
Global grassland under management

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Grassland in the world

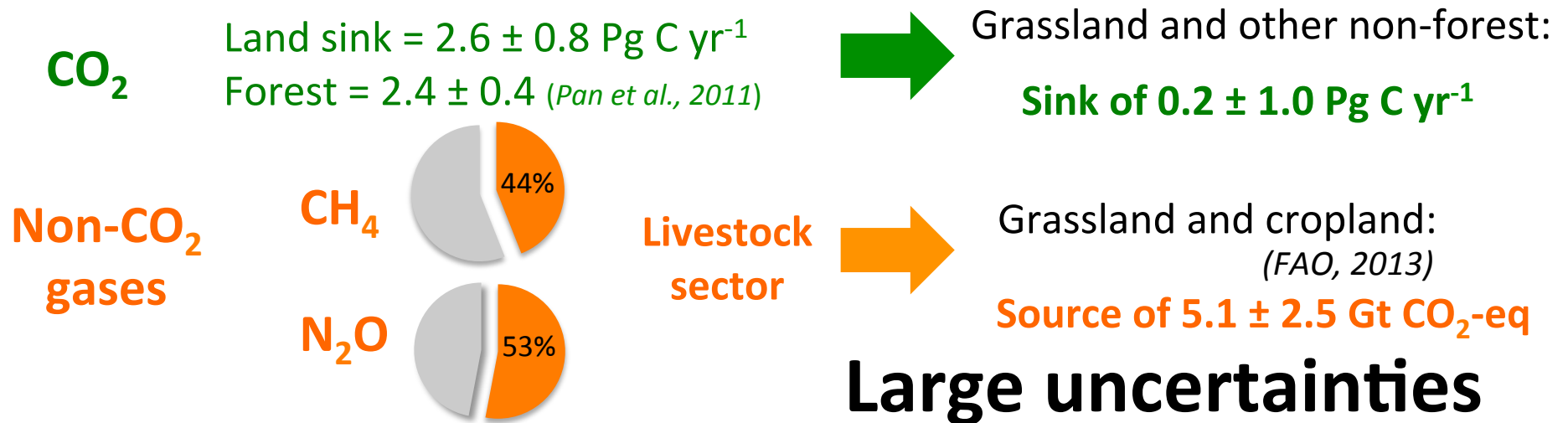
Over the globe, grassland

- Covers up to 40% of the land surface.
- Supports the livelihoods of over 800 million people.
- Provides 48% (2.3 billion tons) of the biomass used by livestock (*Herrero et al., 2013*).

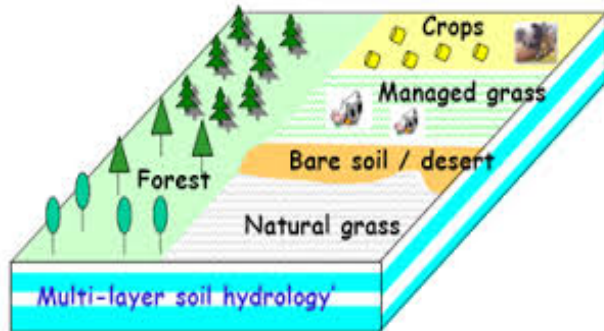


Carbon balance, CH₄ and N₂O emissions

- Livestock: **51%** of annual worldwide GHG emissions (*Goodland and Anhang, 2009*).



