

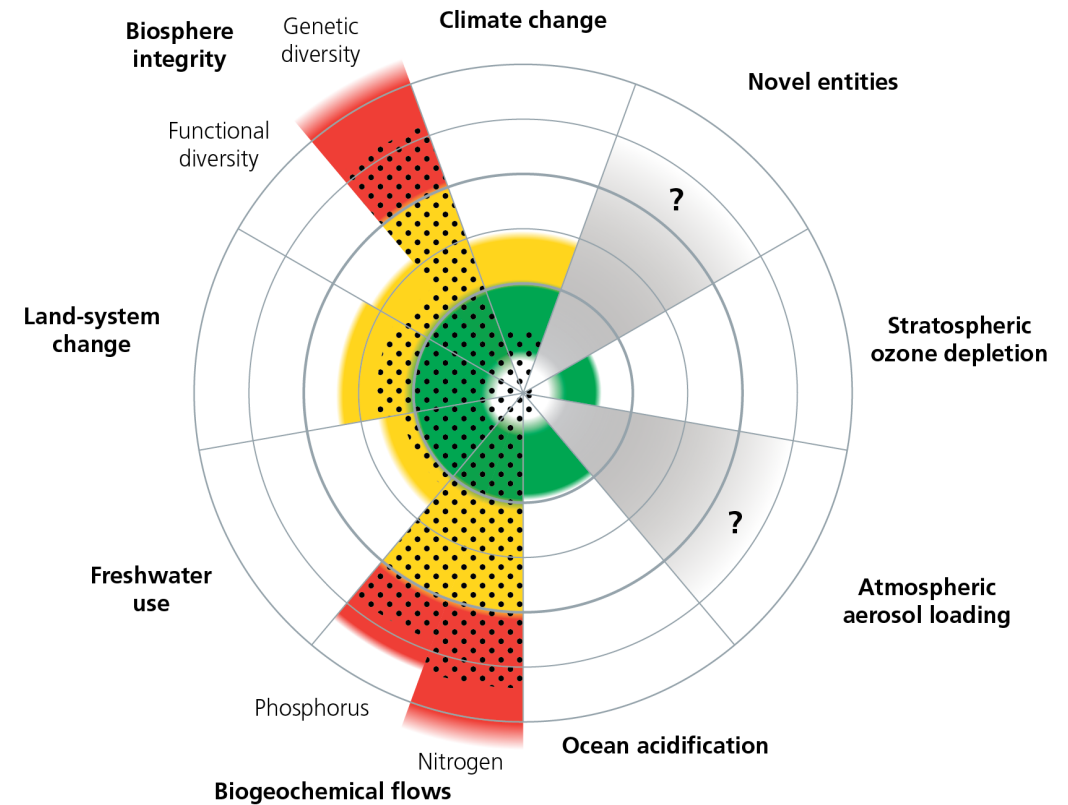
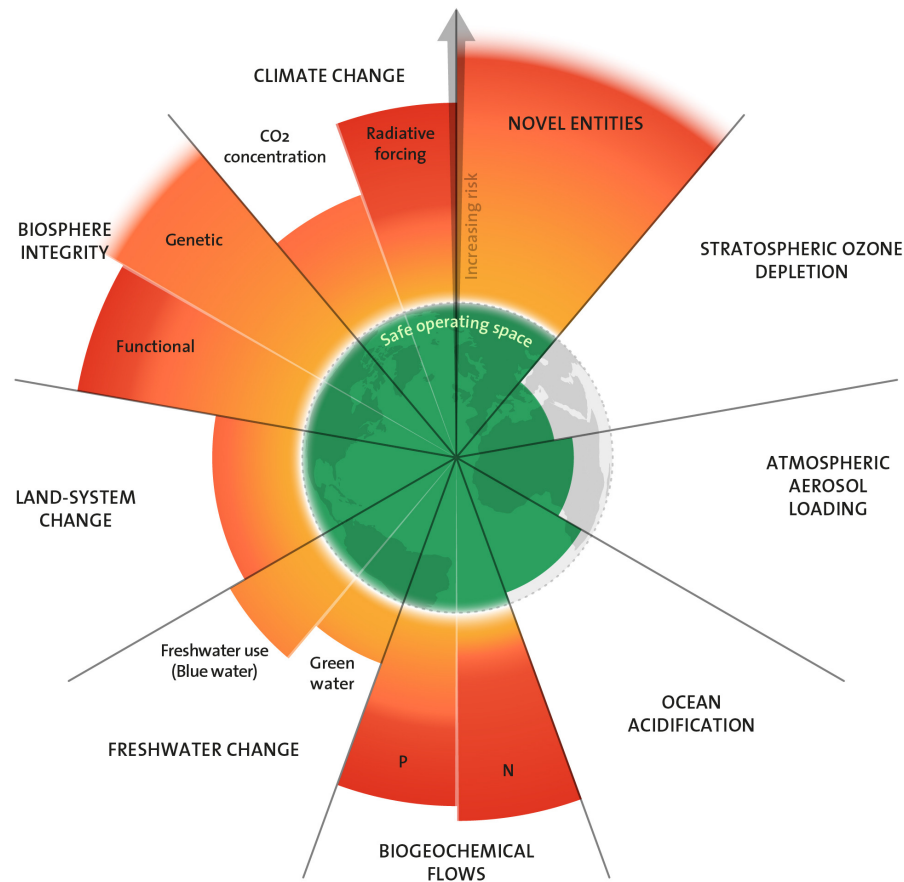
Transforming livestock farming for sustainable development

