



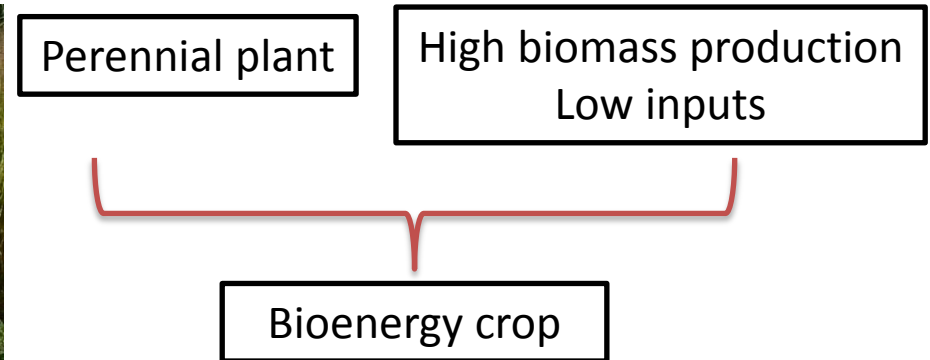
# Carbon and nitrogen dynamics after destruction of a 6-year-old perennial bioenergy crop



AgroImpact Unit

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Literature\*: beneficial effects of **this perennial crop DURING LIFE-TIME**  
**BUT: how about AFTER DESTRUCTION?**

- Soil organic carbon, CO<sub>2</sub> emissions?
- Nitrate leaching, N<sub>2</sub>O emissions?
- Fertilization requirements for the following crop?

\* Ferchaud, F. & Mary, B., 2016. *BioEnergy Research* 9, 656-670.

\* Monti, A. et al. 2012. *Global Change Biology Bioenergy* 4, 420-434.





- North of France (Estrées-Mons)
- Deep loamy soil
- SOERE ACBB
  - Long term experiment
  - since 2009

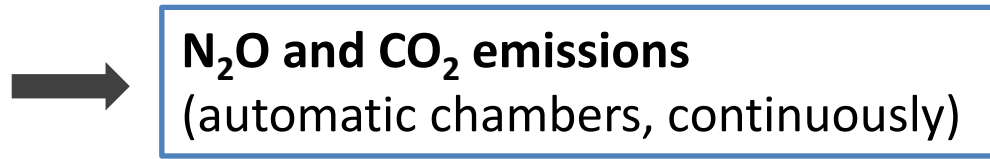
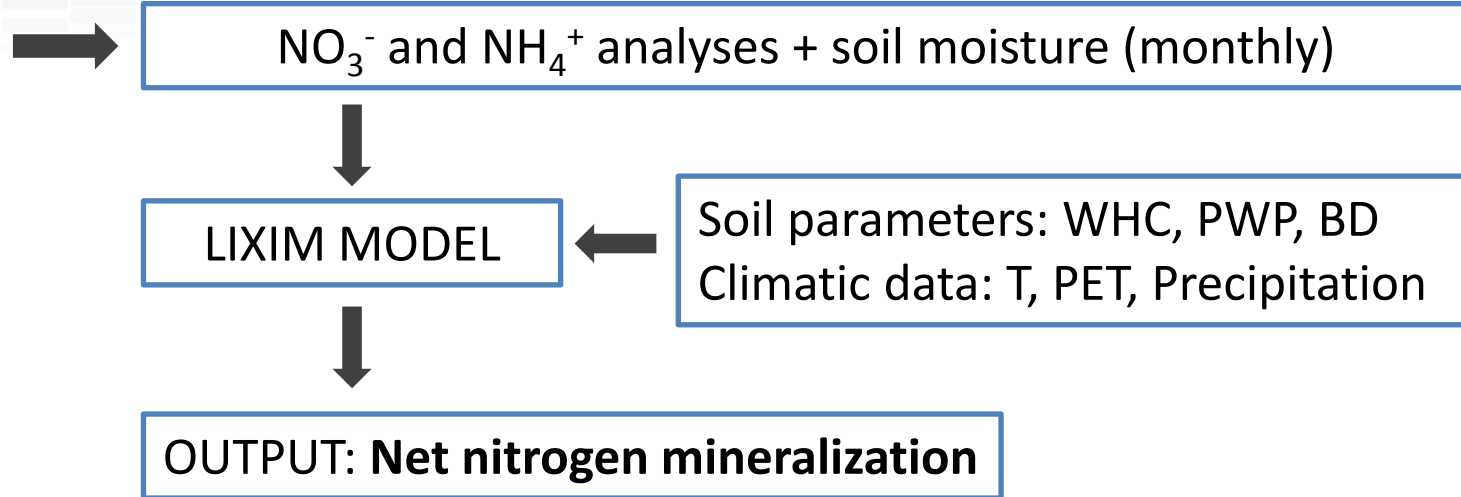


