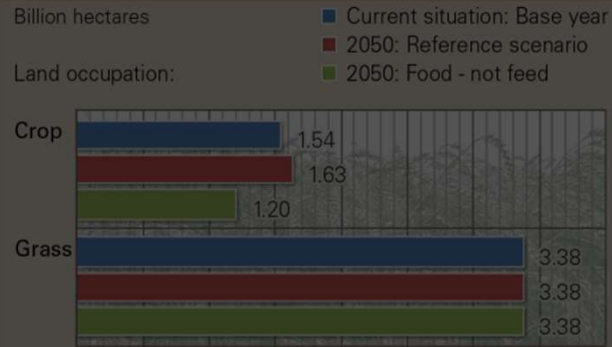
Environment

- Current situation: Base year
- 2050: Reference Scenario
- 2050: Food - not feed



* GHG emissions include emissions from input provision, deforestation and organic soils.

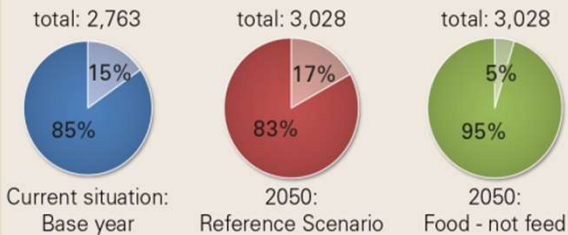
Land use



Diets

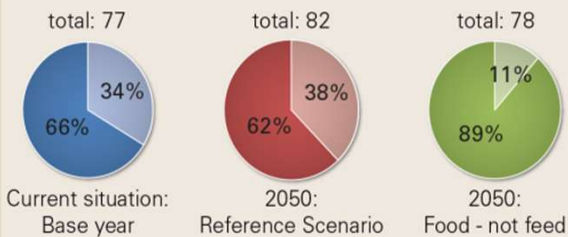
Energy intake

Kcal/cap/day

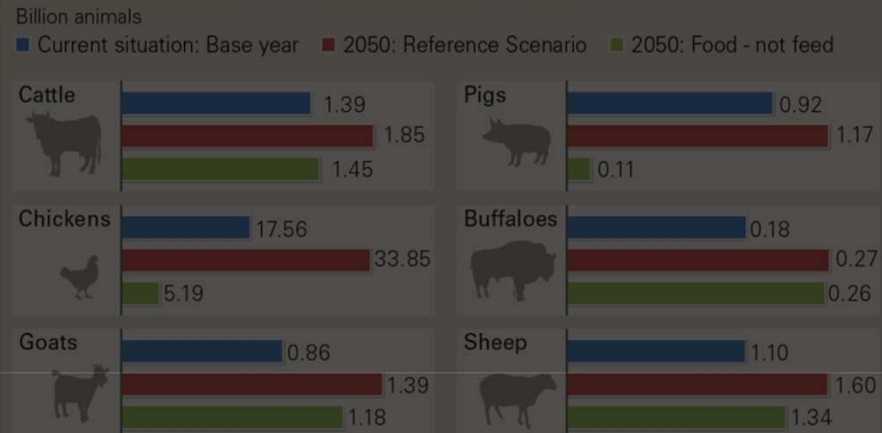


Protein intake

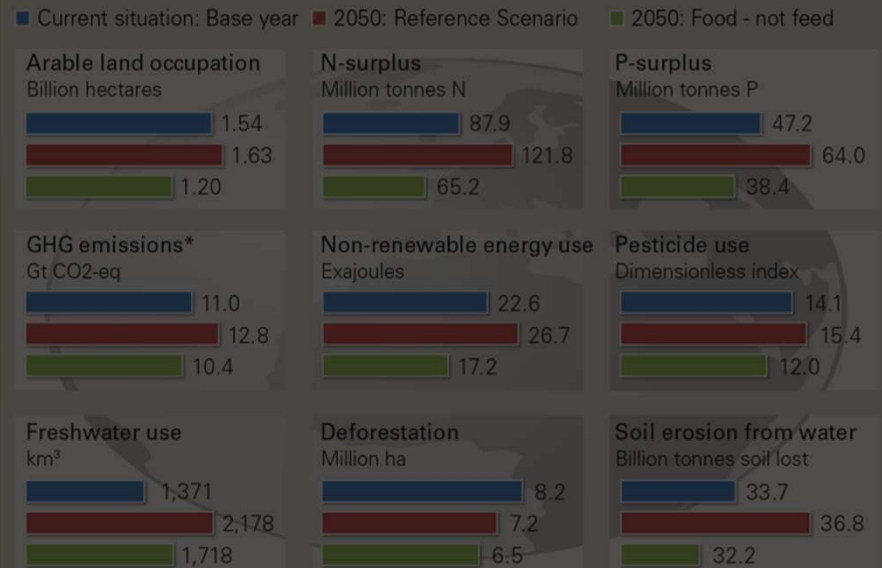
G Protein/cap/day



Livestock



Environment



* GHG emissions include emissions from input provision, deforestation and organic soils.



% Reduction in
food-competing feed

0

50

100

% Organic

0

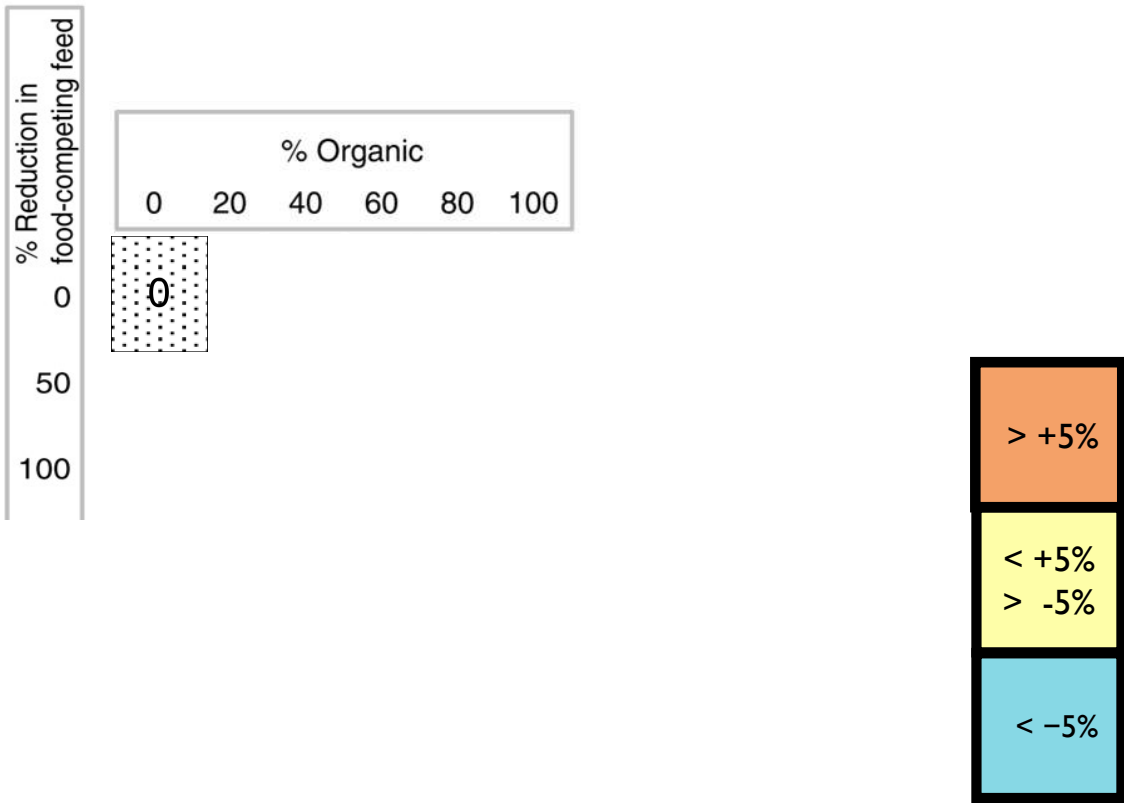
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40