W. Zollitsch, M. Seiringer, S. Hörtenhuber

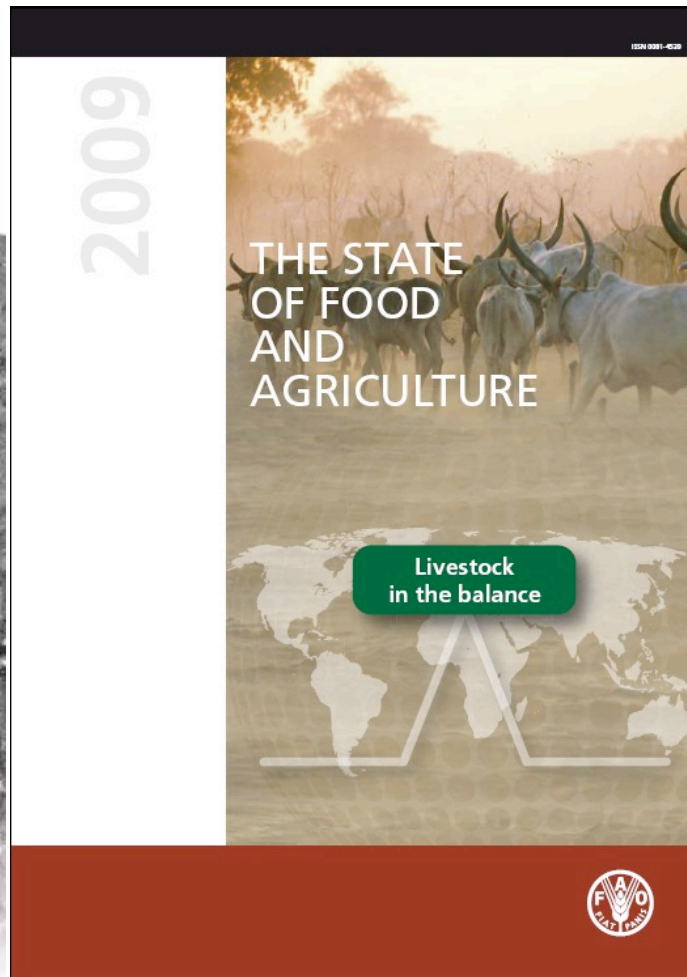
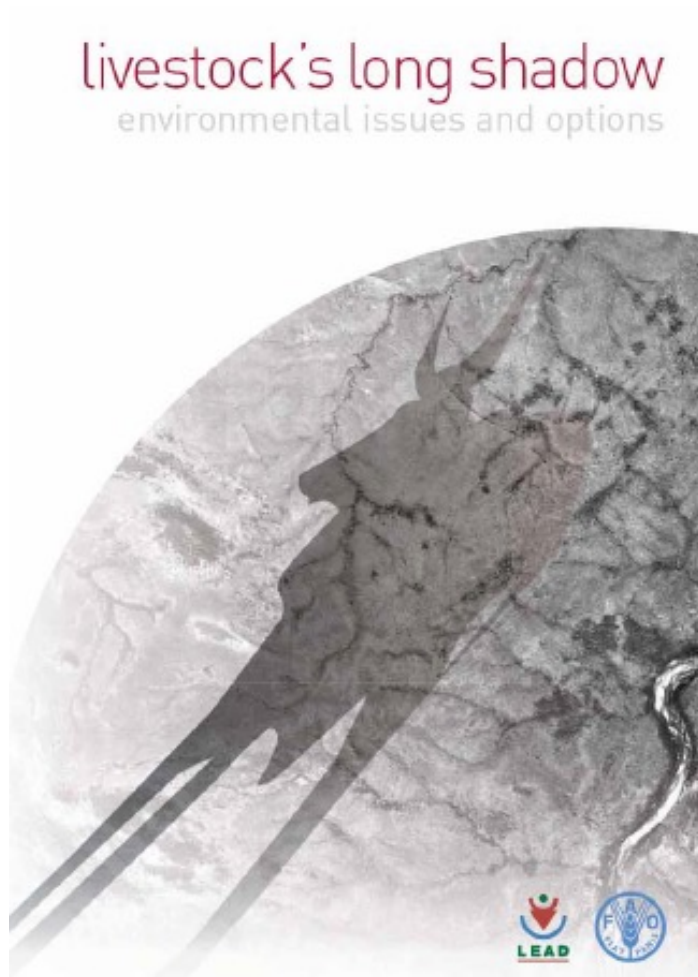


Planetary boundaries & role of agriculture

(SRC 2023, Campbell et al. 2017)

