



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DISPAA

Dipartimento di Scienze
delle Produzioni Agroalimentari
e dell'Ambiente



LIÈGE université
Gembloux
Agro-Bio Tech

The impact of char accumulation in abandoned charcoal hearths on soil and leaf nutrients content in a forest plantation in Wallonia

Giovanni Mastrolonardo, Chiara Calderaro, Joseph Dufey, Brieuc Hardy, Victor Burgeon,
Paolo Cherubini and Jean-Thomas Cornelis



Pictures by: Fabrizio Villa





Ferralsol and *terra preta*



Cambisol and abandoned charcoal hearth soil



Aim:

- Evaluation of the impact of charcoal accumulation on trees growth and nutrients cycling in a forest plantation

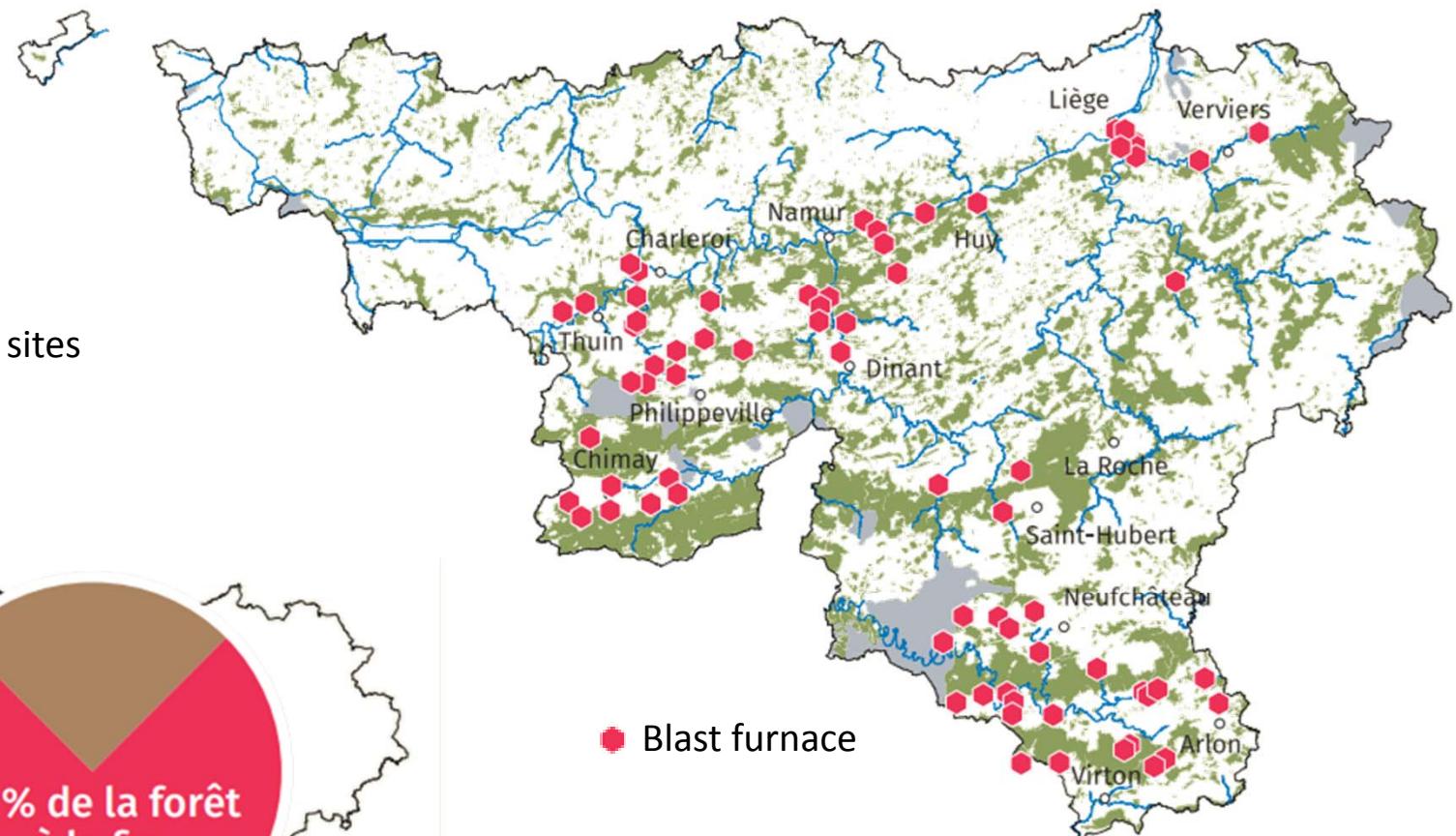
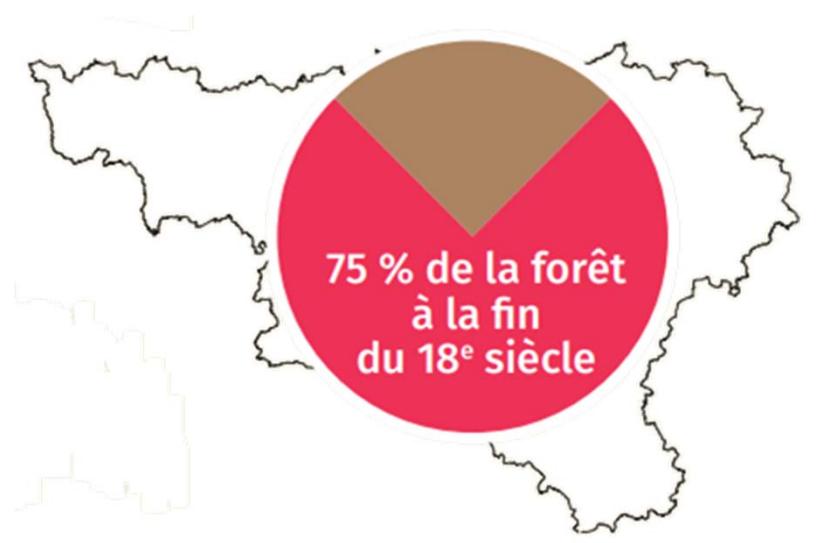
Picture by: Hans Baumann





