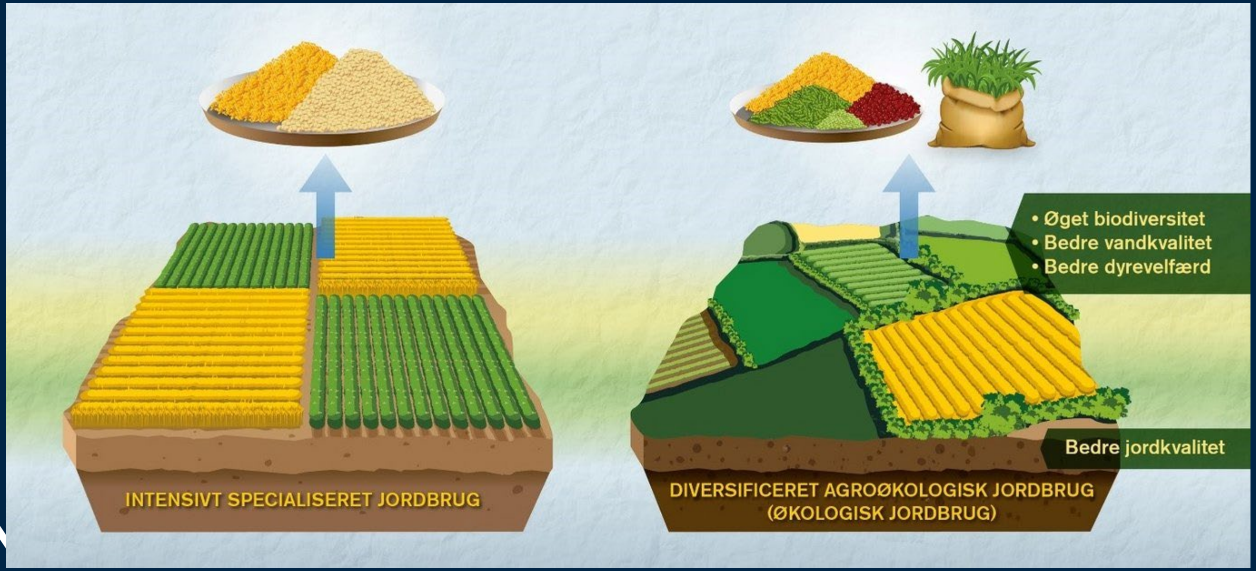
HVIS ØKOLOGIEN FORSVANDT I MORGEN



MARIE TRYDEMAN KNUDSEN

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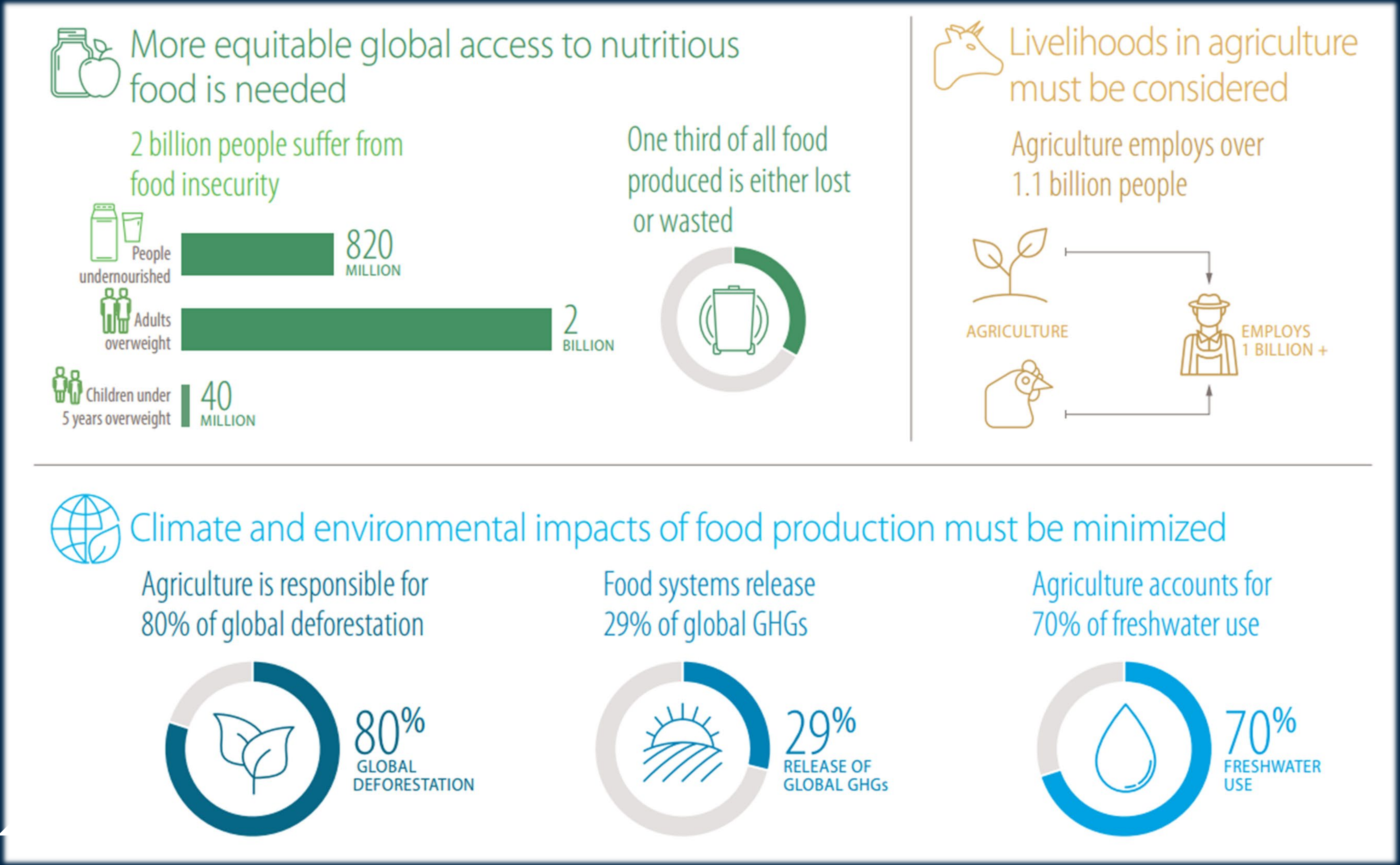
- Professor og sektionsleder ved Institut for Agroøkologi ved Århus Universitet, medlem af Klimarådet

