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Livestock is essential for sustainable agri-food systems

Jean-Louis Peyraud

Deputy scientific director of Agriculture

INRA SCIENCE & IMPACT

@AnimalTaskFrc @PeyraudJean

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Part 1:
A world without livestock is a nonsense

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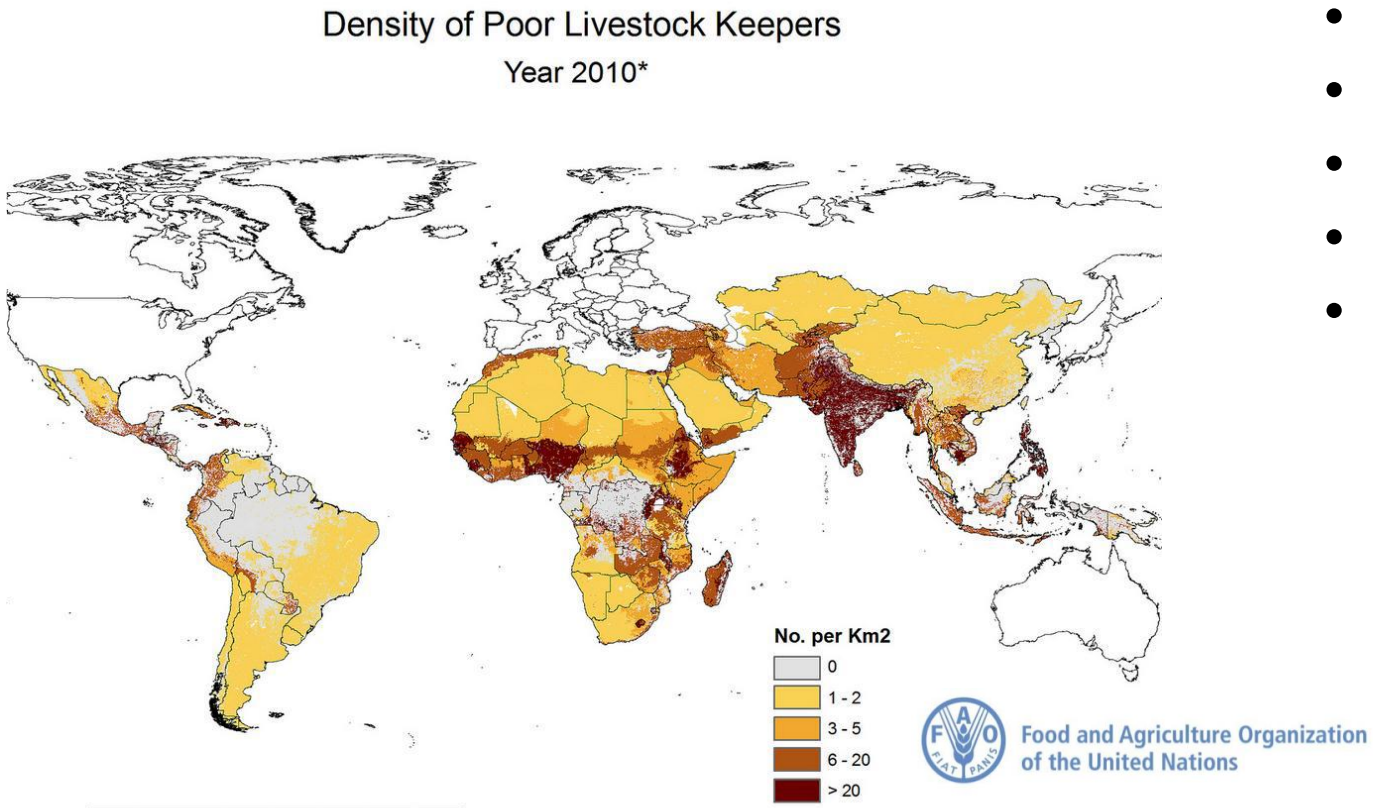
A humanitarian, economic and agronomic nonsense

- **Livestock provides livelihood to more than 800 million poor people**



- **In smallholders family farming systems, livestock enhances food security**
  - **Nutritious food**
  - **organic fertilizer for crops & soils**
  - **workforce and transport (lack of roads)**
  - **source of regular income and savings**
  - **gender equity**

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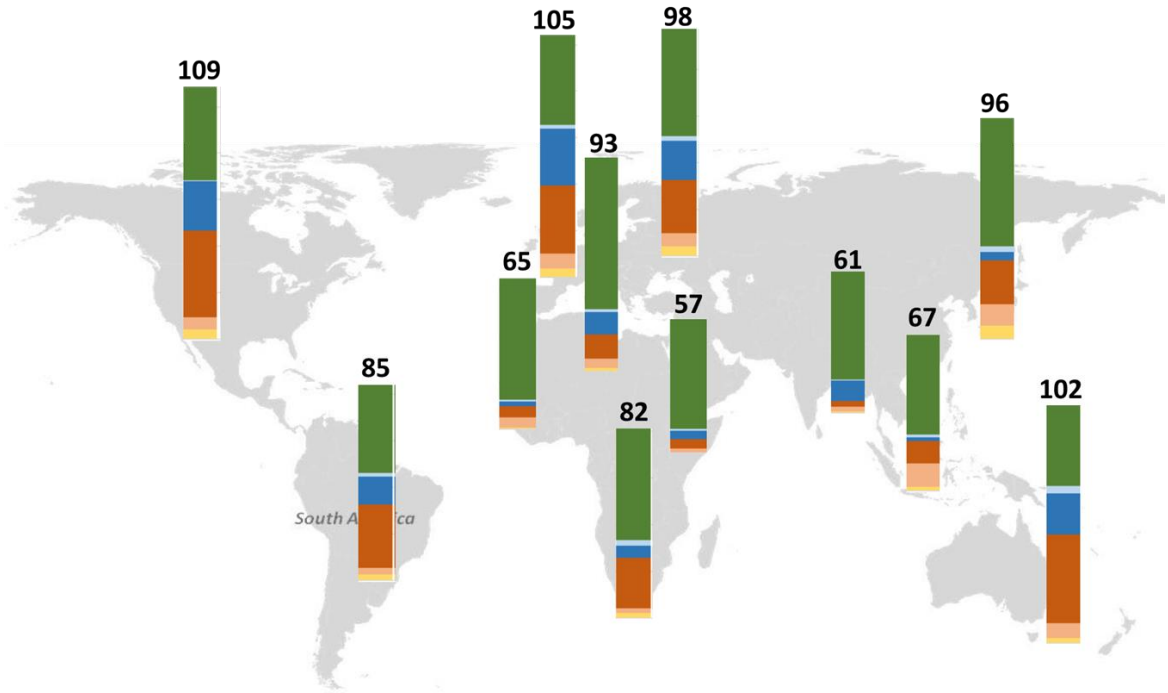
A nonsense for global food and nutrition security

