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Pathways FOR SUSTAINABLE FOOD




Landscape based metrics to assess livestock carrying capacities associated with selected planetary boundaries

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   - What is the debate?
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3. A conceptual framework to assess livestock‘s impact on planetary boundaries
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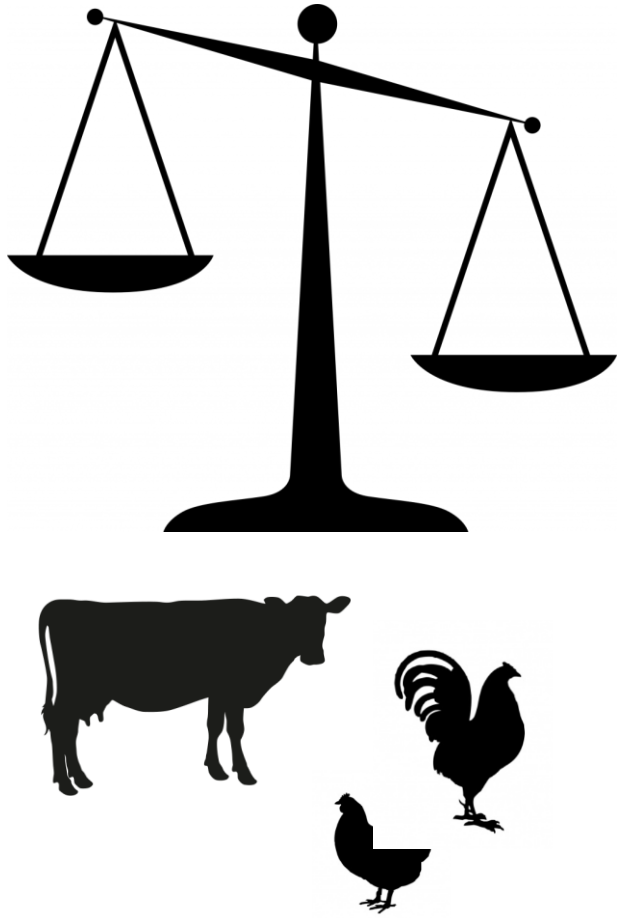
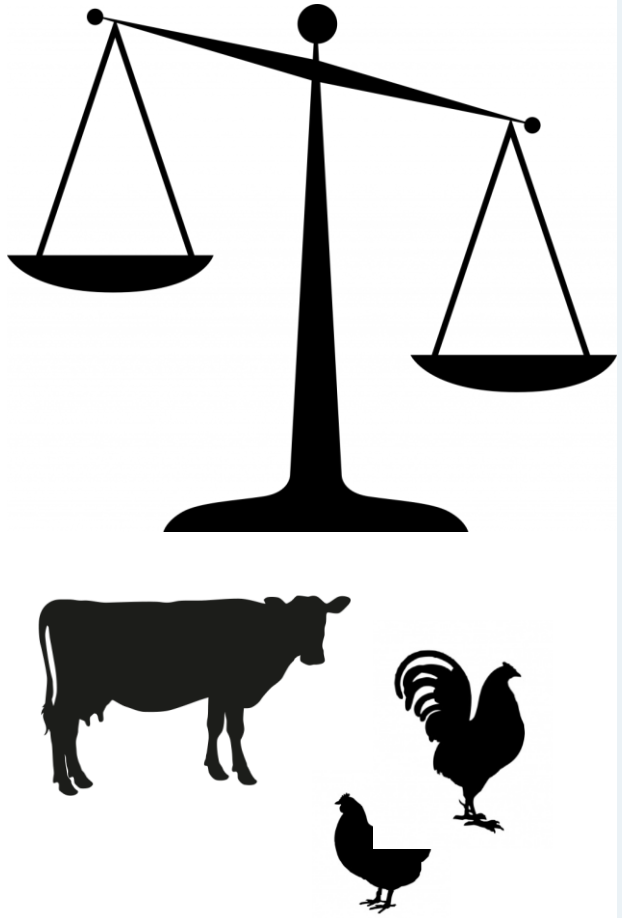
Livestock, a good or a bad?