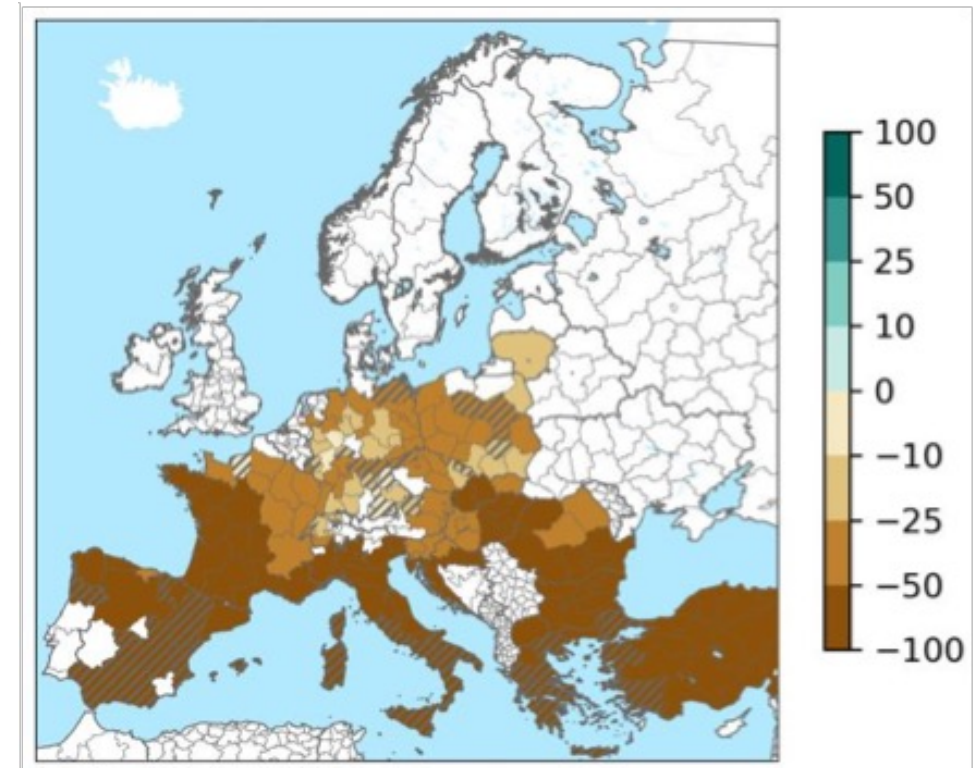
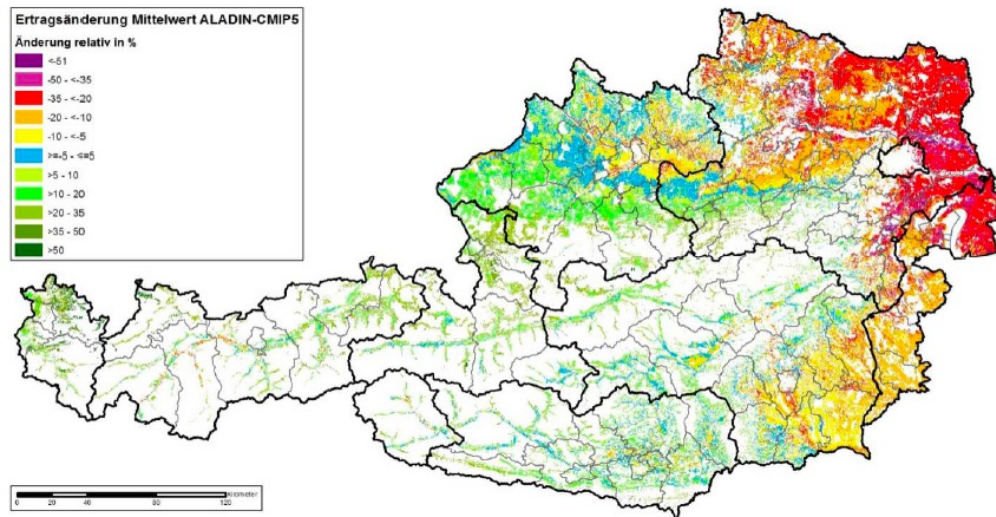


Livestock production: Future-proof?