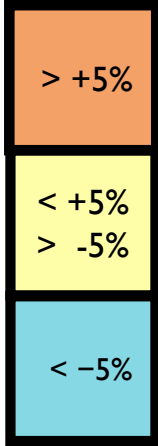
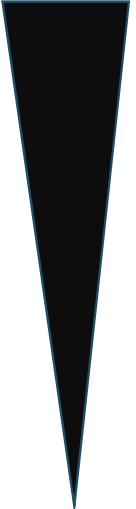
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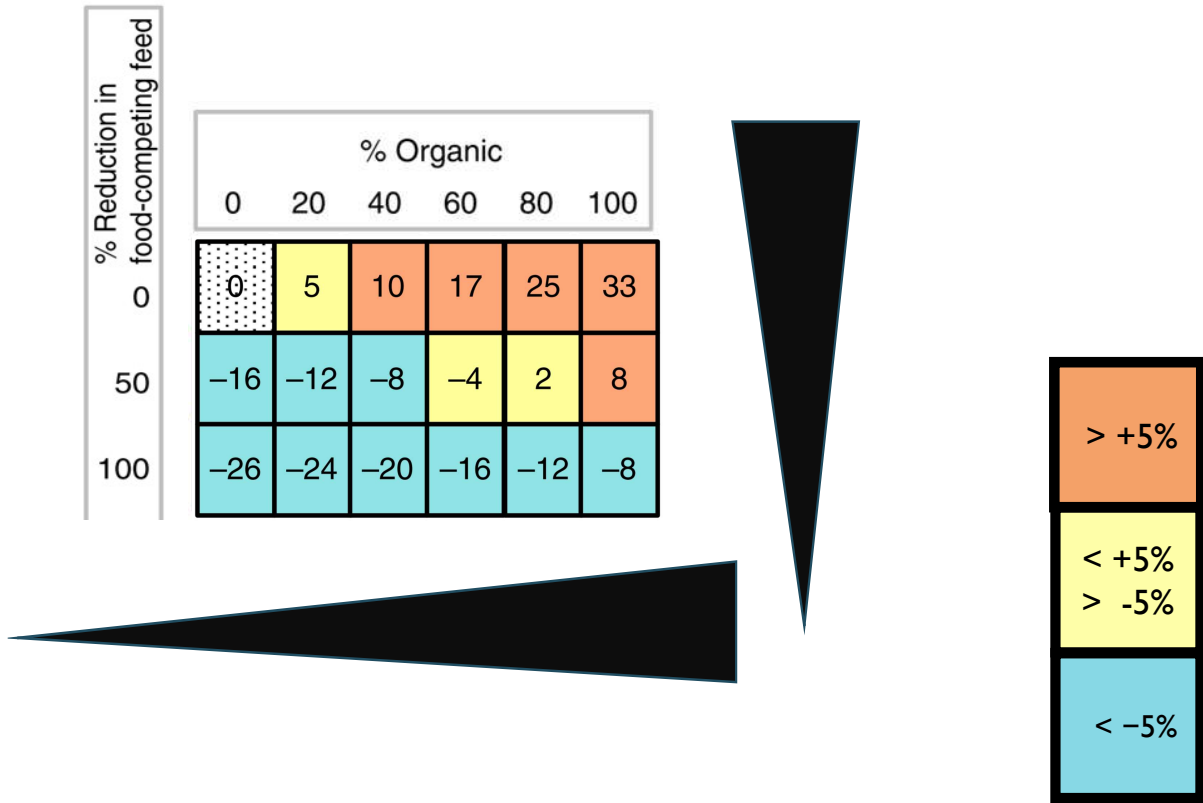
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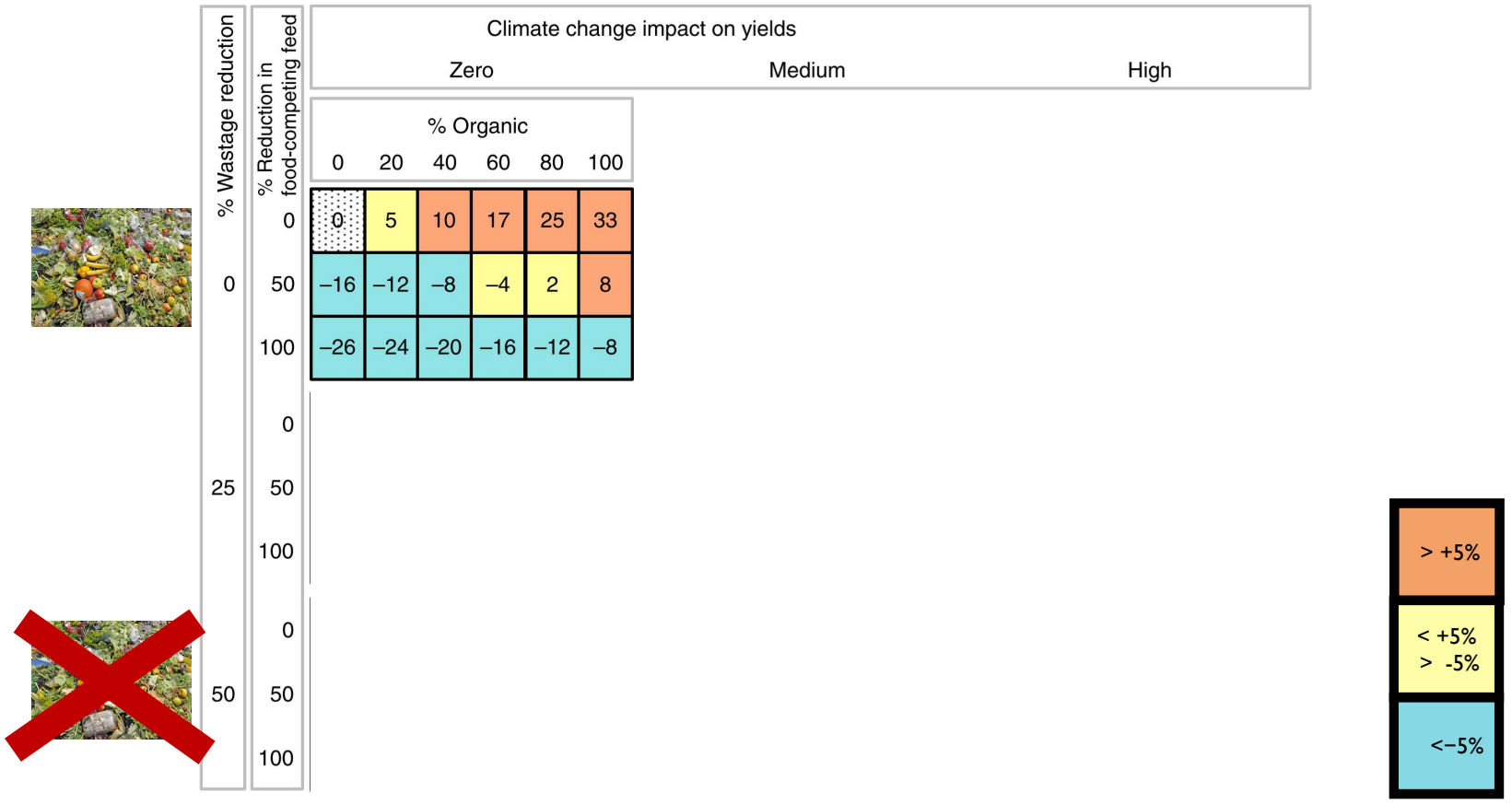
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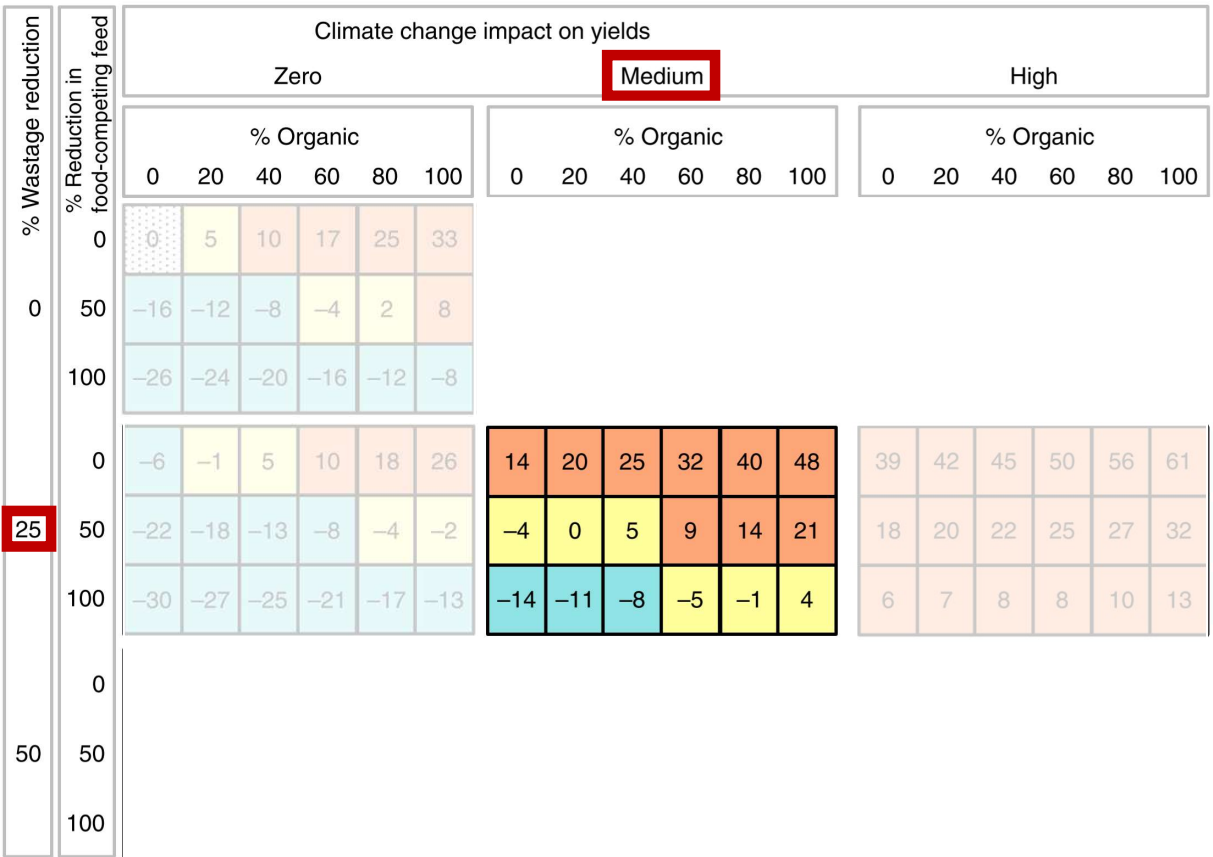


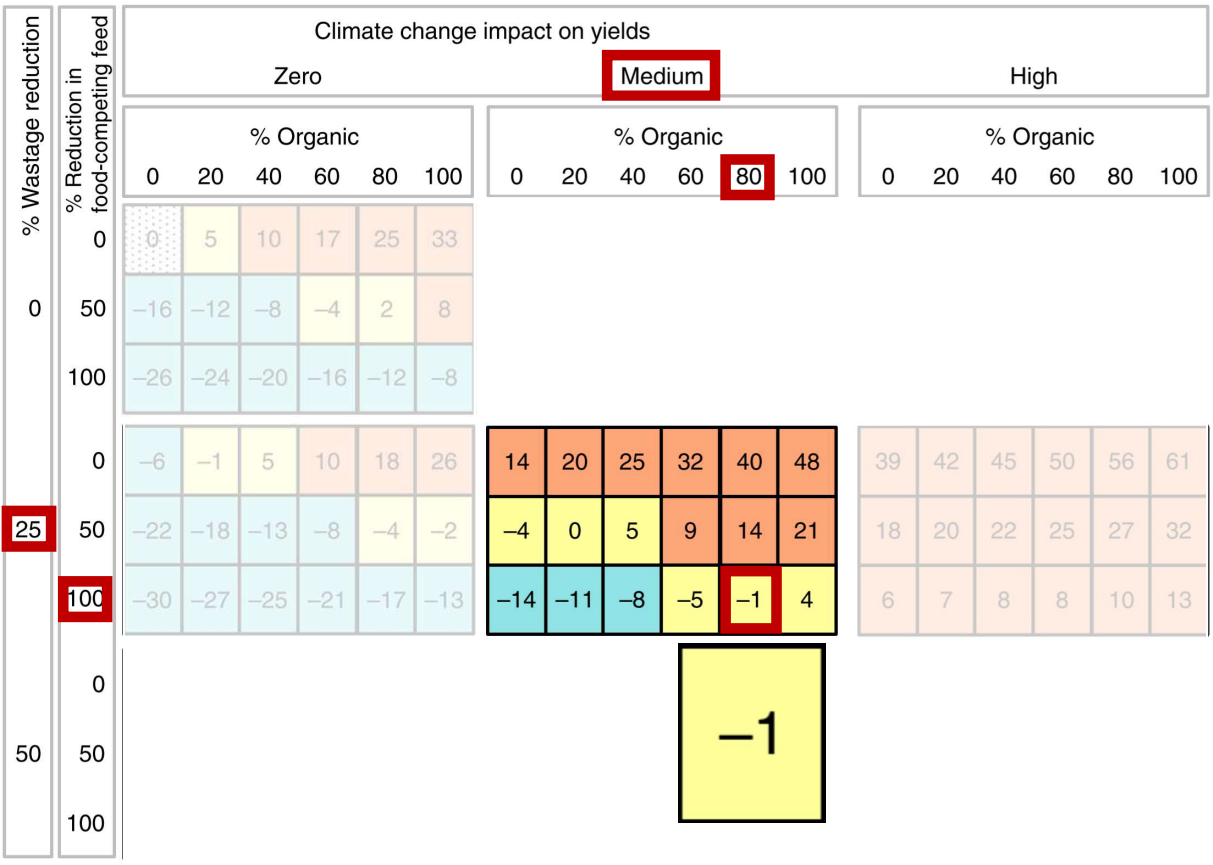
| % Reduction in food-competing feed | % Organic | | | | | |
|------------------------------------|-----------|-----|-----|-----|-----|-----|
| | 0 | 20 | 40 | 60 | 80 | 100 |
| 0 | 0 | 5 | 10 | 17 | 25 | 33 |
| 50 | -16 | -12 | -8 | -4 | 2 | 8 |
| 100 | -26 | -24 | -20 | -16 | -12 | -8 |

