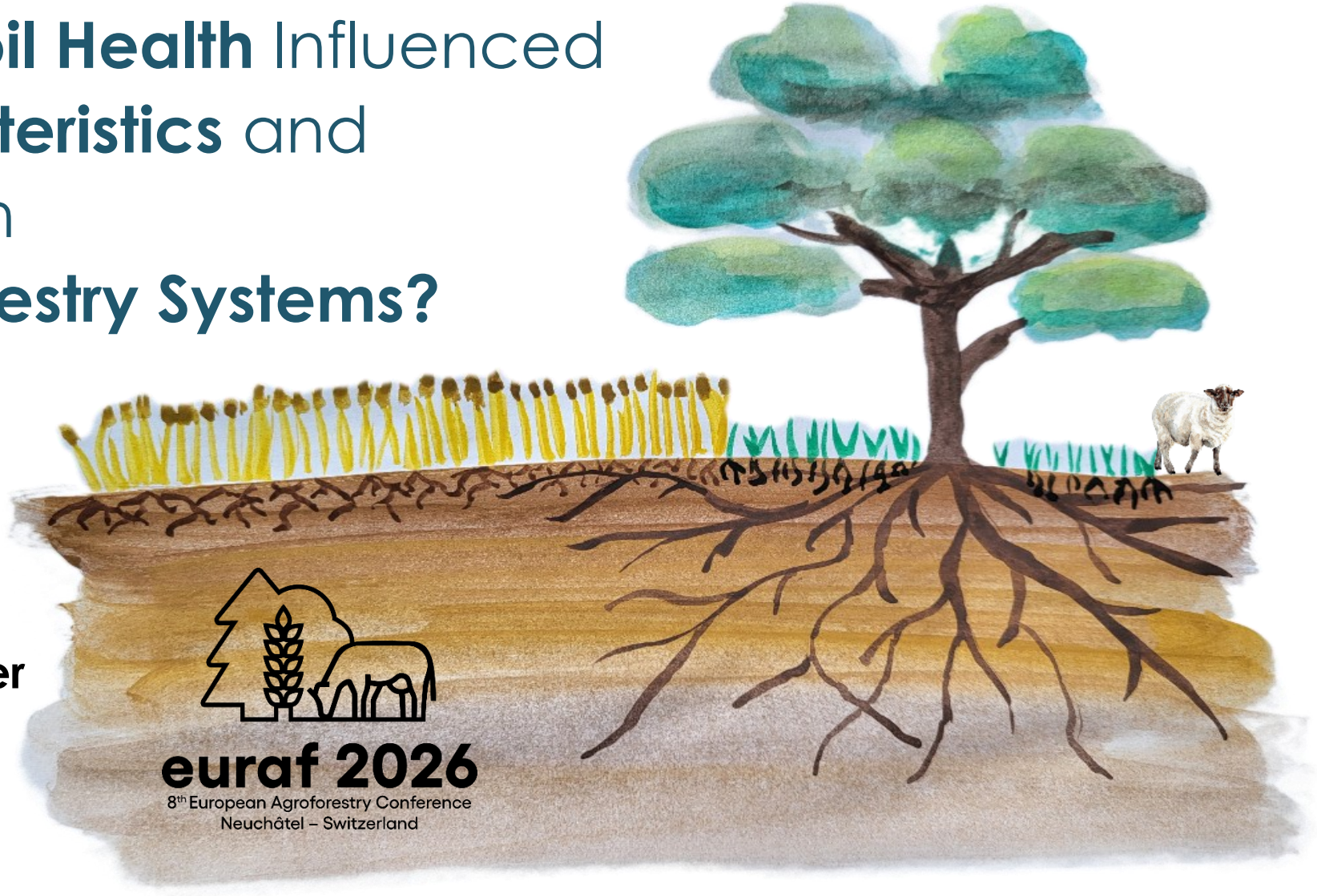
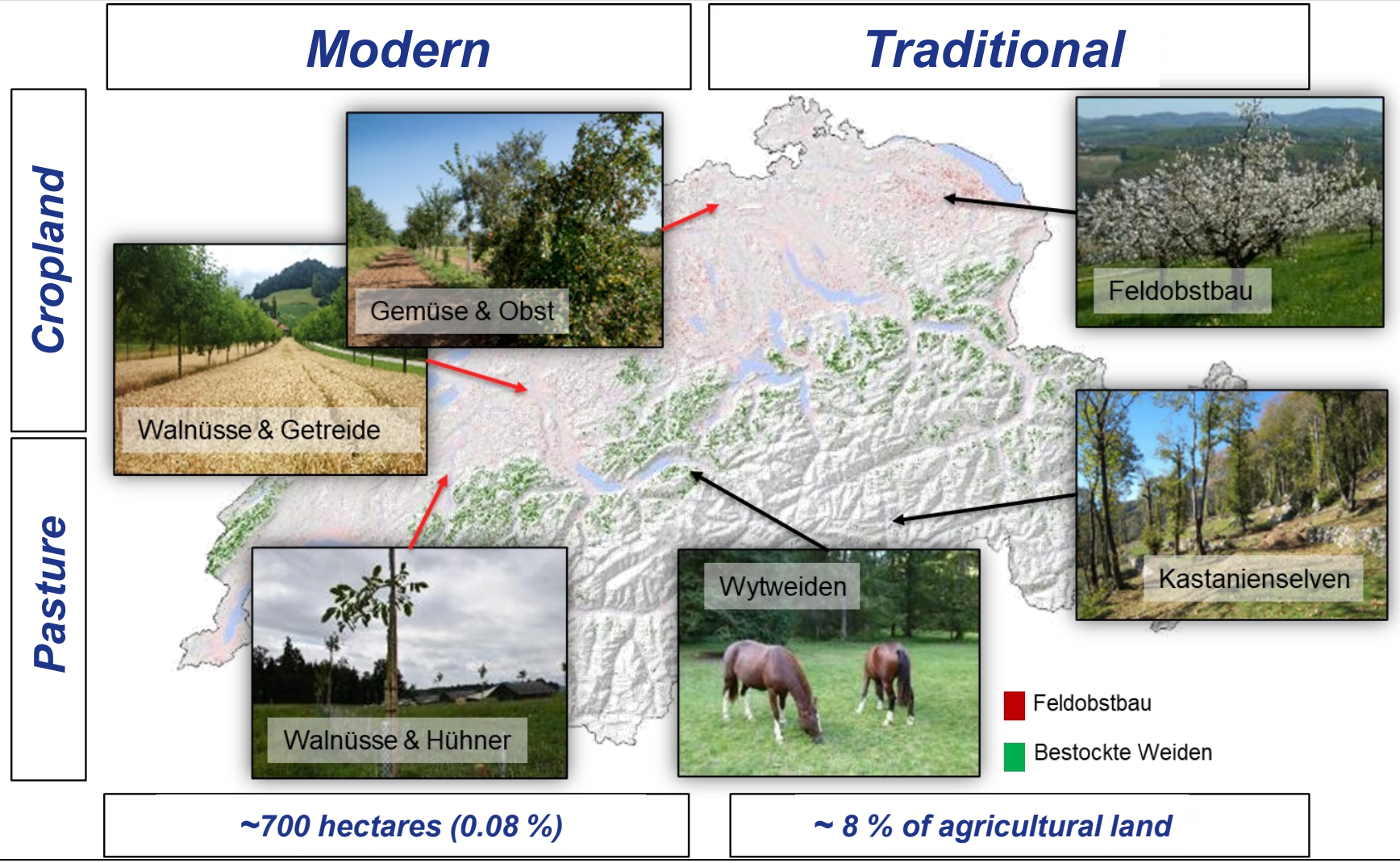
To What Extent is **Soil Health** Influenced by **Systems Characteristics** and **Soil Management** in **Silvoarable Agroforestry Systems?**