# Comparison of two treatments

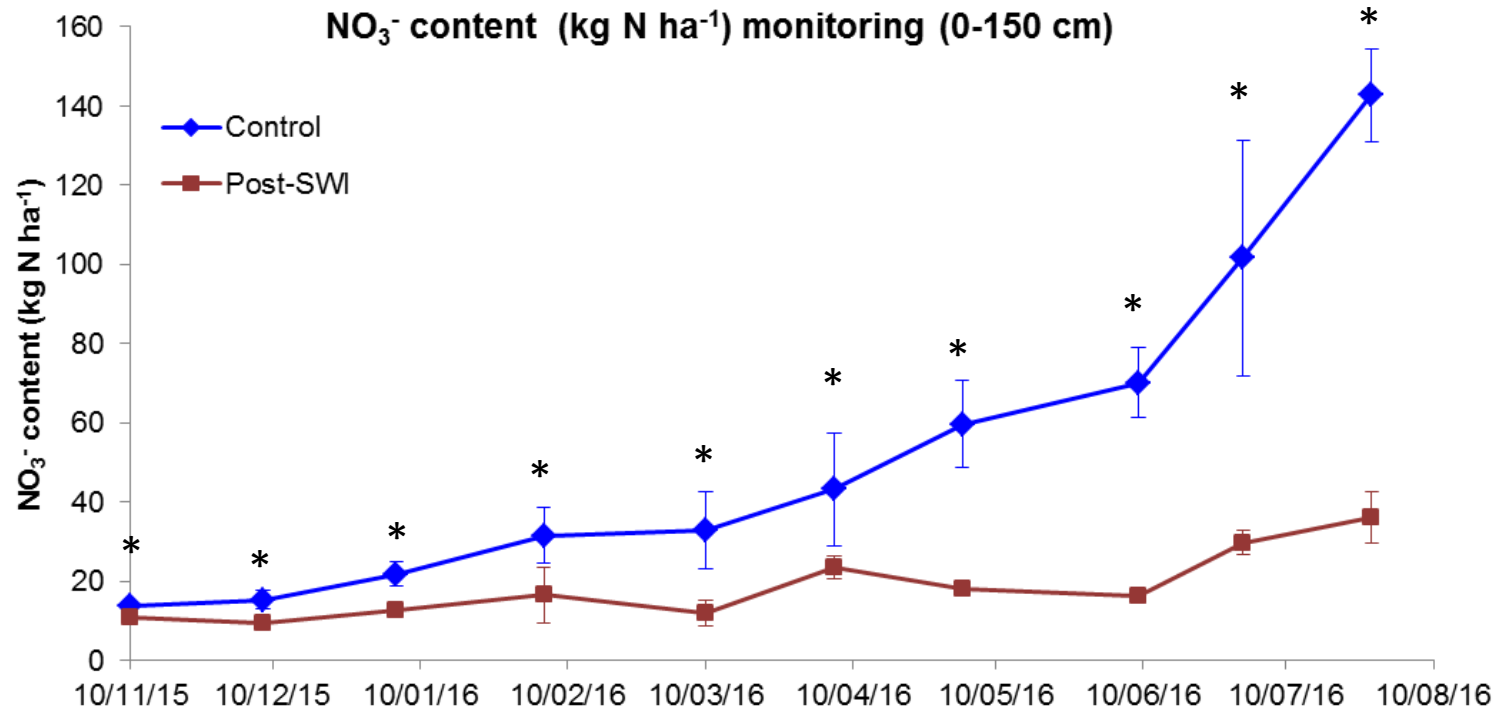


- **Switchgrass destruction** = Superficial tillage and plowing
- **After switchgrass destruction (November 2015)**
  - Monitoring on bare soil subplots for Post-SWI and Control