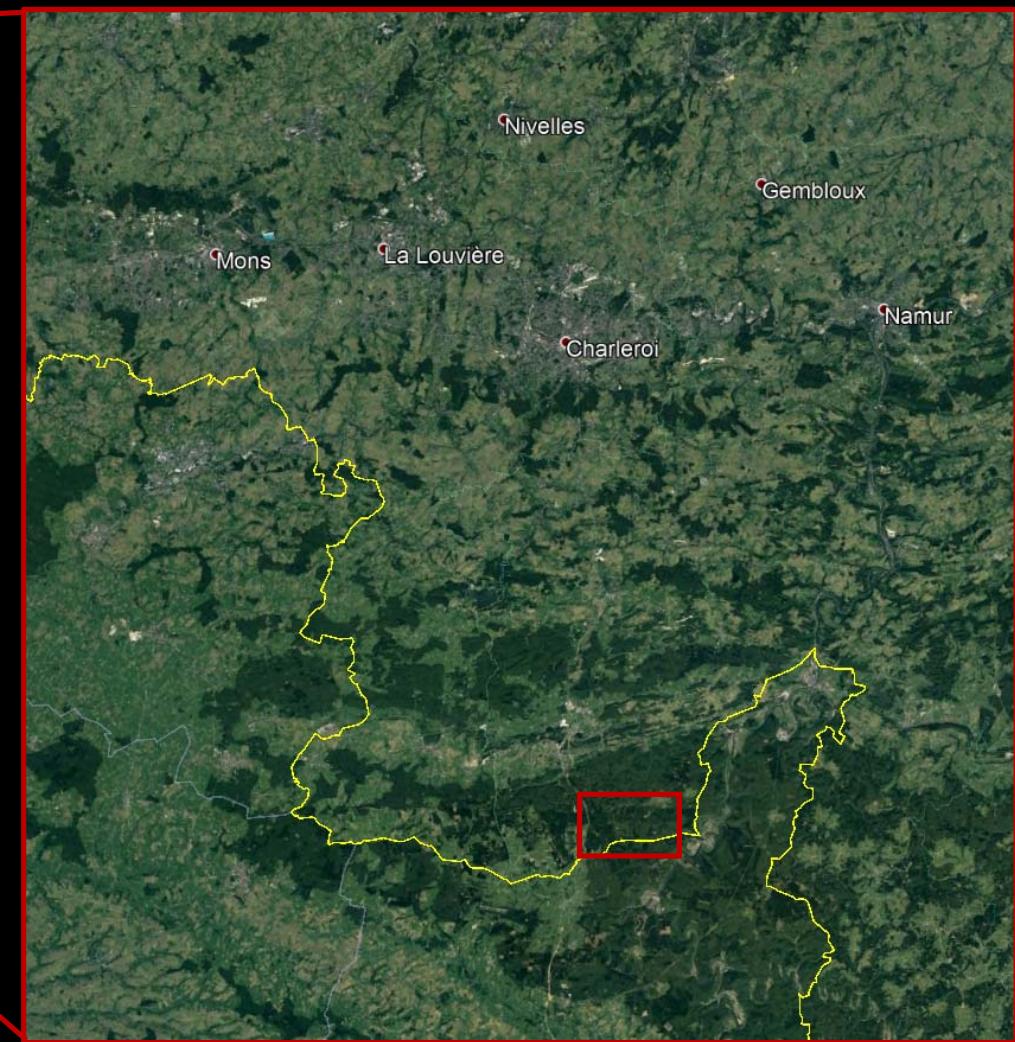
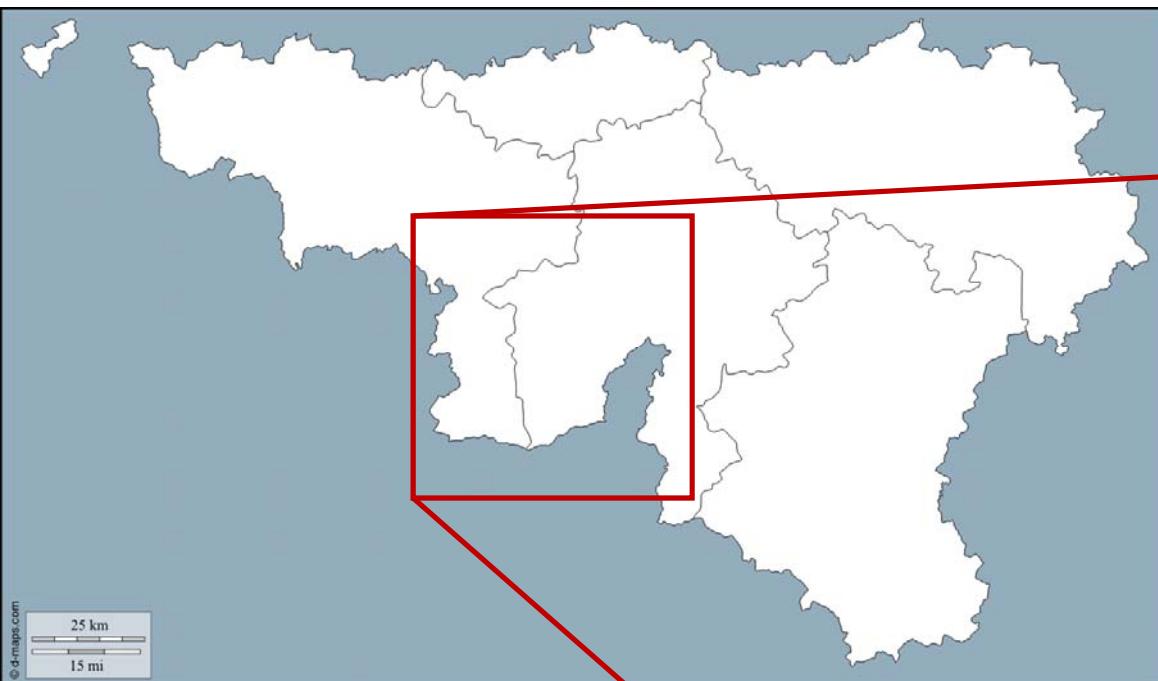
In XIX century:

- 73 blast furnaces
- 450.000 charcoal hearth sites
- 4000 ha

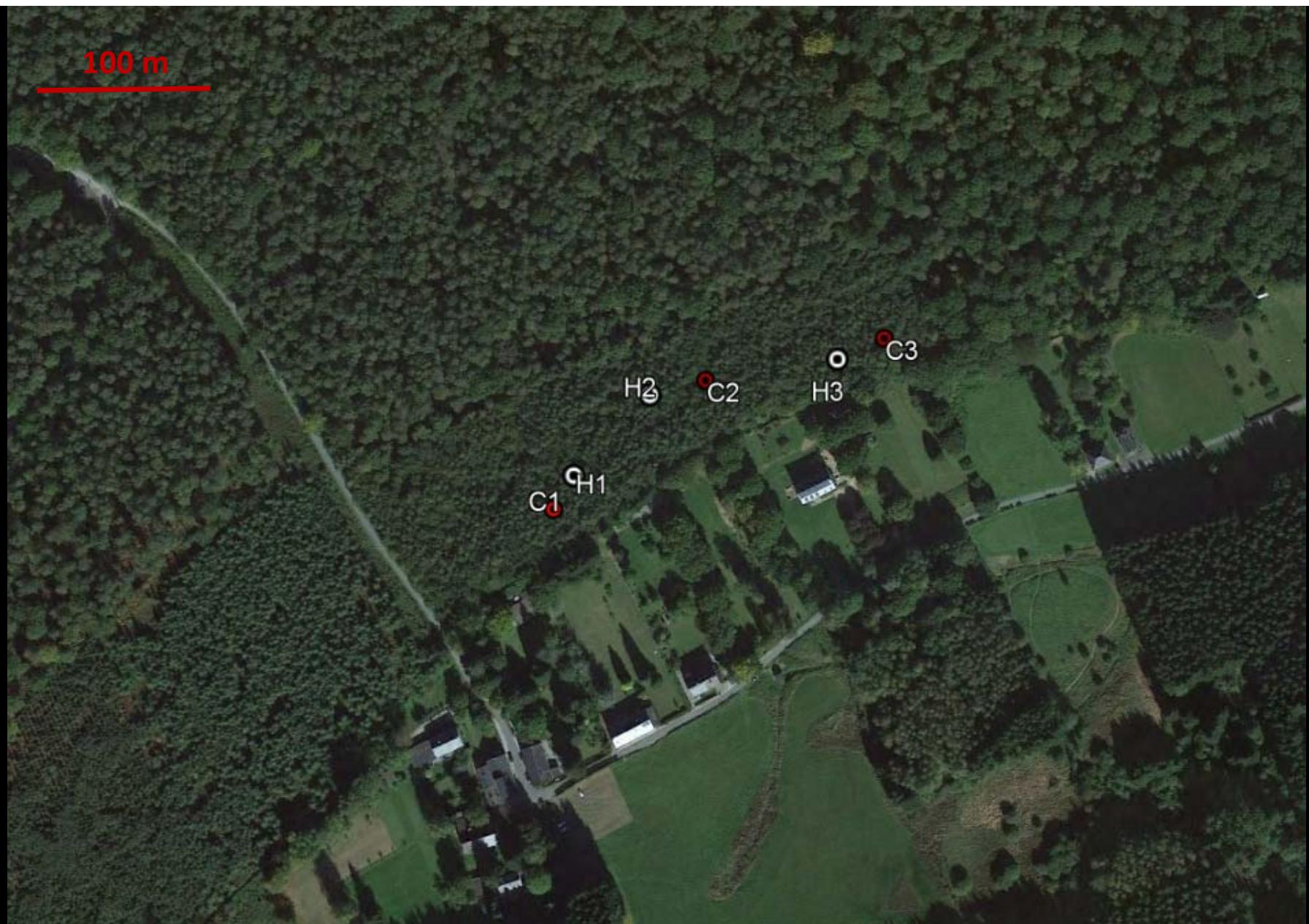


Origine des données :
SPW-DGO3-DEMNA & Evrard⁴.