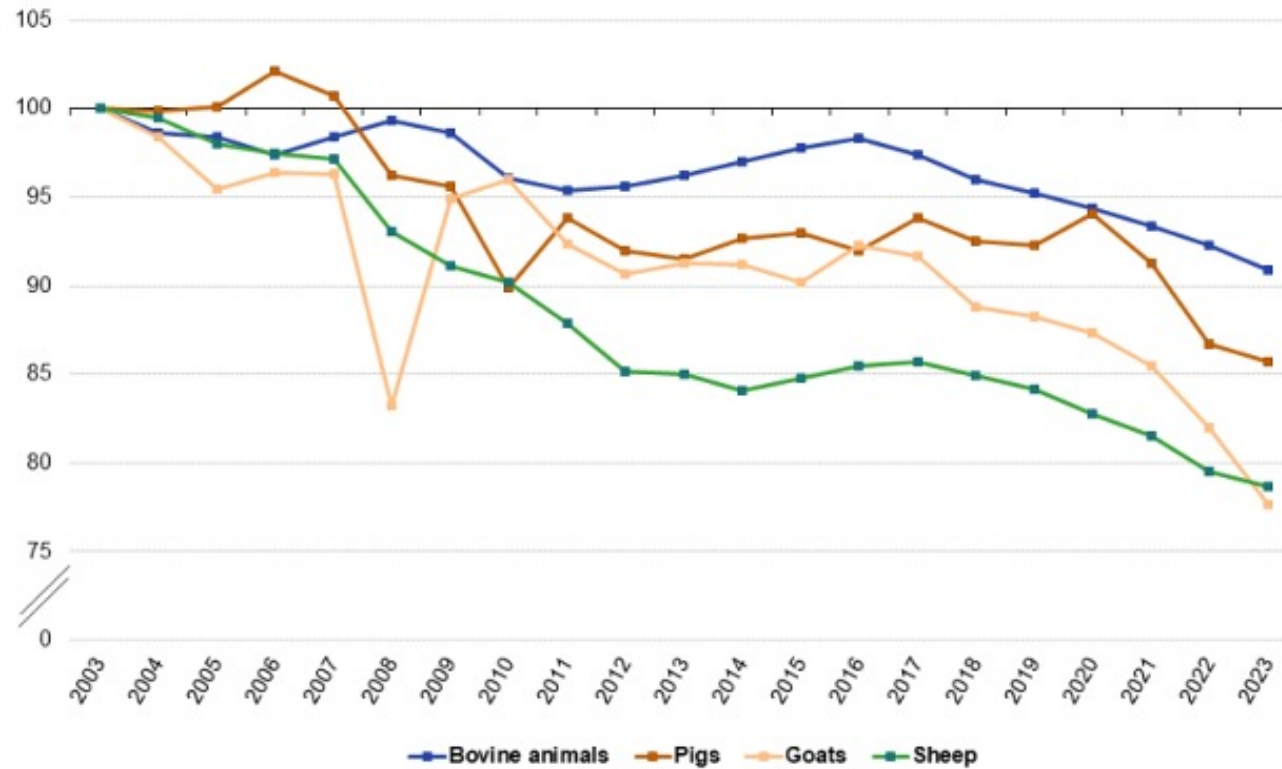


Change in yield (arable land AUT; maize at +2°C)

(Haslmayr et al. 2018; Hristov et al. 2020)



Developments of livestock population EU (eurostat 2024)

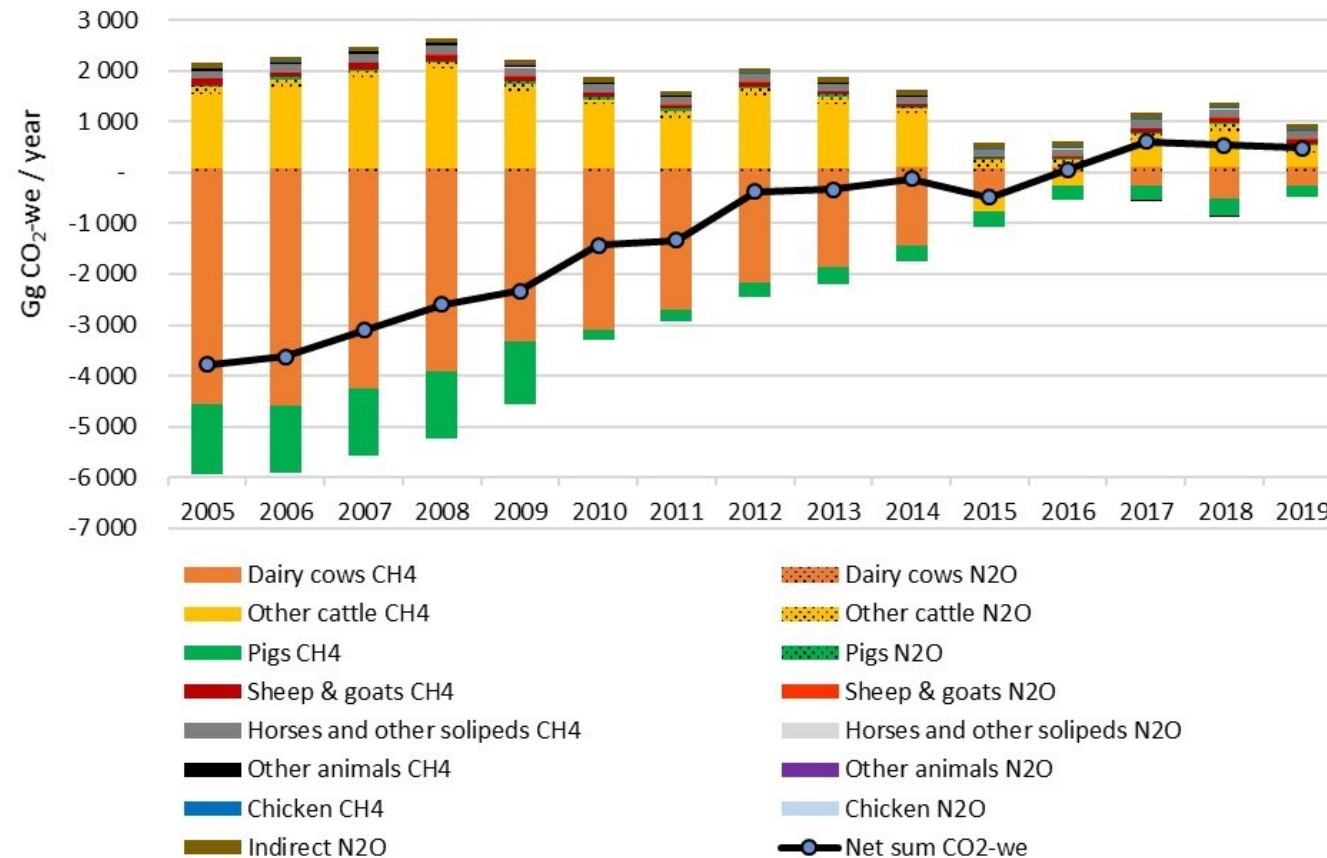


Source: Eurostat (online data code: apro_mt_lscatl, apro_mt_lspig, apro_mt_lssheep and apro_mt_lsgoat)