Livestock, a good or a bad?

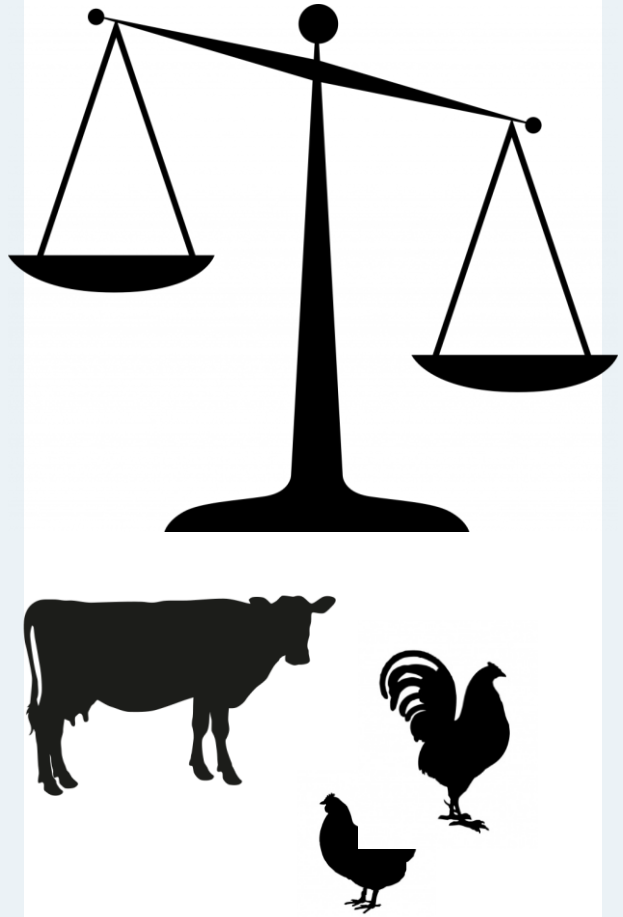


- Is a major threat to the environment
  - 10% EU GHG emissions
    (with current accounting methods)
- Consumed in large quantities contributes unhealthy diet
- Driver of land use change (planted fodder)

Livestock, a good or a bad?

In Europe

- Represents 40% of agricultural activity and 170 billion euro
- Employs 4 million people
- Is central to a healthy diet
- Managing grassland
- Helps close cycles (reduced fertilizer, increased carbon sequestration)



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How to make livestock more sustainable?

Two narratives shaping the livestock discourse

Sustainable intensification ⇔ Agroecology

How to make livestock more sustainable?

Sustainable intensification

- more efficient animals

$$\frac{ressources}{kg\ animal\ source\ food} \downarrow$$

Efficiency - relative performance

Assessement through Life Cycle Analysis (LCA)

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How to make livestock more sustainable?

Agroecology

- Integrate livestock in ecosystem processes (Dumont, 2012) in food system (van Zanten, 2019)
- Sufficency - Absolute performance
- Can be linked to planetary boundaries

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No metrics why?