- **A lack of protein of animal origin cause anemia and stunting in some parts of the world**

Food and Agriculture Organization of the United Nations



- **Food from marginal lands? Ruminants can do!!!**
  - **In Europe, permanent grasslands and rangelands cover 73 M ha (40% Eu AA)**


  - **360 M cattle and 600 M small ruminants provide 25% of world animal product from marginal land**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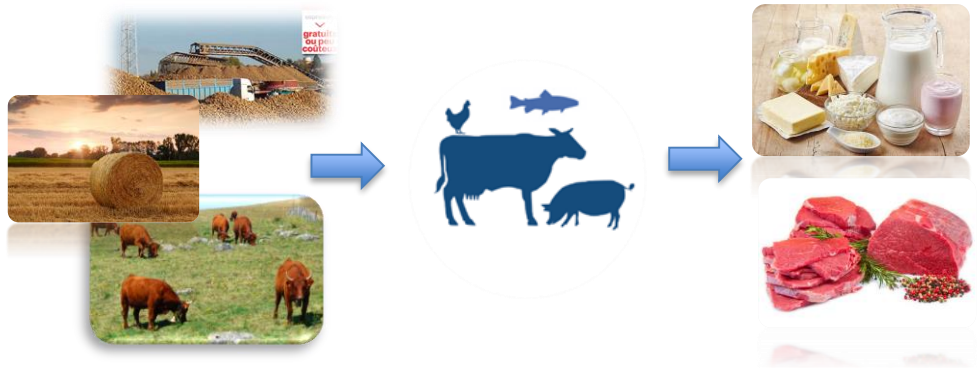
Livestock farming for a more efficient agriculture

We would feed more people without livestock: it's wrong!

- **Complementarity between livestock and crops to maximize food production**
  - **Valorisation of co-products**
  - **Valorisation of uncultivated land**



Non edible biomass **20 g protein/hab/day**

(Adapted from Van Kernebeck et al., 2014 et De Boeer et al., 2018)

- **More land is needed to feed a vegan population than a population eating 20 g of protein of animal origin per day (1/3 of the current supply of animal protein)**

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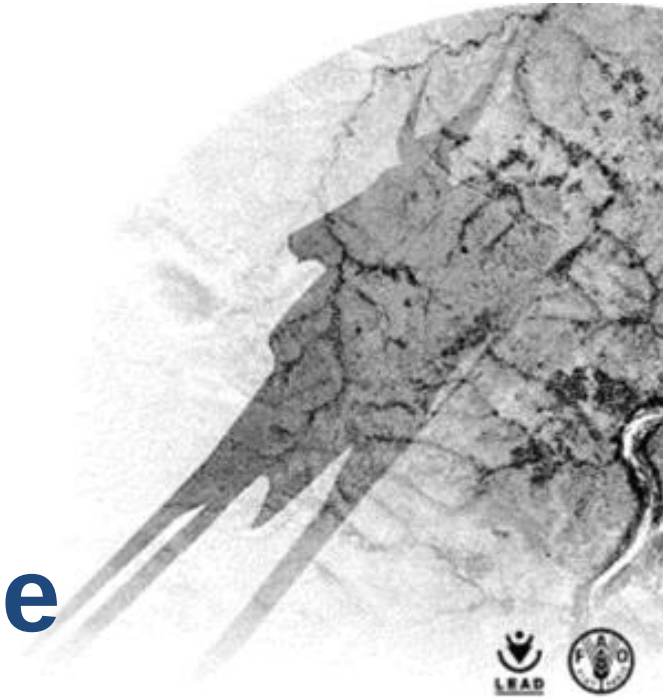

Part 2:
Shadows and benefits of livestock: beyond false assumptions, towards a more balanced vision

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Livestock between Food and Feed!

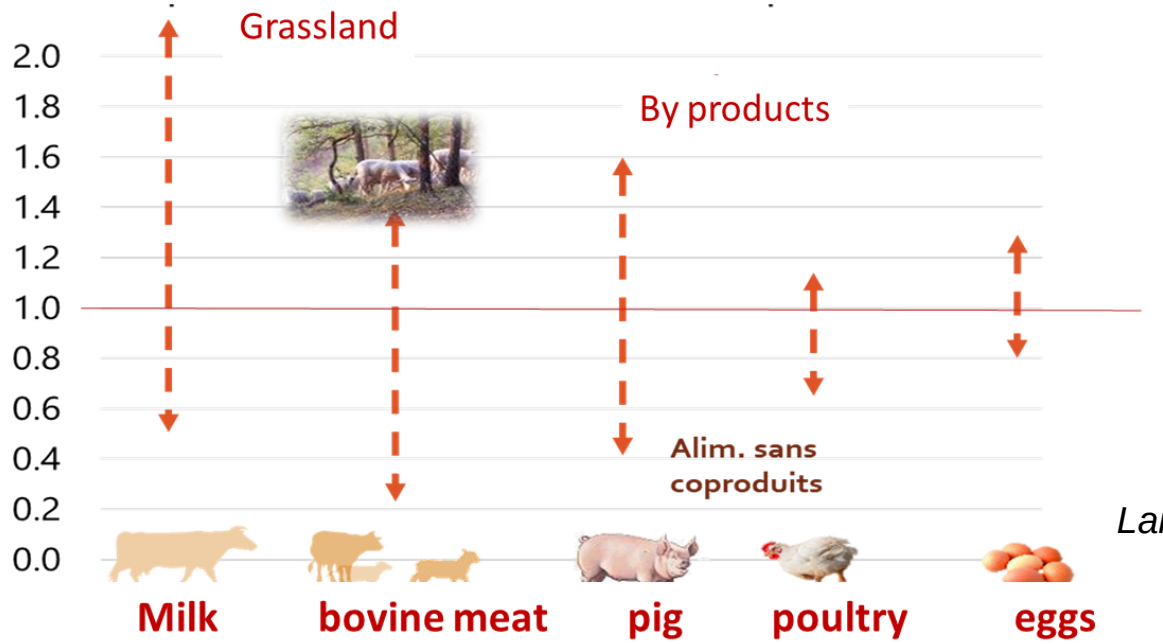
"10 kg of plant proteins to produce 1 kg of animal proteins!"