Hardy & Dufey, 2015



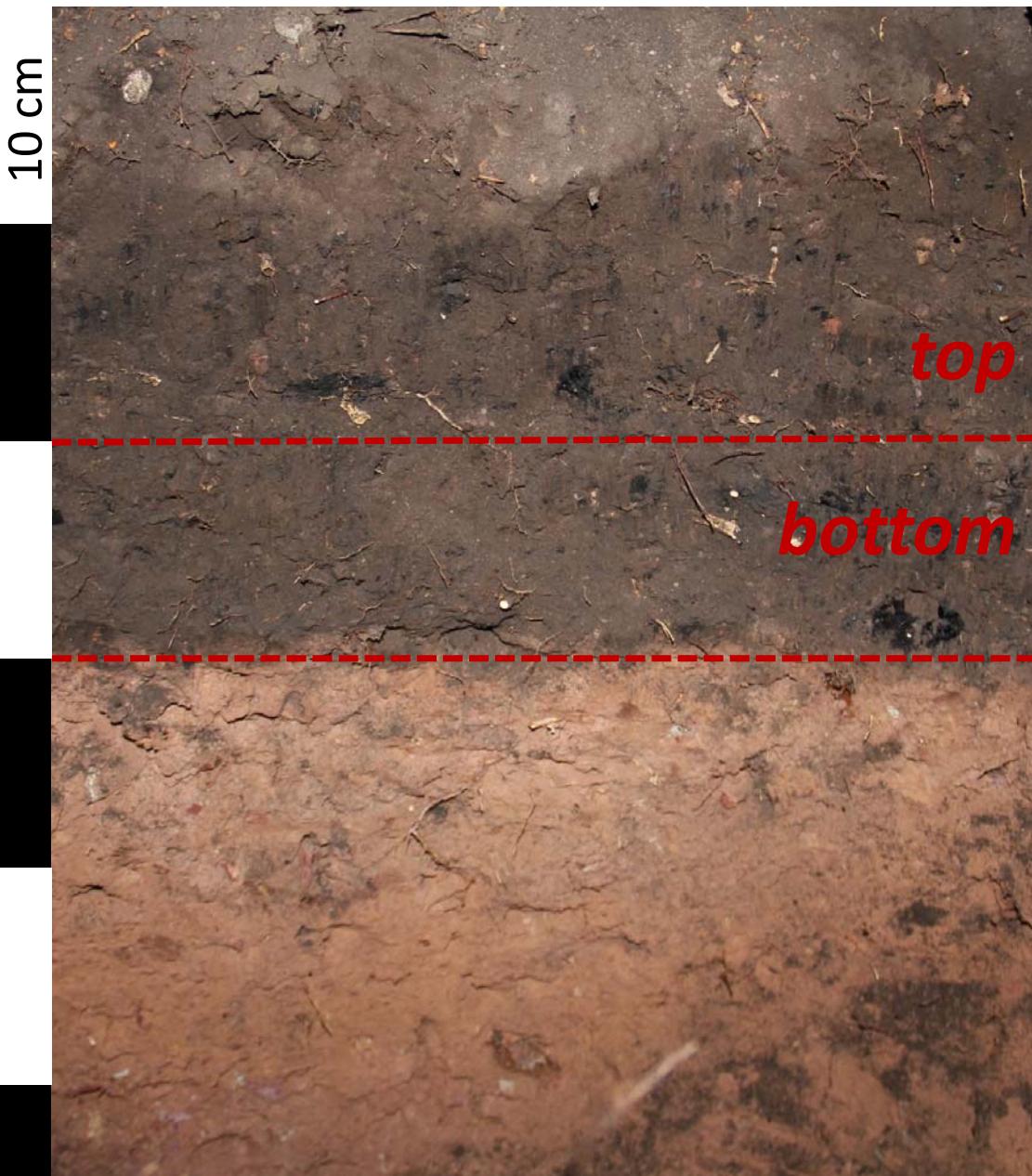








A horizon



top

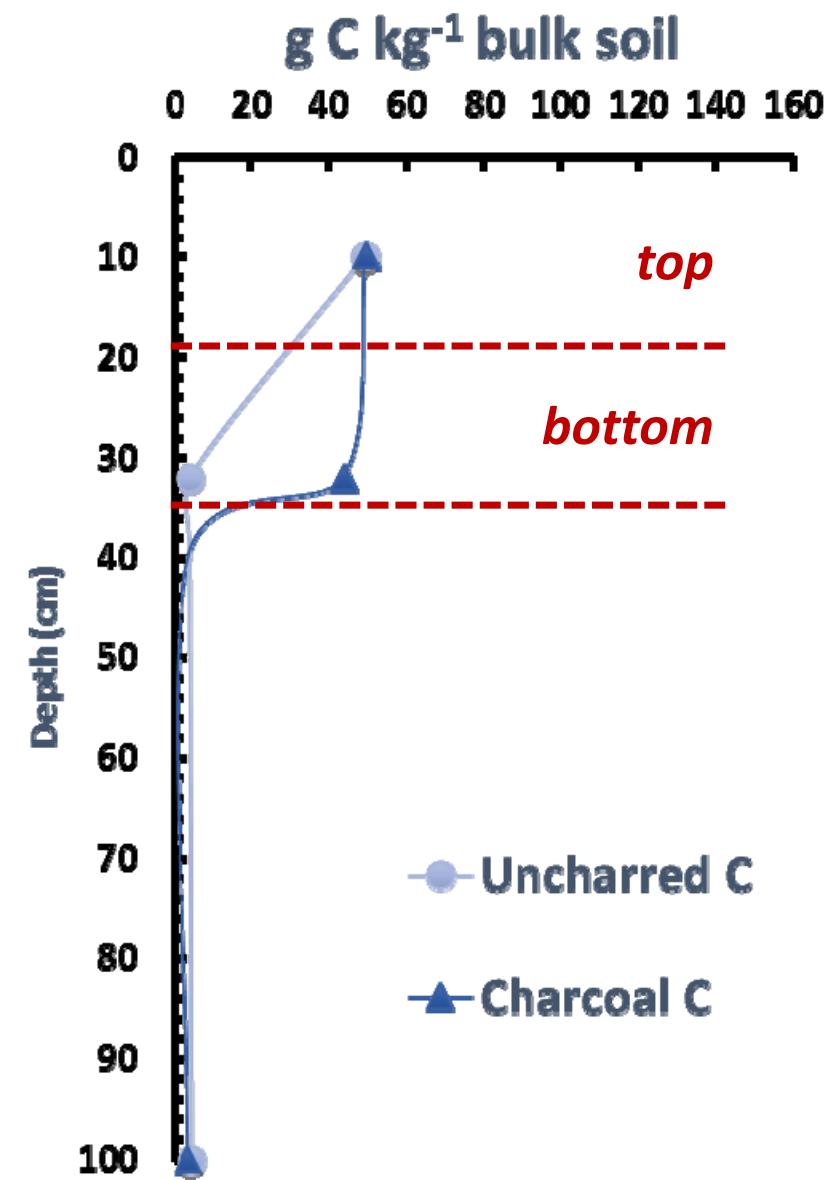
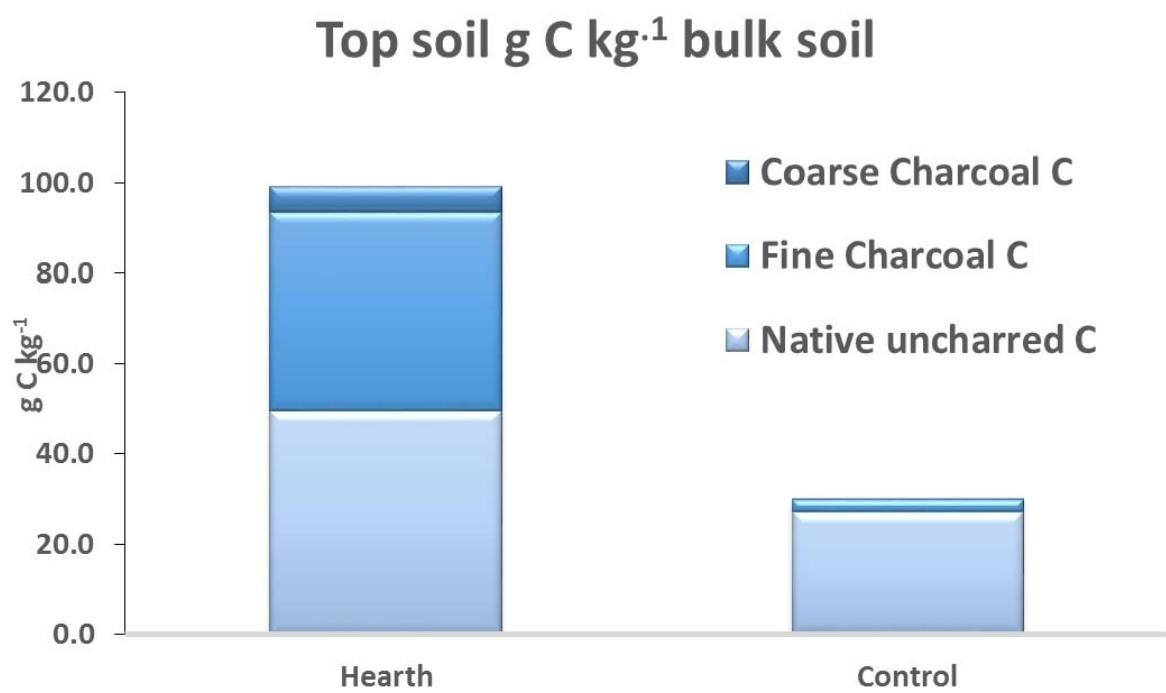
bottom