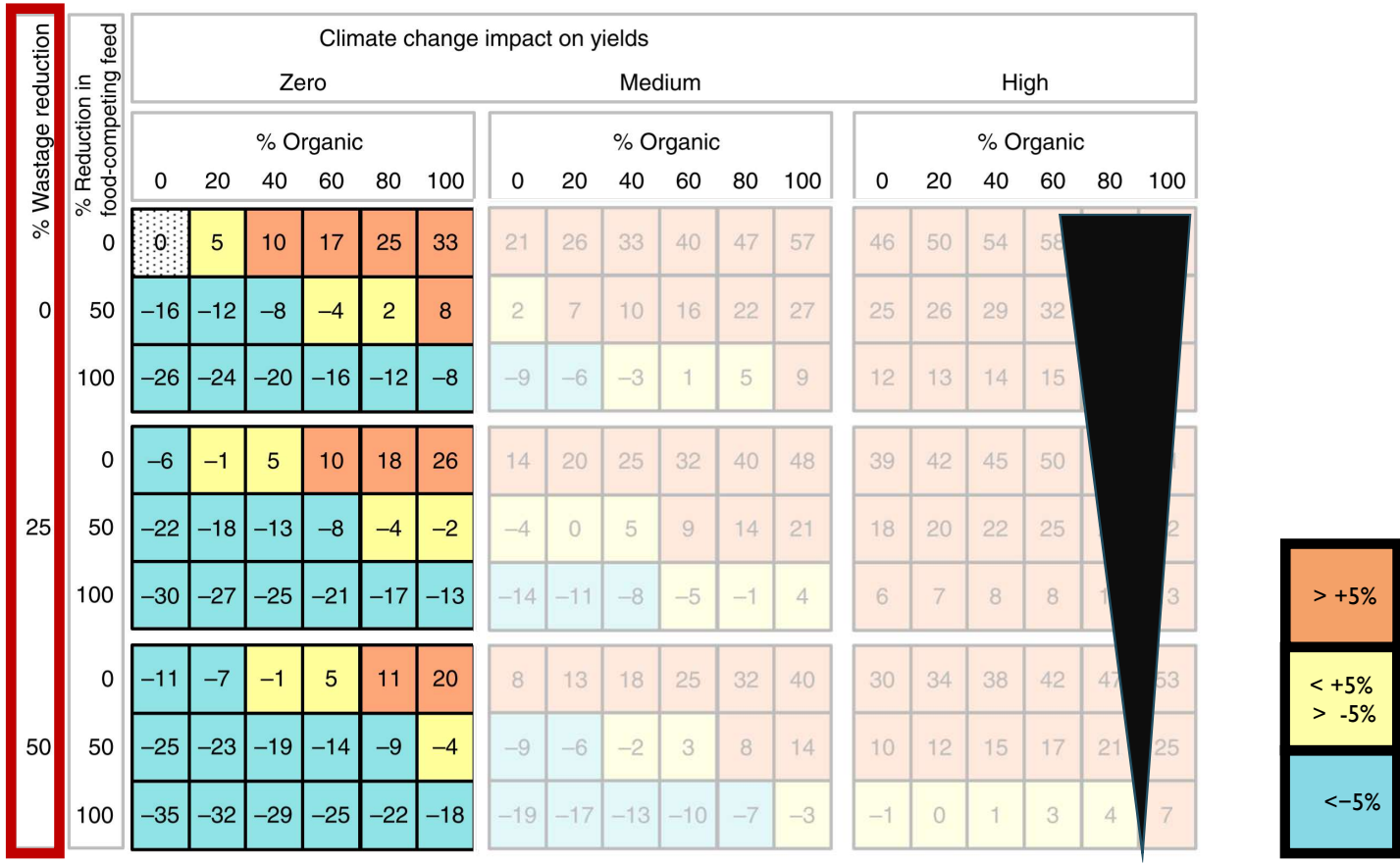


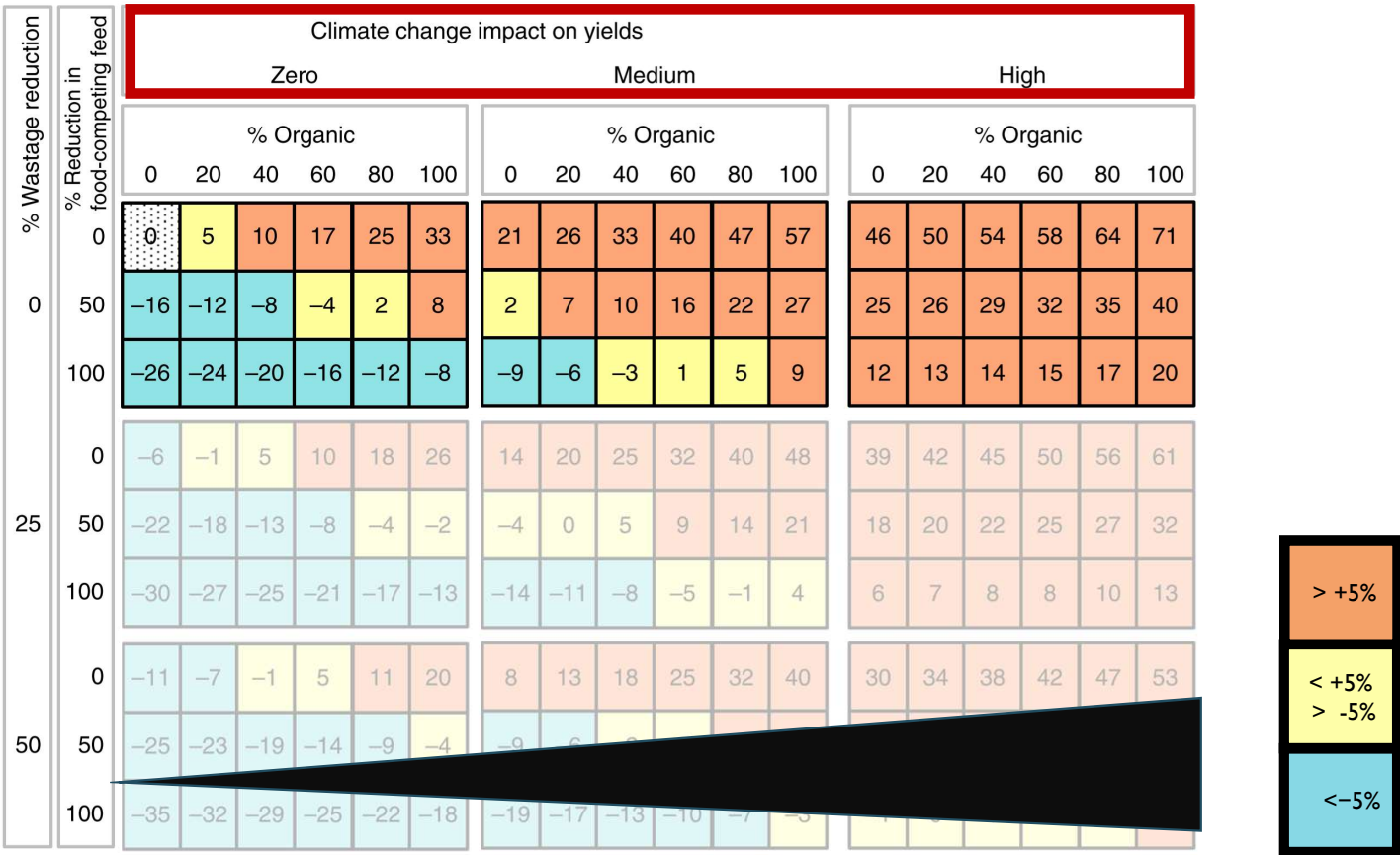


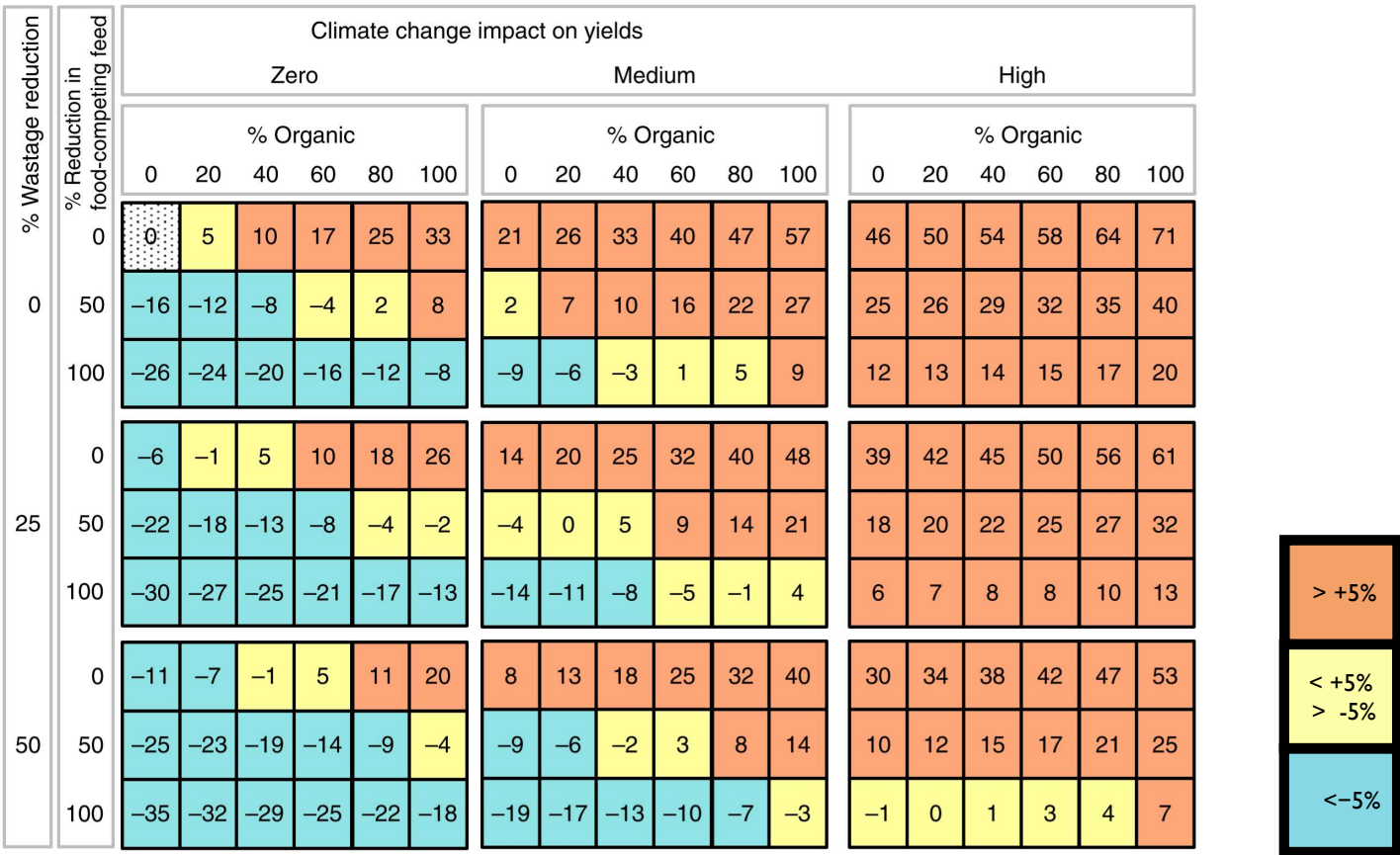












Nährstoffversorgung

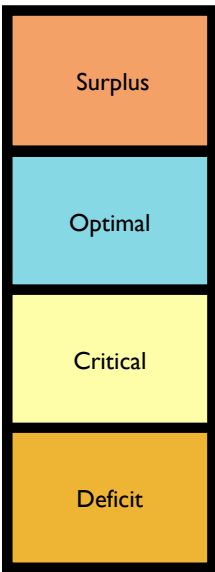
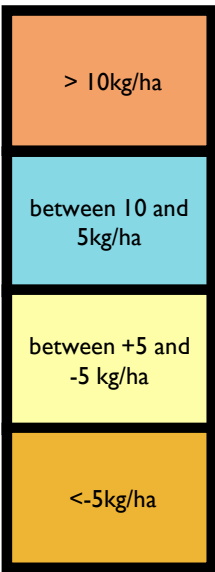
Nährstoffversorgung:

Nicht nur die Produkte, sondern auch der Dünger wird auf den Flächen produziert.

