Effects of tree species diversity on the biological soil activity in European forests

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Introduction:

The conversion of monoculture forests into mixed forests is a major topic in terms of productivity and ecologic stability. However, the knowledge about the effects of tree species diversity on biological soil activity is rather incomplete. Additional research is necessary to allow an unambiguous evaluation.

Hypothesis:
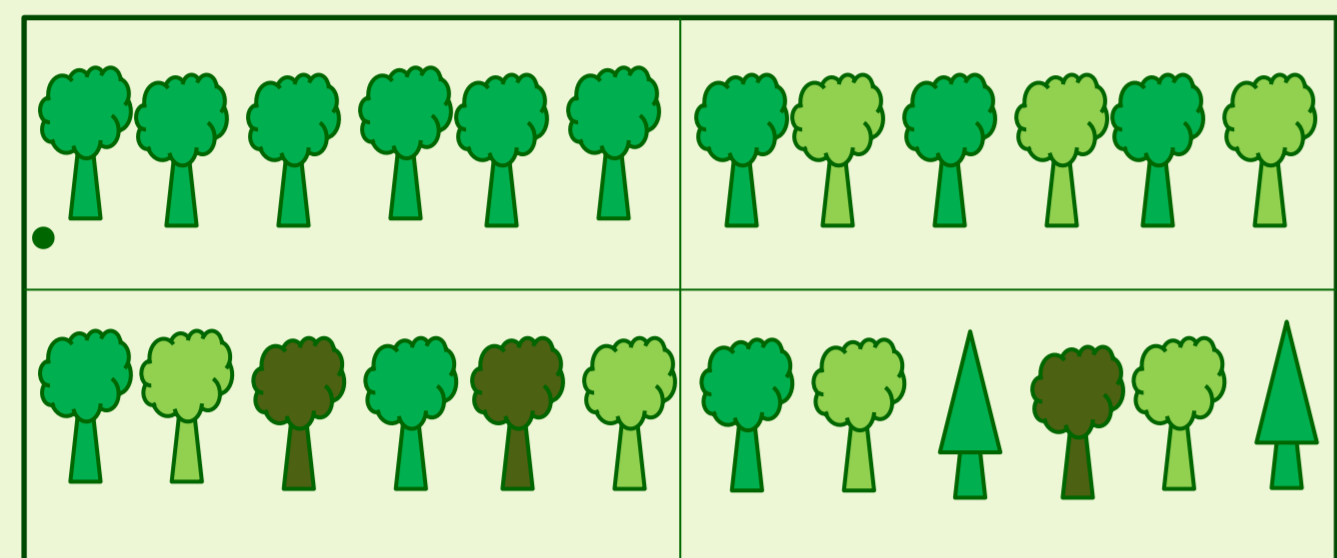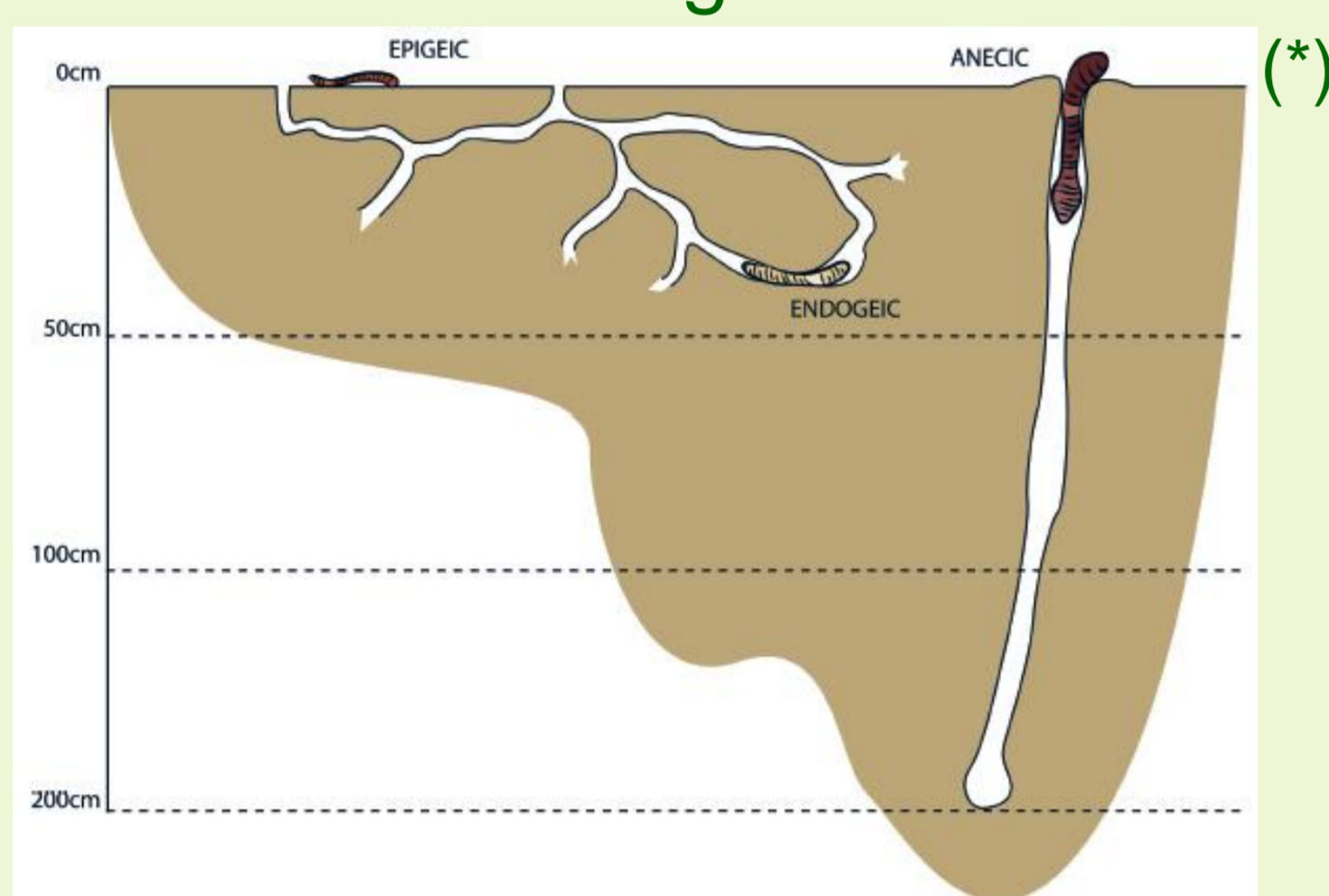