- Quantification of charcoal, both coarse (flotation) and fine (chemical oxidation method)
- Elemental analysis of soil and leaves samples using an atomic absorption spectrometer
- Tree-ring widths measurement on the woody cores using a stereomicroscope



| Diameter (m) | Thickness charcoal layer (cm) | Charcoal (tons ha ⁻¹) |
|-----------------|----------------------------------|--------------------------------------|
| 10.6 | 35 | 50 |

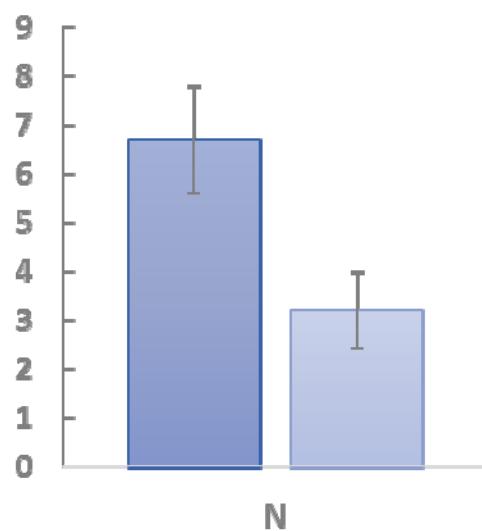


| Topsoil | pH (KCl) | b.d. |
|---------|----------|------|
| Hearth | 3.5 | 0.7 |
| Control | 3.5 | 0.8 |

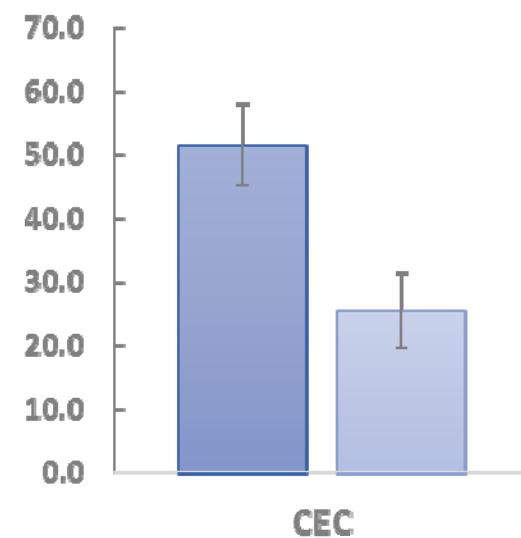
Hearth

Control

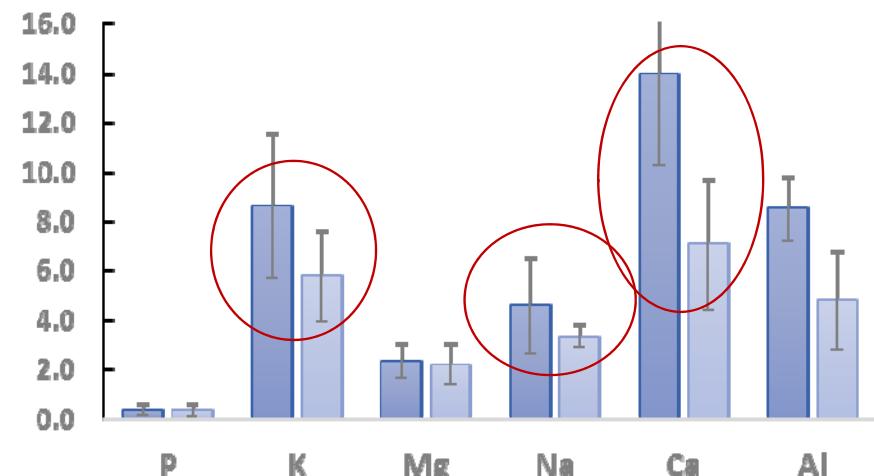
N g kg⁻¹



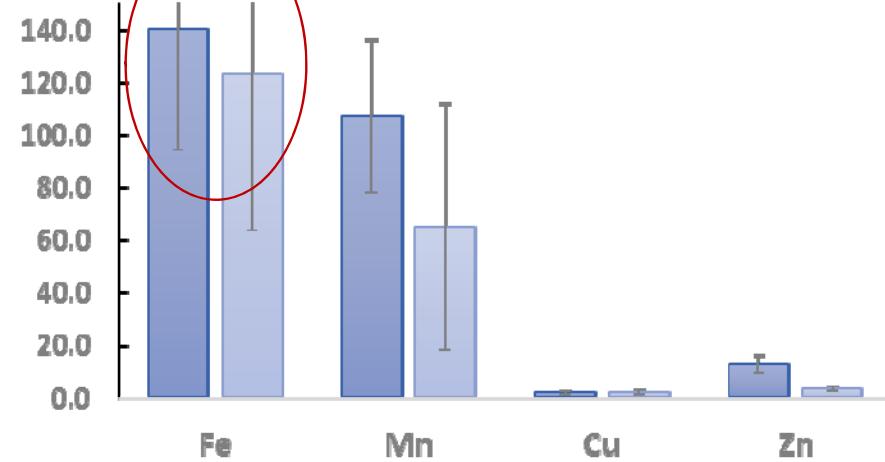
CEC cmol kg⁻¹



Available elements mg 100 g⁻¹



Available elements mg kg⁻¹

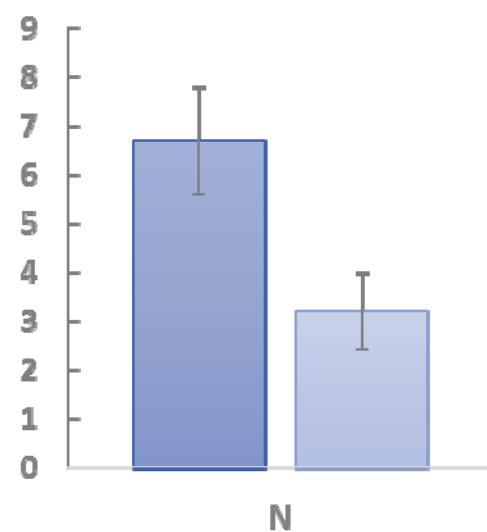


| Topsoil | pH (KCl) | b.d. |
|---------|----------|------|
| Hearth | 3.5 | 0.7 |
| Control | 3.5 | 0.8 |