- Agronom og ph.d. i livscyklusvurderinger af landbrugs- og fødevaresystemer

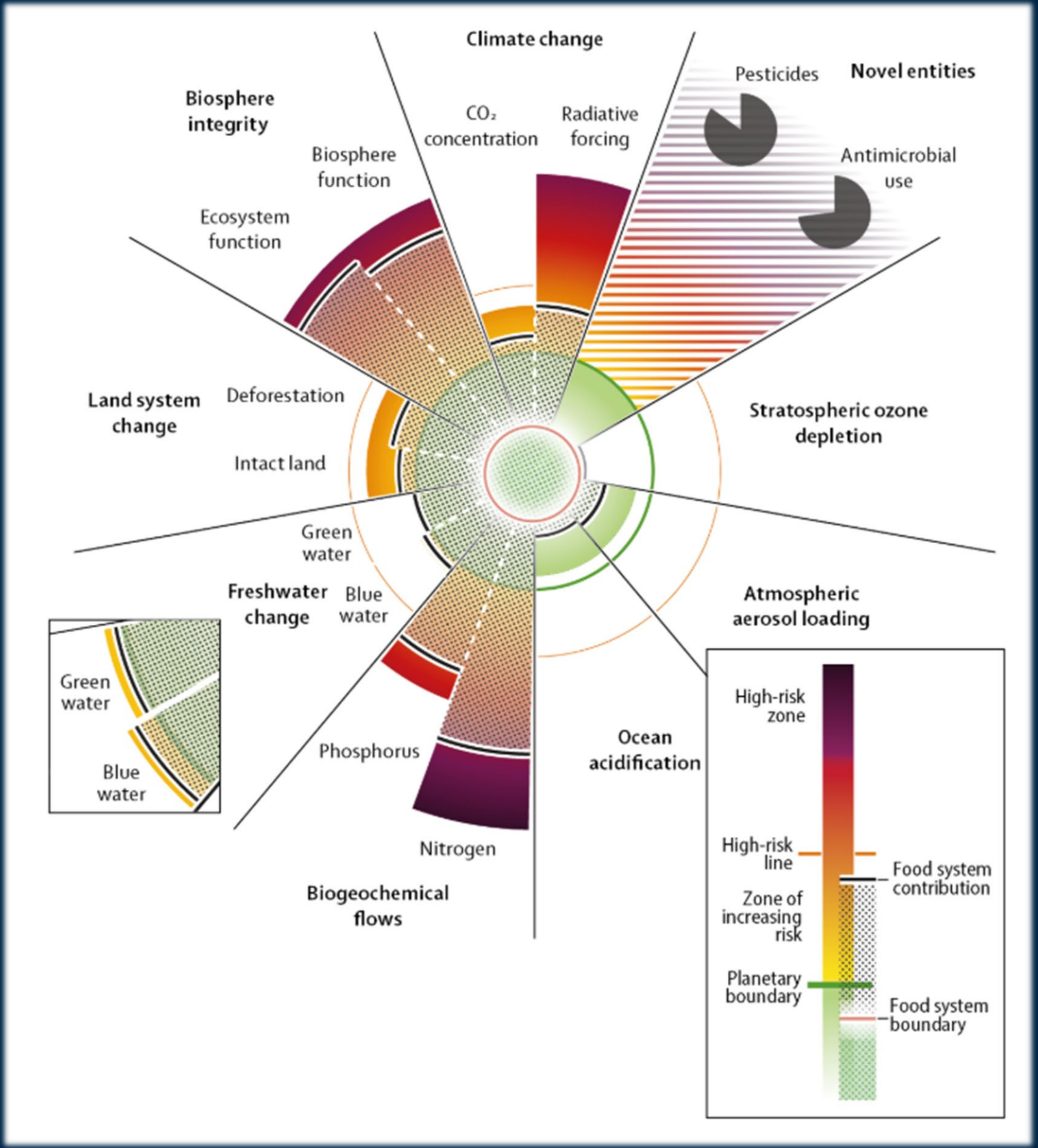
- Klima- og miljømæssig bæredygtighed af fødevarer og landbrugssystemer, hvor jeg arbejder med systemanalyse og primært bruger livscyklusvurderinger (LCA).

UDFORDRINGER I VORES FØDEVARESYSTEM



UN (2019)