Levels of organisation relevant for livestock science

Examples of assessment methods

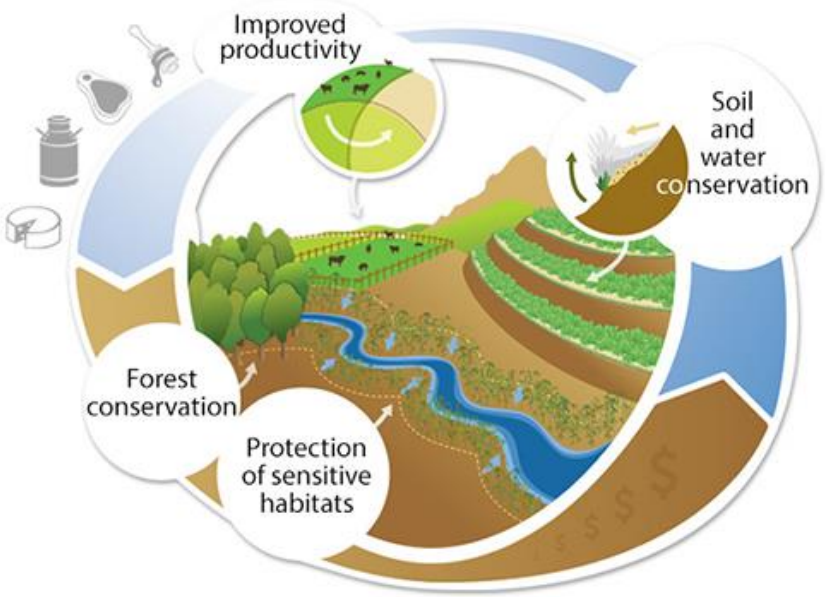
Mass flow model (SOLm or CIFOS)

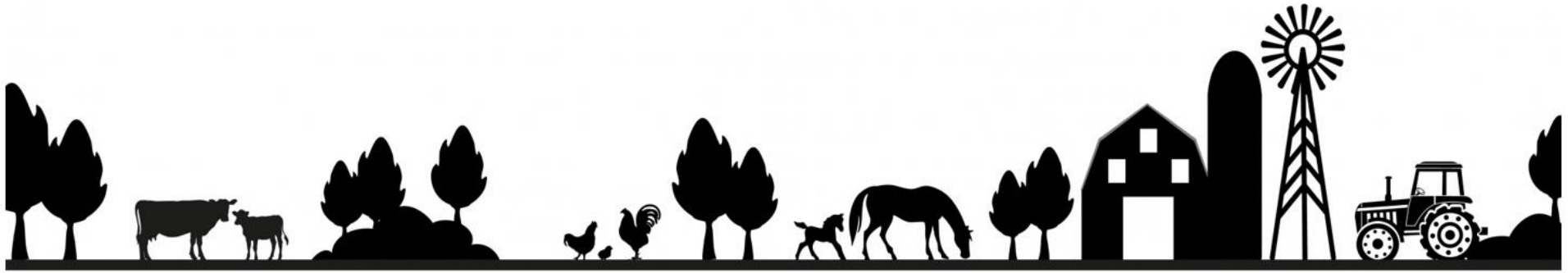
Life Cycle Assessment LCA

Landscape: Why look beyond the farm?

