



What is the Safe Operating Space for EU Livestock?

RISE Foundation

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- RISE funded study conducted by Allan Buckwell, Elisabet Nadeu and Annabelle Williams with special help from Erik Mathijs and Natalia Brzezina (KU Leuven), and invaluable comments from our advisory panel:
 - Tim Benton
 - Krijn Poppe
 - and from those attending our workshop in March 2018
- Henk Westhoek
- Alberto Bernués
- Context: positive & negative contributions of livestock
- Is there a Safe Operating Space for livestock?
- Policies and recommendations to move into the SOS

Context

- **Significant milestones in the literature:**
 - FAO's Livestock's Long Shadow 2006
 - Planetary Boundaries (Rockström 2009, Steffen 2015)
 - N, P: European Nitrogen Assessment (Sutton 2011), Nitrogen on the Table (Westhoek 2015), RISE Nutrient report (2016)
- The **tone is overwhelmingly critical**; substantial adjustments suggested; understandable reaction from the sizable livestock ag & food sector
- Our central idea is **the need to rebalance livestock** in the EU:
 - For millenia crop & animal agriculture were balanced, low pressure
 - For 150 years: Popn. & Econ growth + technical change ⇒ imbalance
 - All expectations are the imbalance will grow – this is unsustainable
 - Where does the balance lie? How can we move there?
- Can we find a framework to engage constructive debate and action?

Benefits and negative impacts of livestock

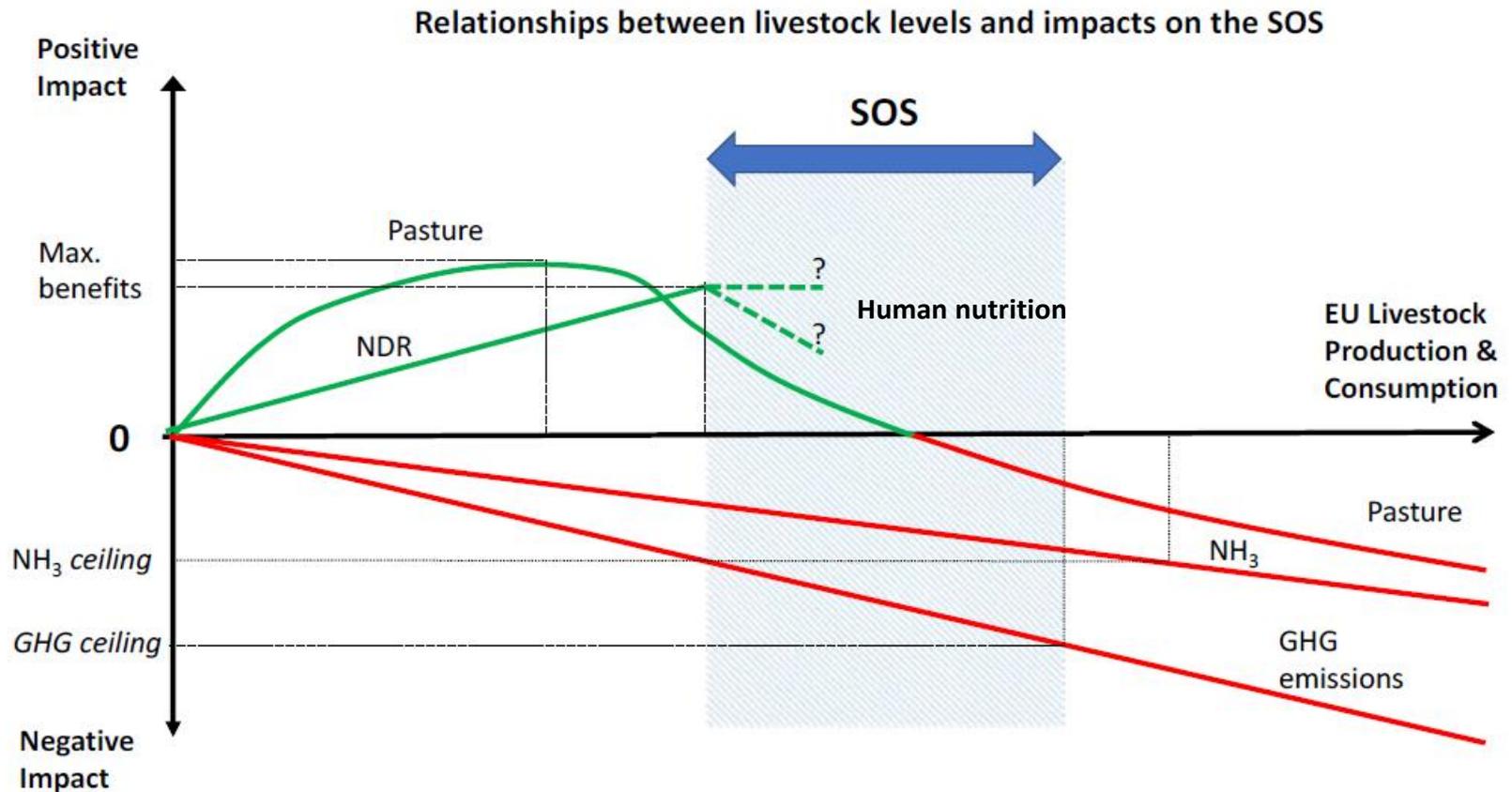
	Benefit	Negative
1 Human nutrition and health	Hi quality nutrients	Overconsumption
2 Utilisation of pastures & by-products	Cultural landscape	Over-grazing
3 Culture and livelihoods	We enjoy it! Provides jobs	
4 Climate harm		GHG emissions
5 Nutrient cycles	Manure Agro-Eco	Water & air pollution
6 Biodiversity	HNV systems	Simplification & specialisation
7 Land use and soil degradation		Pressure for feed
8 AMR and Zoonoses		Dangers for human health
9 Animal welfare	Looking after animals	Treatment, housing, transport