PLANETÆRE GRÆNSER OVERSKREDET

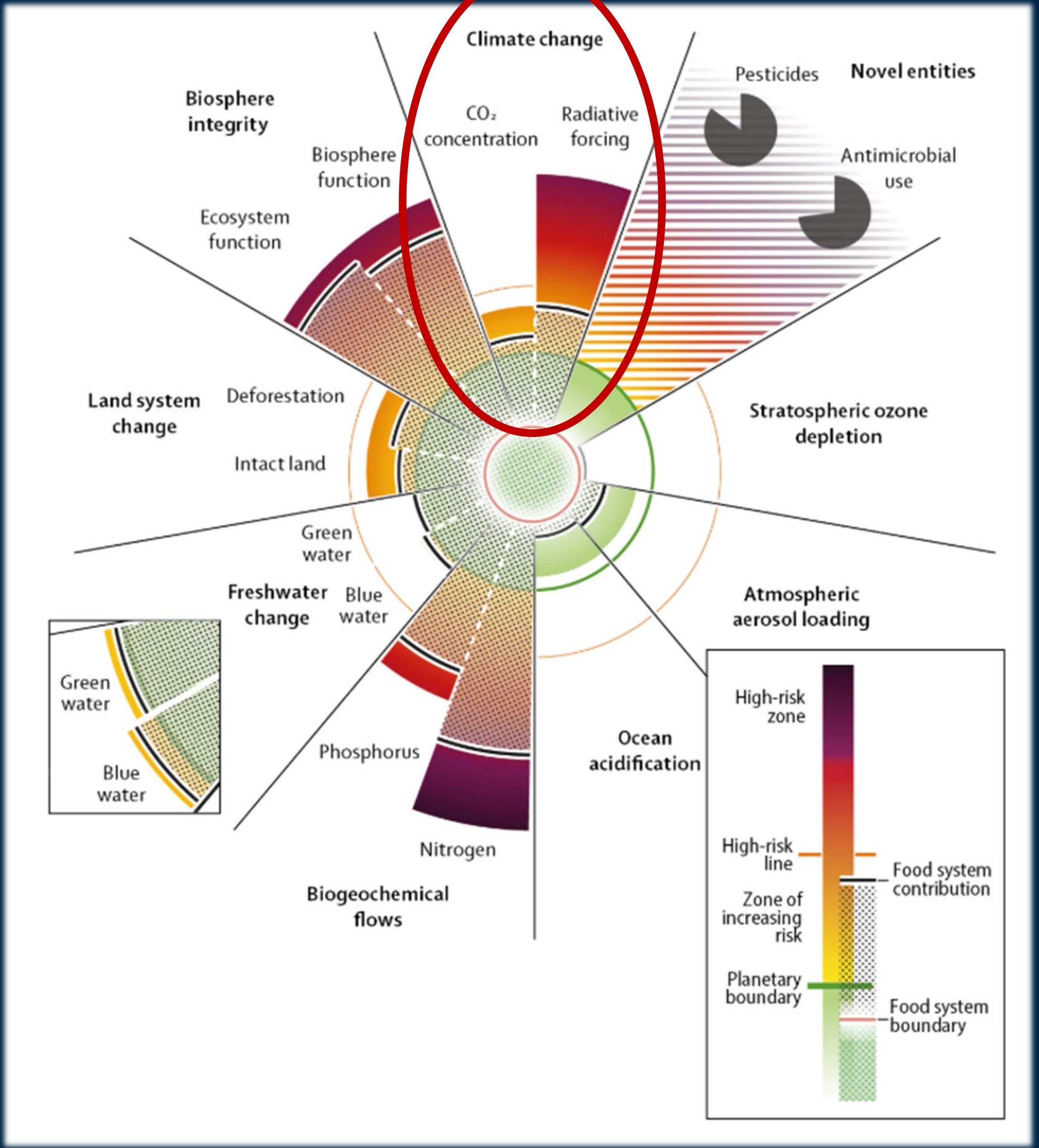


Ni grænser er undersøgt

- syv er overskredet

Rockström et al. (2025)

KLIMAFORANDRINGER

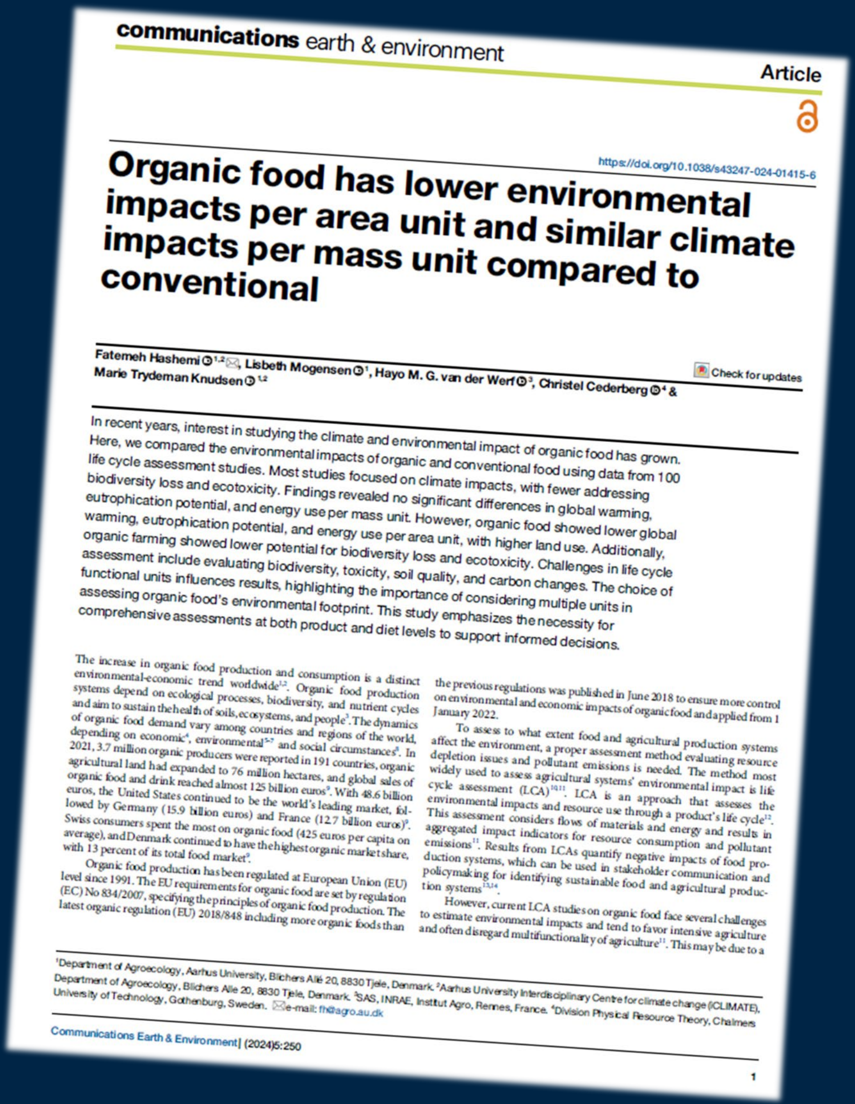


Hvad er klimapåvirkningen af økologisk jordbrug

- og klimaaftrykket af økologiske fødevarer?

Rockström et al. (2025)

KLIMAPÅVIRKNING



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Article

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Organic food has lower environmental impacts per area unit and similar climate impacts per mass unit compared to conventional

Fatemeh Hashemi[1,2], Lisbeth Mogensen[1], Hayo M. G. van der Werf[3], Christel Cederberg[4] & Marie Trydeman Knudsen[1,2]

Check for updates

In recent years, interest in studying the climate and environmental impact of organic food has grown. Here, we compared the environmental impacts of organic and conventional food using data from 100 life cycle assessment studies. Most studies focused on climate impacts, with fewer addressing biodiversity loss and ecotoxicity. Findings revealed no significant differences in global warming, eutrophication potential, and energy use per mass unit. However, organic food showed lower global warming, eutrophication potential, and energy use per area unit, with higher land use. Additionally, organic farming showed lower potential for biodiversity loss and ecotoxicity. Challenges in life cycle assessment include evaluating biodiversity, toxicity, soil quality, and carbon changes. The choice of functional units influences results, highlighting the importance of considering multiple units in assessing organic food's environmental footprint. This study emphasizes the necessity for comprehensive assessments at both product and diet levels to support informed decisions.