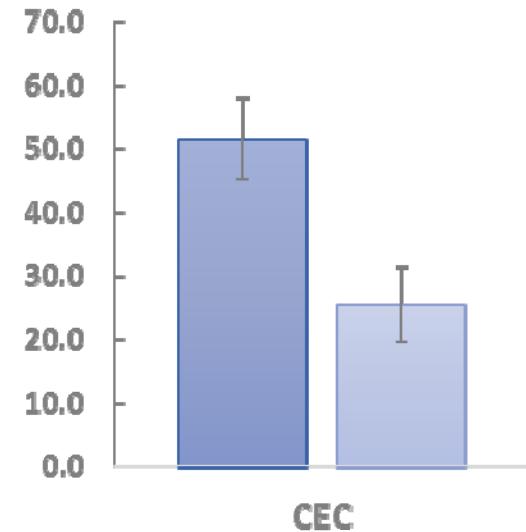
Hearth

Control

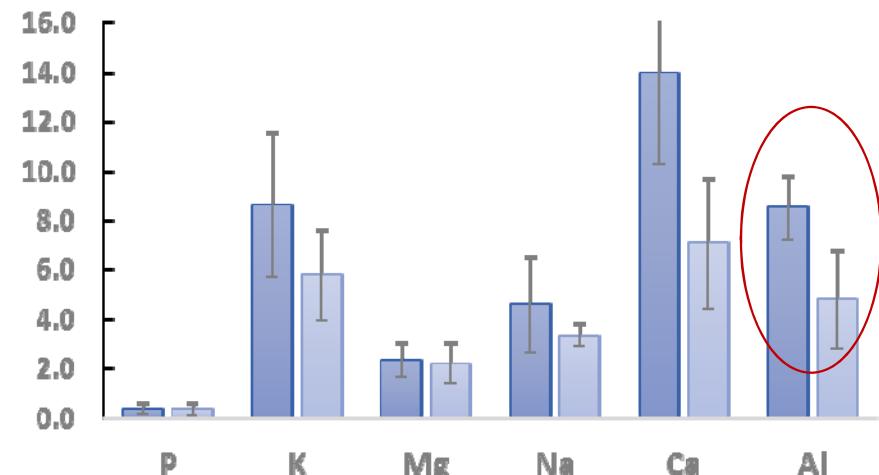
N g kg⁻¹



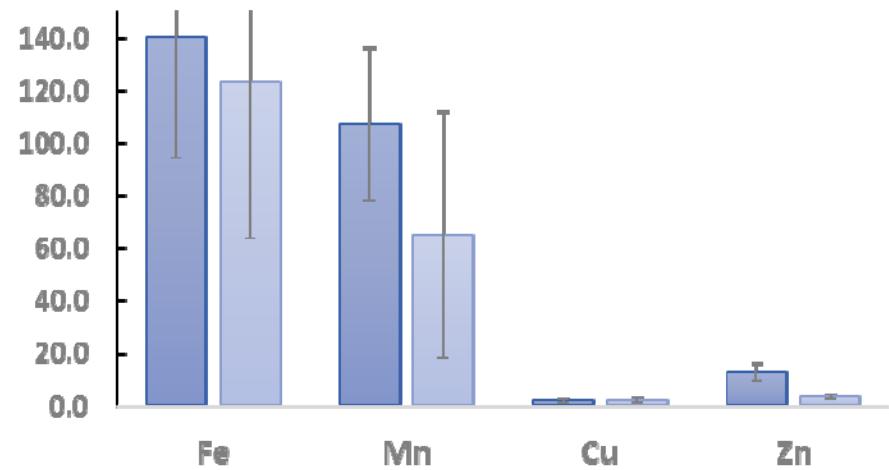
CEC cmol kg⁻¹



Available elements mg 100 g⁻¹



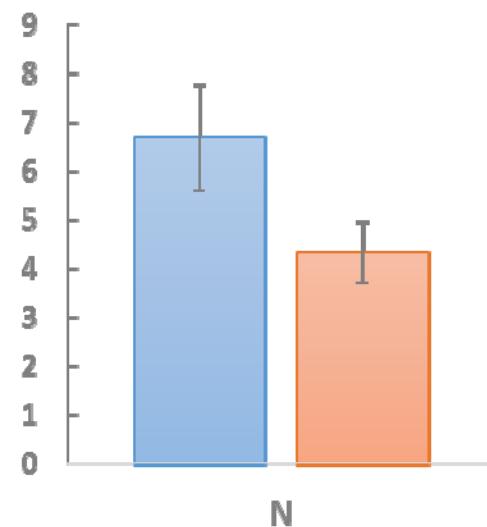
Available elements mg kg⁻¹



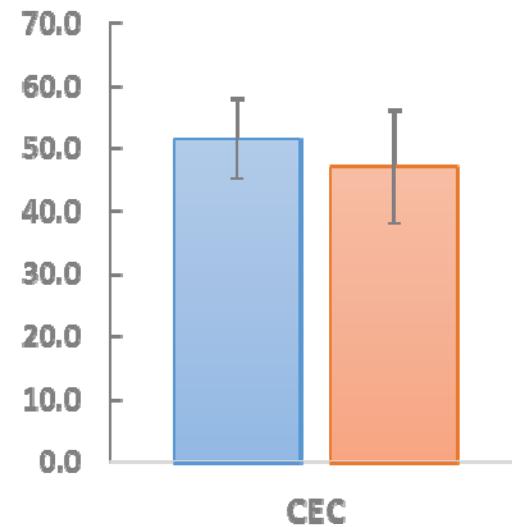
| Hearth | pH (KCl) | b.d. |
|--------|----------|------|
| Top | 3.5 | 0.7 |
| Bottom | 3.7 | 0.7 |