Tool to estimate GHG balance of grassland



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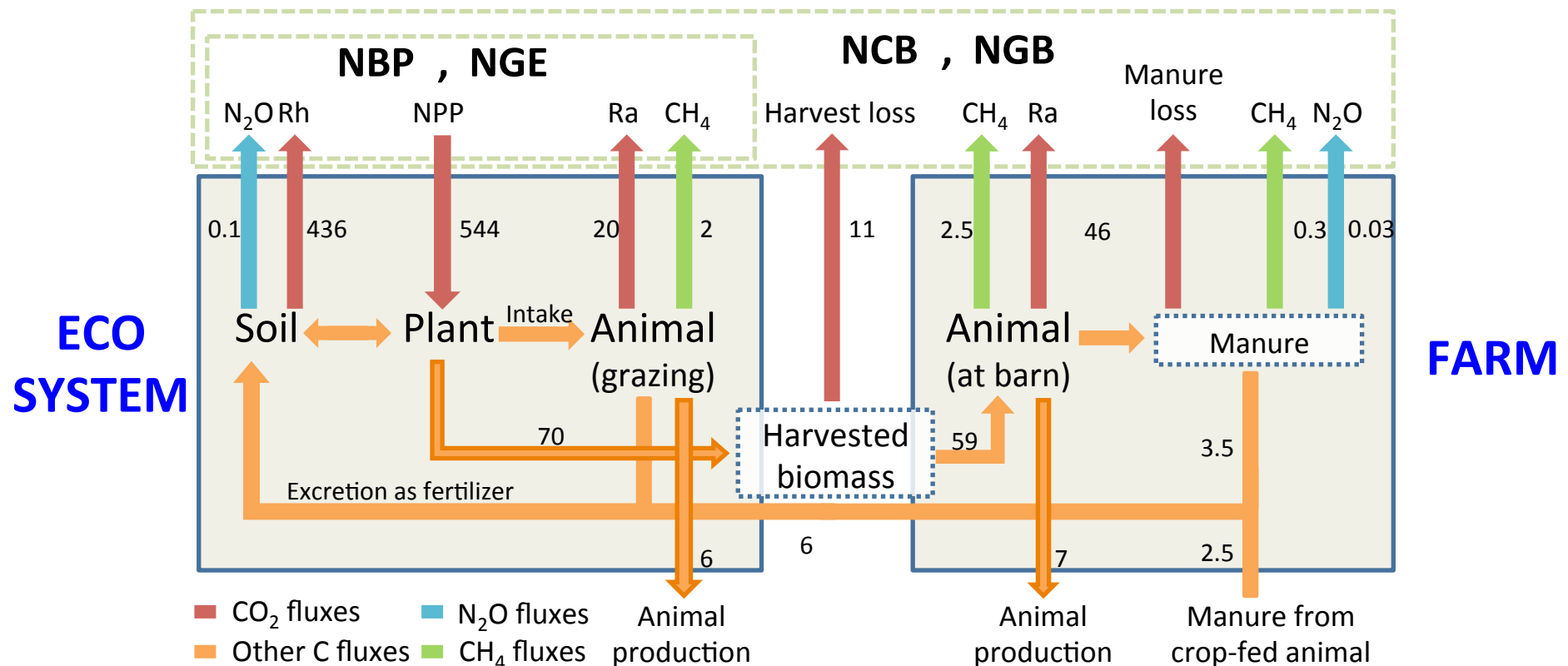
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Management

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An example in Europe: Grassland GHG balance



NBP: net C balance at **ecosystem scale** (\approx soil carbon change)