- **Livestock consume 6 Billion tons dry matter, of which 86% are non edible as human food**

Mottet et al., 2018

- **Feed vs food competition does in fact concern those proteins of plant origin that are consumable by human consumable by human but are actually consumed by animals.**

Kg of protein of animal origin per kg of edible plant protein used as feed



Laisse et al., 2018

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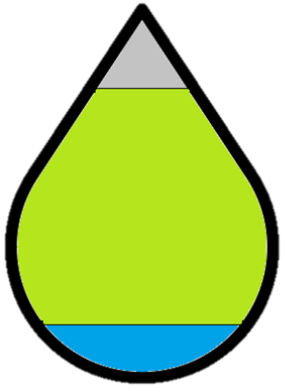
Water consumption by livestock

« 15 000 L of water per one kg of meat! »

- What are we talking about?
  - Green water (soil water consumed for crop cultivation): more than 95% is recycled
  - Blue water (surface water and groundwater)



- Livestock consume 8 to 15% of water resource worldwide (FAO, 2014)
- Comparison of farming systems

1 kg beef meat	22 – 520 L
1 kg pig/poultry meat	190 L
1 kg milk	< 1 - 100 L
1 shower	*50 – 70 L*

Doreau et al. (2014)

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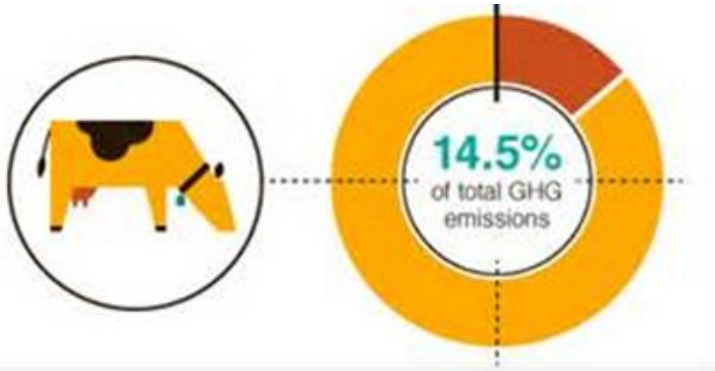
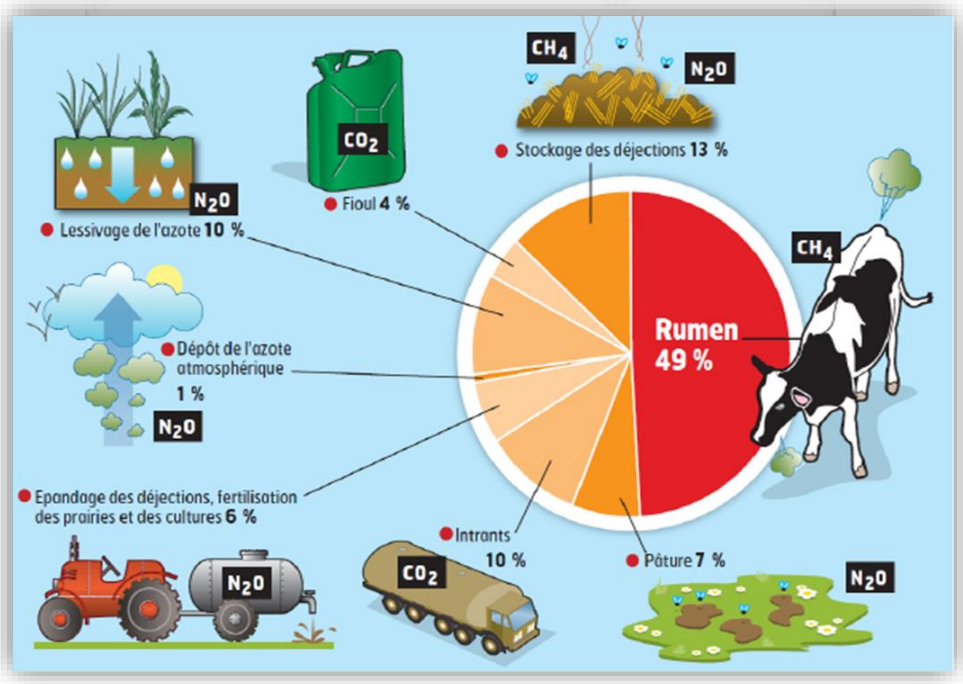
Real Carbon footprint of ruminants





> 40% reduction

- Genotyping low methane production for selection
- Rumen microbiomes
- Improving animal health and husbandry conditions
- Smart use of manure
- More C sequestration (grassland, agroforestry)
- Precision Livestock Farming
- Feed production (circularity)
  - More efficient production (legumes)
  - Better agricultural land use (rotations)
  - Less/no specific feed production