█ Top
█ Bottom

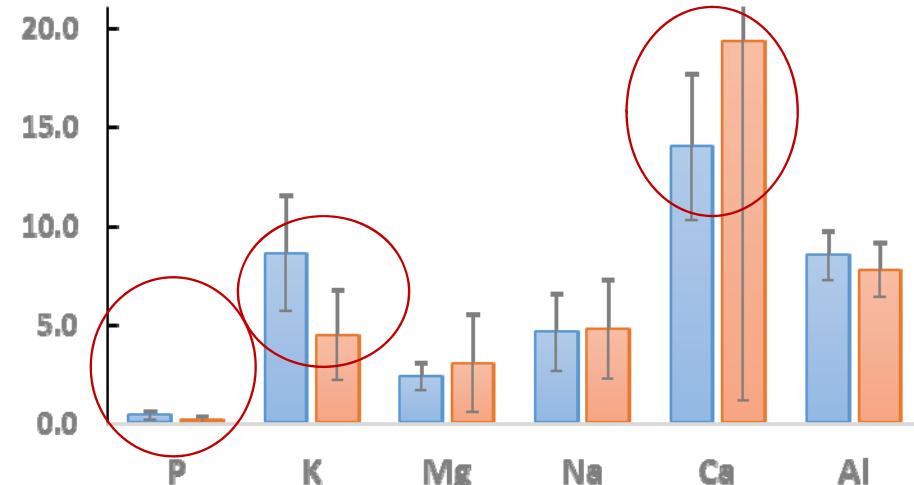
N g kg⁻¹



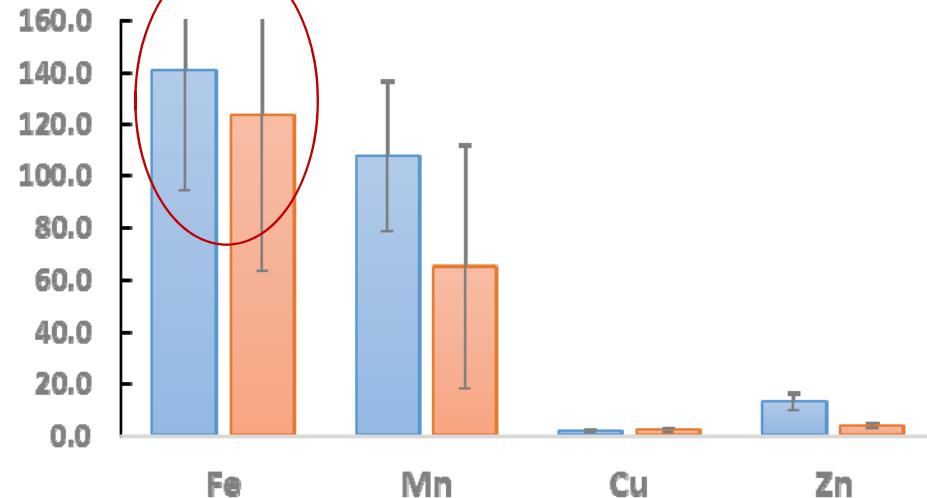
CEC cmol kg⁻¹



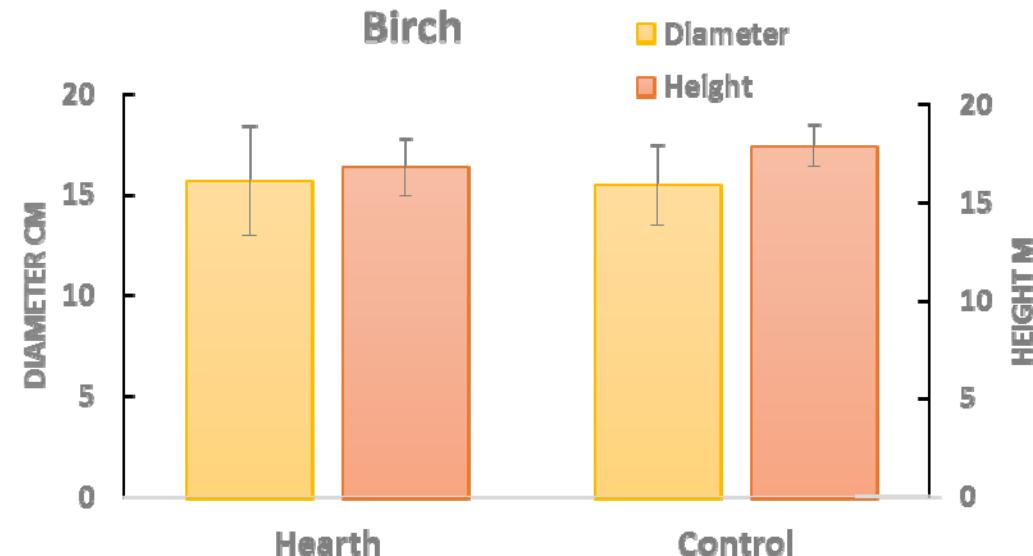
Available elements mg 100 g⁻¹



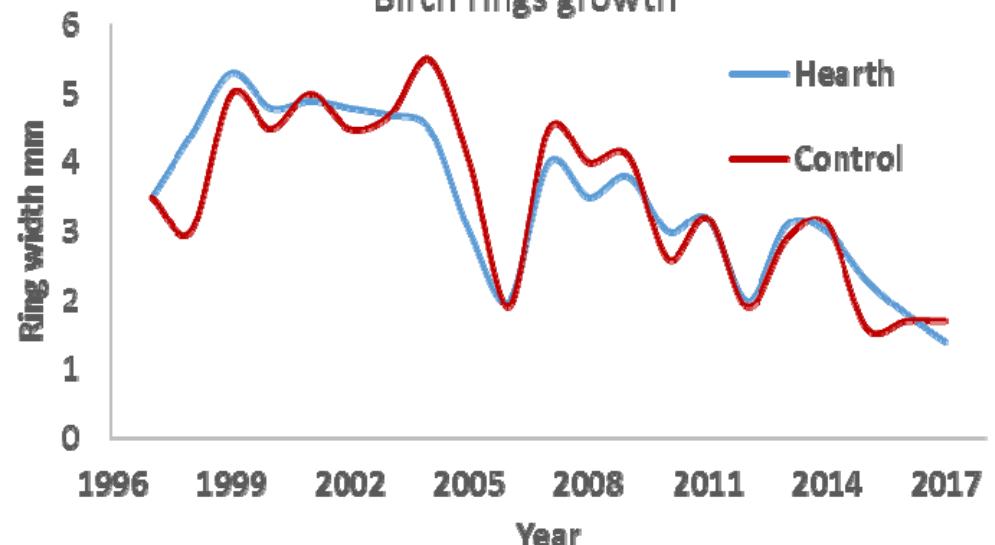
Available elements mg kg⁻¹



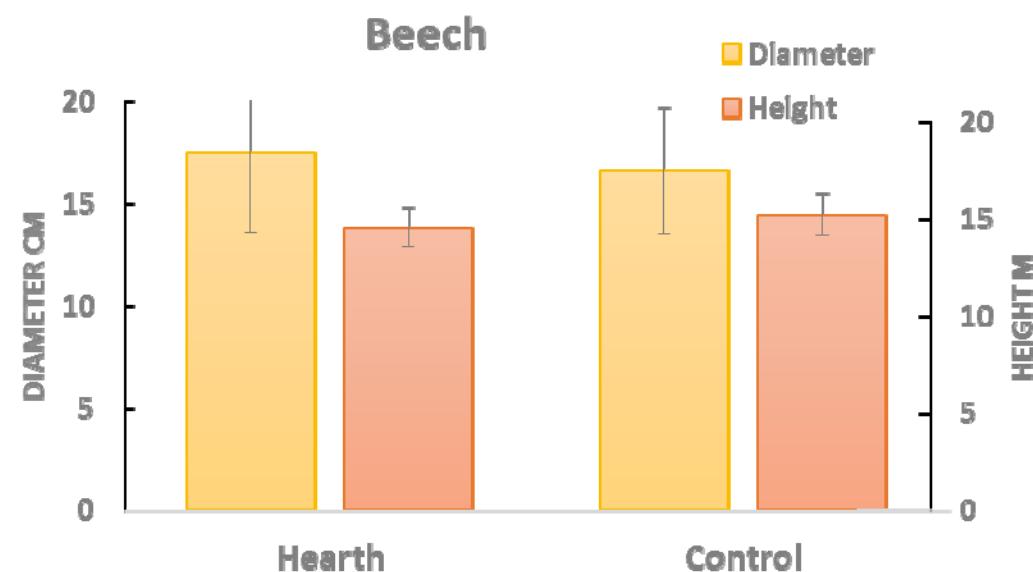
Birch



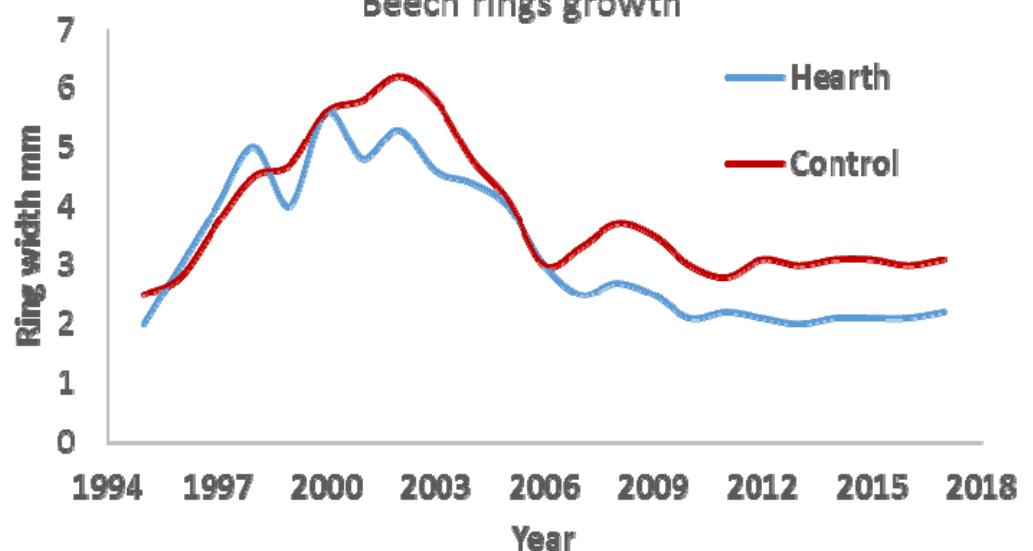
Birch rings growth



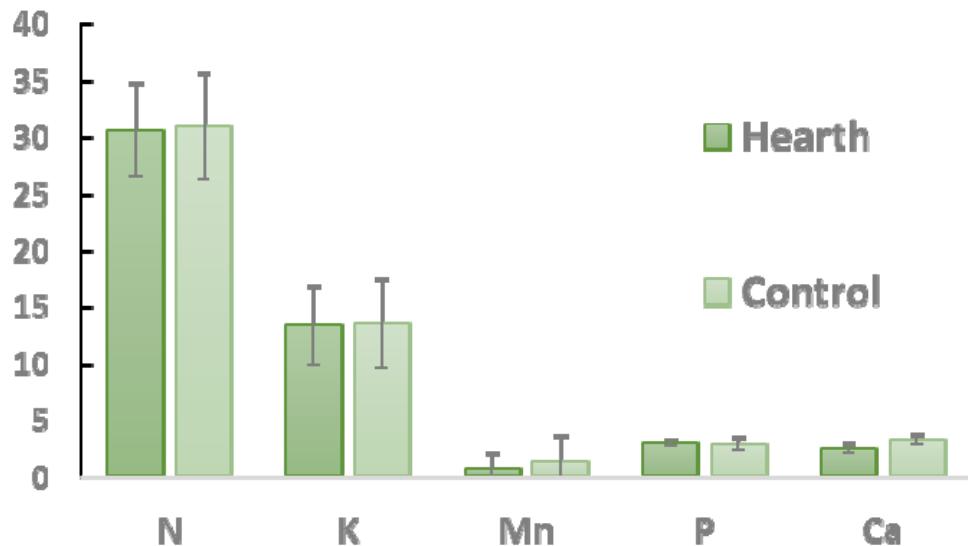
Beech



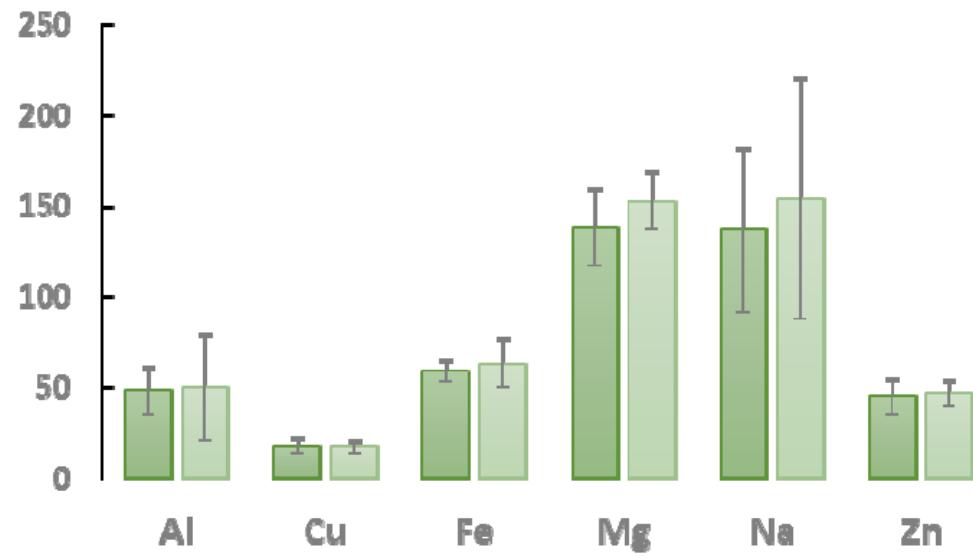