Mixed forests do have a higher biological soil activity.

Earthworms: • Higher densities and biomass
                • Species (functional) diversity

Microorganisms: - Higher total microbial biomass
                - Higher bacterial functional diversity

Sampling strategies:

Earthworms

• Functional categories:

(*)

Epigeic- Litter dweller   Endogeic - Soil dweller   Anecic - Vertical burrower

• Mustard extraction + hand sorting

1. Litter sample (OL, OF)
   25 x 25 cm²

2. Remove same layers in the largest frame
   100 x 50 cm²

3. Sprinkle mustard solution
   2x single dose (30g/l)
   1x double dose (60g/l)

4. Capture earthworms after each mustard sprinkling
   2x 5 minutes
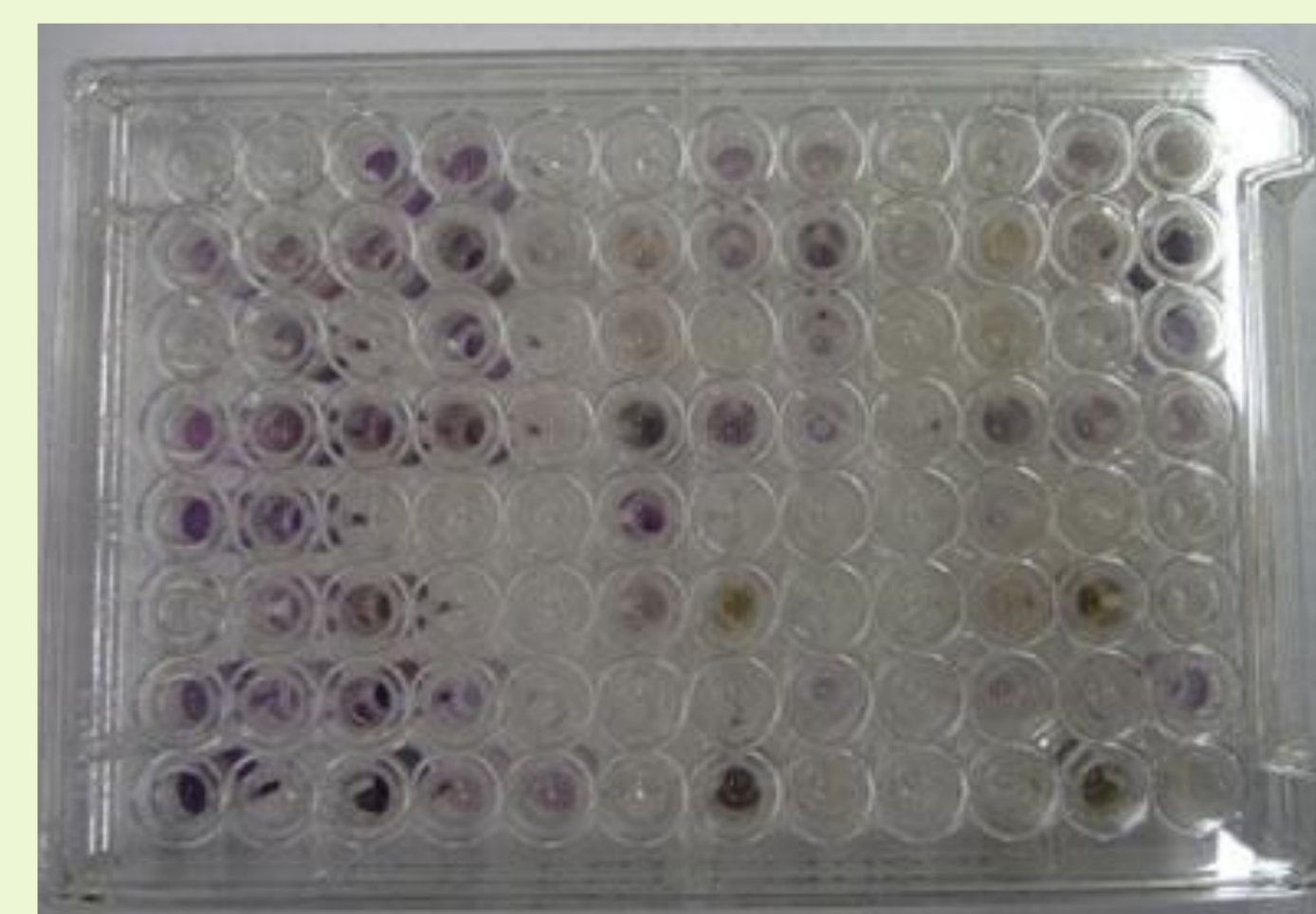   1x 10 minutes