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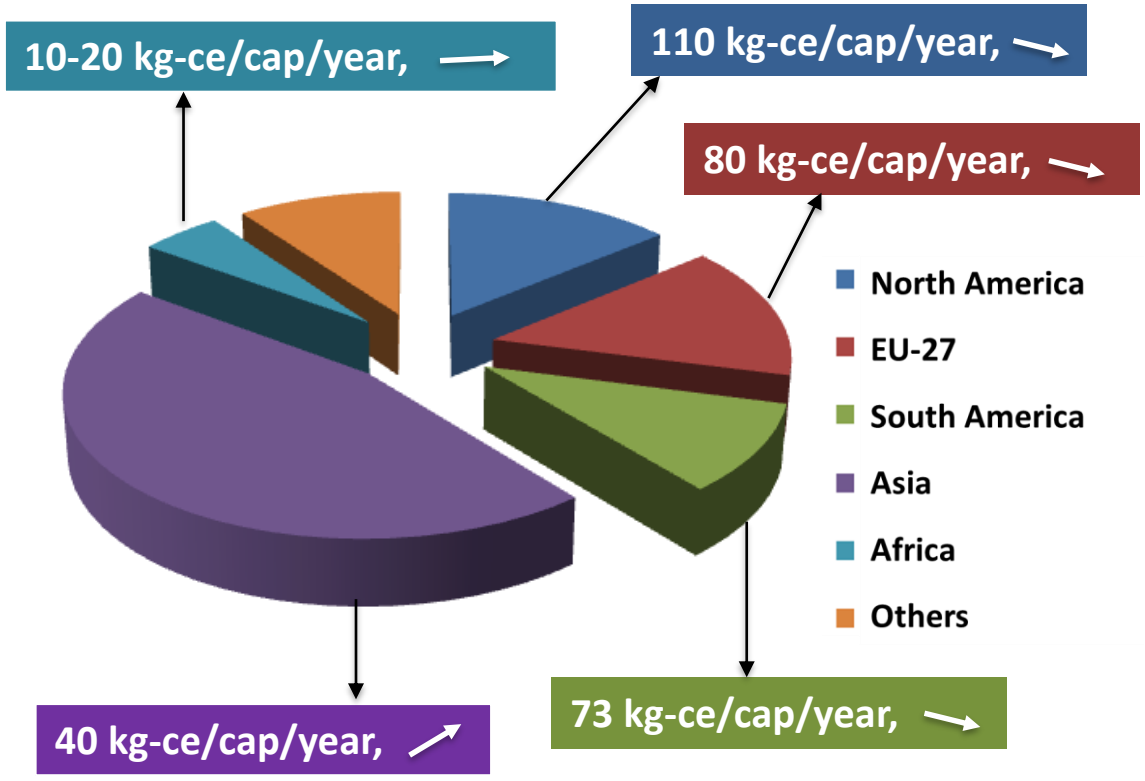
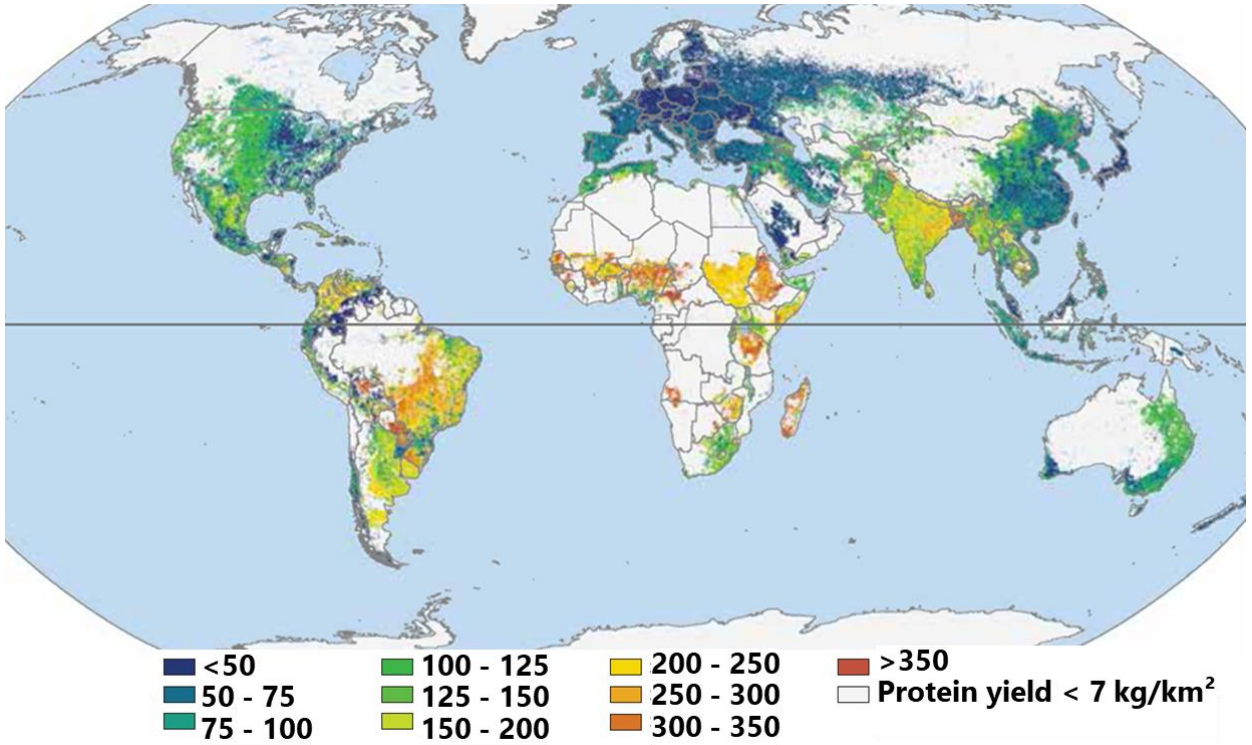
Meat consumption vs GHG emissions: where are the challenges?

- **Meat consumption**



- **Emission intensity**



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Is cow methane to blame for global warming?

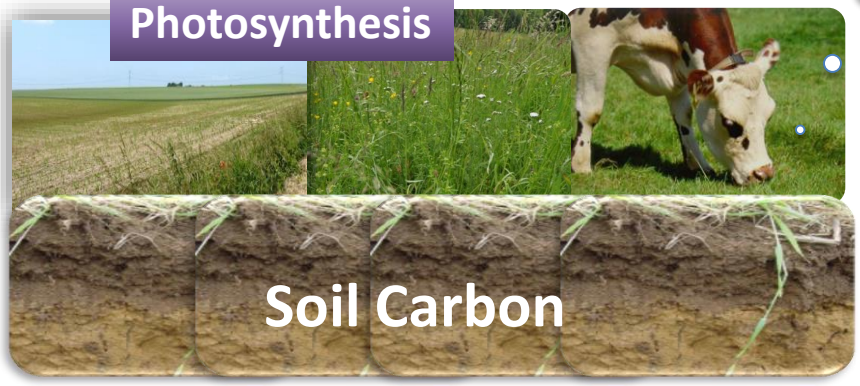
CO_2

Photochemical oxydation

Do not accumulate (10 years) so long emissions do not increase. Atmospheric concentration will decrease if emissions decrease

CH_4

Photosynthesis



Using conventional GWPs to convert CH_4 to "CO_2-eq" emissions misrepresents its impact on global temperature

Fossil CO_2 (hundreds years) accumulates in the atmosphere so long emissions exceed the ability of plants and ocean to take up new CO_2

CO_2

Fossil fuel
Old photosynthetic C
100-200 Million year old
(not in the C cycle)

- **To limit warming to 1.5 to 2°C (COP 21)**
  - **CO_2 (and N_20) emissions should be reduce to zero,**
  - **CH_4 should be declining but do not have to reach net zero**