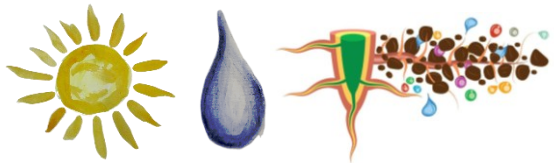
Camille Manon Rubeaud, Sonja Kay, Klaus Jarosch, Johan Six and Florian Walder

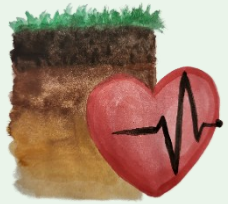
25th June 2026

Agroforestry in Switzerland



Agroforestry Systems (AFS) Improve Soil Health



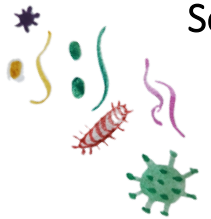


«capacity to sustain ecosystem functions and services»
(Bünemann et al., 2018)

Biomass production

SOC

Soil biota



Mineralisation

Nutrient cycling

Structure

↗ Infiltration & water retention

↘ Erosion

↘ Leaching

(Cannell et al., 1996; Chatterjee et al., 2018; Cardinael et al., 2019; Cherubin et al., 2019; Bergeron et al., 2011)

BUT … remain unclear …

- Systems level effect?
- Drivers of Soil Health improvement? (AFS characteristics?)
- Interaction of AFS with other Soil conservation practices?