The increase in organic food production and consumption is a distinct environmental-economic trend worldwide[1,2]. Organic food production systems depend on ecological processes, biodiversity, and nutrient cycles and aim to sustain the health of soils, ecosystems, and people[3]. The dynamics of organic food demand vary among countries and regions of the world, depending on economic[4], environmental[5-7] and social circumstances[8]. In 2021, 3.7 million organic producers were reported in 191 countries, organic agricultural land had expanded to 76 million hectares, and global sales of organic food and drink reached almost 125 billion euros[9]. With 48.6 billion euros, the United States continued to be the world's leading market, fol-lowed by Germany (15.9 billion euros) and France (12.7 billion euros)[9]. Swiss consumers spent the most on organic food (425 euros per capita on average), and Denmark continued to have the highest organic market share, with 13 percent of its total food market[9].

Organic food production has been regulated at European Union (EU) level since 1991. The EU requirements for organic food are set by regulation (EC) No 834/2007, specifying the principles of organic food production. The latest organic regulation (EU) 2018/848 including more organic foods than the previous regulations was published in June 2018 to ensure more control on environmental and economic impacts of organic food and applied from 1 January 2022.

To assess to what extent food and agricultural production systems affect the environment, a proper assessment method evaluating resource depletion issues and pollutant emissions is needed. The method most widely used to assess agricultural systems' environmental impact is life cycle assessment (LCA)[10,11]. LCA is an approach that assesses the environmental impacts and resource use through a product's life cycle[12]. This assessment considers flows of materials and energy and results in aggregated impact indicators for resource consumption and pollutant emissions[11]. Results from LCAs quantify negative impacts of food production systems, which can be used in stakeholder communication and policymaking for identifying sustainable food and agricultural production systems[13,14].

However, current LCA studies on organic food face several challenges to estimate environmental impacts and tend to favor intensive agriculture and often disregard multifunctionality of agriculture[11]. This may be due to a

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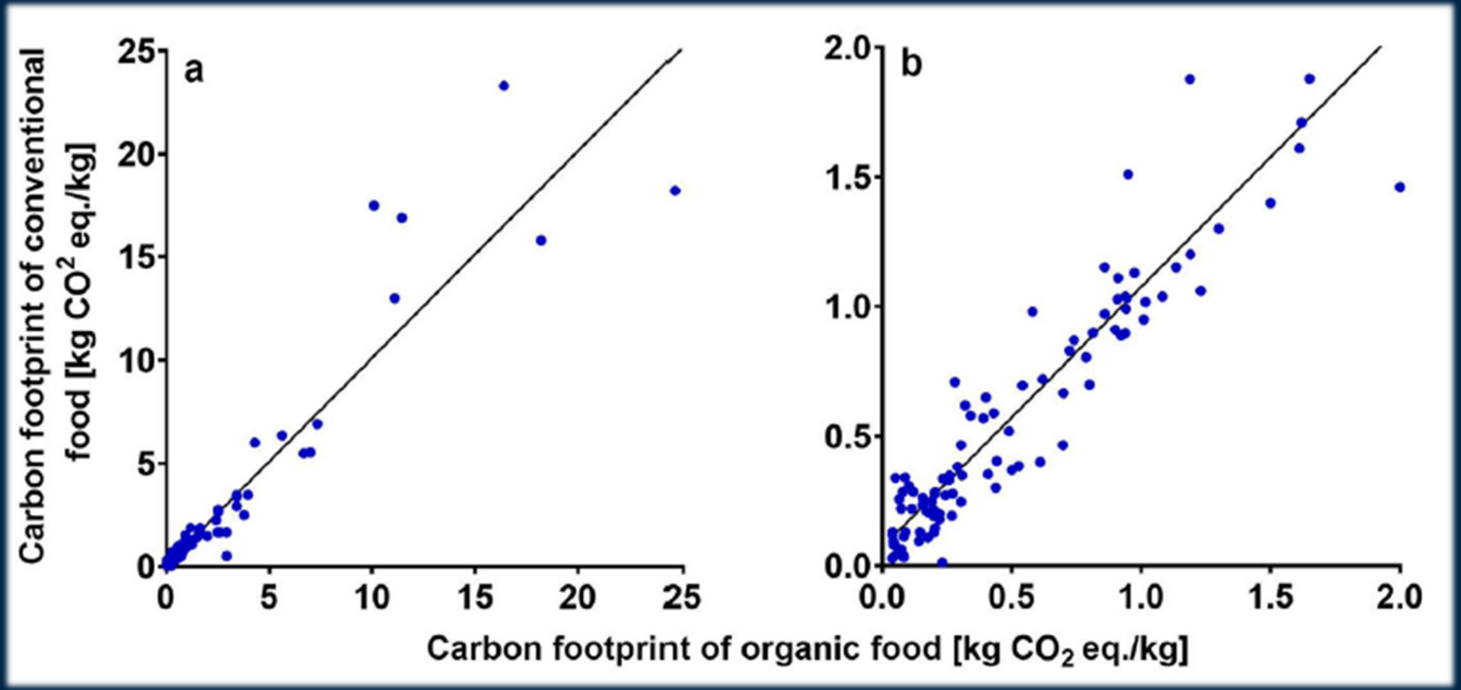
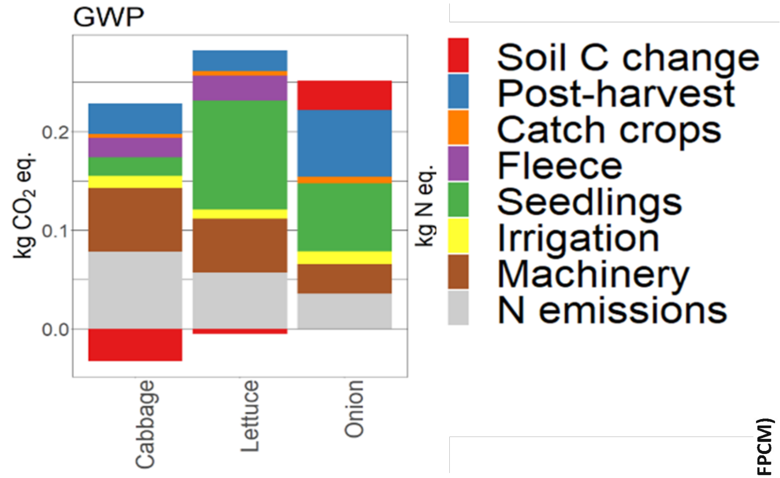
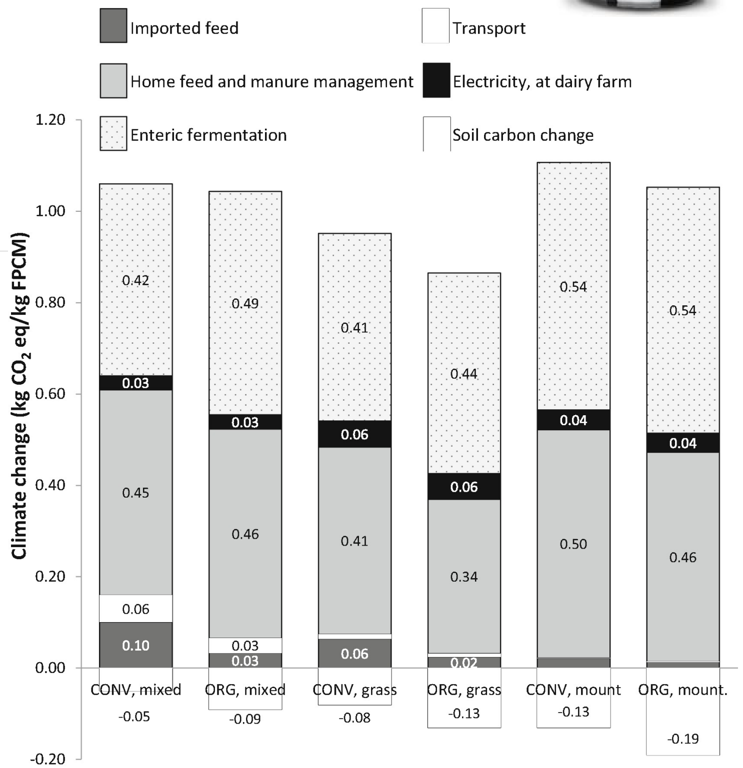