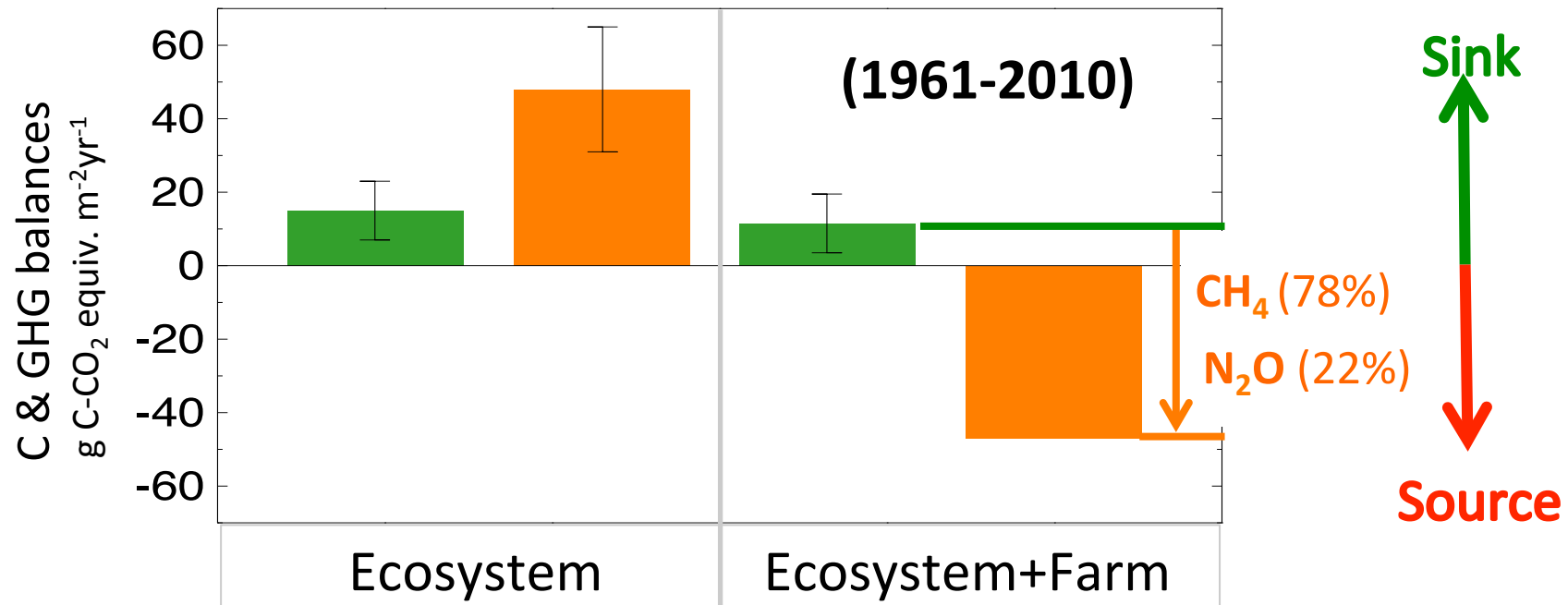
NGE: net GHG exchange of **ecosystem scale** (CO₂ + CH₄ + N₂O expressed in CO₂ -eq)