Es ist eine Herausforderung, eine genügende Nährstoffversorgung zu gewährleisten – primär N und P

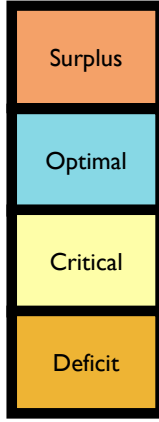


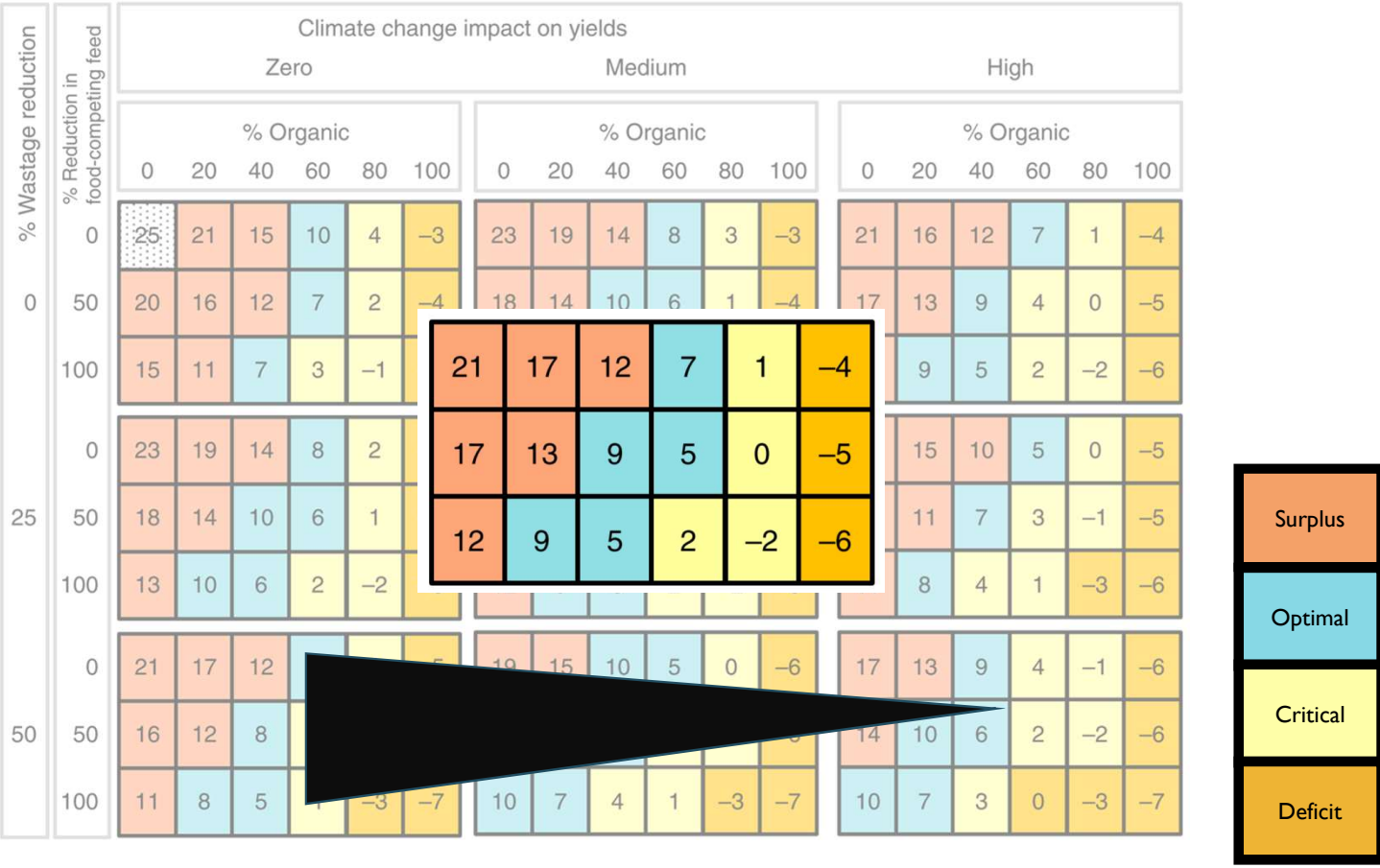
| | | Climate change impact on yields | | | | | | | | | | | | | | | | | |
|---------------------|------------------------------------|---------------------------------|----|----|----|----|-----|-----------|----|----|----|----|-----|-----------|----|----|----|----|-----|
| | | Zero | | | | | | Medium | | | | | | High | | | | | |
| | | % Organic | | | | | | % Organic | | | | | | % Organic | | | | | |
| % Wastage reduction | % Reduction in food-competing feed | 0 | 20 | 40 | 60 | 80 | 100 | 0 | 20 | 40 | 60 | 80 | 100 | 0 | 20 | 40 | 60 | 80 | 100 |
| | | 0 | 0 | 25 | 21 | 15 | 10 | 4 | -3 | 23 | 19 | 14 | 8 | 3 | -3 | 21 | 16 | 12 | 7 |
| 50 | 20 | | 16 | 12 | 7 | 2 | -4 | 18 | 14 | 10 | 6 | 1 | -4 | 17 | 13 | 9 | 4 | 0 | -5 |
| 100 | 15 | | 11 | 7 | 3 | -1 | -5 | 13 | 10 | 7 | 3 | -1 | -5 | 12 | 9 | 5 | 2 | -2 | -6 |
| 25 | 0 | 23 | 19 | 14 | 8 | 2 | -4 | 21 | 17 | 12 | 7 | 1 | -4 | 19 | 15 | 10 | 5 | 0 | -5 |
| | 50 | 18 | 14 | 10 | 6 | 1 | -5 | 17 | 13 | 9 | 5 | 0 | -5 | 15 | 11 | 7 | 3 | -1 | -5 |
| | 100 | 13 | 10 | 6 | 2 | -2 | -6 | 12 | 9 | 5 | 2 | -2 | -6 | 11 | 8 | 4 | 1 | -3 | -6 |
| 50 | 0 | 21 | 17 | 12 | 7 | 1 | -5 | 19 | 15 | 10 | 5 | 0 | -6 | 17 | 13 | 9 | 4 | -1 | -6 |
| | 50 | 16 | 12 | 8 | 4 | 0 | -6 | 15 | 11 | 7 | 3 | -1 | -6 | 14 | 10 | 6 | 2 | -2 | -6 |
| | 100 | 11 | 8 | 5 | 1 | -3 | -7 | 10 | 7 | 4 | 1 | -3 | -7 | 10 | 7 | 3 | 0 | -3 | -7 |



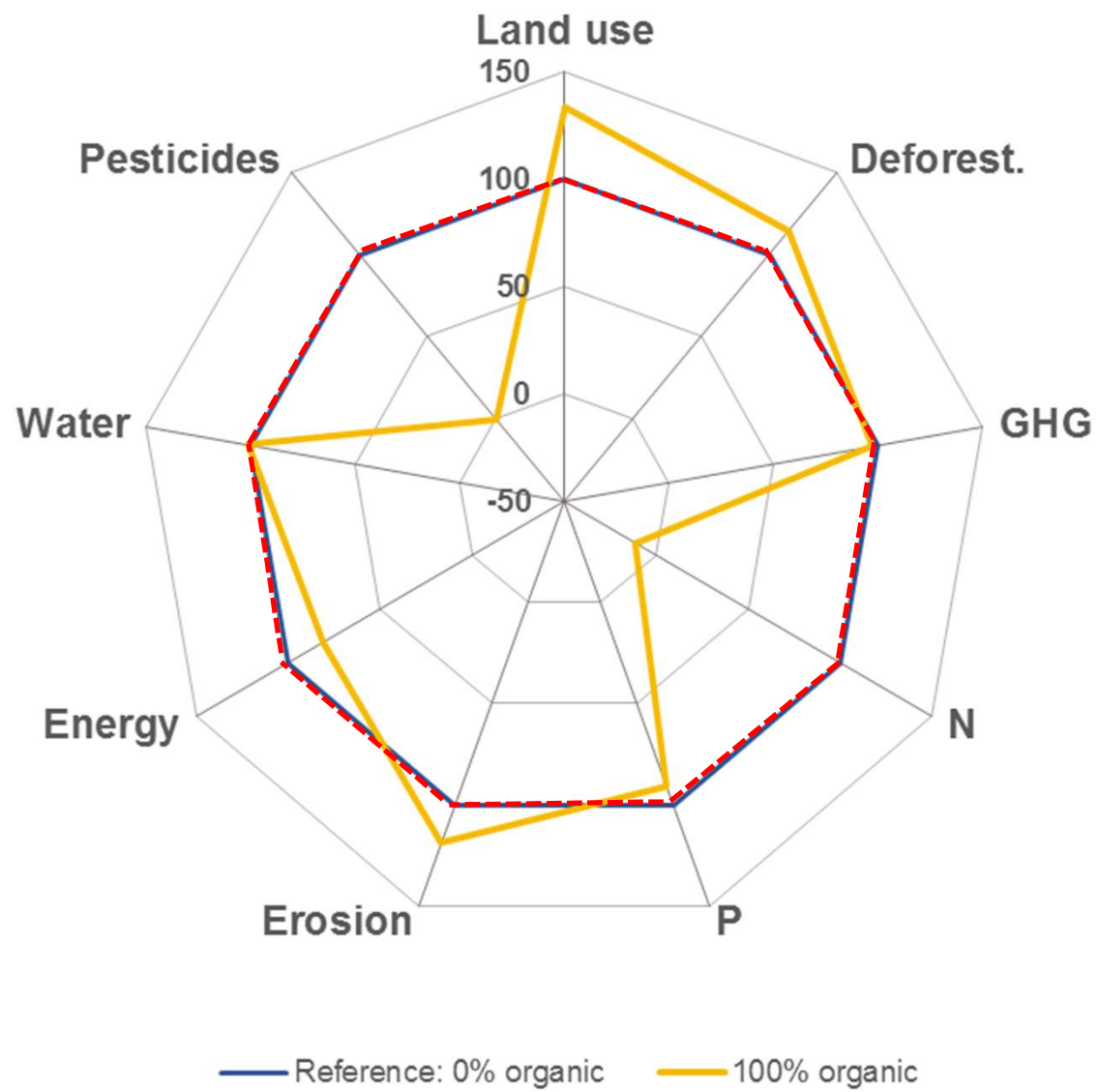
| | | Climate change impact on yields | | | | | | | | | | | | | | | | | |
|---------------------|-----|---------------------------------|----|----|----|----|-----|-----------|----|----|----|----|-----|-----------|----|----|----|----|-----|
| | | Zero | | | | | | Medium | | | | | | High | | | | | |
| | | % Organic | | | | | | % Organic | | | | | | % Organic | | | | | |
| % Wastage reduction | | 0 | 20 | 40 | 60 | 80 | 100 | 0 | 20 | 40 | 60 | 80 | 100 | 0 | 20 | 40 | 60 | 80 | 100 |
| 0 | 0 | 25 | 21 | 15 | 10 | 4 | -3 | 23 | 19 | 14 | 8 | 3 | -3 | 21 | 16 | 12 | 7 | 1 | -4 |
| | 50 | 20 | 15 | 10 | 5 | 0 | -4 | 18 | 14 | 10 | 6 | 1 | -4 | 17 | 13 | 9 | 4 | 0 | -5 |
| | 100 | 15 | 10 | 5 | 0 | -1 | -5 | 13 | 10 | 7 | 3 | -1 | -5 | 12 | 9 | 5 | 2 | -2 | -6 |
| 25 | 0 | 23 | 19 | 14 | 8 | 3 | -4 | 21 | 17 | 12 | 7 | 1 | -4 | 19 | 15 | 10 | 5 | 0 | -5 |
| | 50 | 18 | 14 | 10 | 6 | 1 | -5 | 17 | 13 | 9 | 5 | 0 | -5 | 15 | 11 | 7 | 3 | -1 | -5 |
| | 100 | 13 | 10 | 6 | 2 | -2 | -6 | 12 | 9 | 5 | 2 | -2 | -6 | 11 | 8 | 4 | 1 | -3 | -6 |
| 50 | 0 | 21 | 17 | 12 | 7 | 1 | -5 | 19 | 15 | 10 | 5 | 0 | -6 | 17 | 13 | 9 | 4 | -1 | -6 |
| | 50 | 16 | 12 | 8 | 4 | 0 | -6 | 15 | 11 | 7 | 3 | -1 | -6 | 14 | 10 | 6 | 2 | -2 | -6 |
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25