Hashemi et al. (2024)

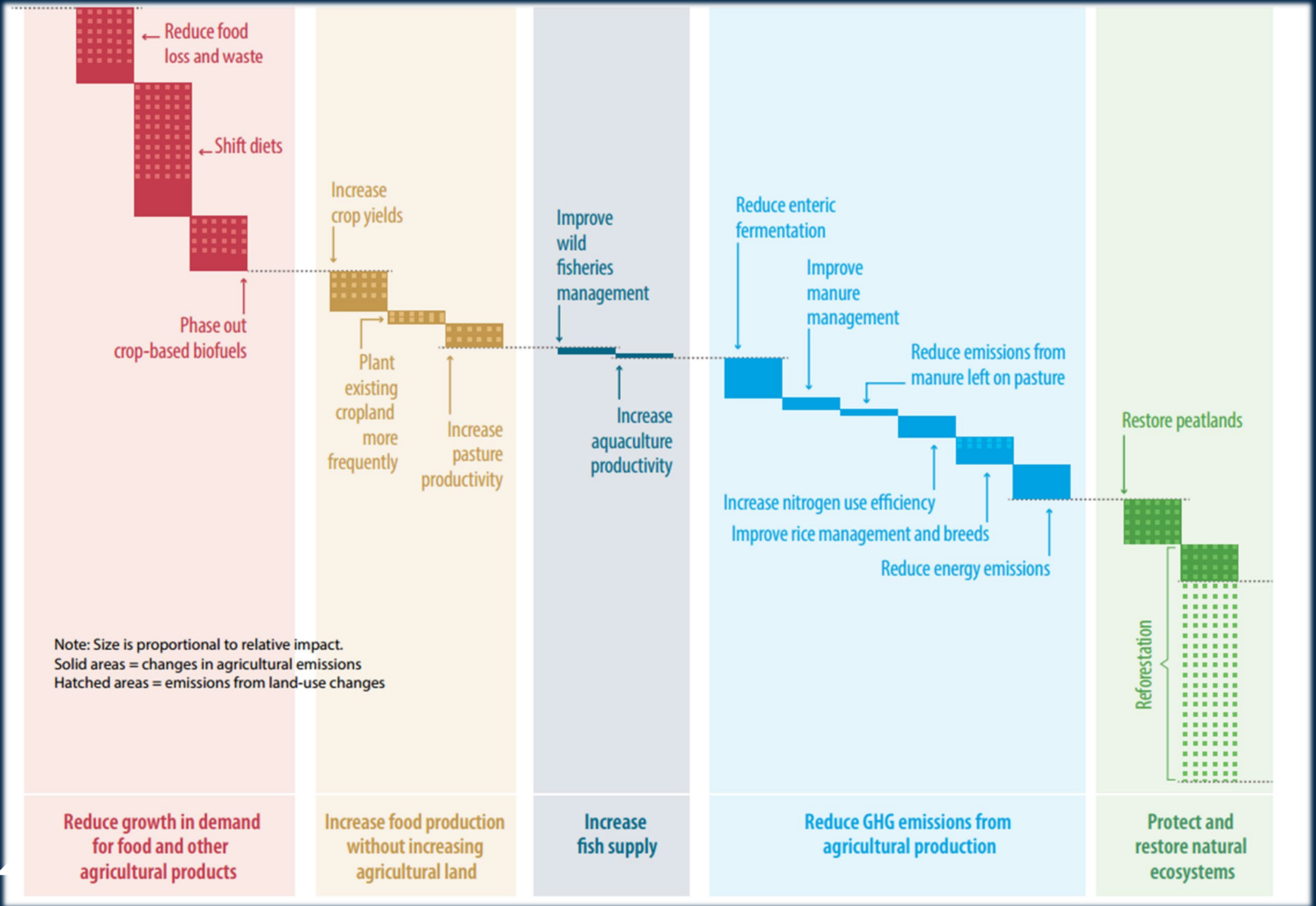
KLIMAAFTRYK (KG CO_2-ÆKV./KG)





Jensen et al. (2024), Knudsen at el. (2019)