eurostat

Livestock's contribution to global warming: Case study AUT

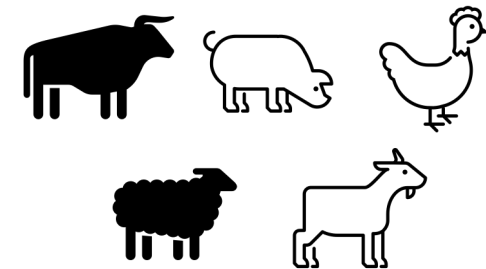
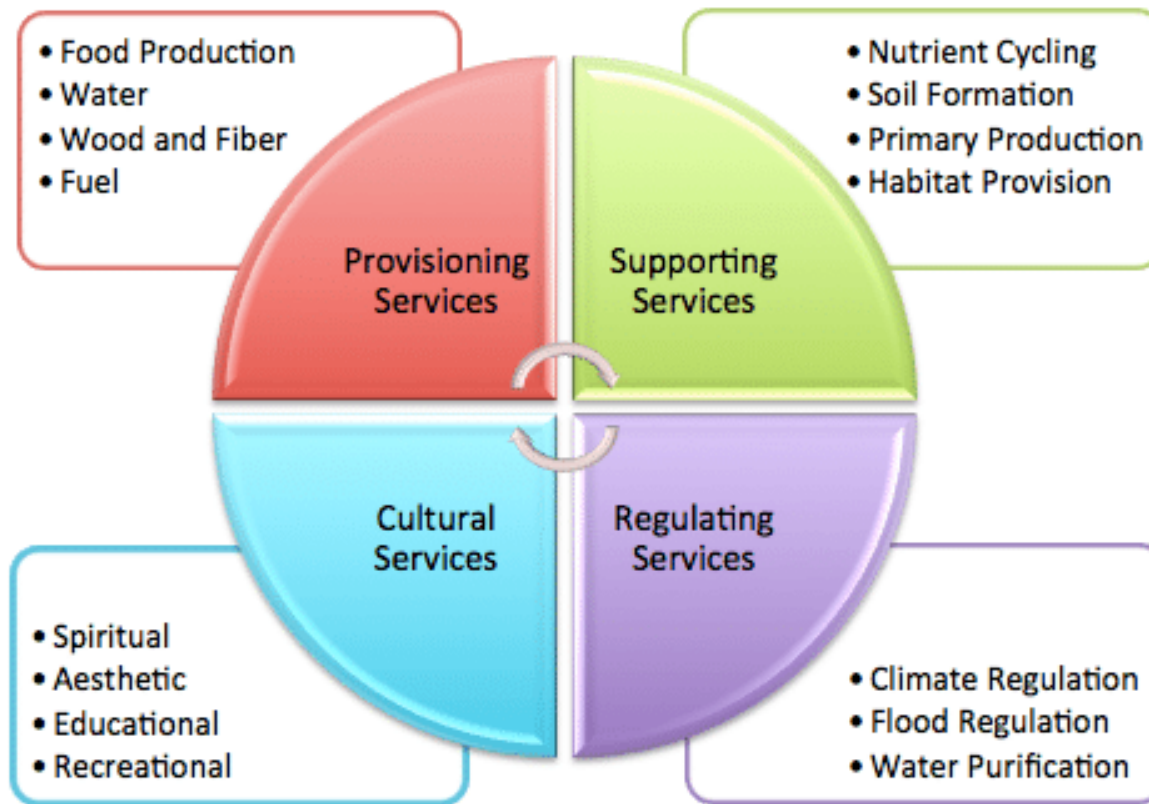
(Hörtenhuber et al. 2022)



Potential mitigation strategies (greenhouse gases)

Strategy	Efficacy			Variability			Practicality		
	low	mod.	high	low	mod.	high	low	mod.	high
Increasing forage quality, pasturage									
Substitution of critical feedstuffs									
Feed additives									
Slurry treatment & management									
Slurry/manure → biogas digester									
Adapting manure system									
Increasing life time performance									
Selecting for feed efficiency									

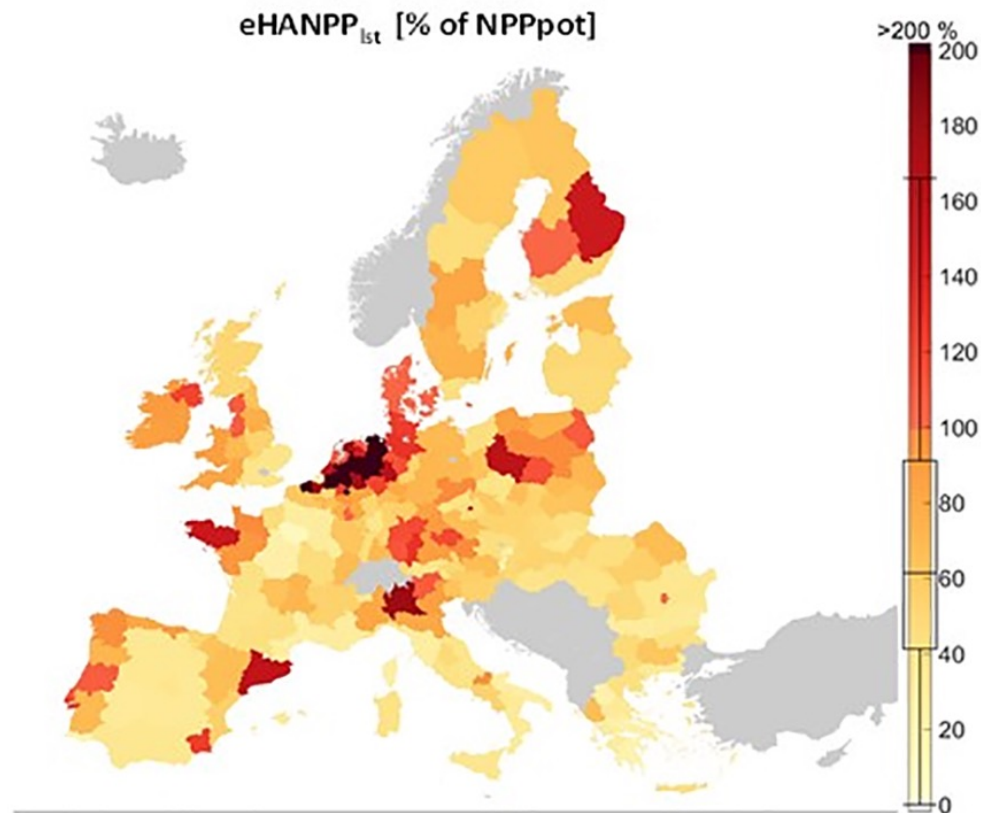
Ecosystem services (Millenium Ecosystem Assessment 2005)