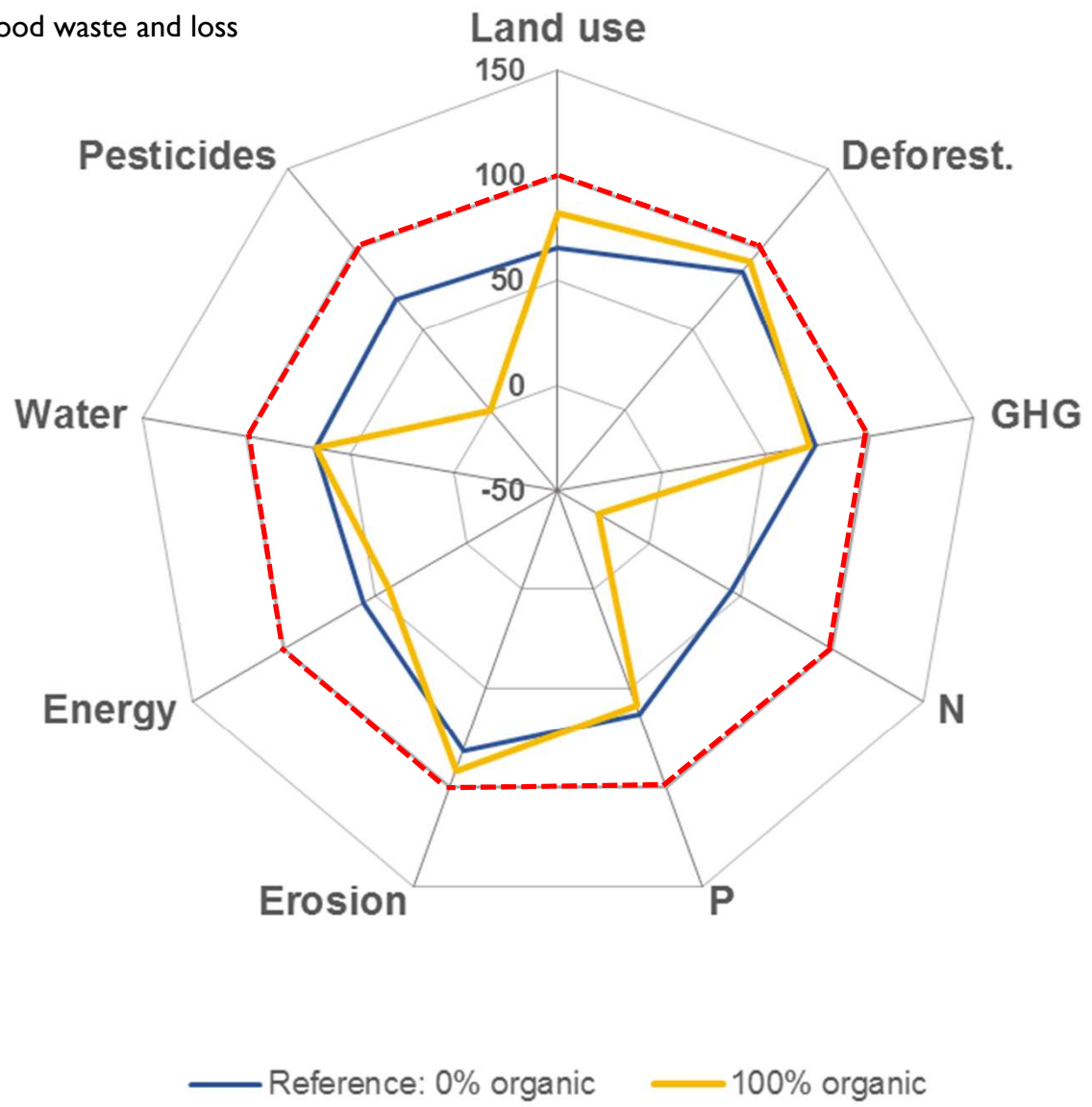


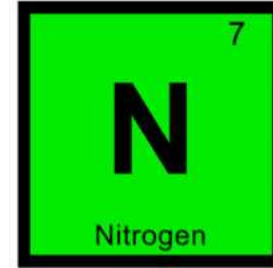


Weitere Umweltindikatoren neben Landverbrauch und N-Überschüssen



100% food competing feed
reduction
50% less food waste and loss

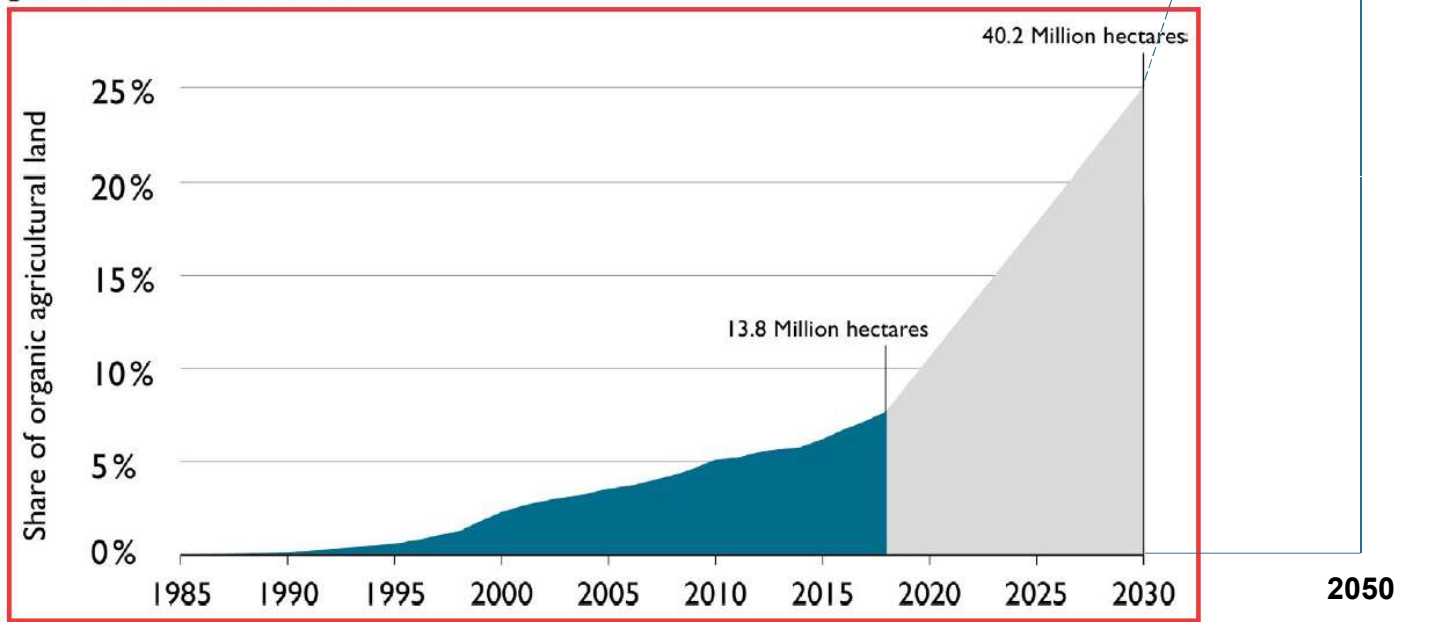




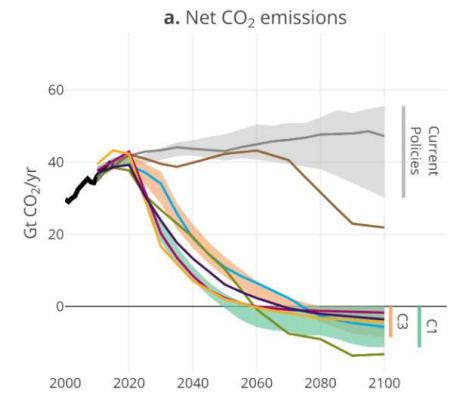
| % Wastage reduction % Reduction in food-competing feed | | Climate change impact on yields | | | | | | | | | | | | | | | | | |
|--|-----|---------------------------------|-----|-----|-----|-----|-----------|-----|-----|-----|----|-----------|-----|----|----|----|----|----|-----|
| | | Zero | | | | | Medium | | | | | High | | | | | | | |
| | | % Organic | | | | | % Organic | | | | | % Organic | | | | | | | |
| | | 0 | 20 | 40 | 60 | 80 | 100 | 0 | 20 | 40 | 60 | 80 | 100 | 0 | 20 | 40 | 60 | 80 | 100 |
| 0 | 0 | 0 | 5 | 10 | 17 | 25 | 33 | 21 | 26 | 33 | 40 | 47 | 57 | 46 | 50 | 54 | 58 | 64 | 71 |
| | 50 | -16 | -12 | -8 | -4 | 2 | 8 | 2 | 7 | 10 | 16 | 22 | 27 | 25 | 26 | 29 | 32 | 35 | 40 |
| | 100 | -26 | -24 | -20 | -16 | -12 | -8 | -9 | -6 | -3 | 1 | 5 | 9 | 12 | 13 | 14 | 15 | 17 | 20 |
| 25 | 0 | -6 | -1 | 5 | 10 | 18 | 26 | 14 | 20 | 25 | 32 | 40 | 48 | 39 | 42 | 45 | 50 | 56 | 61 |
| | 50 | -22 | -18 | -13 | -8 | -4 | -2 | -4 | 0 | 5 | 9 | 14 | 21 | 18 | 20 | 22 | 25 | 27 | 32 |
| | 100 | -30 | -27 | -25 | -21 | -17 | -13 | -14 | -11 | -8 | -5 | -1 | 4 | 6 | 7 | 8 | 8 | 10 | 13 |
| 50 | 0 | -11 | -7 | -1 | 5 | 11 | 20 | 8 | 13 | 18 | 25 | 32 | 40 | 30 | 34 | 38 | 42 | 47 | 53 |
| | 50 | -25 | -23 | -19 | -14 | -9 | -4 | -9 | -6 | -2 | 3 | 8 | 14 | 10 | 12 | 15 | 17 | 21 | 25 |
| | 100 | -35 | -32 | -29 | -25 | -22 | -18 | -19 | -17 | -13 | -8 | -3 | -1 | 0 | 1 | 3 | 4 | 7 | |

| % Wastage reduction % Reduction in food-competing feed | | Climate change impact on yields | | | | | | | | | | | | | | | | | |
|--|-----|---------------------------------|----|----|----|----|-----------|----|----|----|----|-----------|-----|----|----|----|----|----|-----|
| | | Zero | | | | | Medium | | | | | High | | | | | | | |
| | | % Organic | | | | | % Organic | | | | | % Organic | | | | | | | |
| | | 0 | 20 | 40 | 60 | 80 | 100 | 0 | 20 | 40 | 60 | 80 | 100 | 0 | 20 | 40 | 60 | 80 | 100 |
| 0 | 0 | 25 | 21 | 15 | 10 | 4 | -3 | 23 | 19 | 14 | 8 | 3 | -3 | 21 | 16 | 12 | 7 | 1 | -4 |
| | 50 | 20 | 16 | 12 | 7 | 2 | -4 | 18 | 14 | 10 | 6 | 1 | -4 | 17 | 13 | 9 | 4 | 0 | -5 |
| | 100 | 15 | 11 | 7 | 3 | -1 | -5 | 13 | 10 | 7 | 3 | -1 | -5 | 12 | 9 | 5 | 2 | -2 | -6 |
| 25 | 0 | 23 | 19 | 14 | 8 | 2 | -4 | 21 | 17 | 12 | 7 | 1 | -4 | 19 | 15 | 10 | 5 | 0 | -5 |
| | 50 | 18 | 14 | 10 | 6 | 1 | -5 | 17 | 13 | 9 | 5 | 0 | -5 | 15 | 11 | 7 | 3 | -1 | -5 |
| | 100 | 13 | 10 | 6 | 2 | -2 | -6 | 12 | 9 | 5 | 2 | -2 | -6 | 11 | 8 | 4 | 1 | -3 | -6 |
| 50 | 0 | 21 | 17 | 12 | 7 | 1 | -5 | 19 | 15 | 10 | 5 | 0 | -6 | 17 | 13 | 9 | 4 | -1 | -6 |
| | 50 | 16 | 12 | 8 | 4 | 0 | -6 | 15 | 11 | 7 | 3 | -1 | -6 | 14 | 10 | 6 | 2 | -2 | -6 |
| | 100 | 11 | 8 | 5 | 1 | -3 | -7 | 10 | 7 | 4 | 0 | -3 | -7 | 10 | 7 | 3 | 0 | -3 | -7 |