NCB: net C balance at **ecosystem and farm scale**

NGB: net GHG balance at **ecosystem and farm scale**

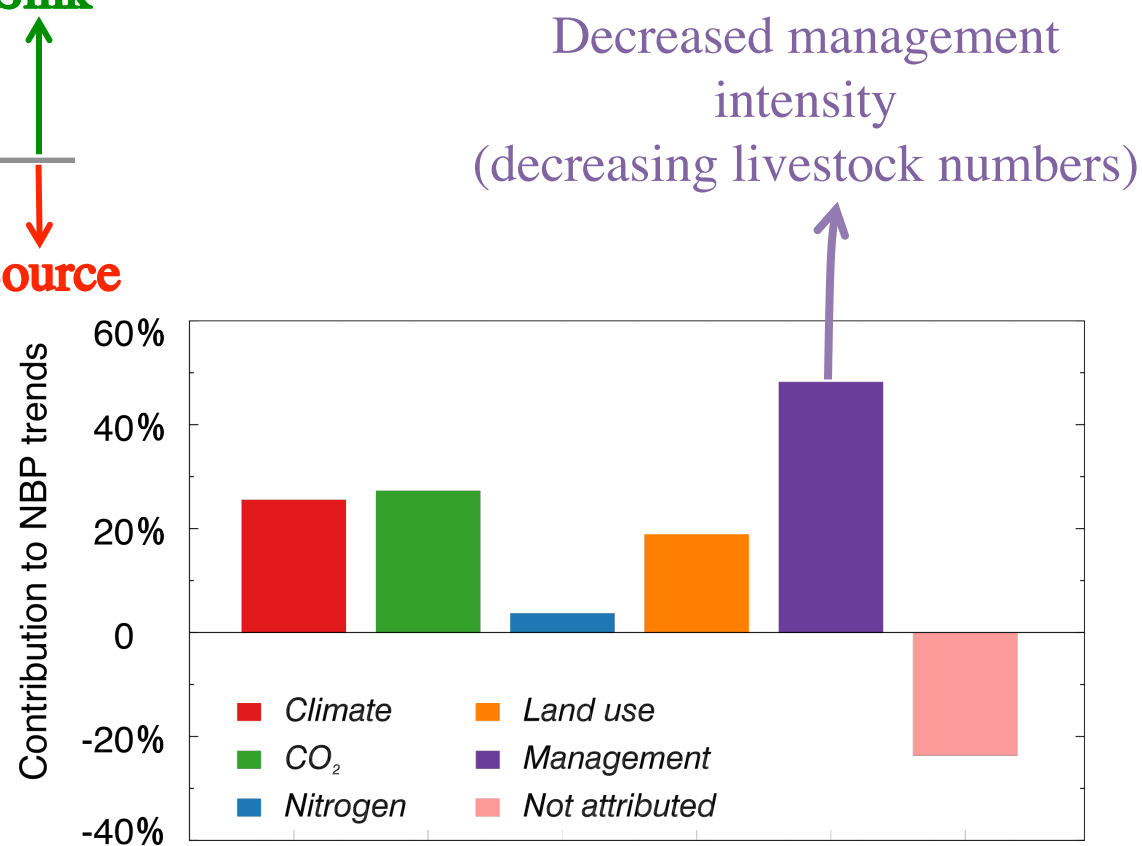
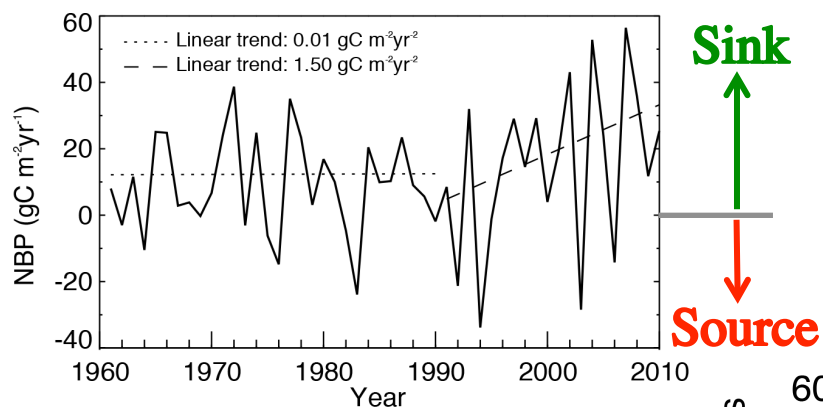
Averaged over
1961-2010