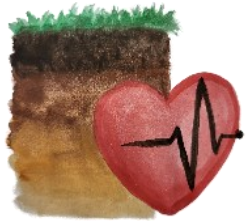

Agroforestry

*

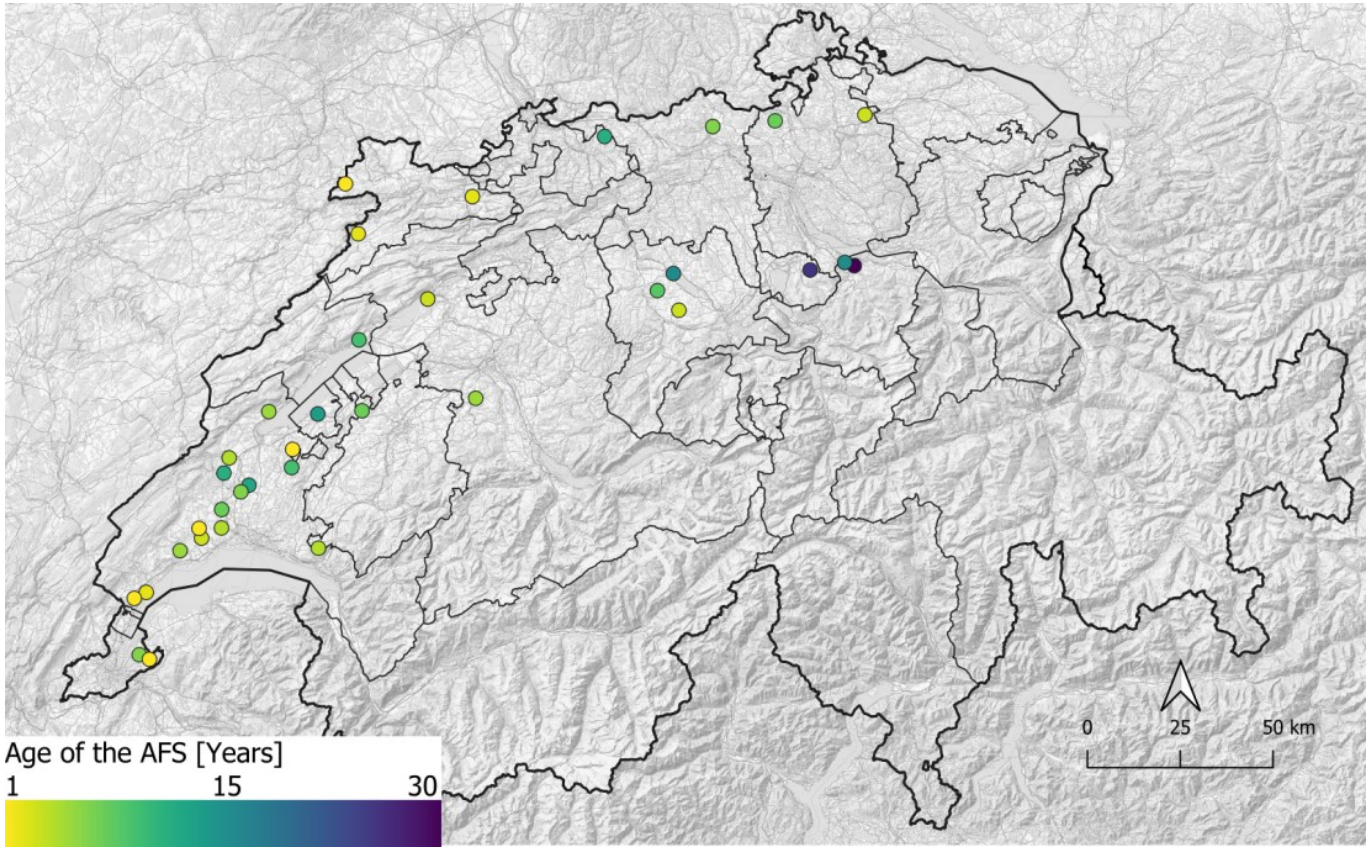

Tillage intensity


C input

Soil cover

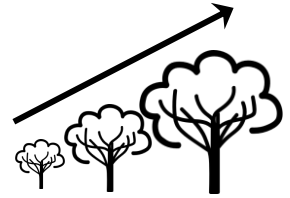


Silvoarable agroforestry sites

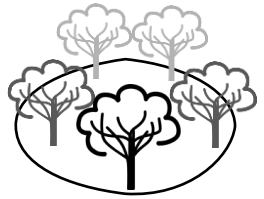


Systems characteristics

- 33 sites
- Stand age:
  3 - 30 years

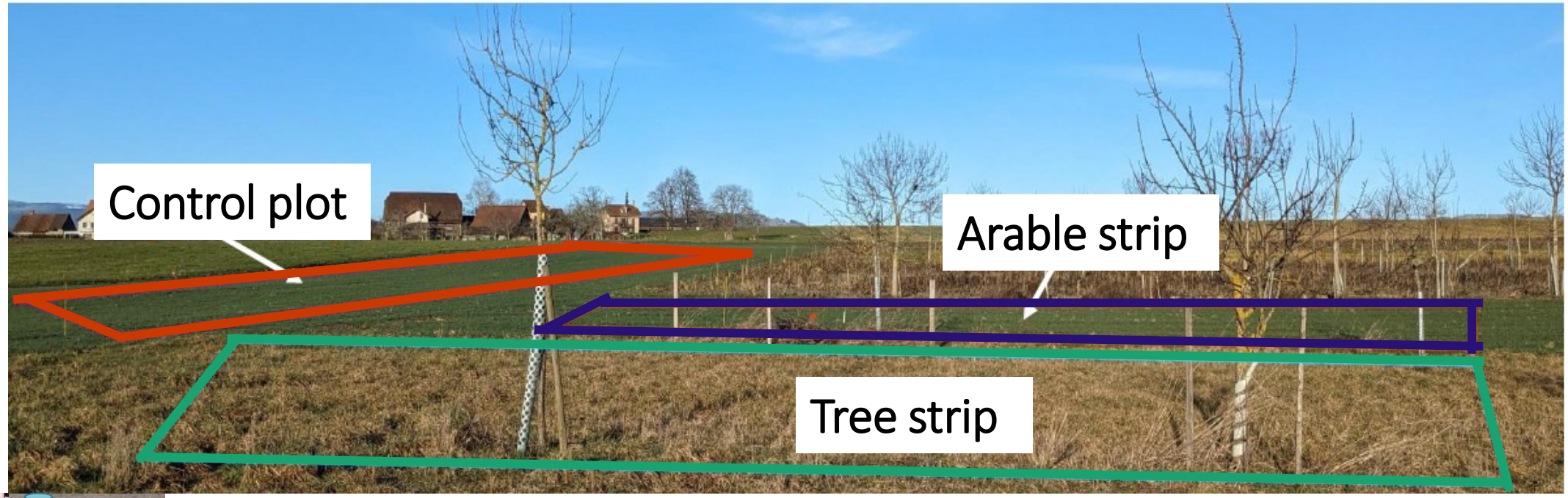


- Tree density:
  5 - 260 #/m^2

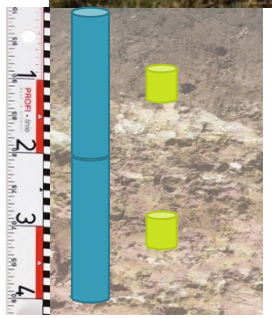