Adapted from Allen et al., (2018) - Nature

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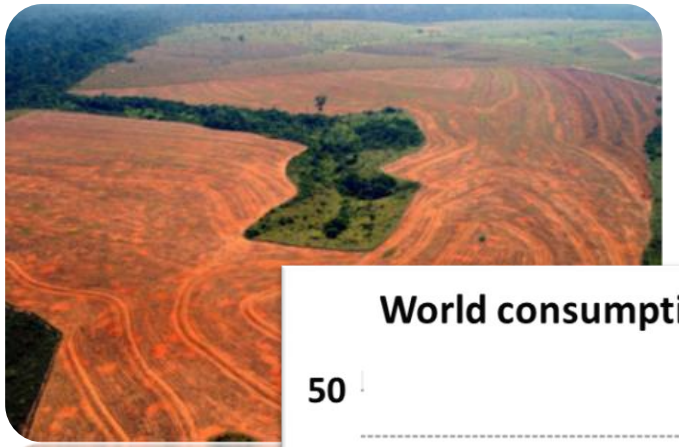
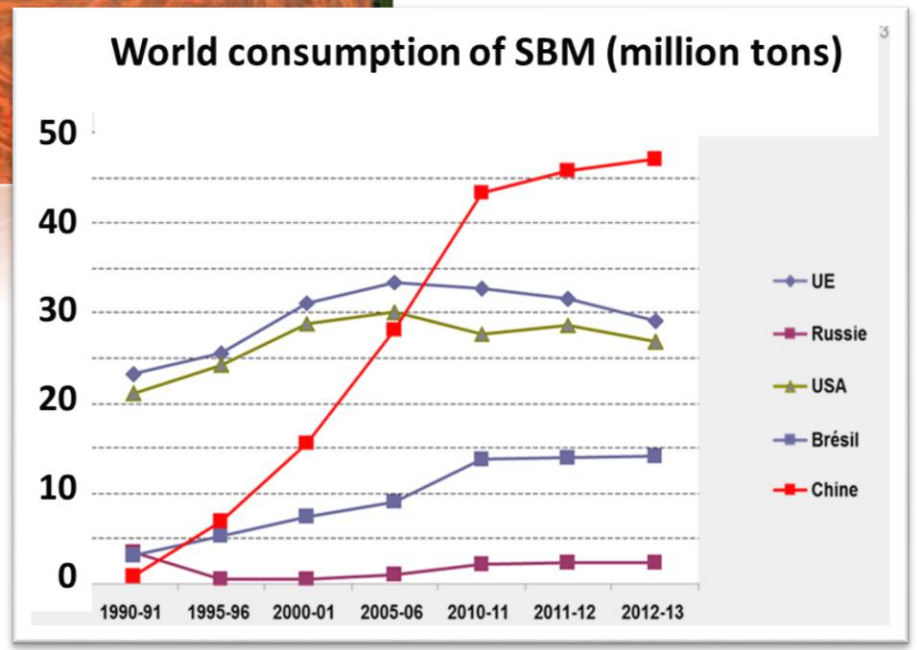
The ambivalent effect of livestock on biodiversity

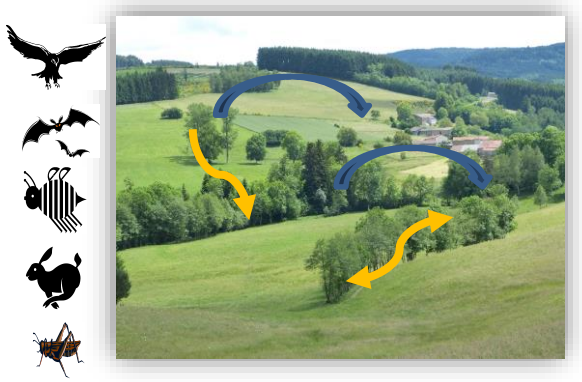
- **Intensive livestock contributes to biodiversity losses**





- **Ruminants produce biodiversity**
  - **Diversity of forage species (including honey plants) and grassland types**

  - **Diversification of land uses, landscapes and maintenance of open habitats (with grasslands)**



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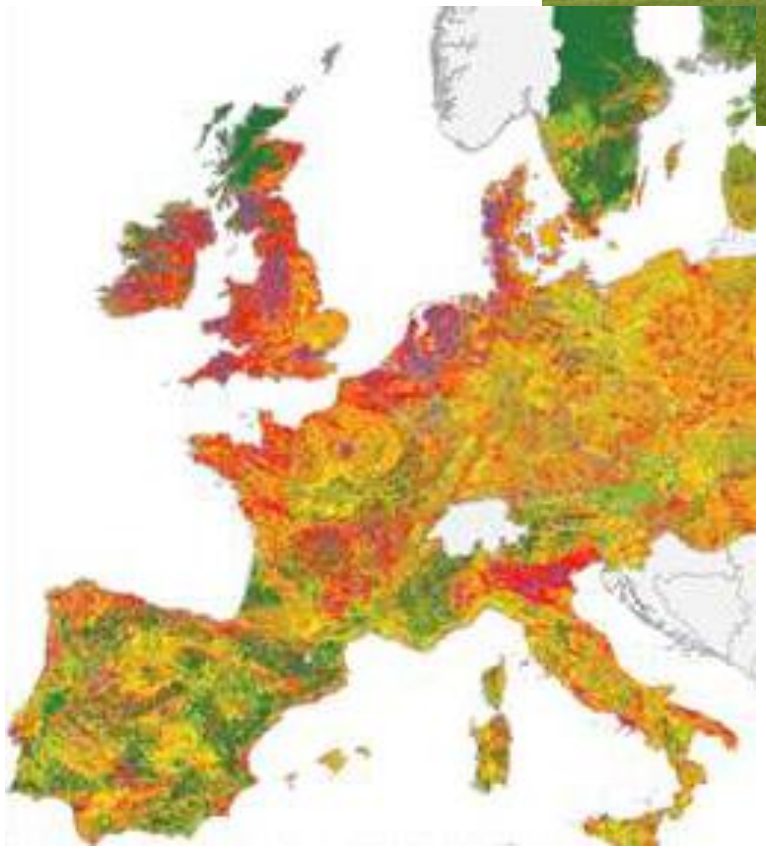
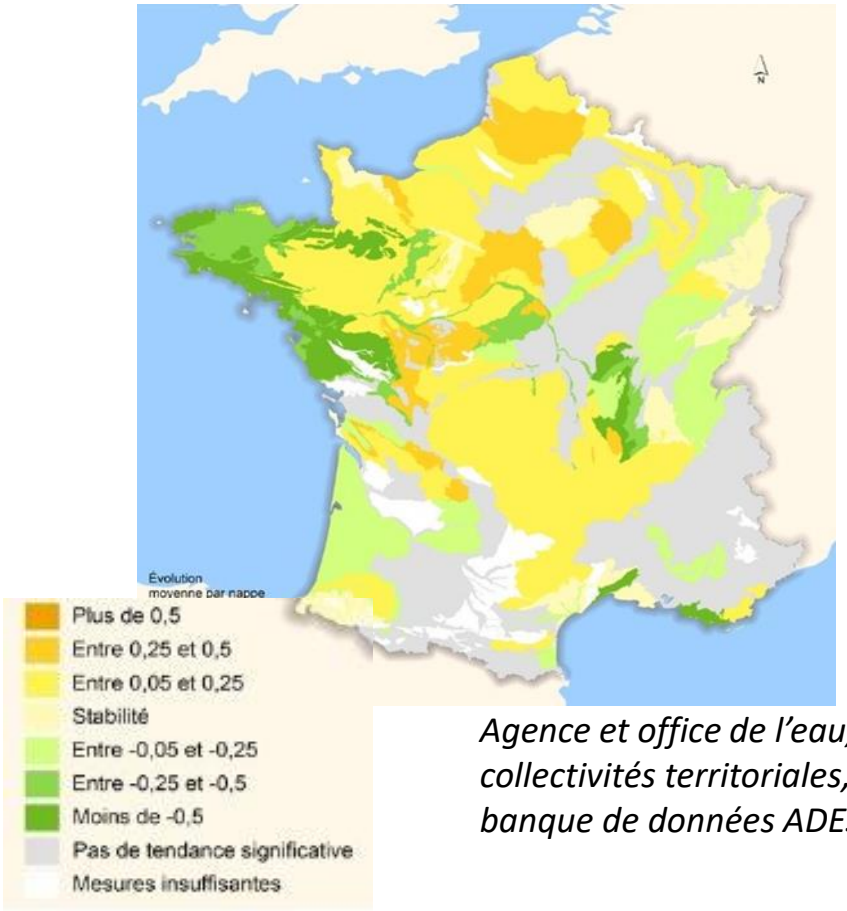
Local pollutions