A safe operating space for EU livestock

- De Vries (2013) suggests a SOS is a balance between
 - Human needs and adverse impacts
 - A social floor and an environmental ceiling
- For EU livestock: two steps to define the SOS:
 - **Select variables** indicating benefits of livestock & their negative impacts treated independently
 - Determine an **objective boundary condition** for each variable
- Use data on the **benefit variables to quantify the lower bound**, of livestock to provide the health, cultural and social needs
- Use data on the **negative variables to quantify the upper bound**, with regard to environment, health & animal welfare.
- We try to do this at EU or Member State level initially to explore the idea, then consider interactions

A SOS for livestock

Illustrated by considering two benefits (nutrition & pasture) and two negatives (GHG and Ammonia)



Quantifying the SOS boundaries

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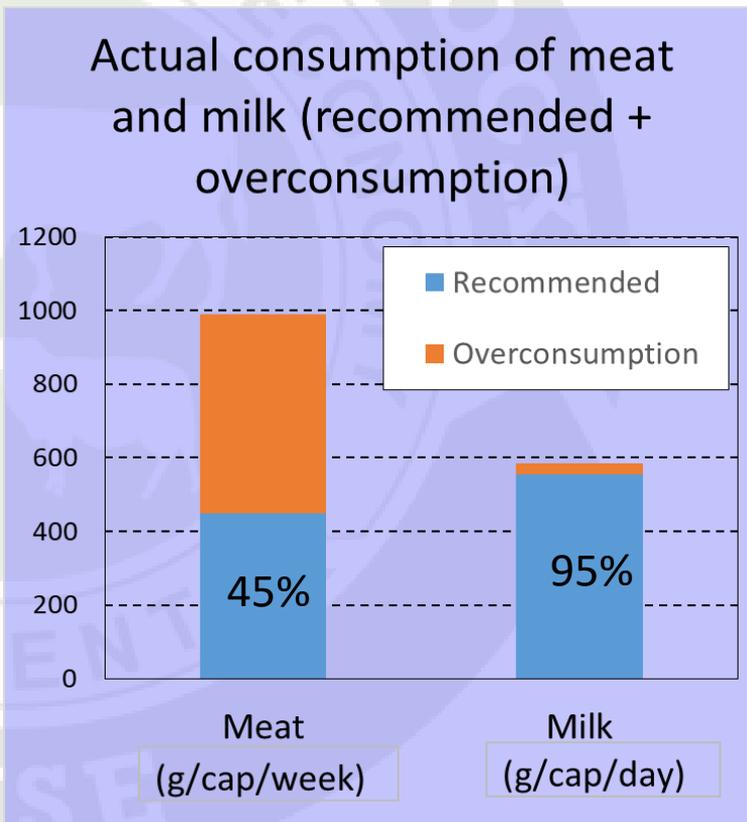
Benefit or negative impact of livestock	Boundary definition	Current values
Human nutrition & health	The recommended diet	Current consumption
Utilisation of pastures	Minimal number of ruminants needed to graze permanent pastures (preserv. habitats) at sustainable stocking rates	Current number of ruminant livestock
Climate harm	Achievement of the Paris agreement emission reduction targets.	Direct GHG emissions from livestock
Nutrient cycles	Downscaled planetary boundary	Total N fixation (biological + fertiliser)