## Monitoring during 9 months

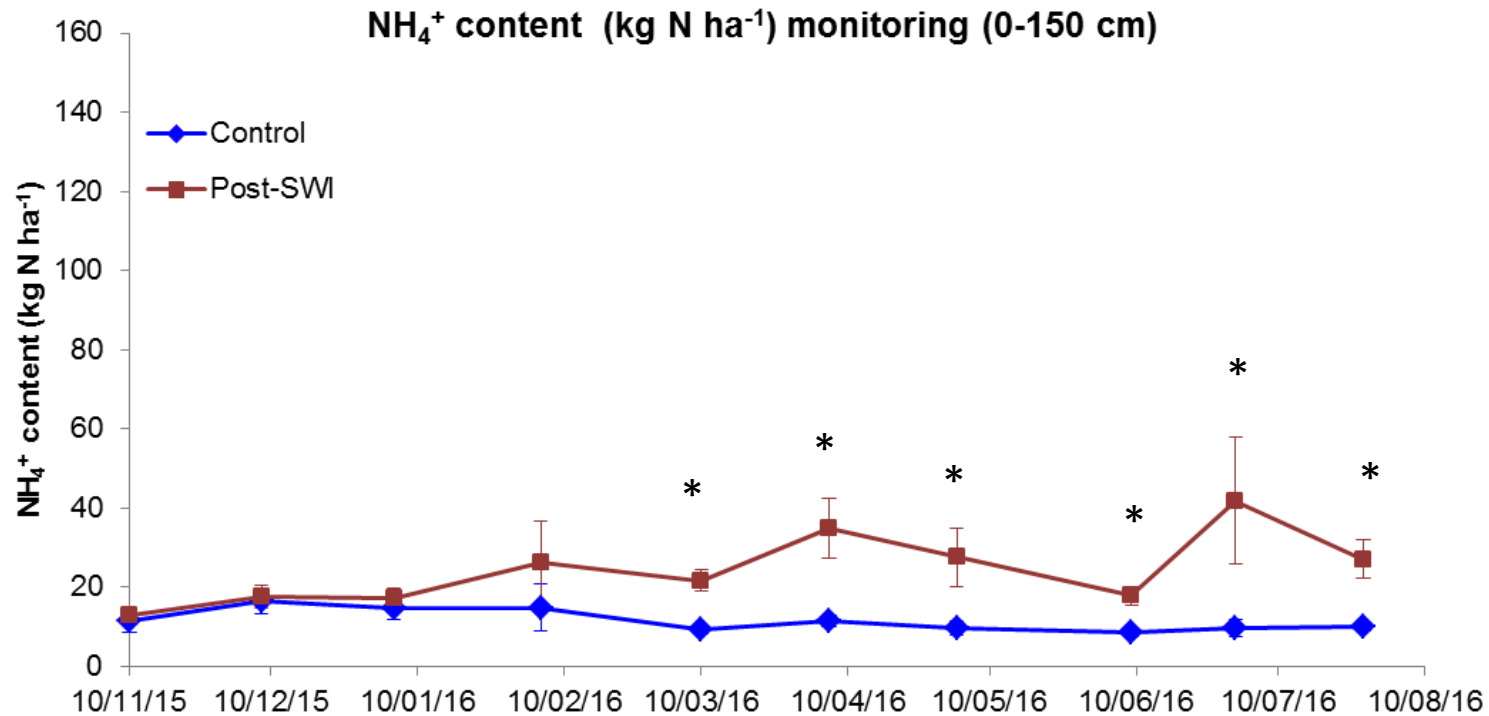


## Lower amount of $\text{NO}_3^-$ in Post-SWI than in Control



\*  $P < 0.05$ ; one-factor ANOVA per sampling date