- Tree diversity:
  1 - 11 species

Sampling design



Picture: Nina Henny



Composite samples

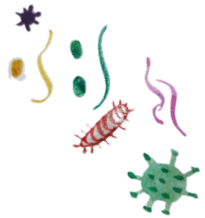
Undisturbed soil cores

Penetration resistance

Selected soil parameters for today's discussion

SOC

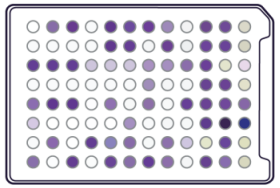
Soil Organic Carbon



Microbial Biomass Carbon

Basal Respiration

CO_2

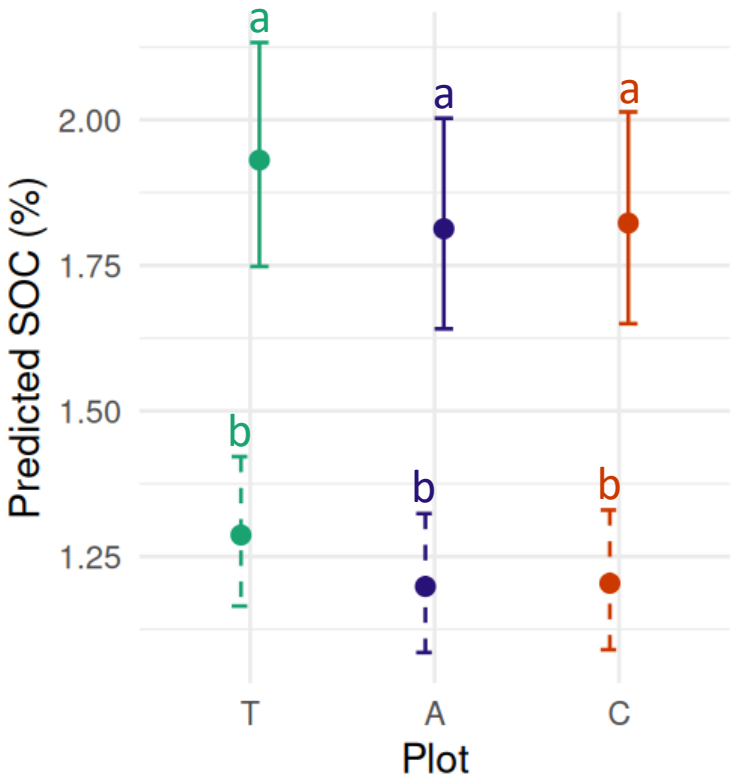


Biolog Ecoplate™

Soil Organic Carbon