NO_3 Emissions



Nitro Europe (2011)

Evolution of nitrate levels (mg / year) in groundwater (1998 – 2014)



Agence et office de l'eau, collectivités territoriales, BRGM, banque de données ADES 2013

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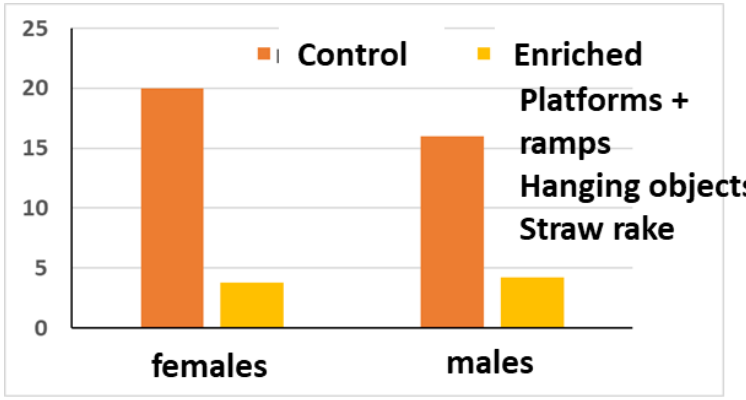
Designing animal-friendly systems

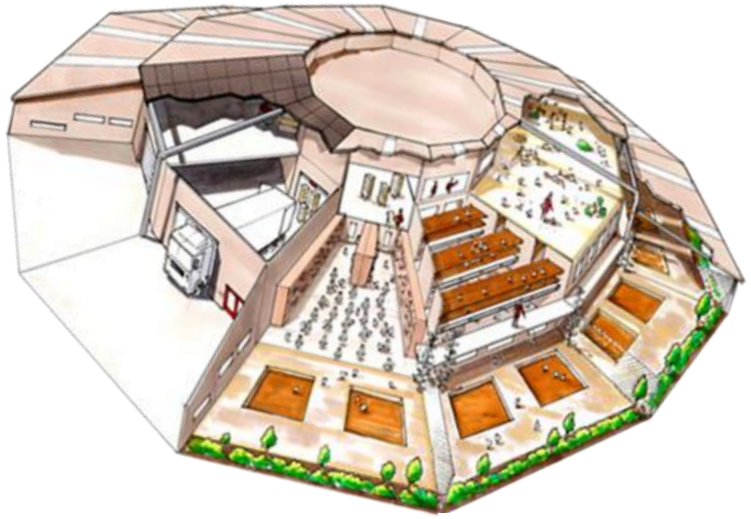
- **Enrichment of the environment**

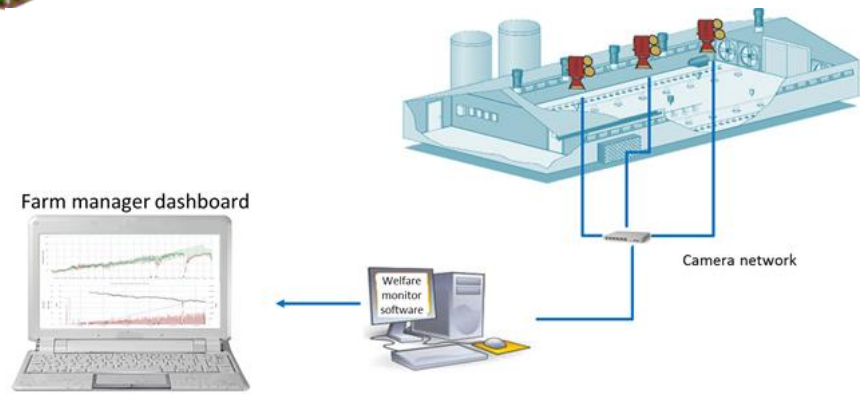
% injured animals



Mirabito et Michel (2003)