Lower boundary for nutrition

Boundary

Group of animal products	Recommendations averaged for EU-28
Meat	450 g per week
Milk and milk products	555 g per day
Eggs	3 eggs per week

Actual vs. boundary EU-28

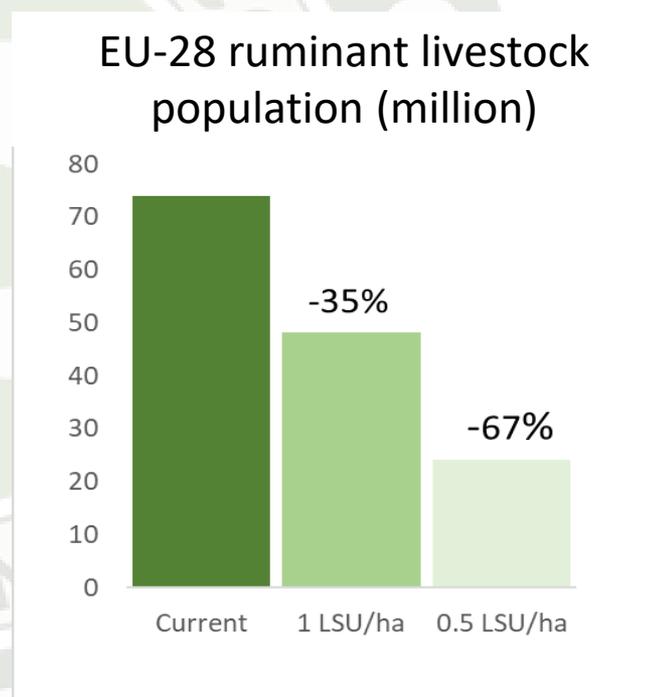


Pasture utilisation

Boundary

Actual vs. boundary EU-28

Scenario	Million LSU
Current	74
1 LSU/ha	49
0,5 LSU/ha	24



Climate protection

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Boundary

GHG reduction targets
(Paris Climate Agreement)