Effect of agroforestry

```
log(Corg) ~ Clay + Silt + MAP + MAT +
Plot * Depth + (1 | Farmer)
```



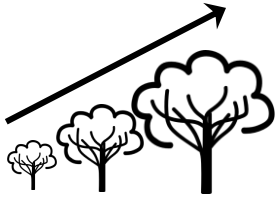
Plot
- T
- A
- C

Depth
- sub
- top

+ 6% SOC
p=0.2

Marginal R^2 = 0.57
Conditional R^2 = 0.88

AFS Characteristics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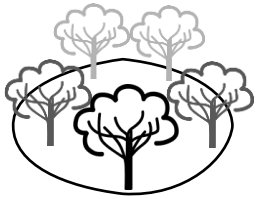
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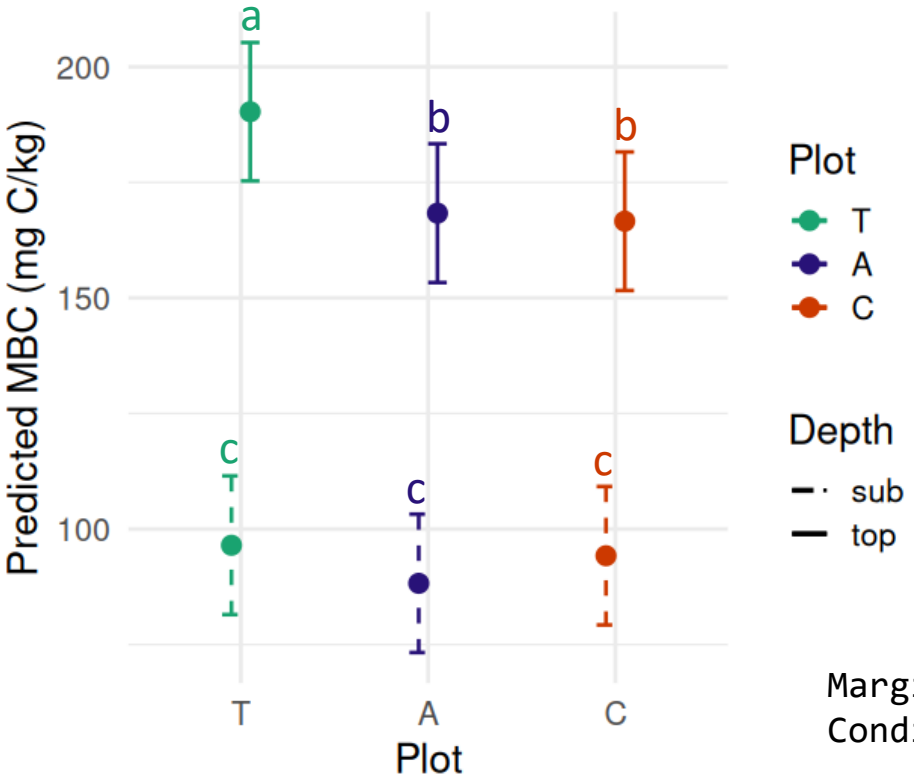
ns