- **Innovative buildings and precision livestock farming**





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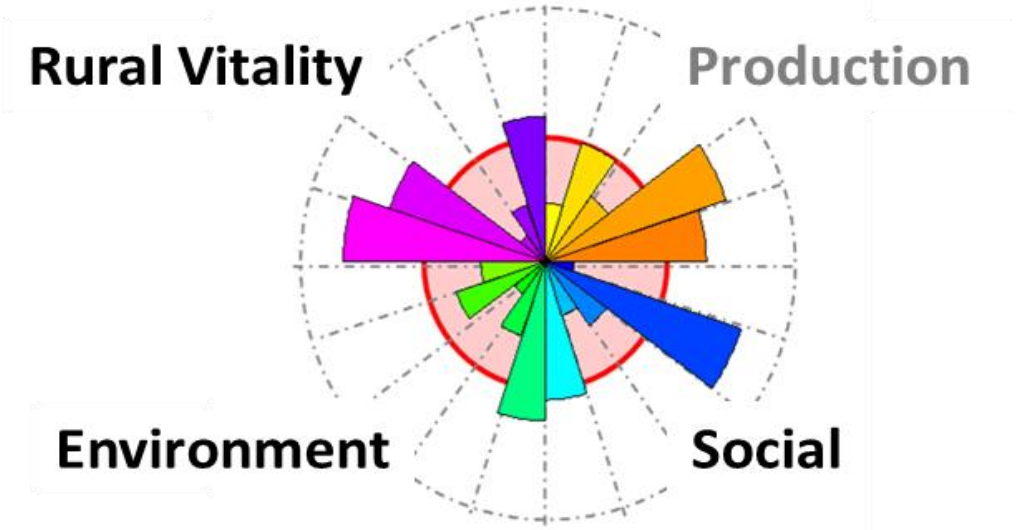
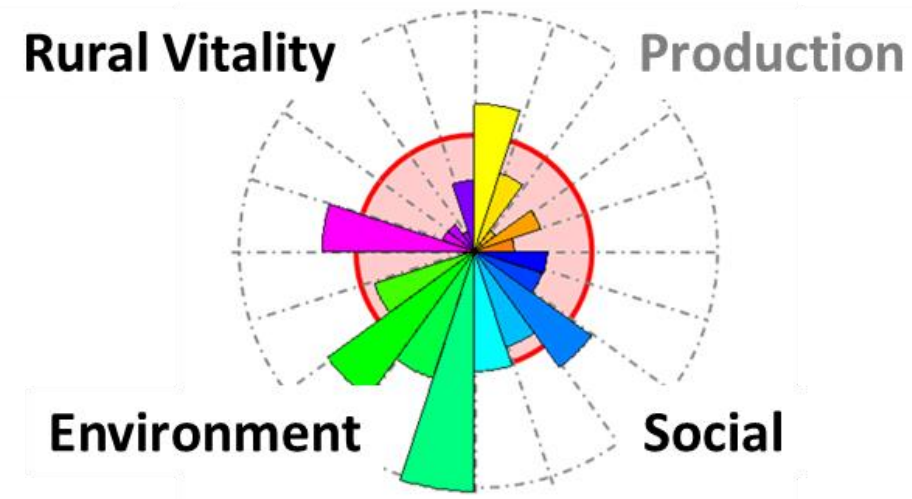
Livestock provides ecosystem and social services

- Various benefits of a sustainable EU livestock sector for rural area
- The bundle of services varies according to local contexts

- **Intensive systems**



- **Extensive systems**



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Part 3:
Changing paradigms: towards a renewed place and role of livestock farming in agri-food systems

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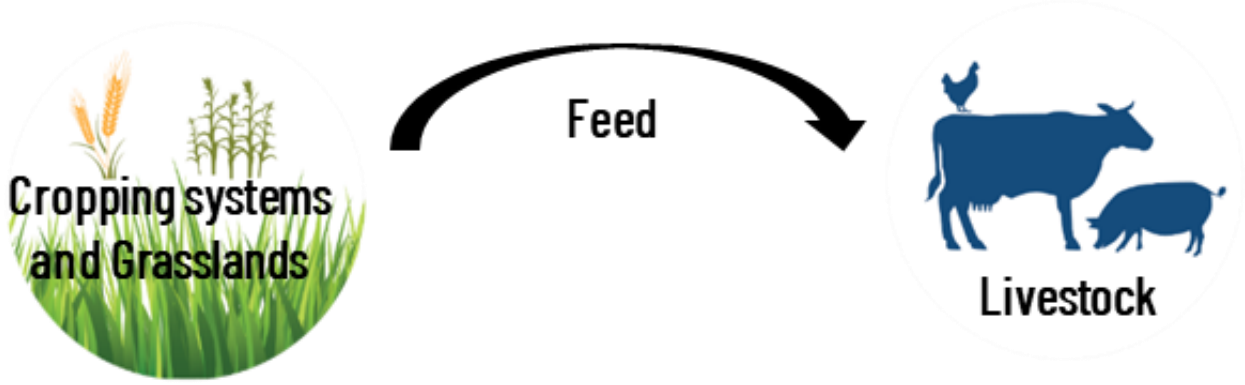
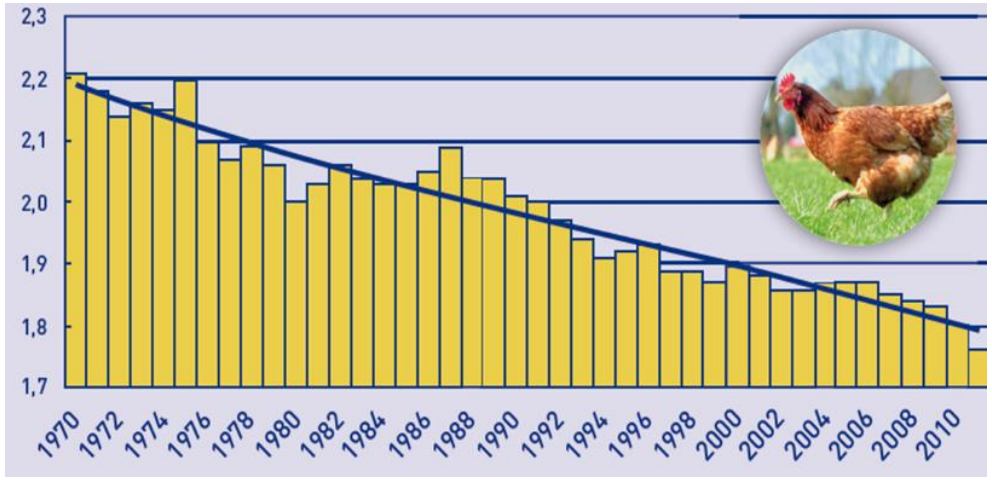
The “linear” vision





- This as led to significant productivity gains but
  - In a linear way of thinking (resource –> production –> product –> waste)
  - Without considering the amount and origin of mobilized resources
  - Without preventing the degradation of ecosystems