An example in Europe: Grassland GHG balance



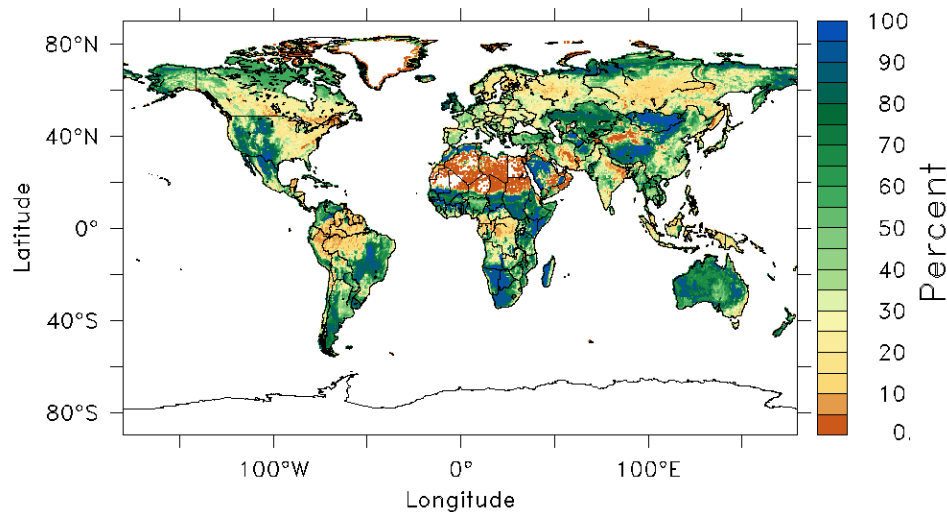
- European grassland acted as net C sinks over the past 50 years.
- C sink < GHG source in CO₂-eq at ecosystem and farm scale .
- Non-CO₂ gases are dominant in the grassland GHG balance of Europe.

An example in Europe: Grassland C balance (NBP) and livestock