**Threat or
contribution?**

Livestock & the overstressing of ecosystems

(Mayer et al. 2021)



embodied **H**uman **A**ppropriation of **N**et **P**rimarily **P**roduction (livestock)

relative to

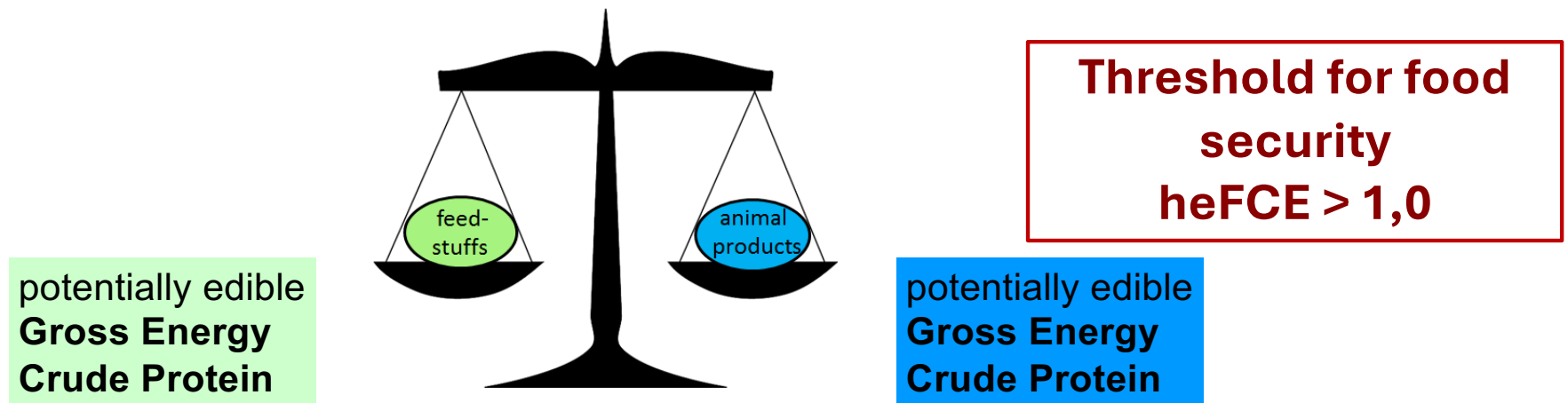
potential **N**et **P**rimarily **P**roduction

- Livestock **over domestic capacity** (1/4 of regions), up to double the potential NPP (hot spots)
- High **pressure** on **domestic ecosystems**
- **Dependence** on **external resources**
- Great **heterogeneity**
- „.... underline the **dominant role of livestock systems** for **alterations in ecosystem flows**“

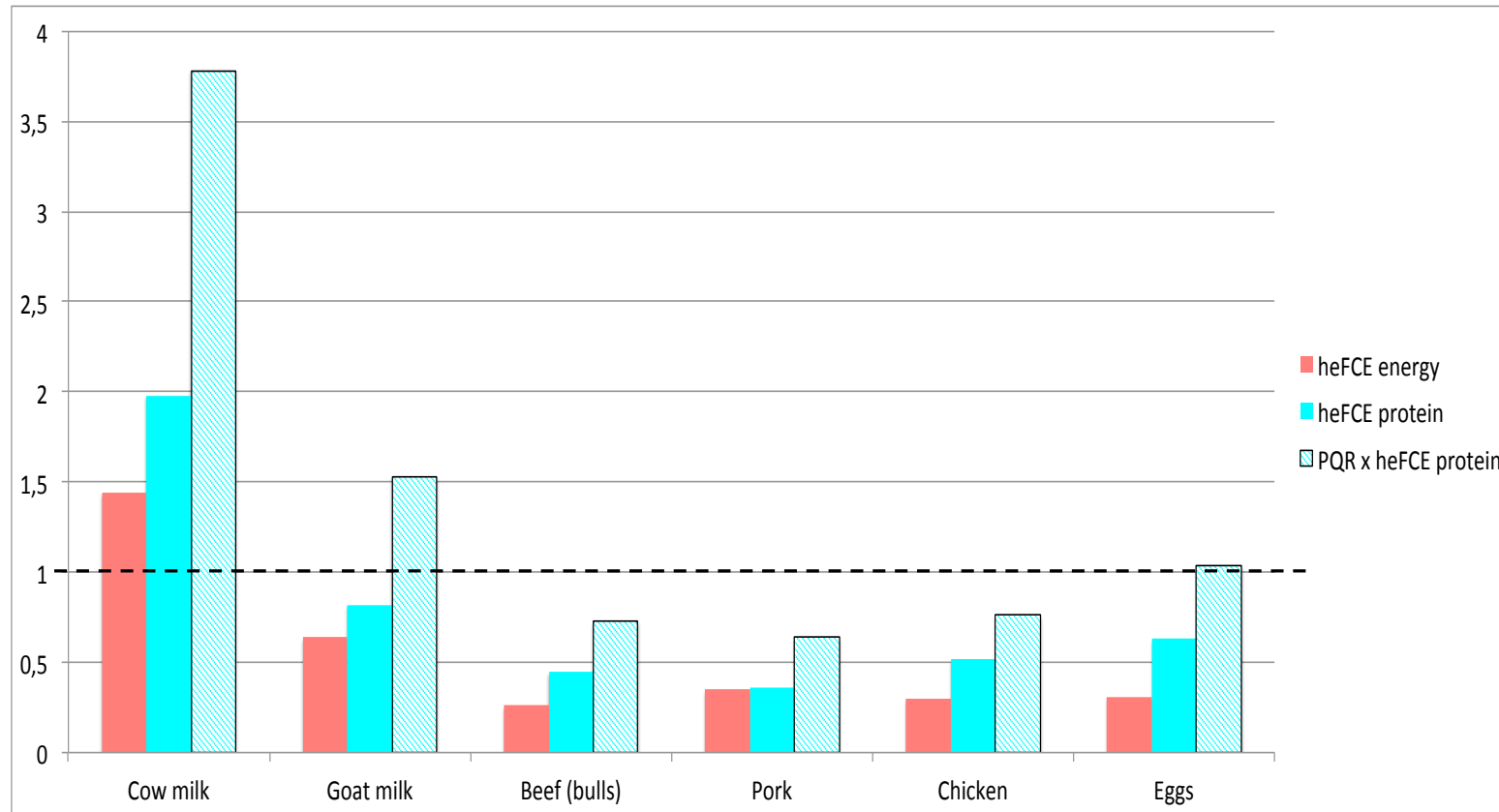
Contributing to or endangering food security?

