Nitrogen cycle regulation in temperate agroforestry. A case study assessing the impact of trees on nitrification stability in grasslands in Brittany (France)

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Introduction:

- Nitrogen losses are of great concern as they threaten ecosystems.
- Due to extreme climate events, nitrogen losses are expected to increase in the future.[1]
- Through direct and indirect impacts, agroforestry is considered as a lever to address this threat. [2,3]
- This PhD aims at depicting the impact of different agroforestry designs on the regulation of nitrogen cycle and associated ecosystem services in temporary grasslands in the Brittany region, France.

Experimental design:

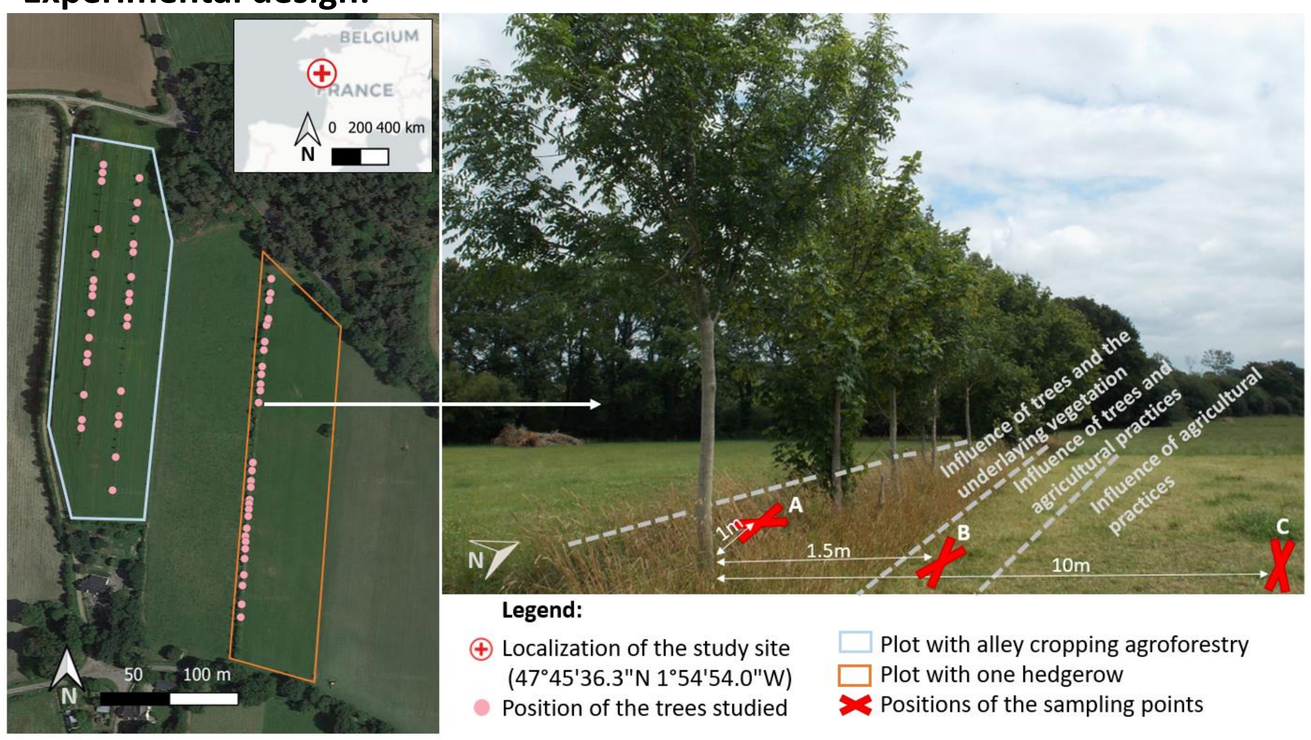


Figure 1:*Experimental design that enabled us to test two explaining factors of soil properties: (i) the agroforestry design and (ii) the distance to the tree row .*

Measured soil properties:

On soil microclimate:
- Soil temperature (°C)
- Soil humidity (%)

On soil porosity:
- Soil density ($g.cm^{-3}$)
- Earthworm abundance ($nb.m^{-2}$)

On soil nutrient availability:
- Mineral nitrogen ($mg.kg^{-1}$)
- pH

On the vegetation cover:
- Ground cover (%)
- Vegetation biomass ($g.m^{-2}$)

Distance to trees and **agroforestry designs** explain **soil properties variability,** and may alter **nitrification resistance and resilience** to extreme climate events.