MULIGHEDER FOR AT REDUCERE EMISSION

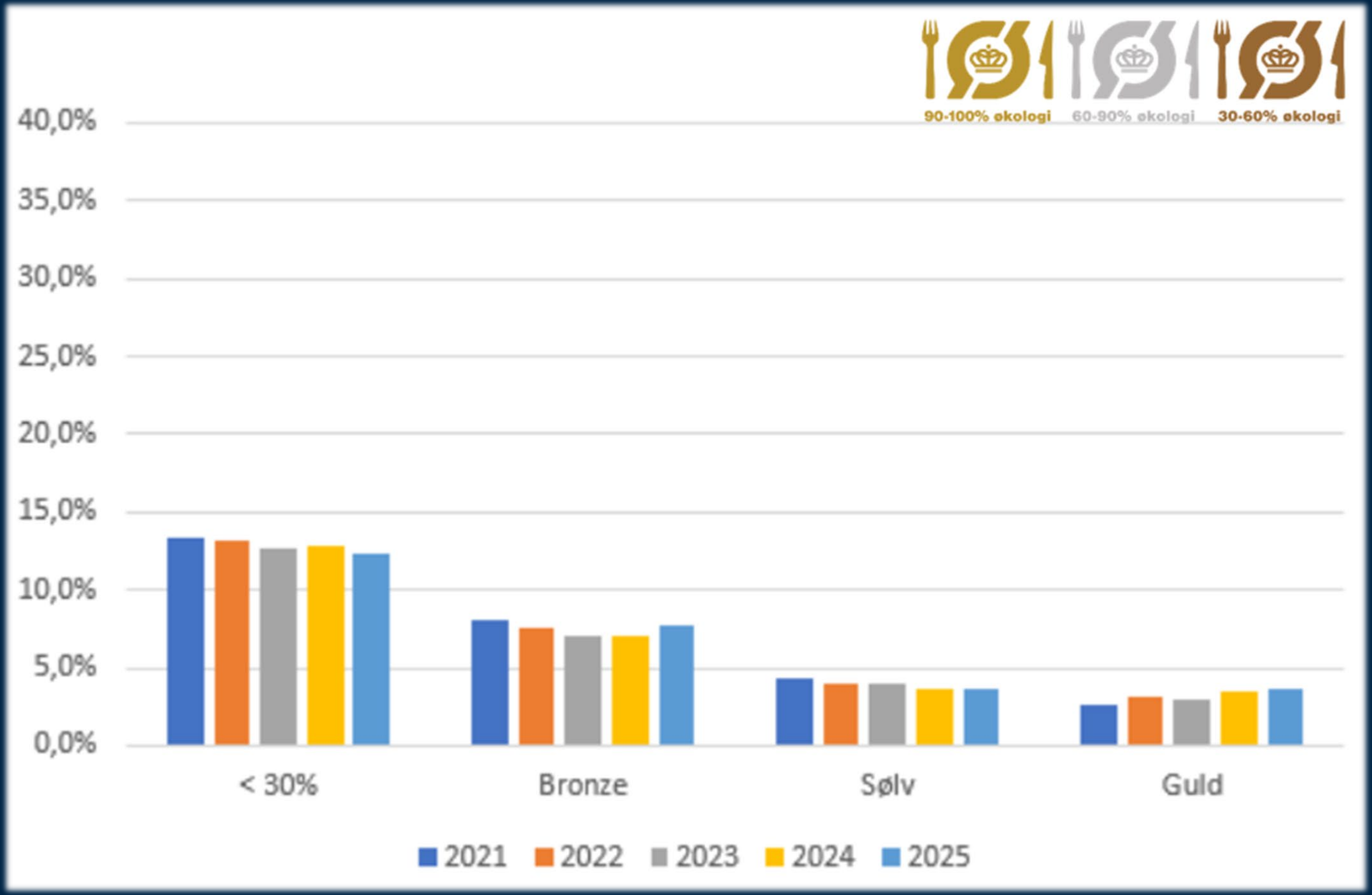


- Reducere fødevaretab og -spild
- Kostændringer

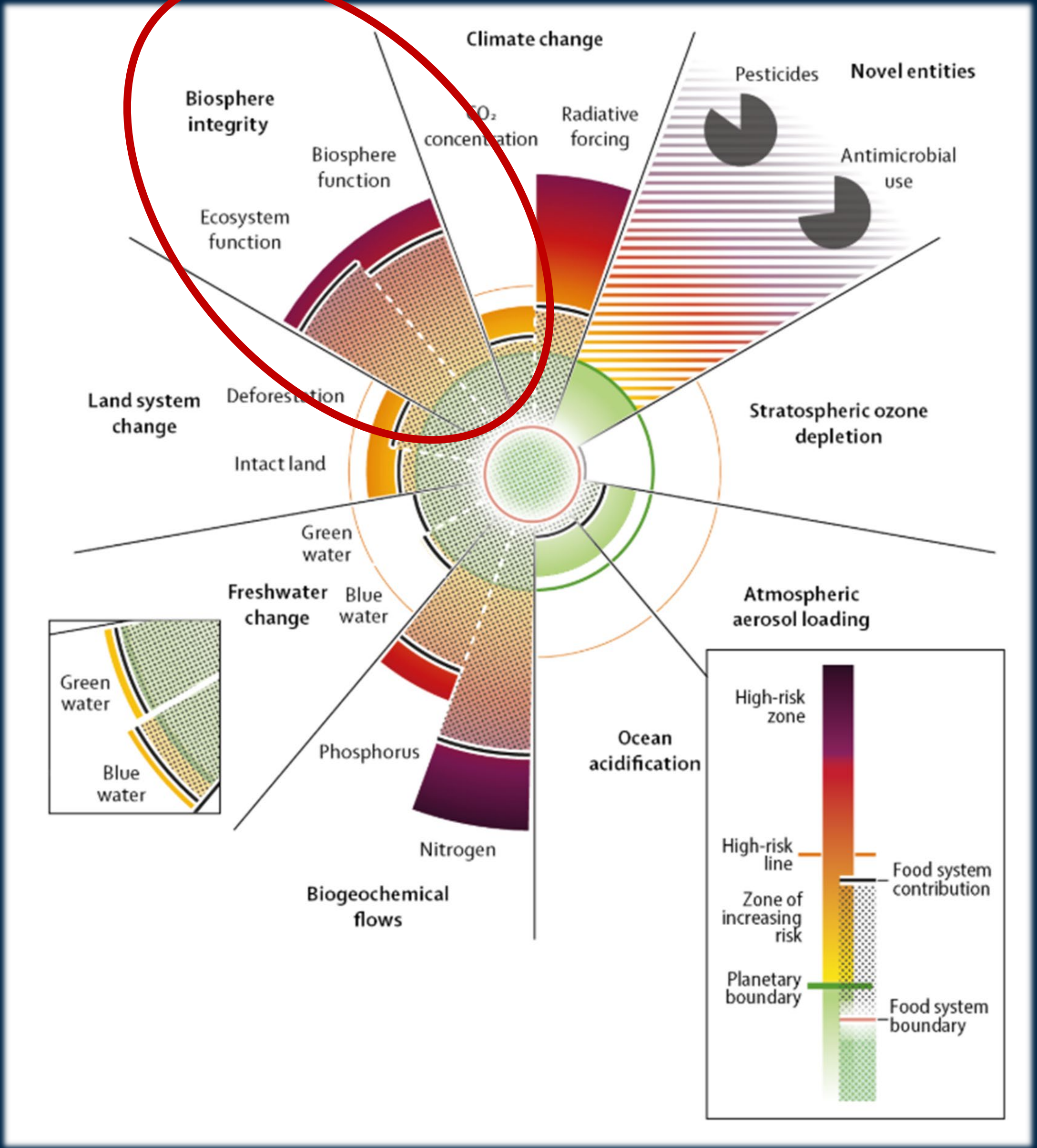
(Baudry et al. 2017)