Microbial Biomass Carbon

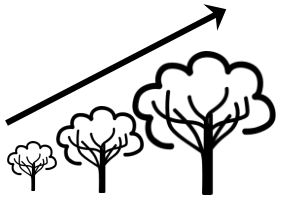
Effect of agroforestry

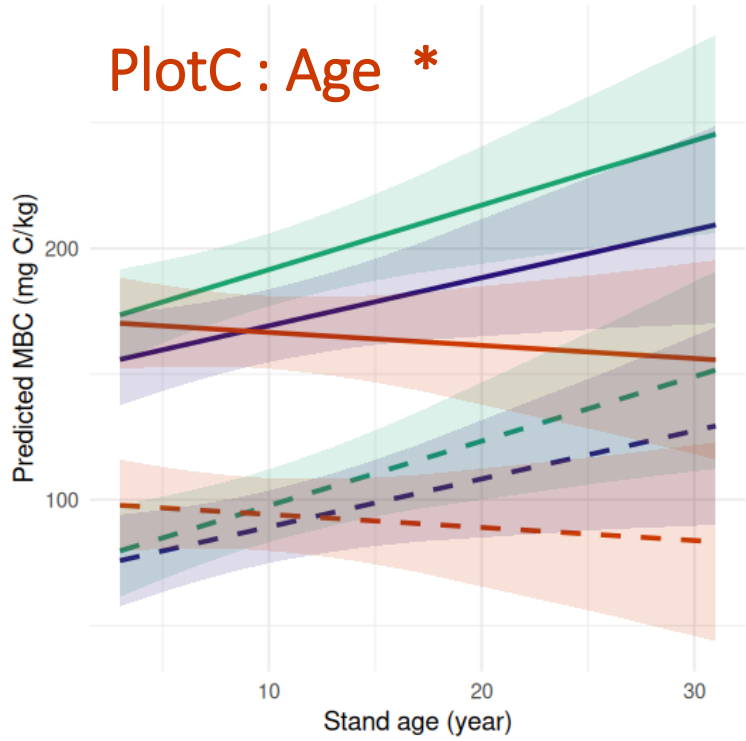
```
MBC ~ Clay + Silt + MAP + MAT +
Plot * Depth + (1 | Farmer)
```