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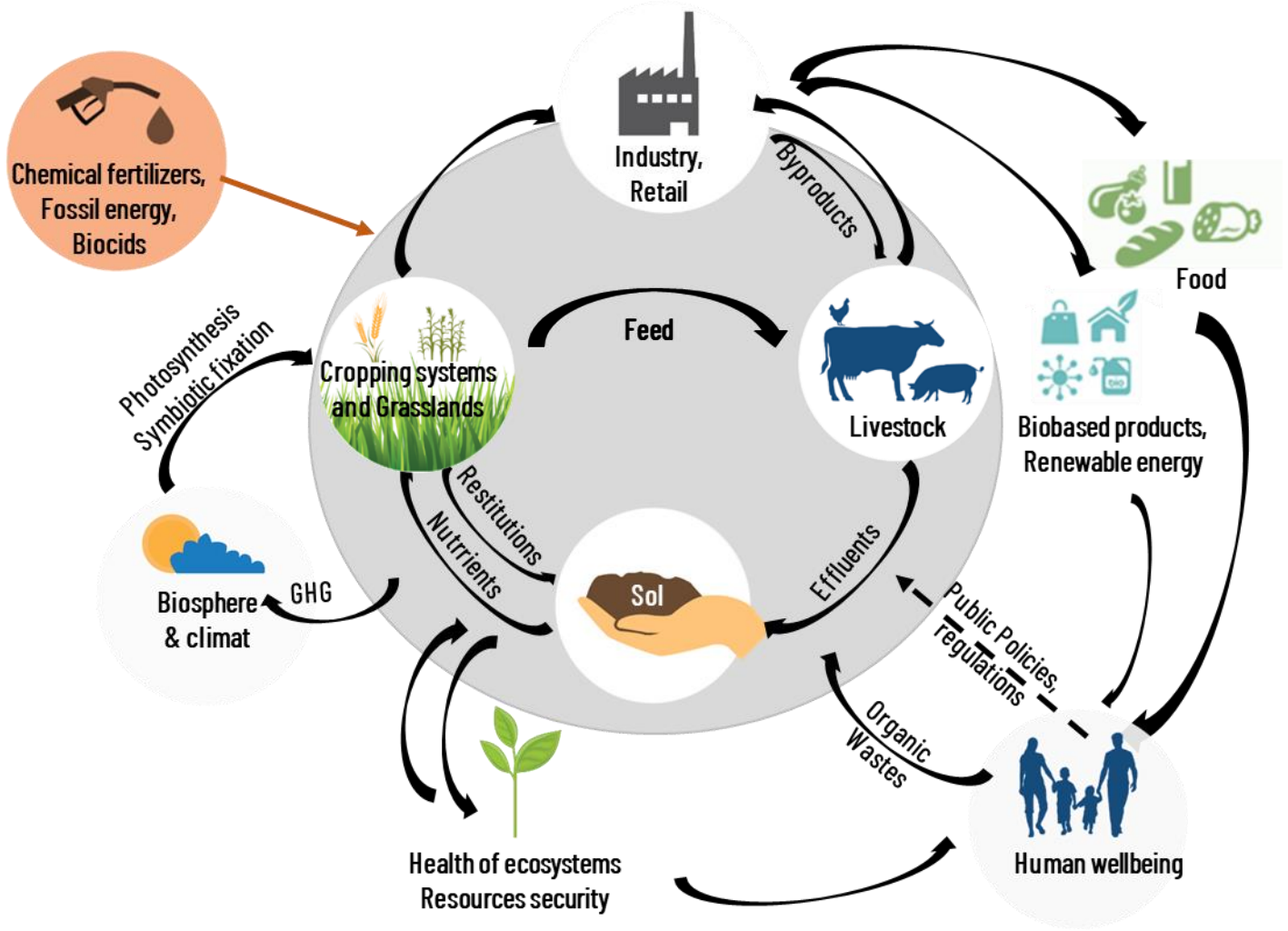
A new paradigm

Livestock is a key issue for sustainable circular agri-food systems



- Rethinking the place, roles and performances of livestock
- Rethinking the links between livestock, crop production, soil fertility and environment
- Rethinking the links between livestock, livestock products and consumption of animal based products
- Balances are to be found according to the political choices and the territorial contexts.
  There is no « one size fits all » optimal solution

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Part 4:
Take home messages

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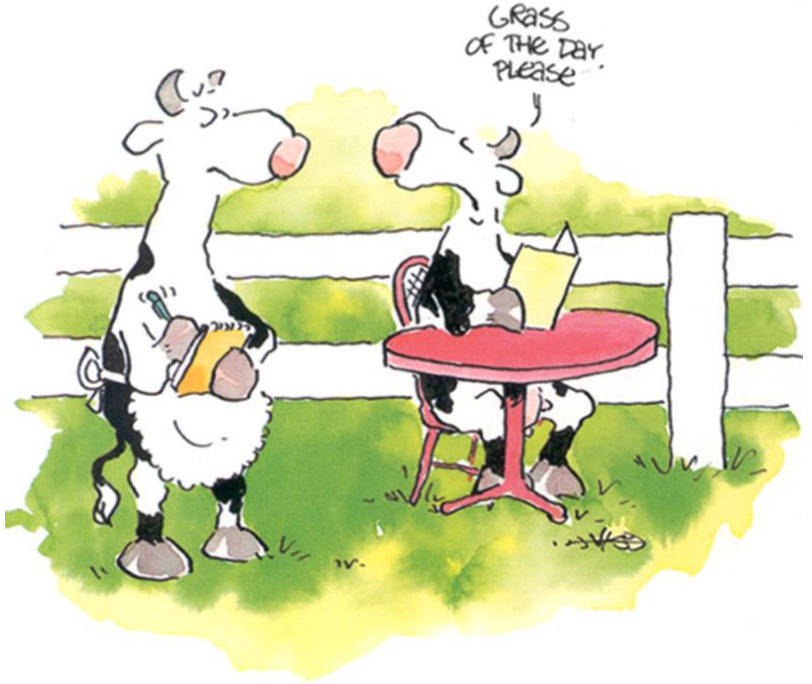

- Think twice: do not step into a simple and narrow vision of livestock farming systems
- Reducing impacts of livestock farming is essential: the shadow of livestock can be mitigated
- Livestock is not only a problem, it is also part of the solution for circular sustainable agri-food systems
- Livestock farming systems should change to regain legitimacy
- Europe needs an ambition for livestock farming systems: articulate local and global, improvement or transformation? food production and/or immaterial functions (multifunctional livestock) ?