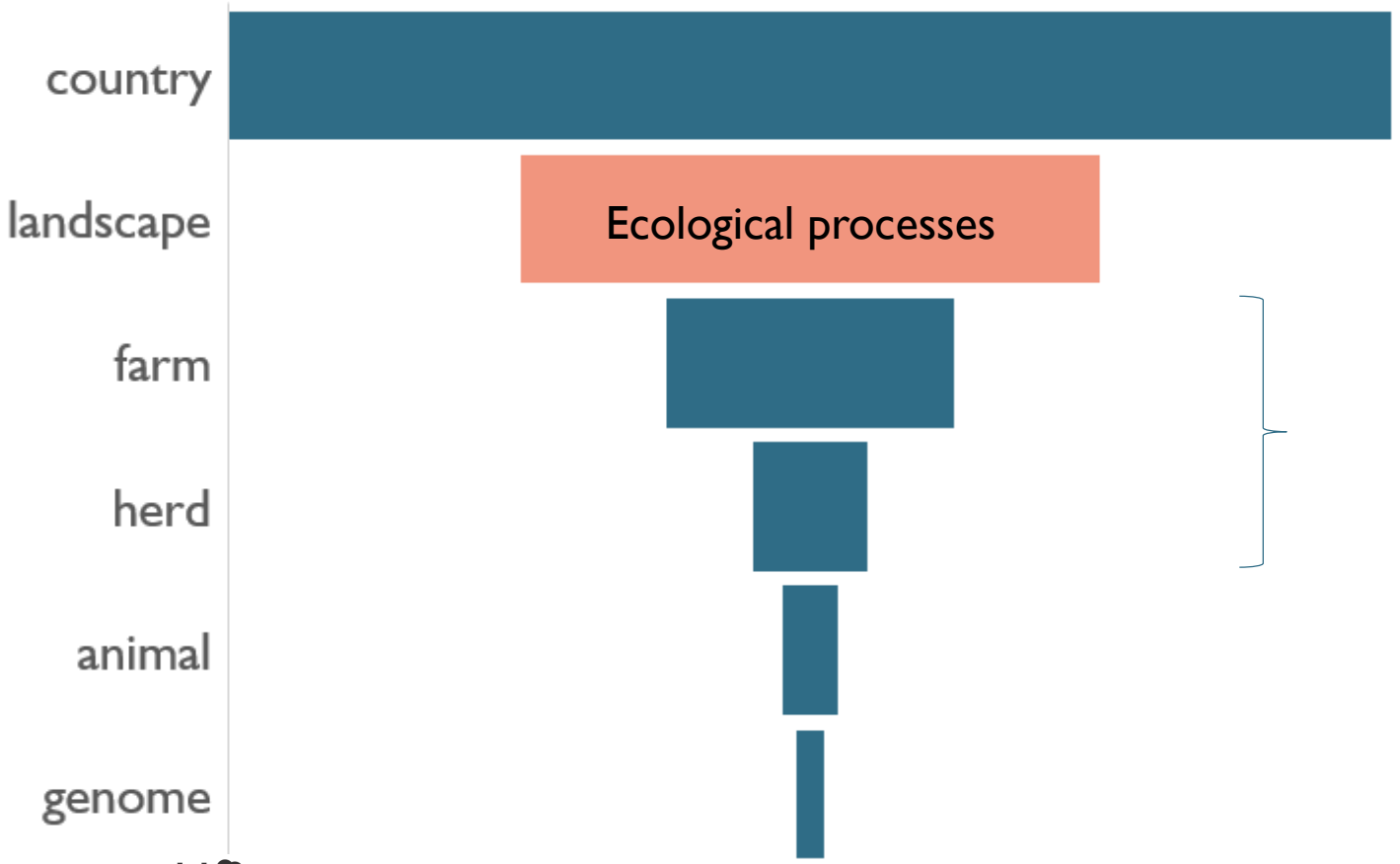
- Ecological processes are generally not bound to the farm
- Account for spatial heterogenity
- Account for possible interations of farmers (feed and fodder, manure transfers)

=> Circularity and linkage to planetary boundaries





Levels of organisation relevant for livestock science



Examples of assessement methods

Mass flow model (SOLm or CIFOS)

=> to be developed (GeoSOL)

Life Cycle Assessment LCA

GeoSOL principle

SOL-m

Bottom-up mass-flow model
Model inputs and outputs, (all physical flows) related to individual agricultural activities
based FAO STAT

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Bottom-up mass-flow model

Model inputs and outputs, (all physical flows) related to individual agricultural activities
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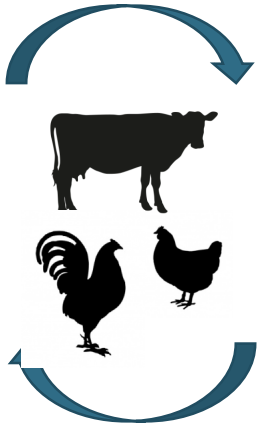
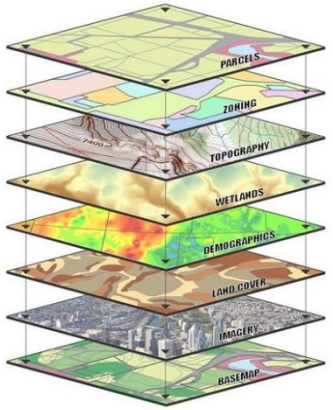
Spatial allocation