(Oltjen & Beckett 1986; Wilkinson 2011; Ertl et al. 2015, 2016)

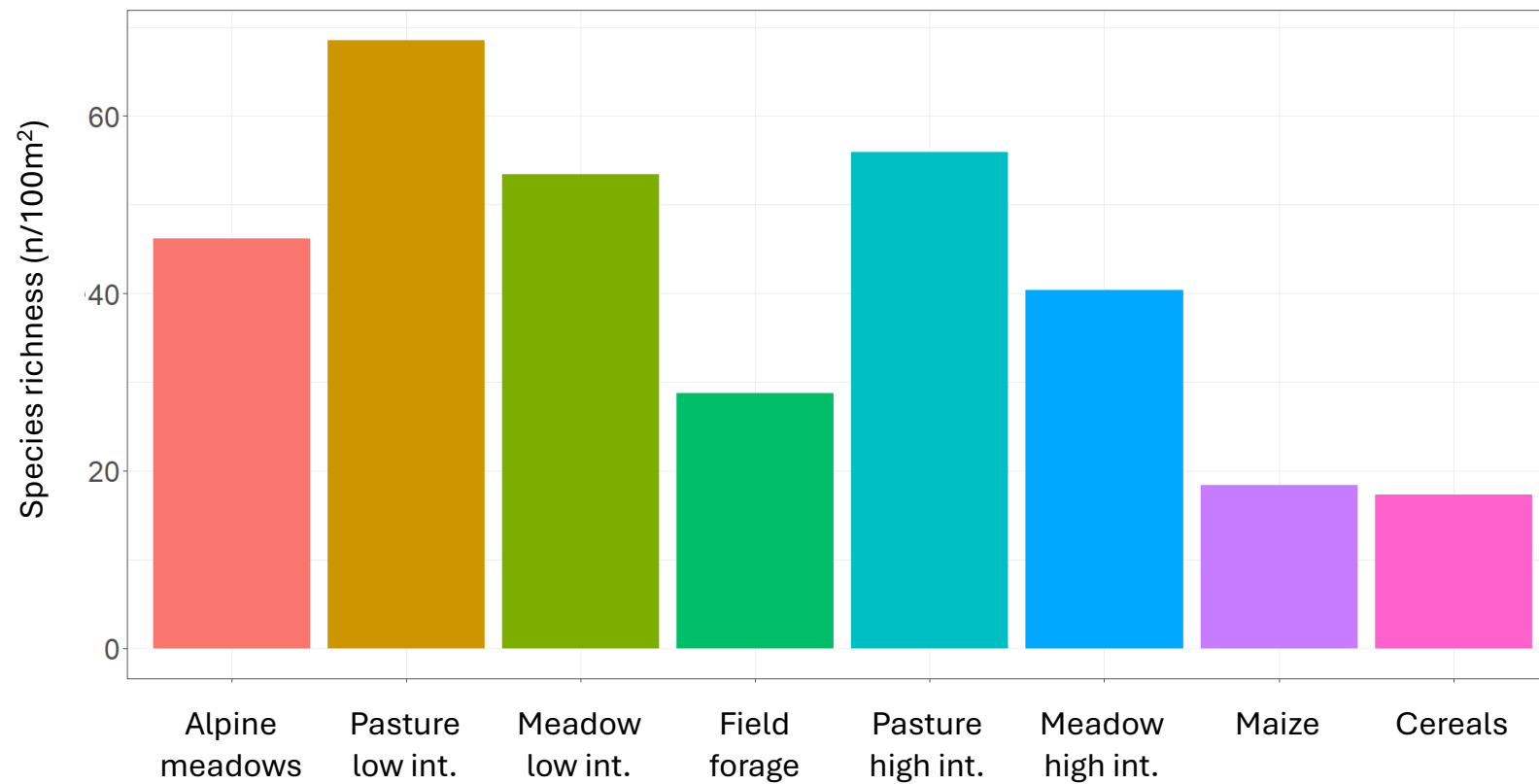
- human edible feed conversion efficiency (heFCE)