## Higher amount of $\text{NH}_4^+$ in Post-SWI than in Control



\* P < 0.05; one-factor ANOVA per sampling date



## LIXIM: 4 times lower N-mineralization in Post-SWI than in Control

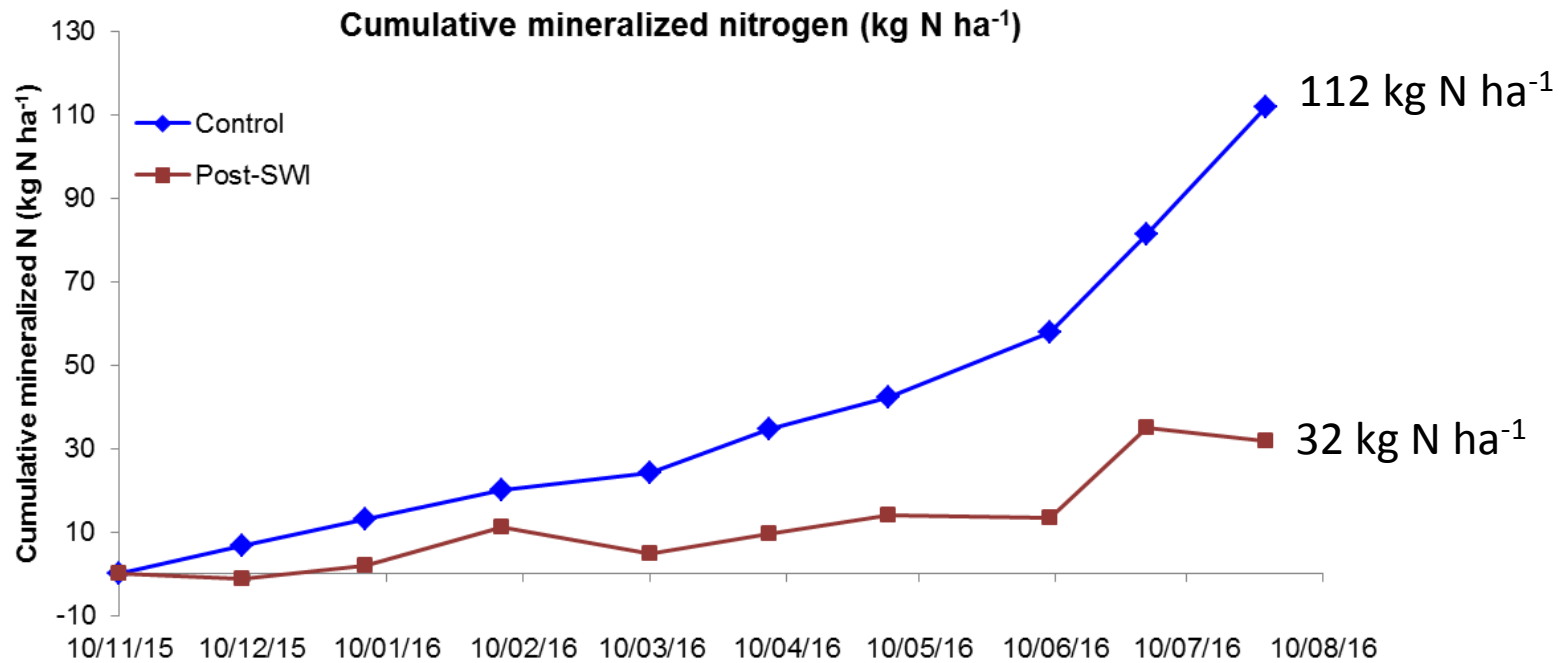
Parameters (including)