Results :

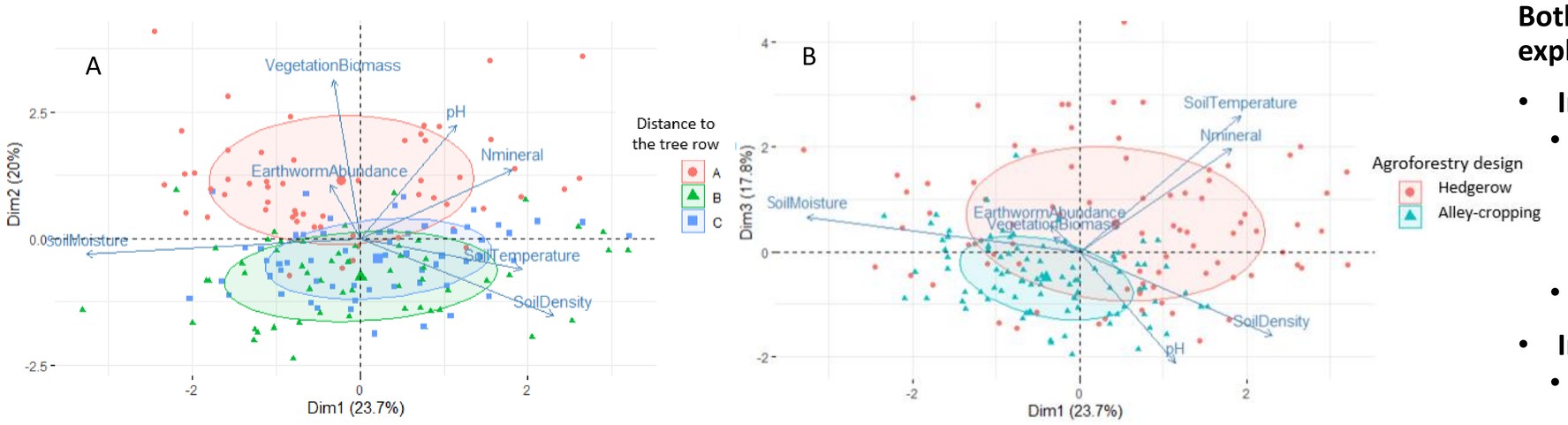


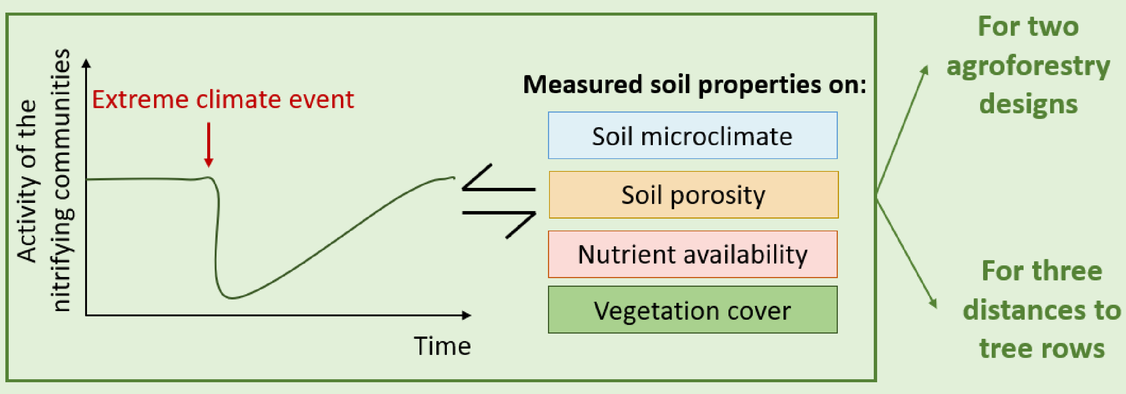
Figure 2: *Principal component analysis performed on the measured soil properties. Graph A shows the individuals and the variables on dimensions 1 and 2 according to the distance to the tree row. Graph B shows the individuals and the variables on dimensions 1 and 3 according to the agroforestry design.*

Both distance to trees and agroforestry design explained variability of soil properties*.

- **Impact of the distance to trees:**
  - Higher **vegetation biomass** in the tree rows (A) than in the grassland (B and C), inversely higher **soil density** in the grassland (B and C) than in the tree rows.
  - More acidic **pH** at distance B.
- **Impact of the agroforestry design:**
  - Higher **soil temperature** and **mineral nitrogen** soil concentration, and lower **soil moisture** and **pH** near the hedgerow.

* Anovas or Kruskal-Wallis statistical tests

Perspectives : Linking soil properties and nitrification resistance and resilience



Keep in touch !

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