

# CLIMATIC AND CROP MANAGEMENT DRIVERS OF CARBON SEQUESTRATION OVER THREE SUCCESSIVE 4-YEAR CROP ROTATION CYCLES

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## Objectives

- To establish the three crop rotation carbon budgets and to analyze the different budget terms.
- To determine climatic and crop management drivers within each crop type.
- To identify and propose to farmers levers of action to help reduce CO<sub>2</sub> emissions from crop and sequester more carbon into the soil.

## Lonzée Terrestrial Observatory (LTO)



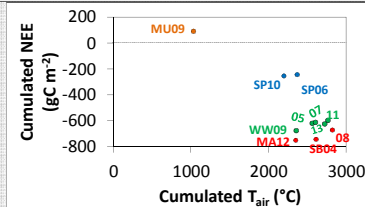
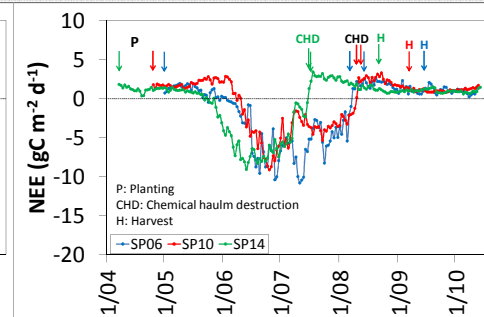
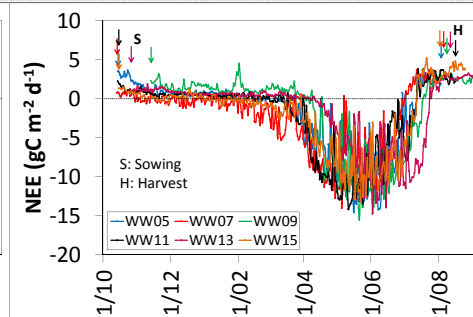
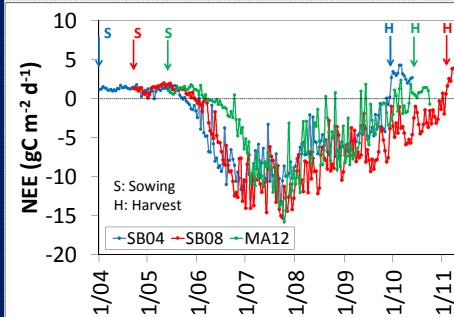
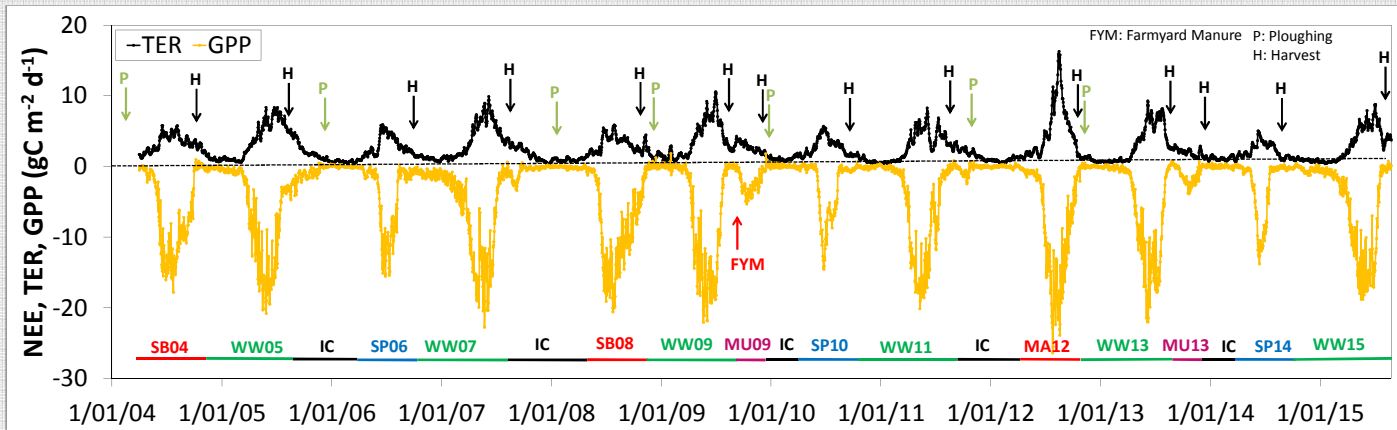
- Temperate climate (mean annual T and P: 10 °C, 800 mm)
- Land cultivated for more than 80 years
- Luvisol (FAO), SOC stock [0-60 cm]: 6.23 ± 0.16 kg C m<sup>-2</sup>
- 4-year crop rotation: Sugar beet (SB) – Winter wheat (WW) – Seed Potatoes (SP) – Winter wheat (WW)

## Methods

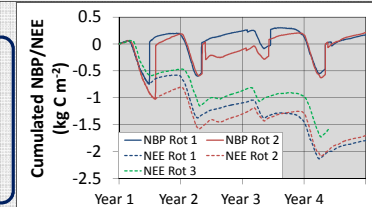
- Eddy-covariance measurements over the crop (2.8 m): sonic anemometer (Solent Research Gill R3) + infrared gas analyzer (Li-COR Li-7200)
- Measurements active since 2004
- Crop biomass samplings
- U\* filtering
- Data gap-filling and flux partitioning based on air temperature with the online tool provided by the MPI-BGC Jena ([www.bgc-jena.mpg.de/~MDIwork/eddyproc/](http://www.bgc-jena.mpg.de/~MDIwork/eddyproc/))



## Results and Discussion



- NEE is negative on average but the crop appears to behave as a small source (NBP is about 0.20 (0.10) kg C m<sup>-2</sup> for each crop rotation)
- Large interannual variability for one given crop
- Management largely influences the carbon budget
- Cumulated NEE tends to increase with cumulated Tair
- Catch crops (mustard) allow more C sequestration



## Conclusions

- At LTO, the crop tends to behave as a small source (NBP ranges about [0.05-0.15] kg C m<sup>-2</sup> y<sup>-1</sup> on average)
- Next to climate, the crop carbon budget is largely affected by management
- The estimated average amount of carbon lost each year by the crop would represent [1-2] % of the soil C stock over [0-60cm], which is not a negligible amount