Figure 1: Projected required growth of organic agricultural land to reach 25 per cent in the EU in 2030

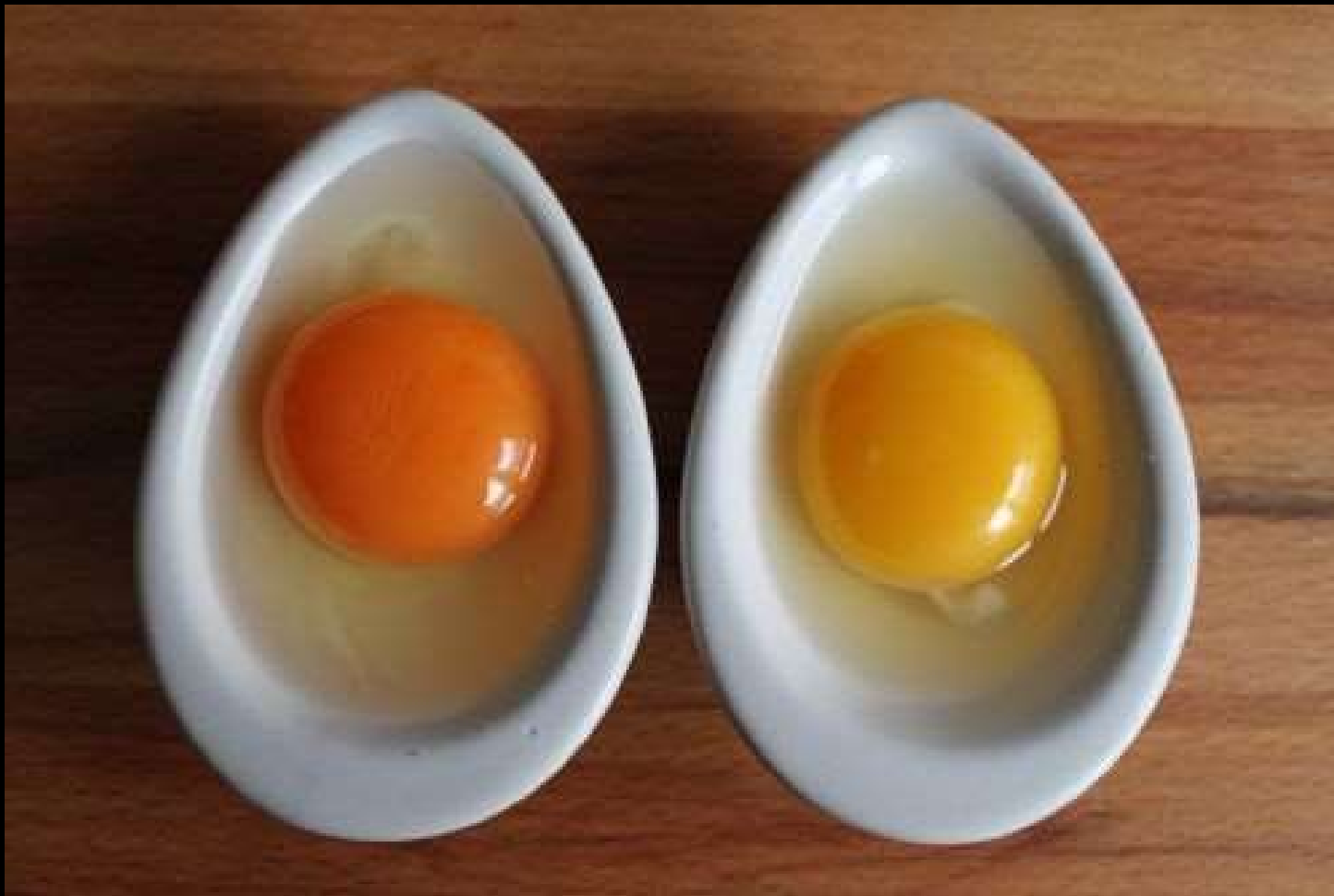


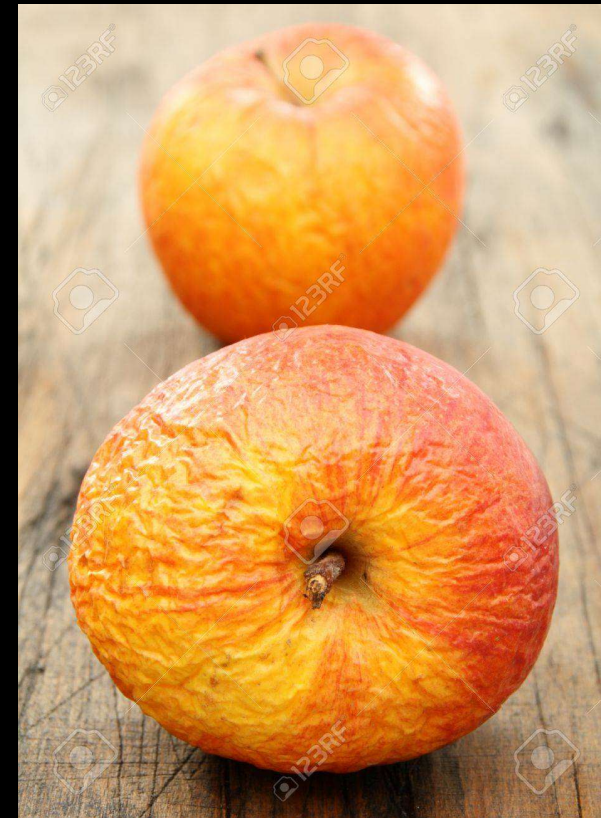
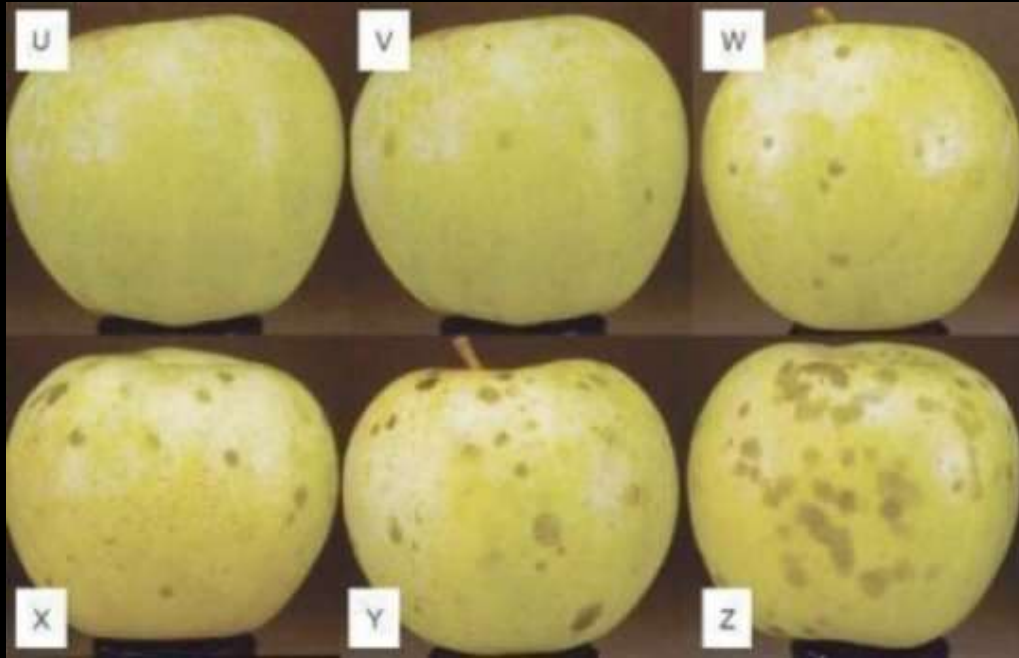
Source: FiBL-IFOAM-SOEL Surveys 2001-2020