Beech rings growth



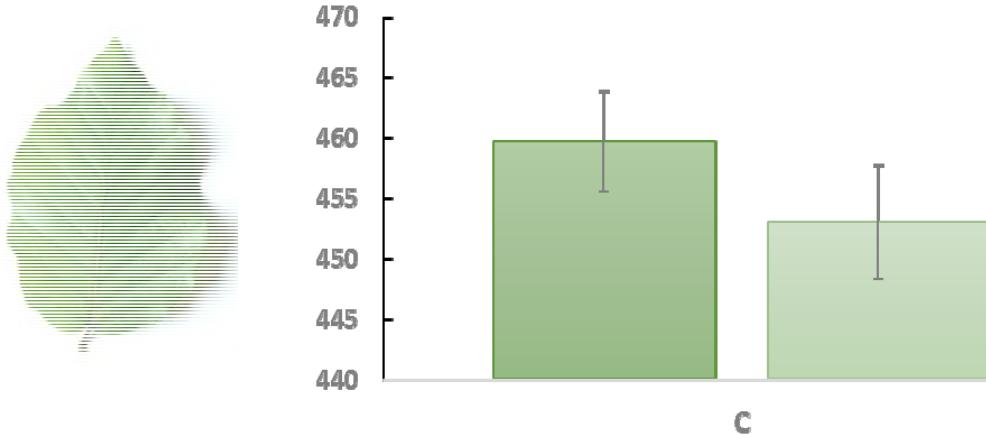
Elements g kg⁻¹



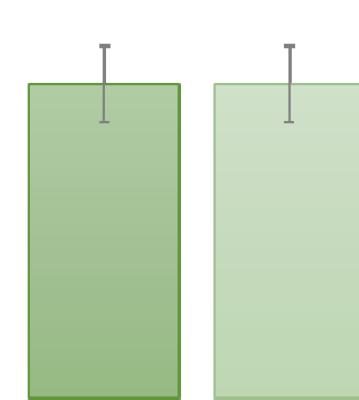
Elements mg kg⁻¹



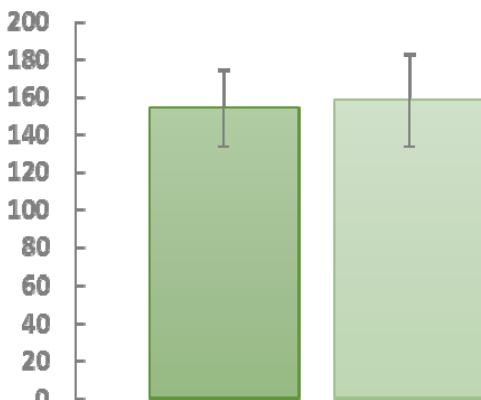
Elements g kg⁻¹

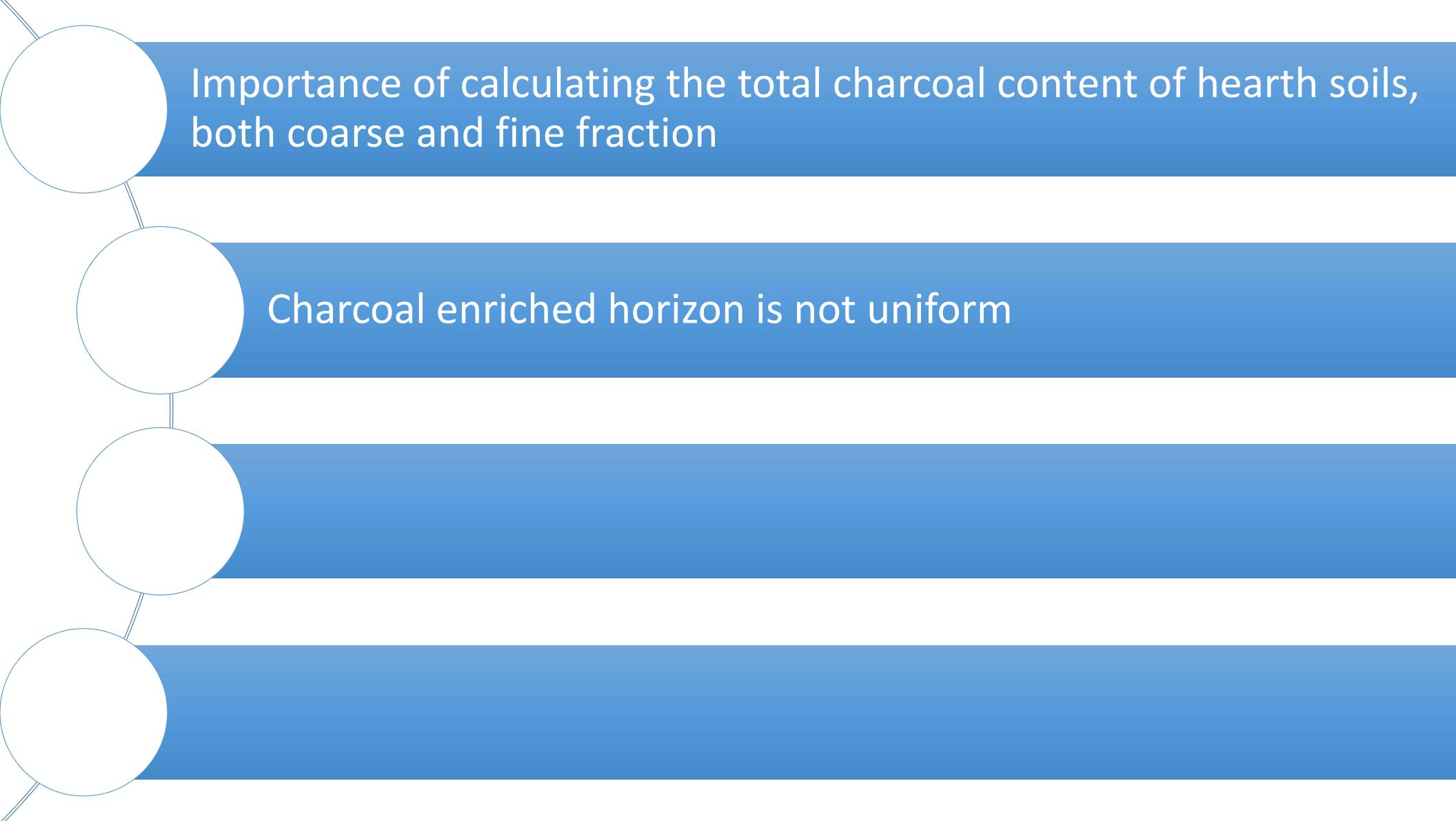


C/N



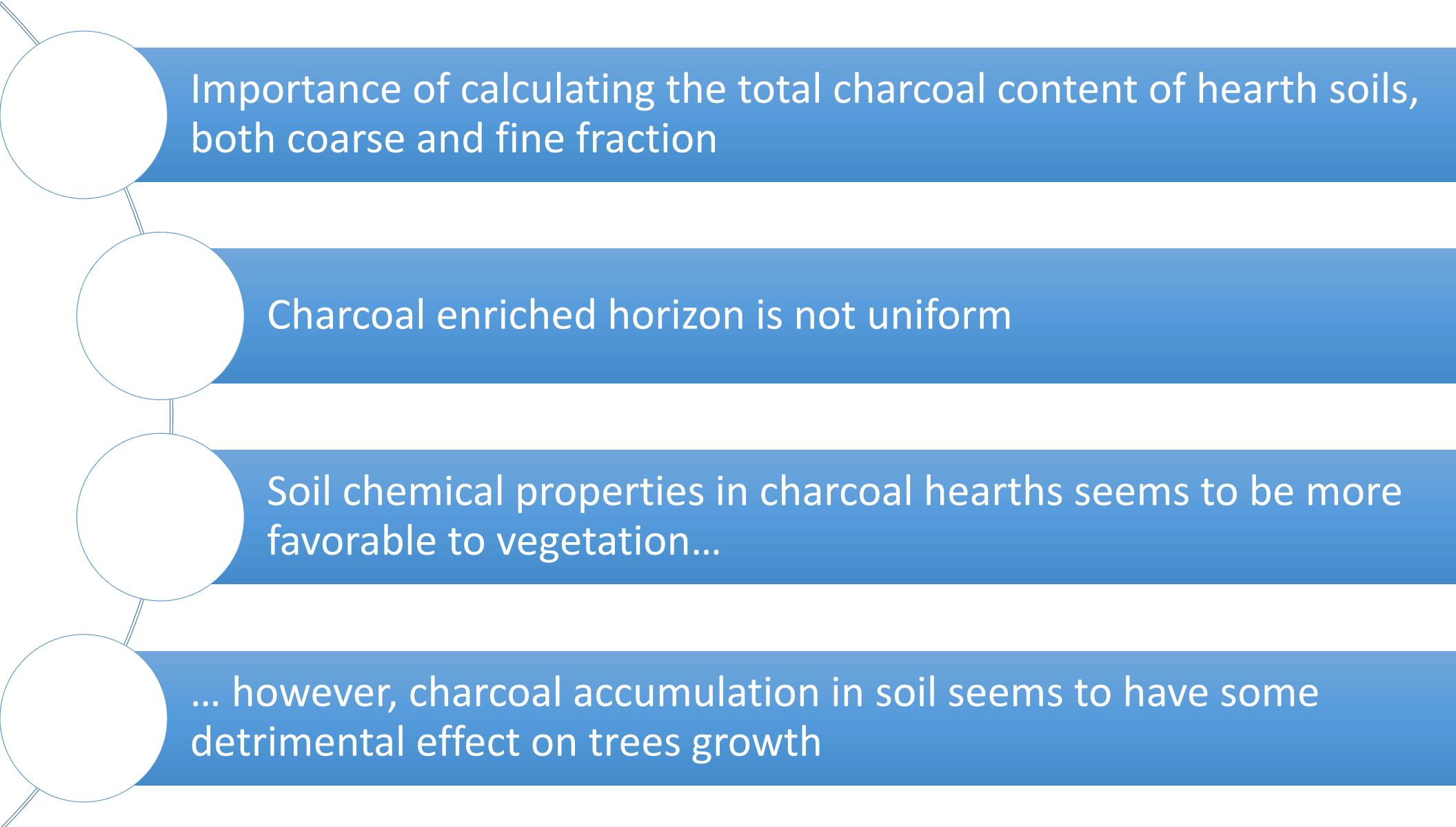
C/P





Importance of calculating the total charcoal content of hearth soils,
both coarse and fine fraction

Charcoal enriched horizon is not uniform



Importance of calculating the total charcoal content of hearth soils, both coarse and fine fraction

Charcoal enriched horizon is not uniform

Soil chemical properties in charcoal hearths seems to be more favorable to vegetation...

... however, charcoal accumulation in soil seems to have some detrimental effect on trees growth

Thank you for your kind attention!

This work was supported by a MarieCurie COFOUND postdoctoral fellow,
co-founded by the European Commission and the University of Liege

giovanni.mastrolonardo@gmail.com