Soil Mineral Nitrogen  
Soil Water Content

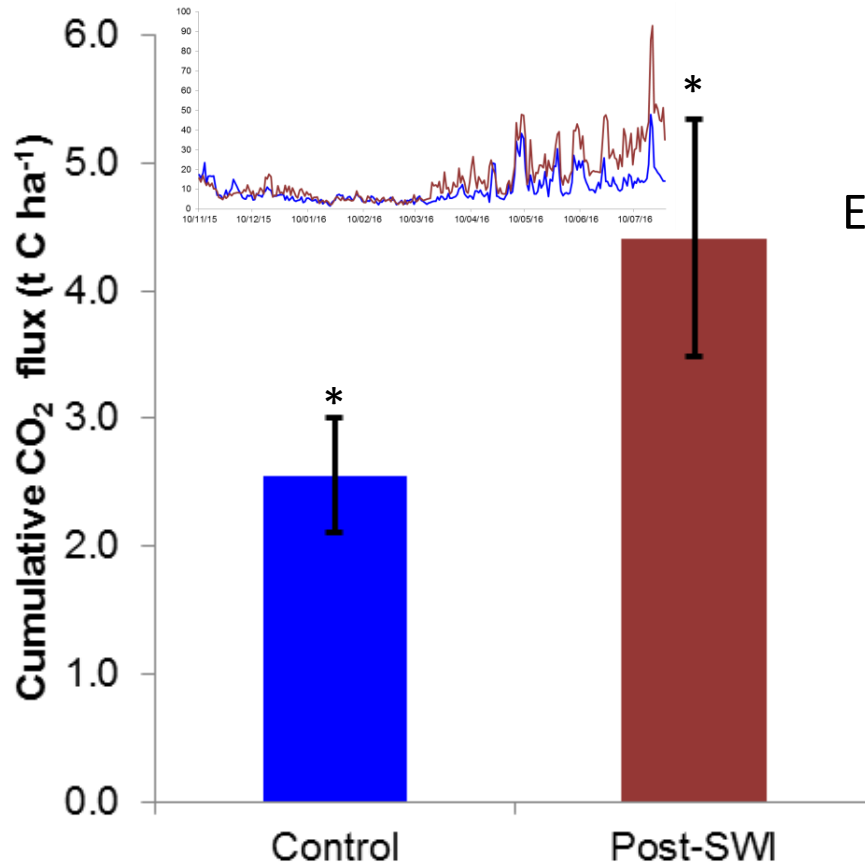
LIXIM

Flux

Water drainage  
Leached nitrate  
**Mineralized nitrogen**



## More cumulative CO<sub>2</sub> emissions in Post-SWI than in Control

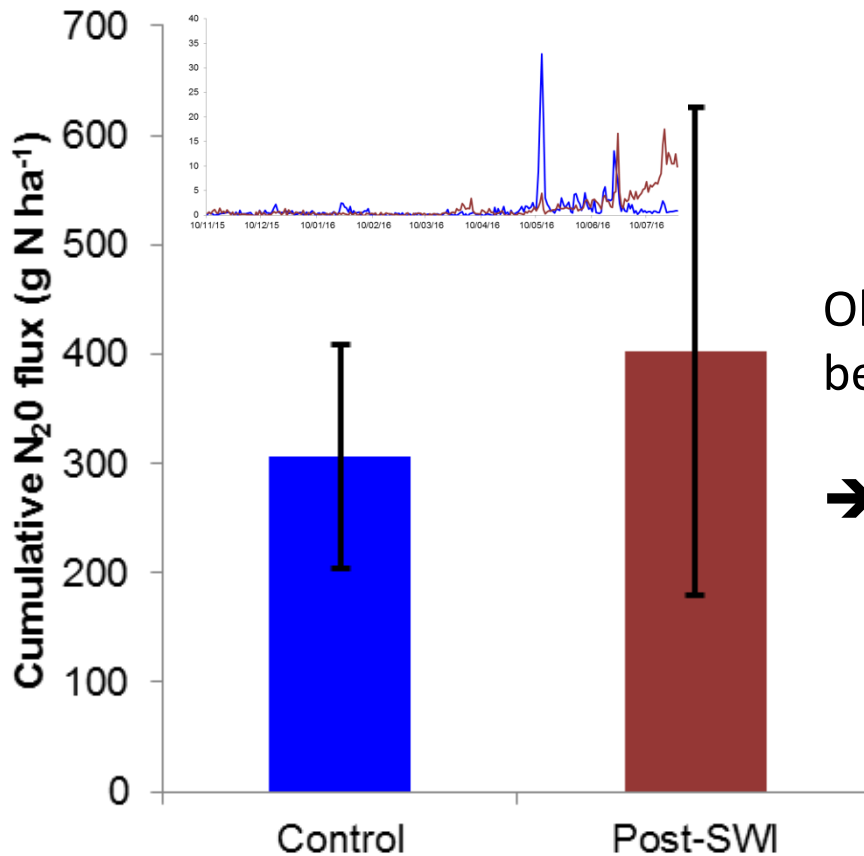


### Explanation

- Total biomass returned to soil (belowground + base of stems)  
Post-SWI: **31.2 ± 7.3 t DM ha<sup>-1</sup>**  
Control: **5 t DM ha<sup>-1</sup>**

\* P < 0.05; t-test

## Similar cumulative N<sub>2</sub>O emissions between Post-SWI and Control



Observed lower NO<sub>3</sub><sup>-</sup> content in Post-SWI between 0 and 30 cm

➔ Expected lower N<sub>2</sub>O emissions in Post-SWI BUT not observed

\* P < 0.05; t-test



## Conclusion

### Impacts of bioenergy crop destruction on ecosystem services?

Lower N mineralization

→ Less nitrate leaching BUT higher need of N inputs for the following crop

High CO<sub>2</sub> emissions BUT final impact on soil organic carbon unknown

## Prospects

N: Yield impact on the following crop with or without N input?

C: Soil organic carbon measurements before and after destruction