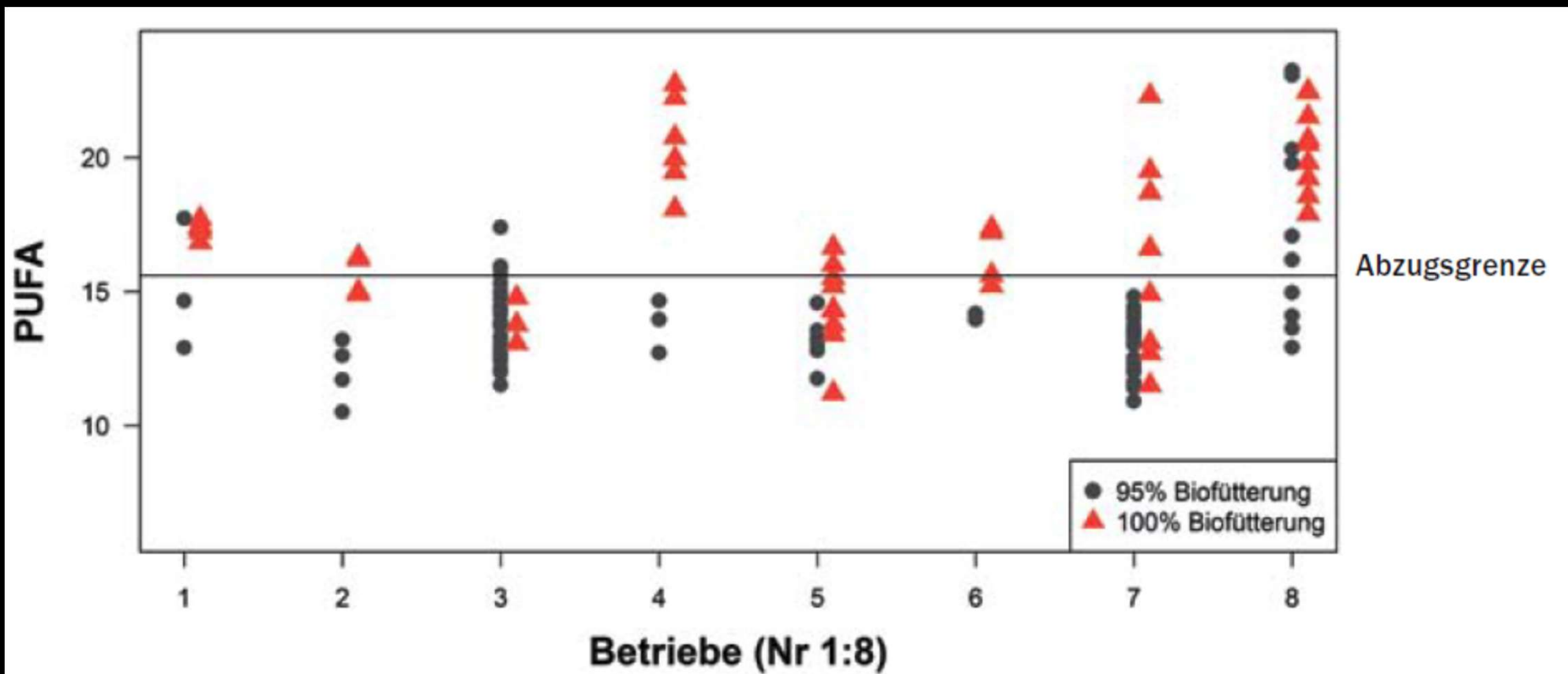
Moschitz et al. 2021

Herausforderungen

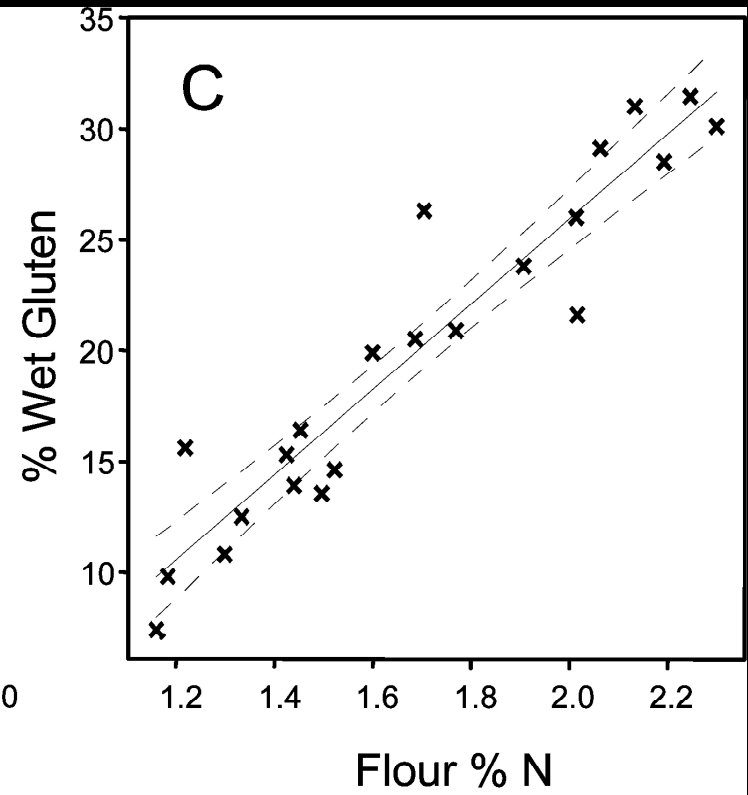
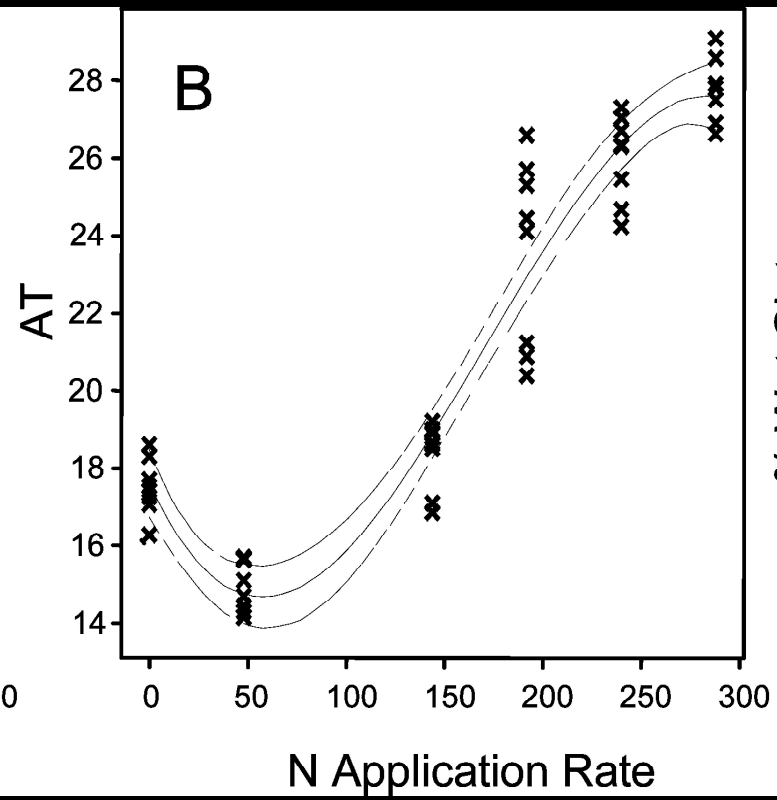
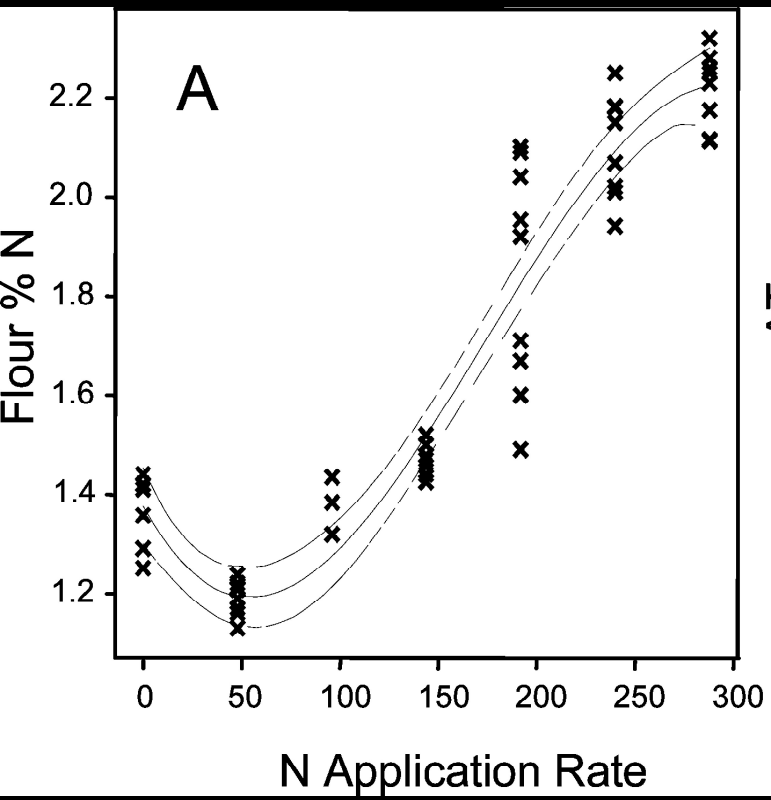




- CRISPR-Cas – Gemüsevollsortiment...



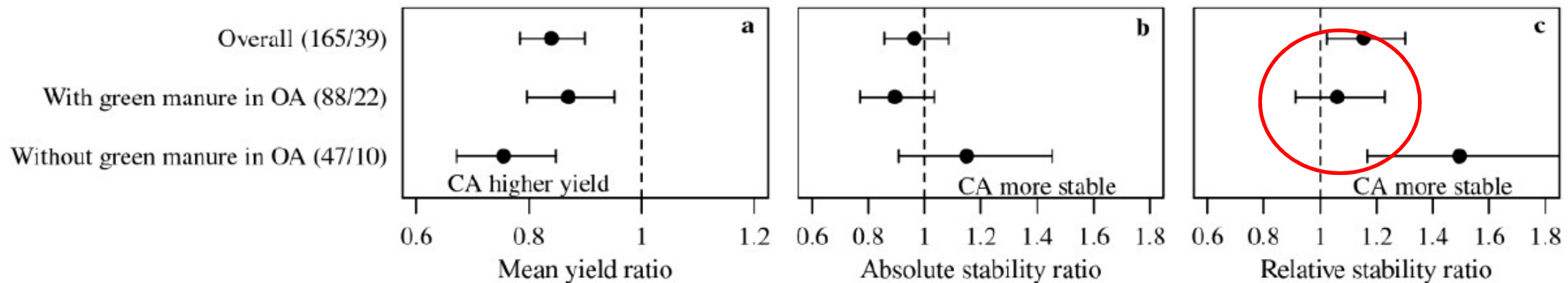
Vergleich der PUFA-Zahl-Messungen zwischen 100 Prozent Biofütterung und 95 Prozent Biofütterung auf acht Versuchsbetrieben mit unterschiedlichen Futterrationen. Grafik: FiBL



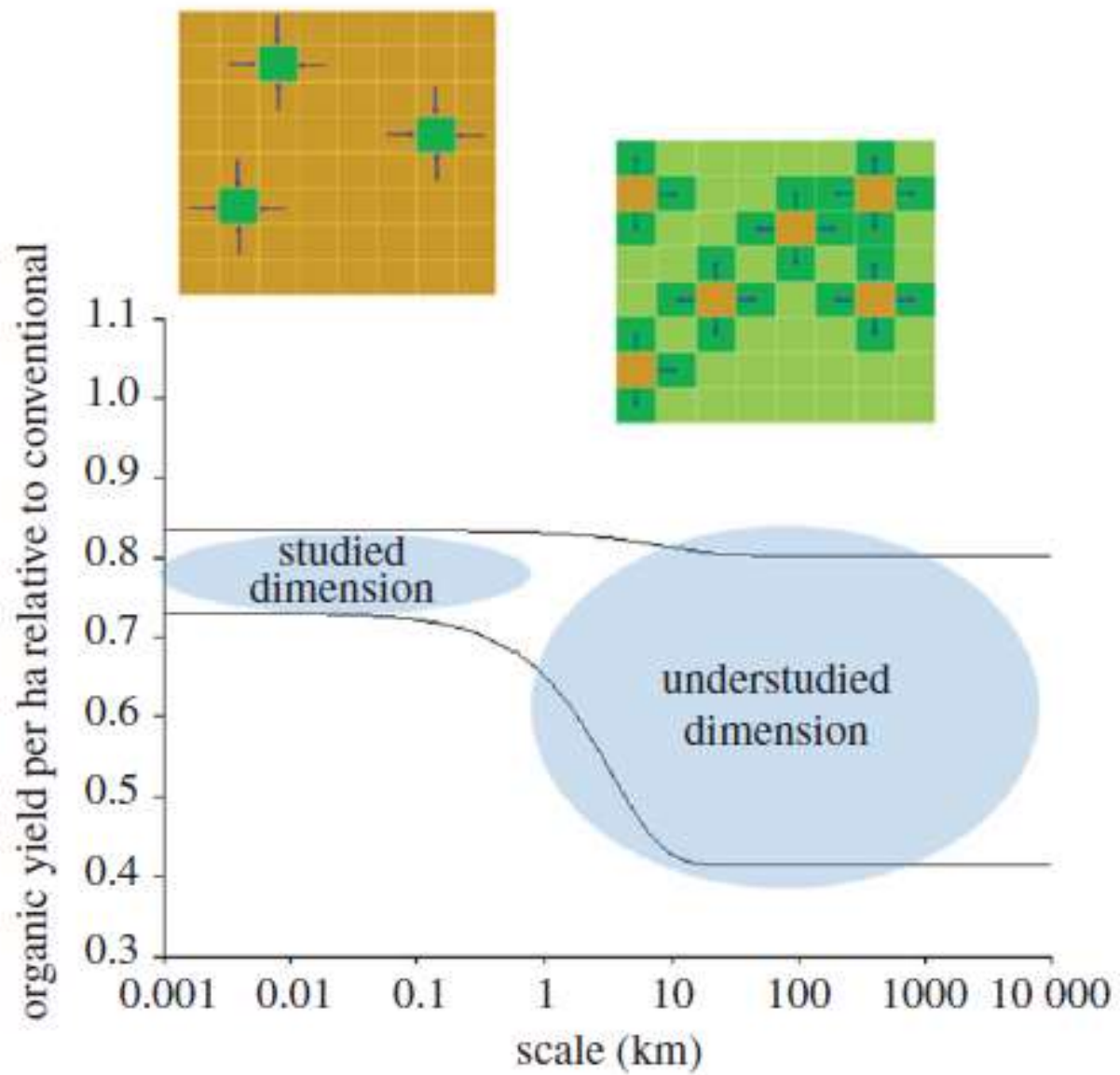




Ertragsstabilität



- Mangelnde Diversität im Biolandbau?
- Vgl. z.B. grossflächiger Anbau in Osteuropa