UN (2019)

KØDFORBRUG OG ØKOLOGIPROCENT



BIODIVERSITET

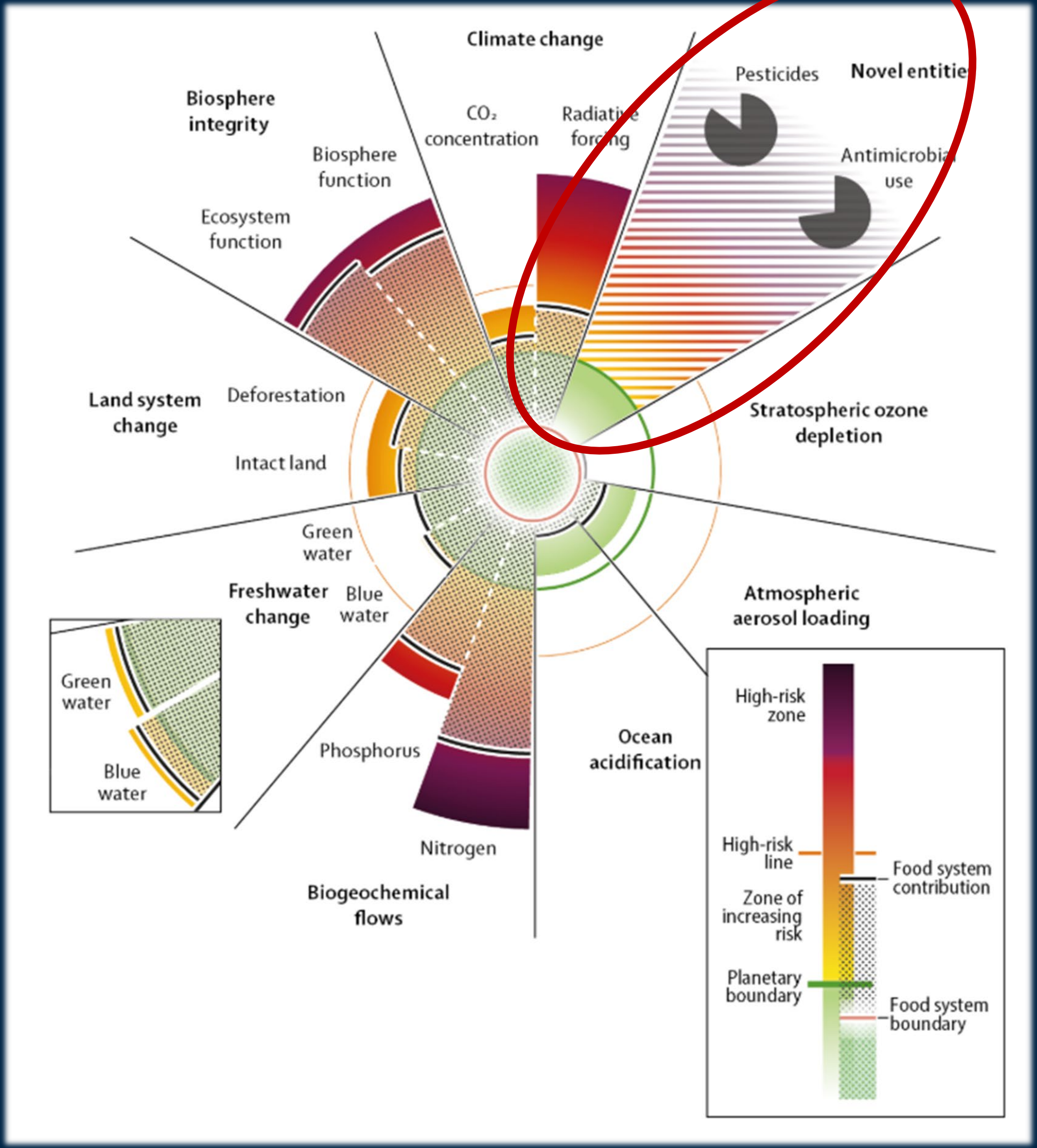


- Økologiske marker har ca. 30 pct. højere artsrigdom end konventionelle marker - baseret på 94 studier over de sidste 30 år (Tuck et al. 2014)

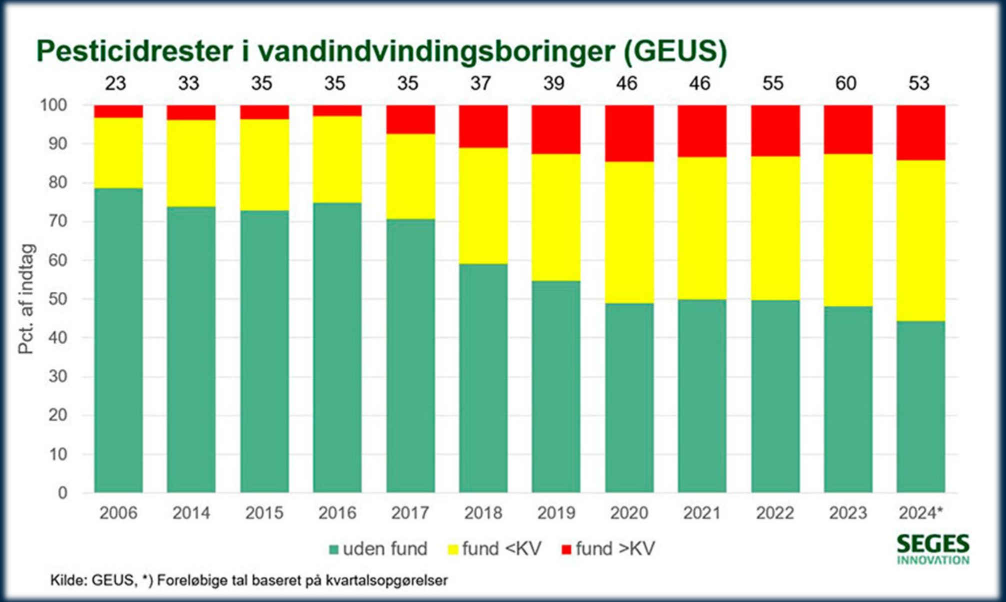
- Det tager tid at opbygge artsrigdommen igen, der også understøtter bestøvning og nyttedyr og dermed udbytte (Carrié et al. 2024)