2030 → -40 %

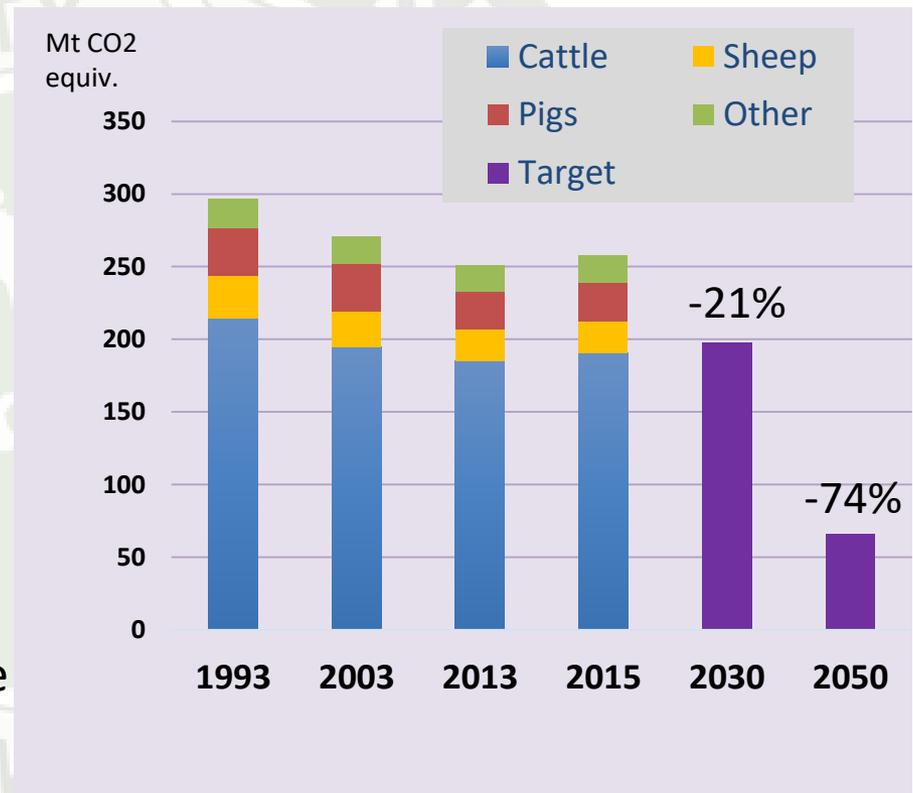
2040 → -60%

2050 → -80%

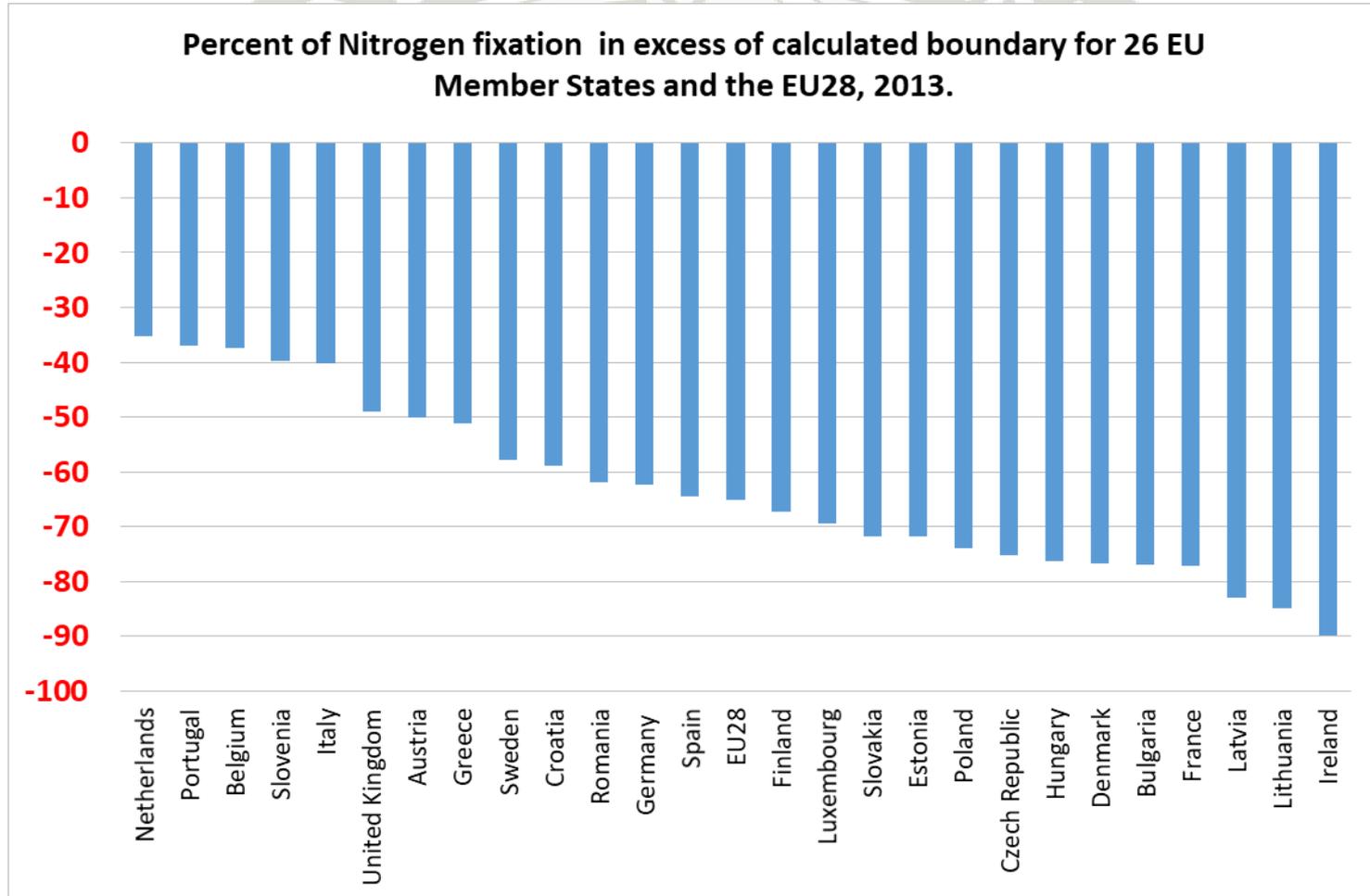
Direct, enteric fermentation &
manure management