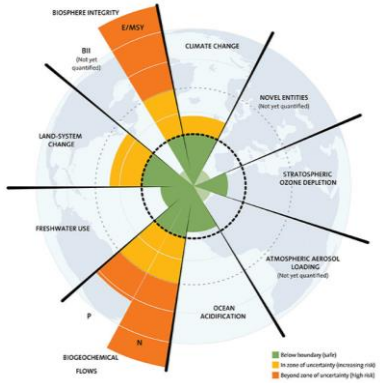
Open access GIS layers

Spatially explicit modeling

interactions; livestock - ecosystem processes

- Nitrogen
- Phosphorous
- Water
- (Carbon)
- (Biodiversity)

GeoSOL principle



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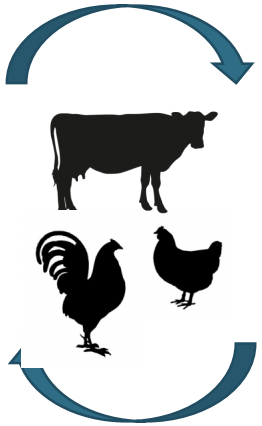

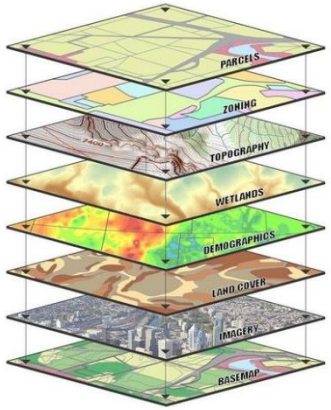

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Assessing planetary boundaries locally

Linkage with carrying capacity aggregated to landscapes

- Soil nutrient balance
- Agricultural water balance

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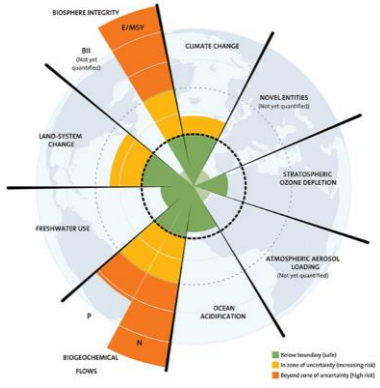

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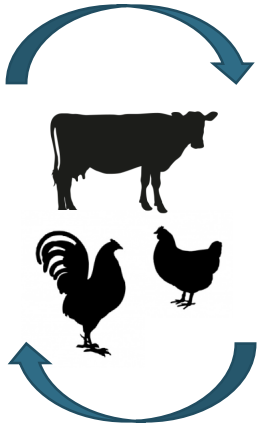

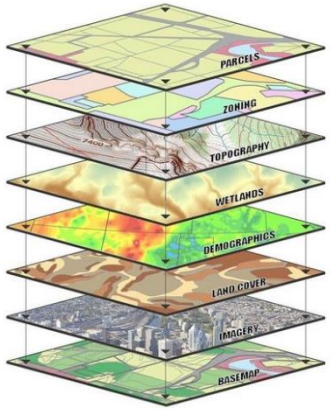

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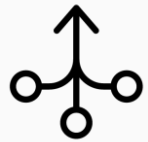
Linkage to ecosytem services?



Assessing planetary boundaries locally

Linkage with carrying capacity aggregated to landscapes

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What we plan to achieve ?

- Assess the role of livestock for circularity
- Provide local carrying capacity related metrics for livestock
- Understand how mixed farming supports livestock production within planetary boundaries

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