5. Soil sample
   25 x 25 x 20 cm³

6. Hand sorting

Microorganisms

• Fungi, Bacteria, Protists

• Composite samples

  o 9 subsamples per plot

• Biolog EcoPlates with carbon sources

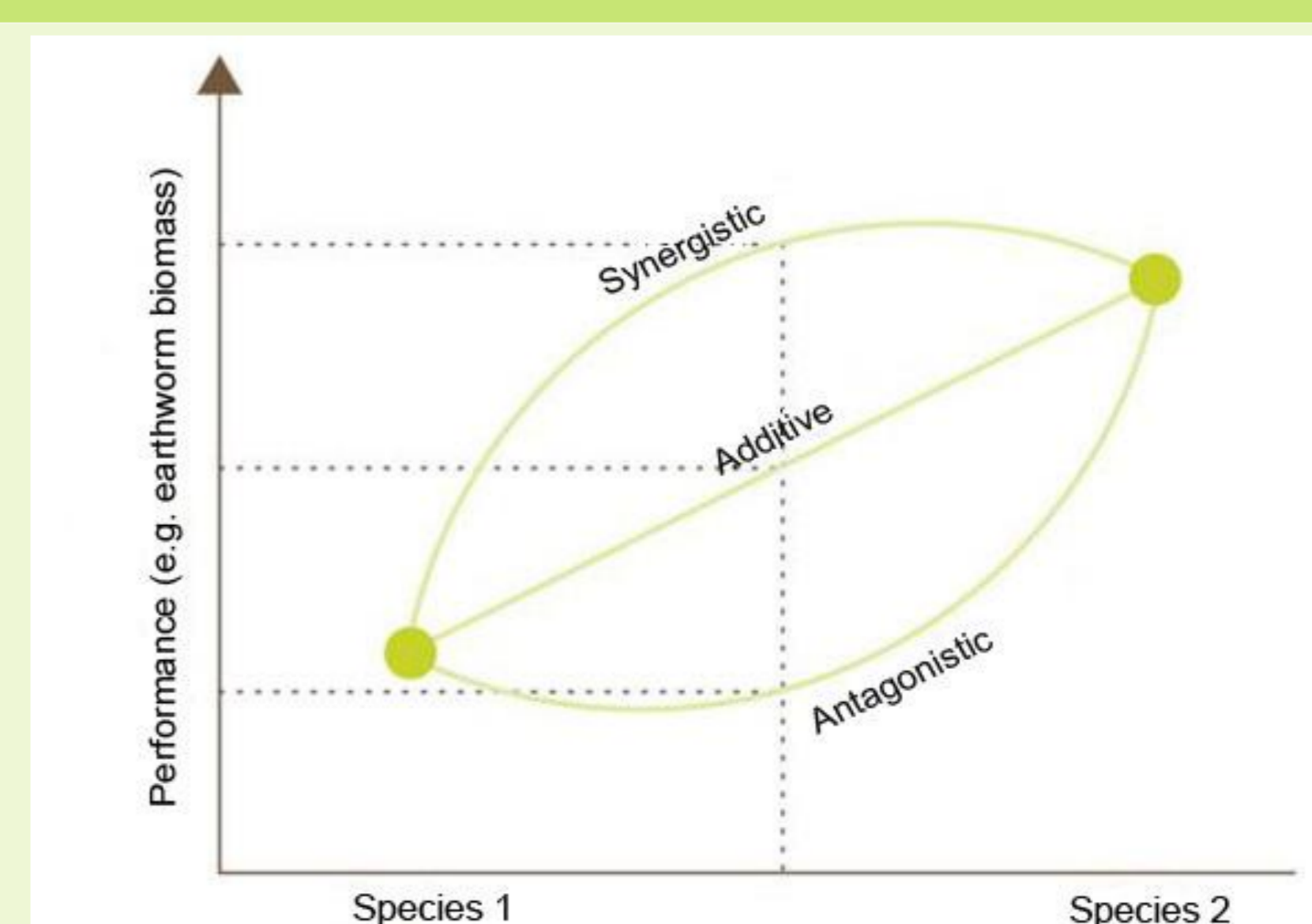• Chloroform fumigation extraction method

Gouge auger   Biolog EcoPlate with reaction patterns

Statistical analysis

• Exploratory analysis

  o Ordination techniques

• Compared analysis

  o Analysis of variance

    ❑ Explore differences between all plots

  o Transgressive overyielding

    ❑ Explore differences between mixed plots and monocultures

    ❑ Dmax = [observed variable] – [maximum monoculture variable]