Indirect emissions not included here

Actual vs. Boundary EU-28



Percentage of nitrogen in excess of calculated boundary for EU28 & 26 Member States, 2013



Lessons on the idea of SOS

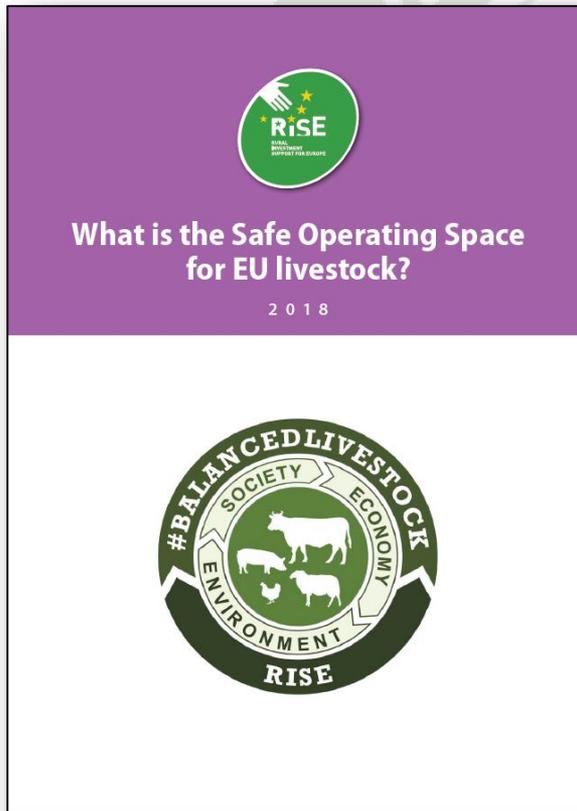
1. The appropriate scale and spatial resolution for SOS boundaries is tricky: more work on biodiversity, soils, AMR and animal welfare
 2. Note: strictly, none of the positive contributions are absolutes. The lower boundaries reflect long-standing cultural preferences.
- Key conclusions from our results:
 - EU livestock production & consumption are not in a SOS
 - Consumption & production are much greater than the lower SOS boundaries for diets & pasture utilisation
 - There are large exceedances for upper boundaries of GHG & nutrient flows, on average in the EU-28 reductions up to 60%
 - Lower boundaries may imply greater production than allowed to comply with upper boundaries. This implies uncomfortable choices for society. Upper environmental limits should take precedence over the cultural lower boundaries?

Adjustment on two fronts

1. **Reduce negative impacts of livestock production**
 - Resource efficiency: feed, water, animal health and welfare
 - Manure management, processing and reuse
 - Reducing density and concentration of livestock
 - Large scope for innovation in: breeding, nutrition, housing, pollution, waste capture & reuse
2. **Shift and reduce consumption of livestock products**
 - Changing the species balance of consumption
 - Substituting new protein sources: insect, algal, cultured
 - Changing diets to less protein and plant based protein

**The indications are that route 1 alone is not sufficient.
Acting on current consumption is unavoidable.**

Thank you!



A digital copy of the report is available from:

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