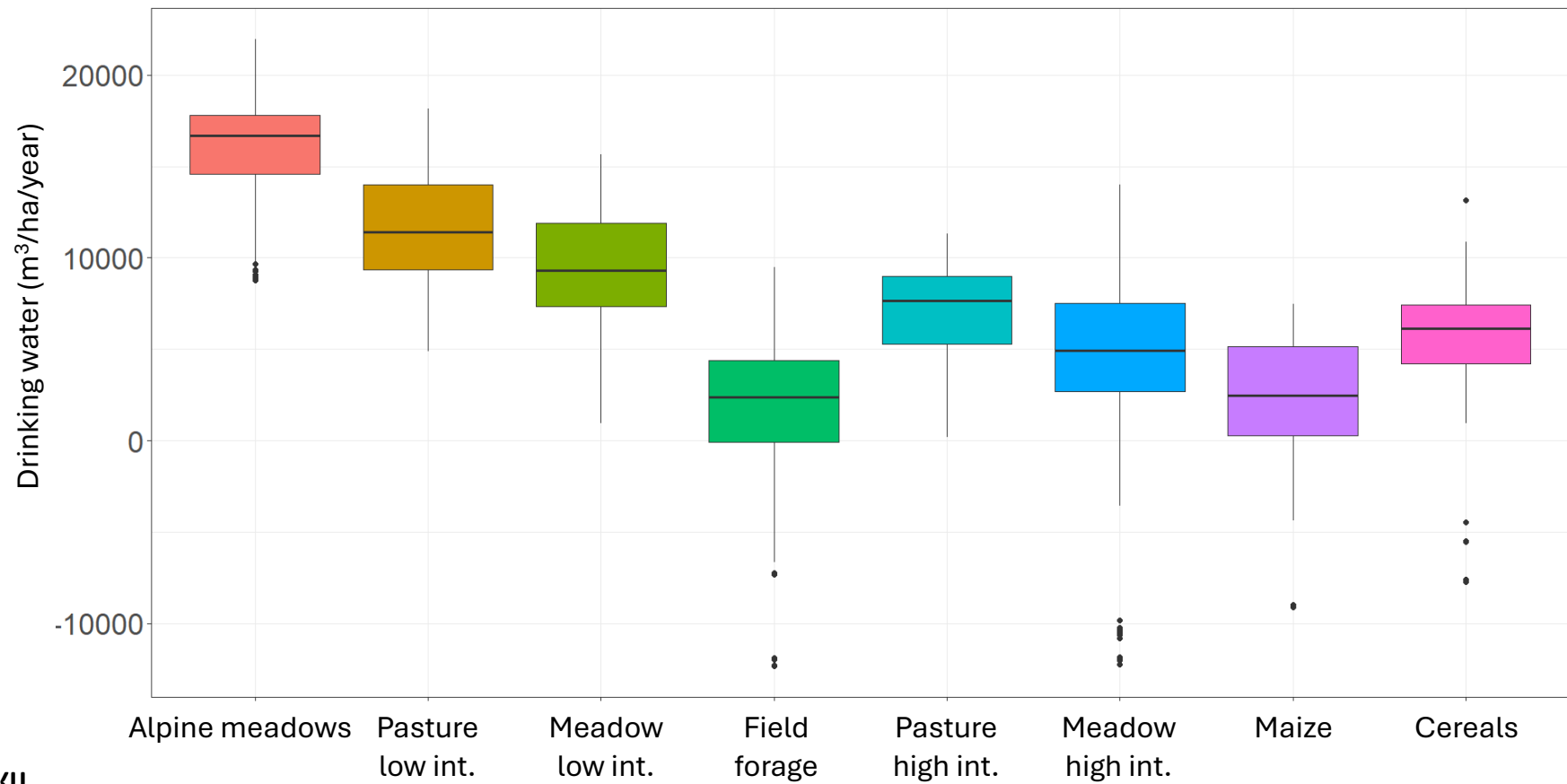
Net food production of Austrian livestock (Ertl et al. 2016)



Biodiversity & agricultural land use (Seiringer 2023)



Provision of drinking water & agricultural land use (Seiringer 2023)



Conclusions (1)

- **Livestock production & climate change:**
 - Reducing livestock numbers had a strong mitigating effect over the last decades.
 - Mitigation options exist within livestock systems: Effectivity, cost-benefit, variability, practicability?
 - Adaptation measures need to aim at the animals' environment and the feed supply chains.
- **Livestock production & ecosystem services:**
 - Provisioning services partially overstressed;
 - Livestock systems with marked differences in net-food supply;
 - Livestock-related land use as key factor for provision of drinking water and state of biodiversity.

Conclusions (2)

- **Supply-side transformation:**

- Further reduction of livestock numbers? To be carefully assessed and planned according to region, production system, resource demand and supply.
- Restocking of stockless farming systems?
- Effective, if paralleled by

- **Demand-side transformation:**

- Otherwise risk for shift of burden.
- Consumption patterns are changing, highly heterogeneous.

- **Need to balance interests of different groups =>**

Socio-ecological transformation

Thank you for your attention!

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