- Each of the 5 drivers contributes to a positive NBP trend.
- Livestock number change has the largest effect (47%).

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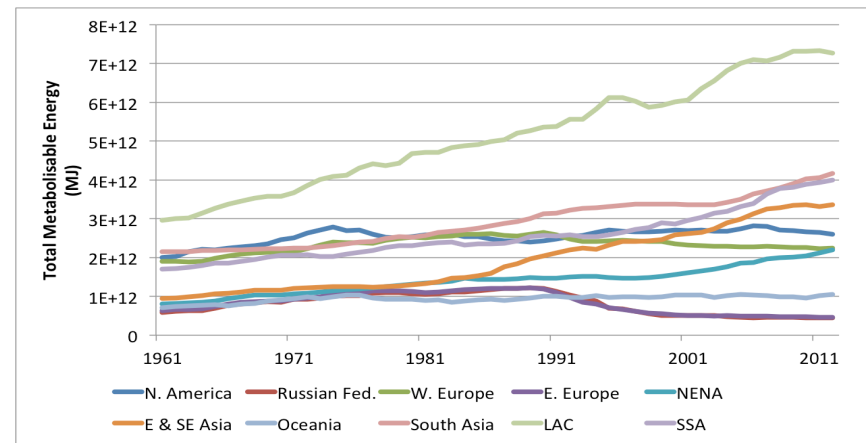
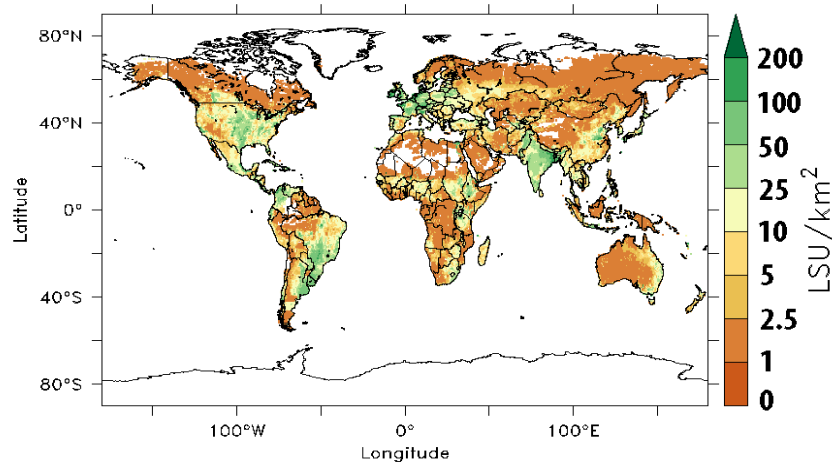
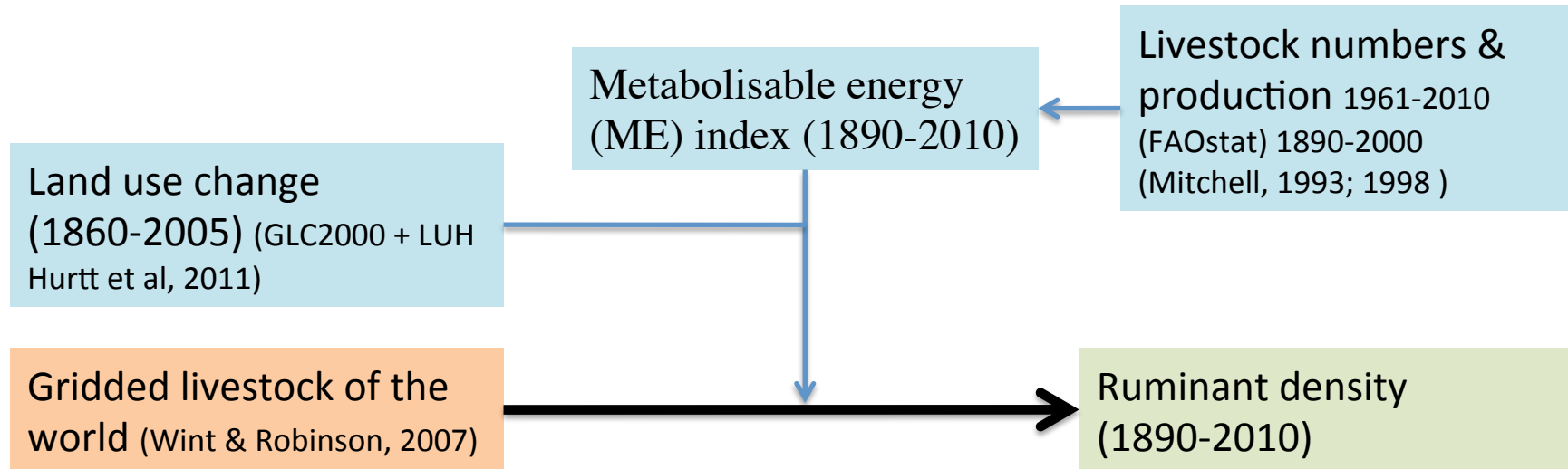