Rockström et al. (2025)

NYE STOFFER OG MATERIALER

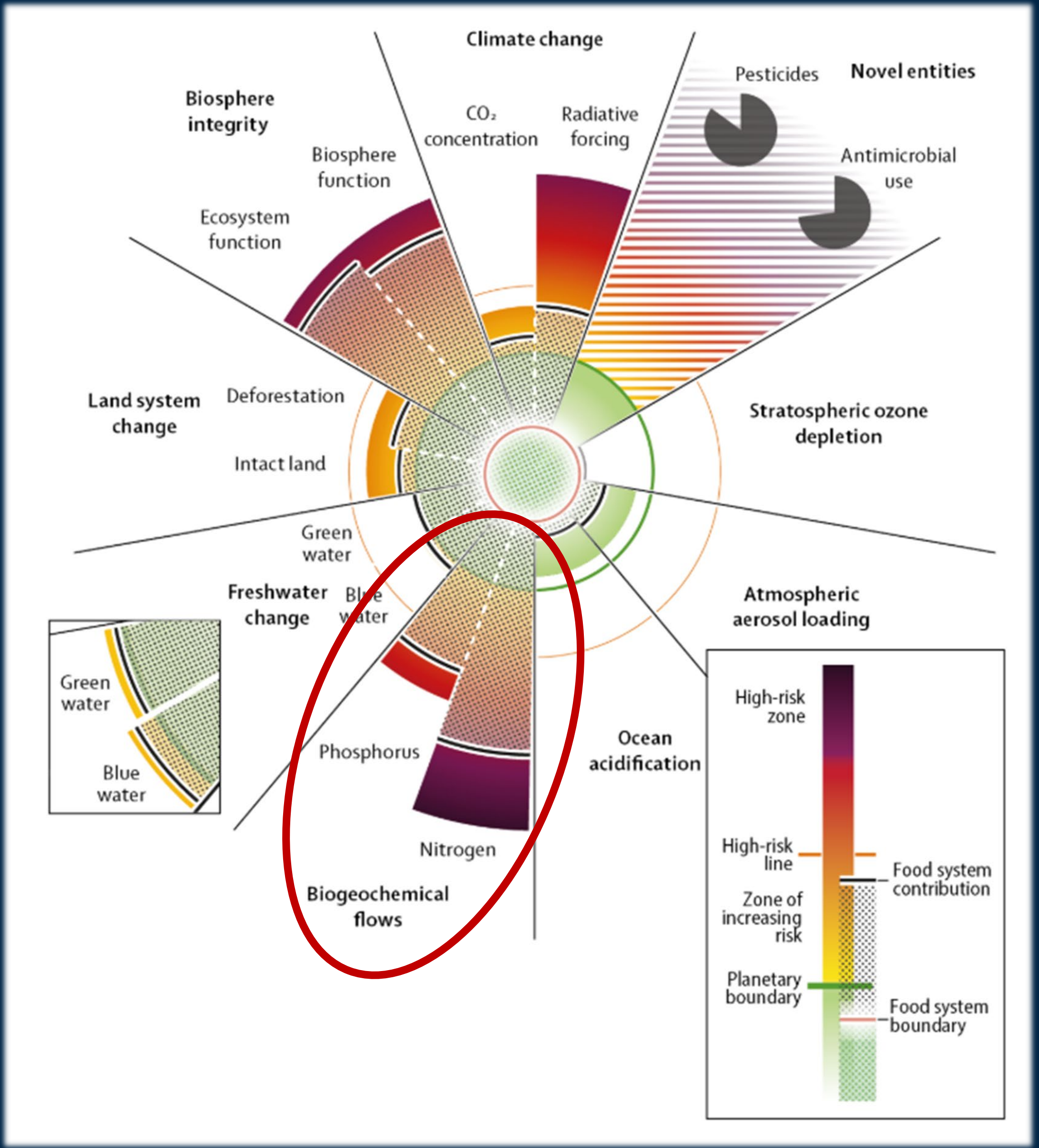


- Færre pesticidrester i urinen (Hyland et al. 2019, Hakme et al. 2024)



Rockström et al. (2025)

TAB AF NÆRINGSSTOFFER



- Ingen reaktivt kvælstof ind i systemet (via Haber-Bosch proces), men stadig tab af N og P fra økologiske systemer. N-udvaskning ens for planteavl, lavere for mælkeproduktion og højere for grise (Hermansen et al. 2015).

Rockström et al. (2025)

DYREVELFÆRD

JORD

KLIMATILPASNING OG NYE SYSTEMER

van der Werf at el. (2019)

TO STORE UDFORDRINGER

Ingen "fossil pumpe" ➡

Effektiv udnyttelse af ressourcer (cirkularitet)

Biomasse til fødevarer, materialer og energi + negative emissioner og biodiversitet

➡ Pres på arealforbruget

➡ Kostændringer

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➡ Pres på arealforbruget

➡ Kostændringer

Vejrekstremer (og andre chok/kriser) ➡

Har brug for resiliente systemer – til stabile udbytter

➡ Bygge resiliens i jorde og mikroklima (træer)

➡ Robuste og diverse sædskifter (N_2-fiksering)

KONKLUSION

- Økologien har givet sig selv "benspænd", hvilket har gjort at den er foran med løsninger på mange udfordringer såsom drikkevandskvalitet, dyrevelfærd, biodiversitet i agerlandet, antibiotikaresistens og jordkvalitet. – kan inspirere.

- Kostændringer og reduktion af spild er nødvendige – især for økologien.

- Nye produktionssystemer og –fødevaresystemer bør designes med fokus på:
  - produktion og forbrug af fødevarer,
  - alle relevante klima-, miljø- og andre sideeffekter,
  - reduktion af effekter samt klimatilpasning – og her kan økologien have en fordel.

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