Rotational and continuous grazing does not affect the total net ecosystem exchange of a pasture grazed by cattle but modifies CO$_2$ exchange dynamics.
Dorinne Terrestrial Observatory: Intensively managed pasture

Candidate ICOS site

Average 5 year **Net Biome Productivity**

-163 g C m$^{-2}$ yr$^{-1}$

*(Gourlez de la Motte et al., 2016)*

CO$_2$ fluxes, methane, and other variables measured since 2010
Grazing impact on CO\textsubscript{2} fluxes:

For more details: Jérôme et al., 2014

Impact of grazing timing-management?
Rotational grazing? Continuous grazing?
Rotational grazing vs continuous grazing

- Rotational grazing
- 1 ha

- Continuous grazing
- 4.2 ha

- Eddy covariance CO₂ flux measurements
- Same measurement systems
- Footprint filtering
- Biomass measurements
- Experiment from April 2015 to November 2015

South-west main wind direction
Rotational grazing vs continuous grazing

Rotational grazing: 6 rotations, 36 days of grazing, and 1.9 LU ha\(^{-1}\) yr\(^{-1}\)
Continuous grazing: 220 days of grazing, 2.1 LU ha\(^{-1}\) yr\(^{-1}\)
Grazing method impact on CO$_2$ flux dynamics

Does grazing impact NEE dynamics through photosynthesis, ecosystem respiration or both?
Grazing method impact on CO$_2$ flux dynamics: Daytime analysis
(cf Lasslop et al., 2010)

Who is responsible?

\[
\text{NEE}_{\text{day}} = -\frac{\alpha \times \text{PPFD} \times G_{1500}}{\alpha \times \text{PPFD} + G_{1500}(1 - \frac{\text{PPFD}}{1500})} + \text{Rd}_{10} \times \exp \left\{ \frac{1}{T_{\text{ref}} + 46.02} - \frac{1}{T_s + 46.02} \right\}
\]

Ecosystem respiration?

Gross primary productivity?

\[ \text{PPFD} = 1500 \, \mu\text{molm}^{-2}\text{s}^{-1} \]
Grazing method impact on CO$_2$ flux dynamics: $G_{1500}$
Grazing method impact on CO$_2$ flux dynamics: relation to biomass

- Significant relationship between differences in standing biomass and vegetation photosynthetic capacity
- No such relationship for ecosystem respiration

→ Photosynthesis seems to be the most impacted by grass heights/grazing

What about total NEE? Implications for the carbon budget?
Grazing method impact on total NEE

Total $\text{NEE}_{\text{RG}} = -88 \text{ g C m}^{-2} \text{ yr}^{-1}$

Total $\text{NEE}_{\text{CG}} = -74 \text{ g C m}^{-2} \text{ yr}^{-1}$

≠ Not significant
• CO₂ flux showed very different dynamics between the two grazing management

• The strong link between light curve response parameters and standing biomass highlights the need to account for biomass changes when modelling or studying other environmental drivers

• No evidence that rotational grazing offers an overall benefits in term of carbon storage