Grassland of the world
(derived from GLC2000)

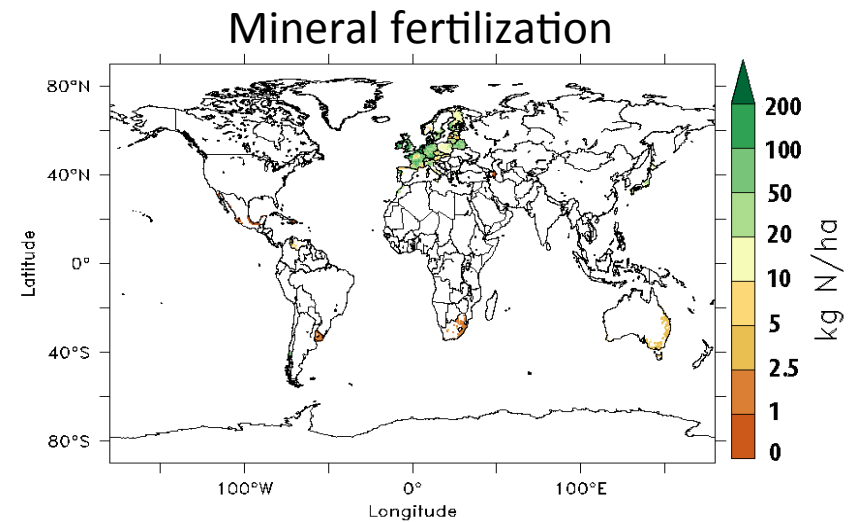
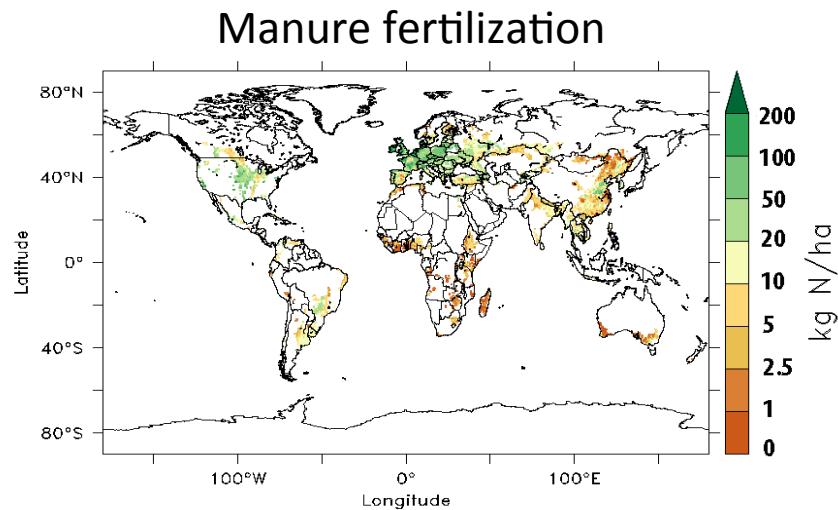
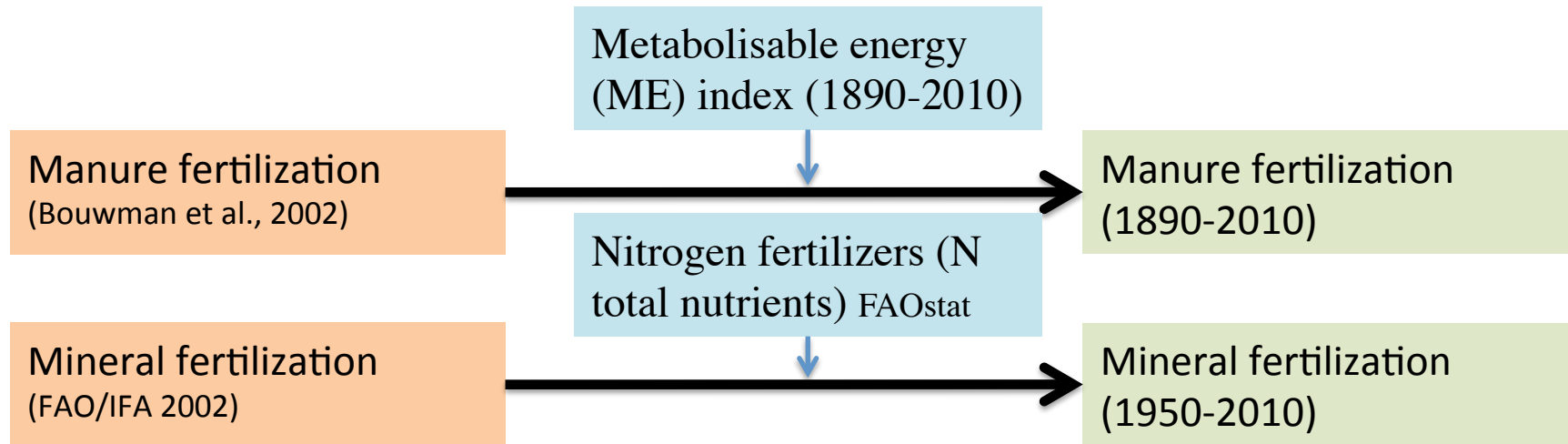
Factors impact the GHG balance of grassland:

- Climate change, rising CO₂
- Livestock feeding, e.g., grazing, cutting
- Fertilization with manure or mineral N
- N deposition
- Land cover or land use change, e.g., grassland establishment, abandonment, transition to cropland/forest