Marginal R^2 = 0.73
Conditional R^2 = 0.81

Stand age

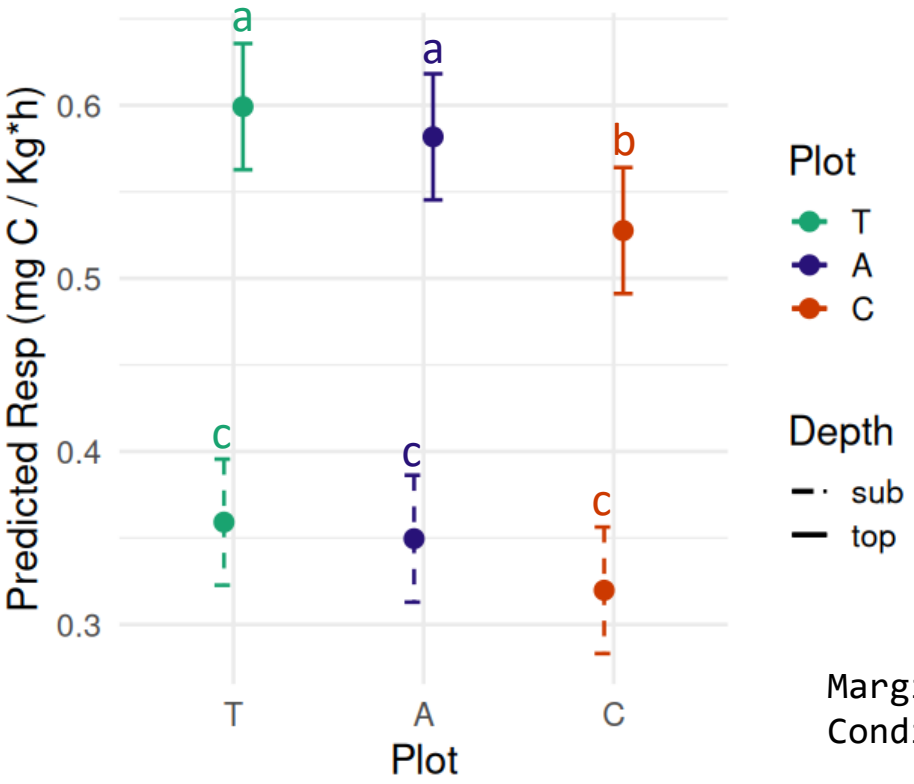




Respiration

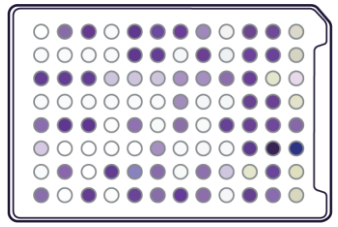
Effect of agroforestry

```
Resp ~ Clay + Silt + MAP + MAT + pH +
Plot * Depth + (1 | Farmer)
```

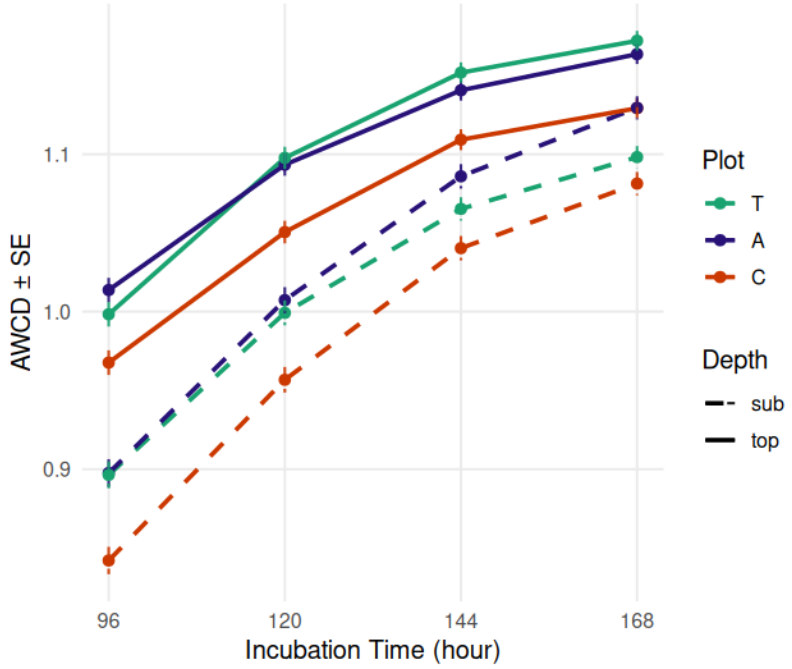


Marginal R^2 = 0.78
Conditional R^2 = 0.87

Biolog Ecoplate™



functional community composition

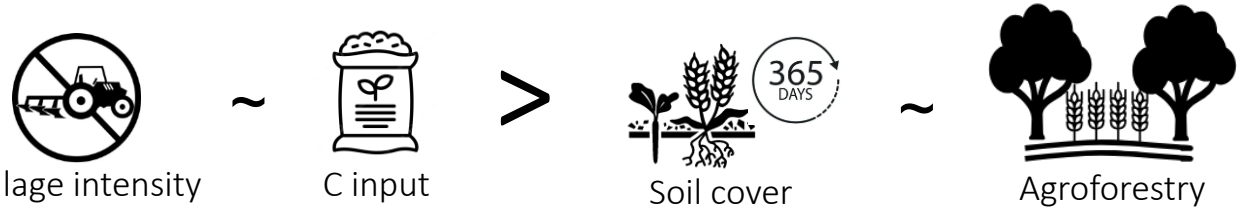


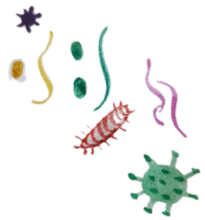
Main drivers of soil parameters

Clay + Silt
+ MAP + MAT
+ (pH)

>

SOC





+ Depth

CO_2

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