Carbon balance of an intensively grazed grassland in southern Belgium

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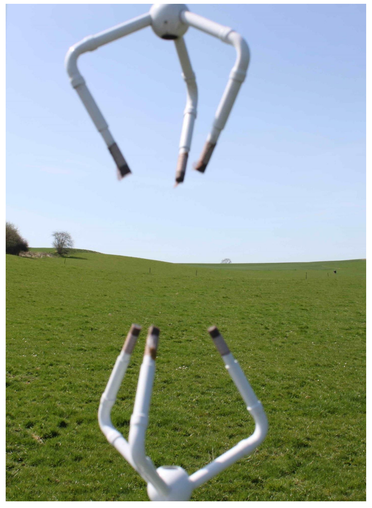
1. Objectives

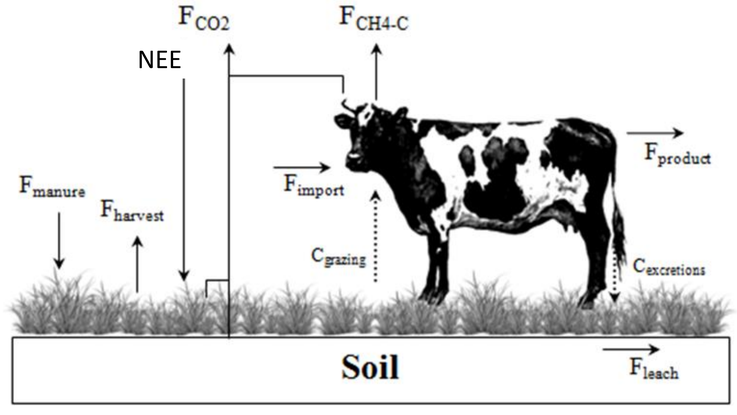
- ❑ Assess the total carbon balance of an **intensively** managed **permanent** grassland in southern Belgium at the field scale
- ❑ Study the impact of climate and management on the carbon budget
- ❑ To do so, we combined **5 years** of CO_2 **Eddy covariance** measurements with organic carbon fluxes exchange at the system boundaries



2. Study site

Site description: Dorinne Terrestiral Observatory (DTO)	
Highly productive pasture	**≈ 8500 kg dry matter $ha^{-1}yr^{-1}$**
Grazed by Belgian Blue cattle	
Age of the pasture	**>100 years**
Intensively managed for around	**40 years**
Site mangement	
Stocking rate	**2.3 Livestock units $ha^{-1}yr^{-1}$**
Length of the grazing season	**160 days**
Fertilization rate	**120 kg N $ha^{-1}yr^{-1}$**
Continuous grazing with adapted stocking density	
Site climate	
Average Air Temperature	10°C
Average Precipitation	628mm
Altitude	250m

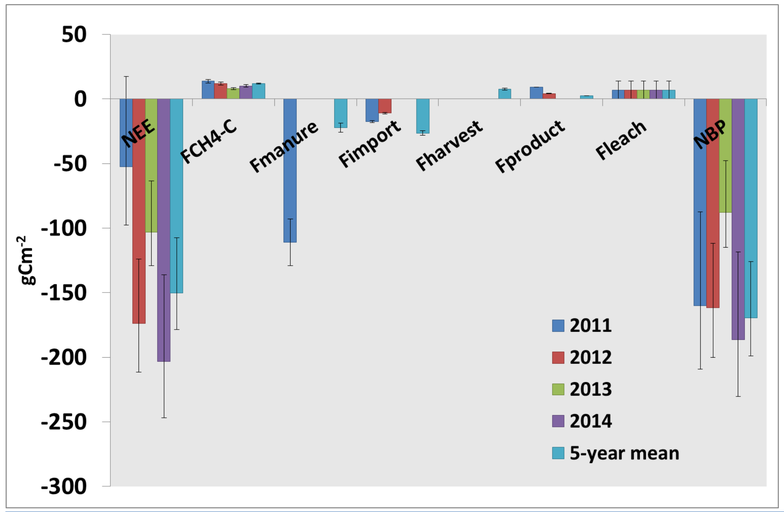
3. Methods: Carbon budget of the pasture



- **NEE**: Net eocsystem exchange, **eddy covariance**
- **F_{CH4-C}**: Based on cattle dry matter intake
- **F_{manure}**: organic fertilization, based on C content
- **F_{import}**: food supplement, based on C content
- **$F_{harvest}$**: $C_{content}.(m_{beforeharvest}-m_{afterharvest})$
- **$F_{product}$**: Deduced from the carbon budget of the cattle
- **F_{leach}**: 7 ± 7gCm^{-2}y^{-1} (Schultze et al., 2009)

$$NBP = NEE + F_{CH4-C} + F_{manure} + F_{import} + F_{harvest} + F_{product} + F_{leach}$$

4. Results: a stable carbon sink



- ❑ Stable NBP (sink) from year to year of **-173 [-128 -203] gCm^{-2}yr^{-1}**
- ❑ The carbon sink behaviour was directly increased by management practices trough food supplement and organic fertilization
- ❑ Both weather conditions and management practices were found to affect carbon fluxes
- ❑ The low carbon budget variability was attributed to :
  - ✓ Grazing management that regulated Growth Primary Productivity by adapting the stocking rate to the leaf area index which itself depends on weather conditions
  - ✓ Carbon imports through food supplements only when grass growth was not sufficient to feed the cattle

The results suggest that a stable carbon sink could be maintained at DTO despite the high stocking rate and the old age of the pasture

Acknowledgements

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