Vielfalt auf dem Teller – Vielfalt in der Landschaft



Have plenty of
vegetables and fruits



Choose
whole grain
foods

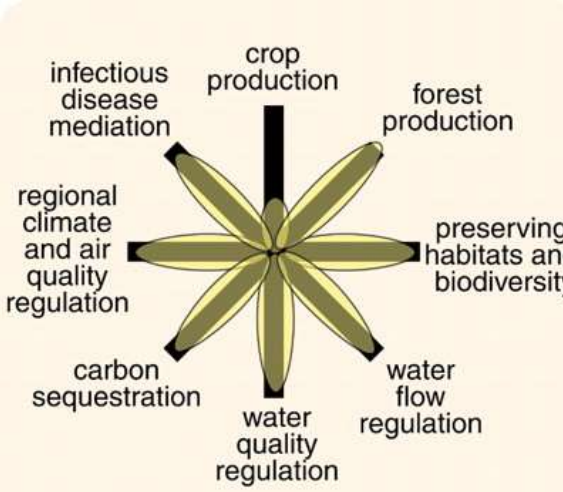
| | | Indicators for climate change adaptation | | | | | | | | | | | | | | | | | |
|---|-----------------------------------|--|----------------|--------------------------------------|---|--------------------------|----------------|--------------------|--------------------------|-------------------------------|-------|-----------------|----------------------|-------------------------|-------------------------------|---------------|--------------------------------|------------------|------------------------|
| | | Soil health | | Biodiversity | | Plant protection | | | Productivity | | | | | | | | Employment | Health | |
| | | Soil organic carbon | Soil fertility | Species richness/abundance/diversity | Stability of species richness/abundance | Natural plant protection | Weed abundance | Pathogen abundance | Total biomass production | Stability in total production | Yield | Yield stability | Pollination services | Resource use efficiency | Eco-system services stability | Profitability | Stability of costs and profits | Rural employment | Exposure to pesticides |
| Agroecological practices | Organic agriculture | ✓ | ✓ | ✓ | ✓ | | ✗ | ✓ | | | ✗ | ✗ | | | | | | ✓ | ✓ |
| | Low-input systems | | | ✓ | | | | | | | ✗ | | | | | | | | |
| | Agroforestry | | ✓ | ✓ | | | | | ✓ | | | | | | | | | | |
| | No tillage | ✓ | ✓ | | | | | | | | ✗ | | | | | | | | |
| | Reduced tillage | ✓ | ✓ | | | | | | | | | | | | | | | | |
| | Cover crops | ✓ | ✓ | | | | | | | | | | | | | | | | |
| | Biochar | ✓ | | | | | | | | | | | | | | | | | |
| | Organic fertilizers | ✓ | ✓ | | | | | | ✗ | | | | | | | | | | |
| | Crop rot./diversity/intercropping | ✓ | ✓ | ✓ | | ✓ | | | | ✓ | | ✓ | | | | ✓ | ✓ | | |
| | Grassland diversity | | | | | | | | | | ✓ | | | | | | | | |
| Practices enhancing biodiversity & complex landscapes | | | | | ✓ | | | | | ✓ | | ✓ | ✓ | ✓ | | | | | |




Authentizität bedeutet Echtheit im Sinne von Ursprünglichkeit

- **Hilft uns das? – Wie und wobei?**
- **Geschmackssache oder Notwendigkeit?**
- **«Ich will so und nicht anders leben» –
oder
«ich rette die Welt»?**
- **«Sich wieder mit der Natur verbinden»
Wie natürlich ist (Öko-)Landwirtschaft?**

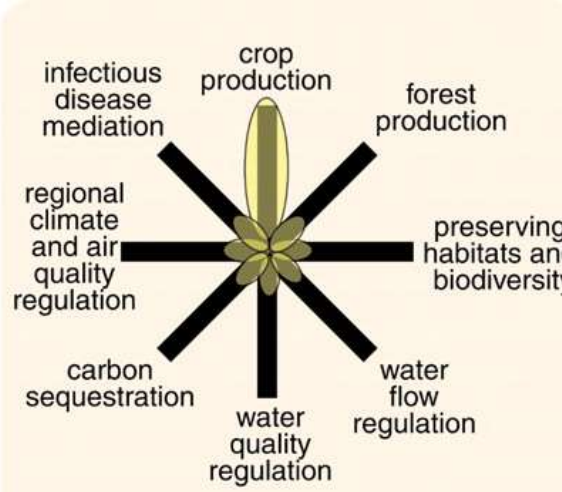
Belastungen in der Landschaft – «share – spare»




A diagram of a natural ecosystem represented as a flower with eight petals. Each petal is connected to a specific ecosystem service by a thick black line. The services are: infectious disease mediation, crop production, forest production, preserving habitats and biodiversity, water flow regulation, water quality regulation, carbon sequestration, and regional climate and air quality regulation.



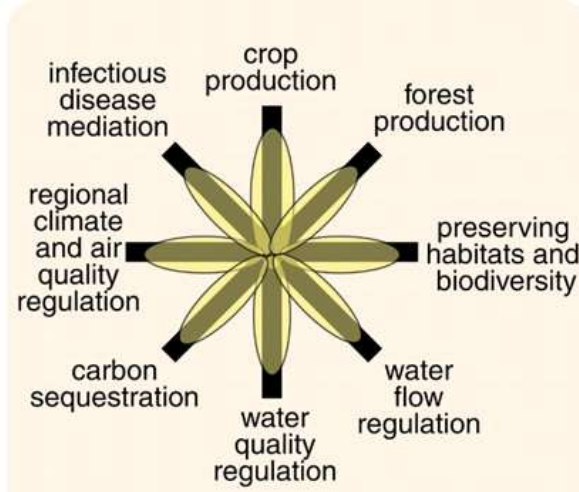
natural ecosystem




A diagram of intensive cropland represented as a flower with eight petals. The petals are significantly smaller and thinner than in the natural ecosystem diagram, indicating a reduction in ecosystem services. The services are: infectious disease mediation, crop production, forest production, preserving habitats and biodiversity, water flow regulation, water quality regulation, carbon sequestration, and regional climate and air quality regulation.



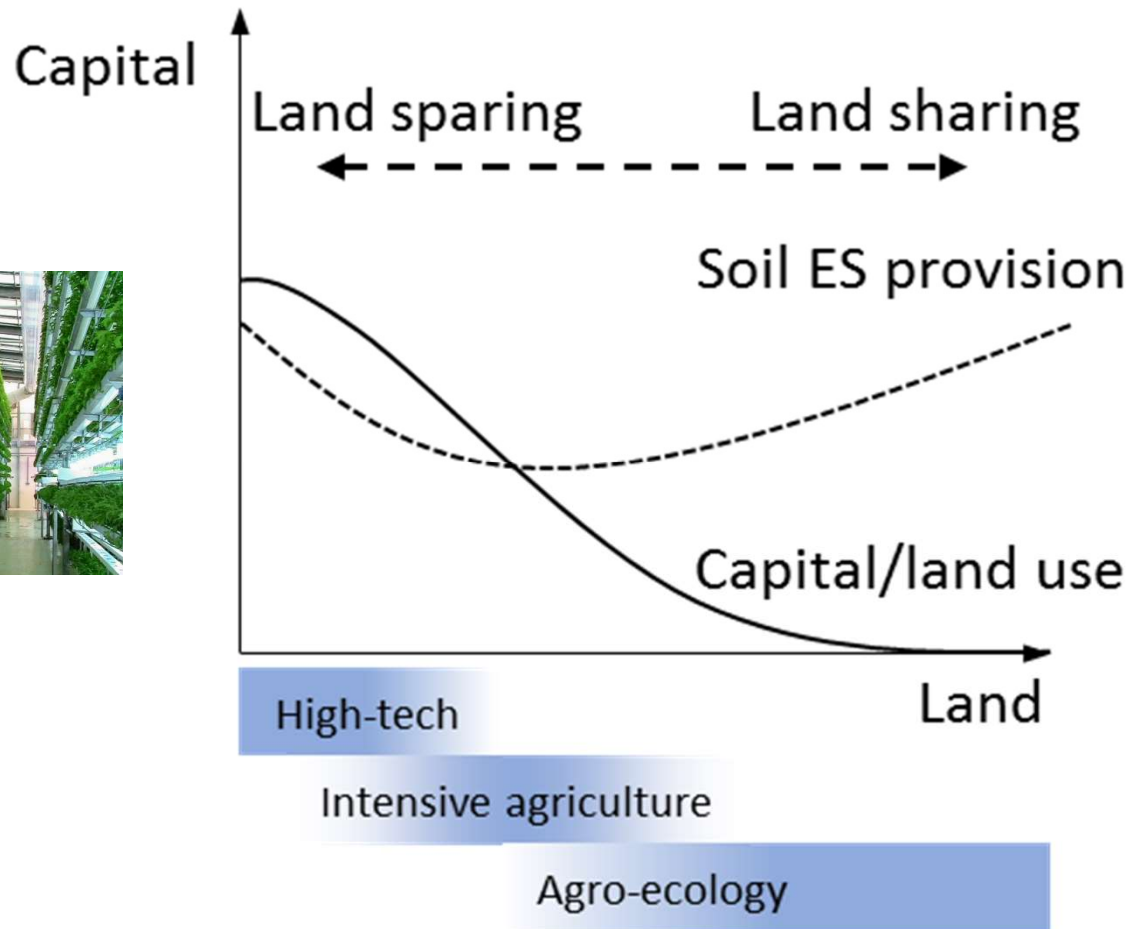
intensive cropland

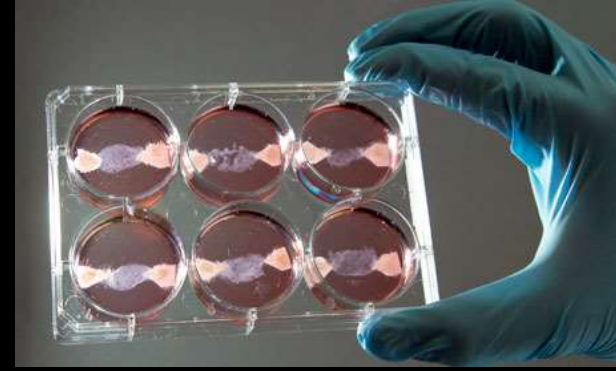


A diagram of cropland with restored ecosystem services represented as a flower with eight petals. The petals are larger and thicker than in the intensive cropland diagram, indicating a partial restoration of ecosystem services. The services are: infectious disease mediation, crop production, forest production, preserving habitats and biodiversity, water flow regulation, water quality regulation, carbon sequestration, and regional climate and air quality regulation.



cropland with restored ecosystem services





Interesse, Profit, Werte, Handlungsfähigkeit

- **Muss ich mich für nachhaltige Ernährung interessieren?**
- **Umsetzung dessen, was getan werden muss**
Effizienz – Freiheit - Gerechtigkeit
- **Für Unternehmen: Business Cases in der Kreislaufwirtschaft?**
z.B. Futtermittelhändler bei halb so vielen Schweinen?
z.B. Fleisch als Umsatztreiber im Detailhandel?
z.B. Rolle der Bioverbände?
- **Bin ich als Individuum handlungsfähig**
oder
bin ich den Umständen ausgeliefert
(z.B. «obesogenic environment», Markt)?

Fazit

- Die Utopie einer nachhaltigen Welternährung muss Realität werden; wir wissen, was zu tun ist, nur nicht wie.
- Wir sollten bedenken, dass das alles sehr viele Menschen nicht interessiert und auch nie interessieren wird – und auch nicht interessieren muss!
- Authentizität, Natürlichkeit, etc. – hilft das oder ist das eher hinderlich? – Jede und jeder muss einen Umgang damit finden.
- Alle an einen Tisch! – aber neben verschiedenen Sektoren insbesondere auch entlang der Wertschöpfungskette.

Dabei: die Akteure konkret in die Pflicht nehmen:

z.B.: Was ist euer Business-Modell in 30 Jahren?
Angesichts planetarer Grenzen und
sozialer Minimalanforderungen?

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