Livestock density

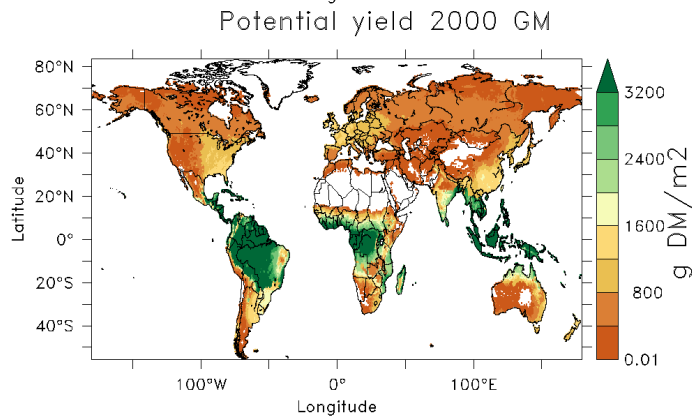
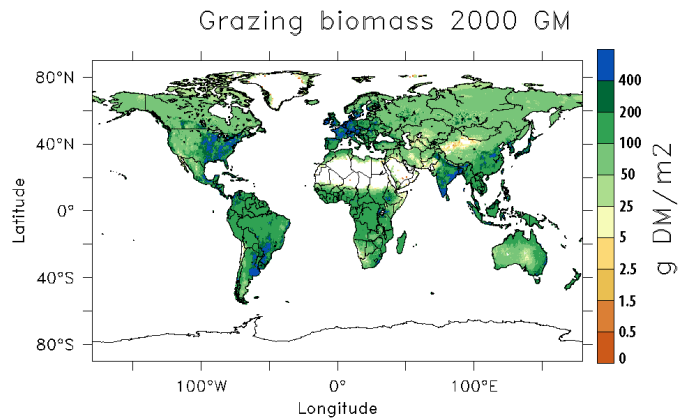


Fertilization: manure & mineral N

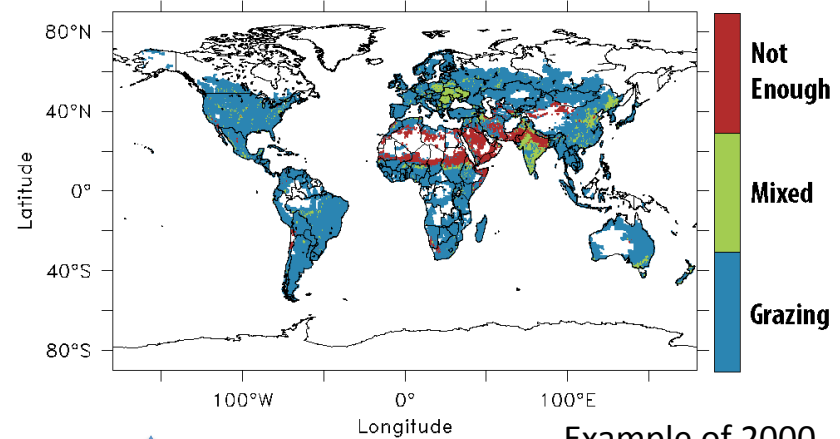


Management type: grazing, cutting, mix, natural

Pre-output: grazing biomass & potential yield



Changes in management type (1890-2010)



Example of 2000

Constrain biomass use

Grass biomass use 2000 (Herrero et al., 2013)

Metabolisable energy (ME) index (1890-2010);
Changes in diet & feed conversion efficiency

Global grassland under management

Input:

Ruminant density
(1890-2010)

Manure fertilization
(1890-2010)

Mineral fertilization
(1950-2010)

N deposition (1860-2010)
(LMDzINCA)

Changes in management
type (1890-2010)

Climate change & CO₂
(1900-2010) (CRU-NCEP, etc.)

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Land use change
(1860-2005) (GLC2000 + LUH
Hurtt et al, 2011)

Output (to be continued):

The GHG balance,
Role of management,
C sequestration potential,
etc.

Thanks!