Agroforestry: Can trees change aggregate stability ?

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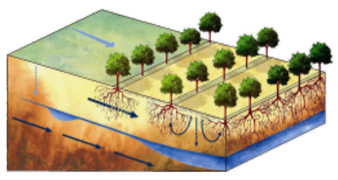
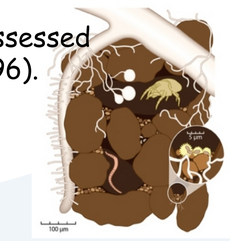
Why ?



Soil erosion in farmlands is a major cause of water quality degradation and reduced crops production potential throughout the European countries.

Soil erodibility = the ability of soils to resist erosion, assessed by measuring **soil aggregate stability** (Le Bissonnais 1996).



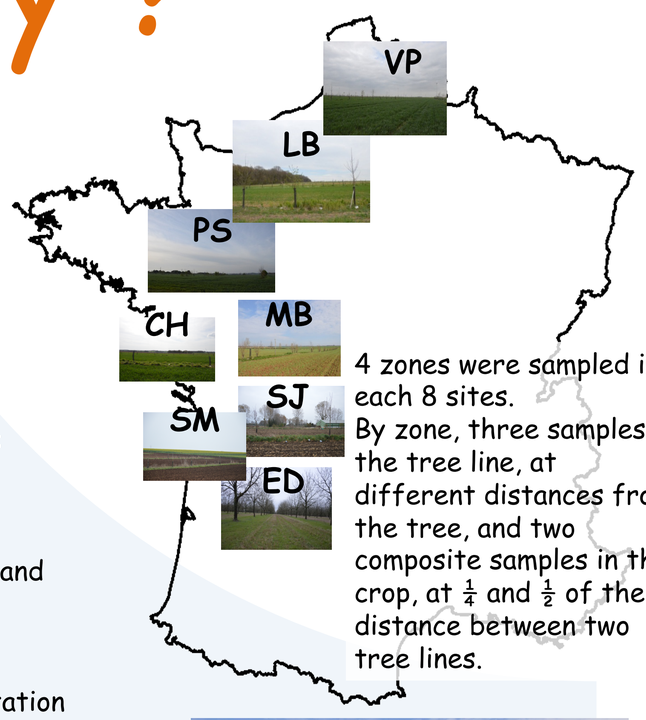
Soil aggregate stability can be positively correlated to soil organic matter content, **roots presence** and soil biota (Graf and Frei 2013, Pérèz et al. 2013).

In **agroforests**, if the role of tree lines as physical barriers to runoffs is easily understanding, processes involving rooting systems and soil erodilbility are still unknown.

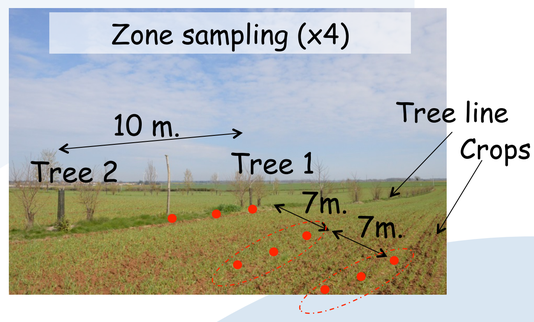
How ?

For each sample we measured :

- soil aggregate stability (Le Bissonnais, 1996)
- microbial metabolic activity and diversity (microresp ©)
- root biomass and root trait diversity
- characteristics of the vegetation structure and soil properties.



4 zones were sampled in each 8 sites.
By zone, three samples in the tree line, at different distances from the tree, and two composite samples in the crop, at $\frac{1}{4}$ and $\frac{1}{2}$ of the distance between two tree lines.



Objectives

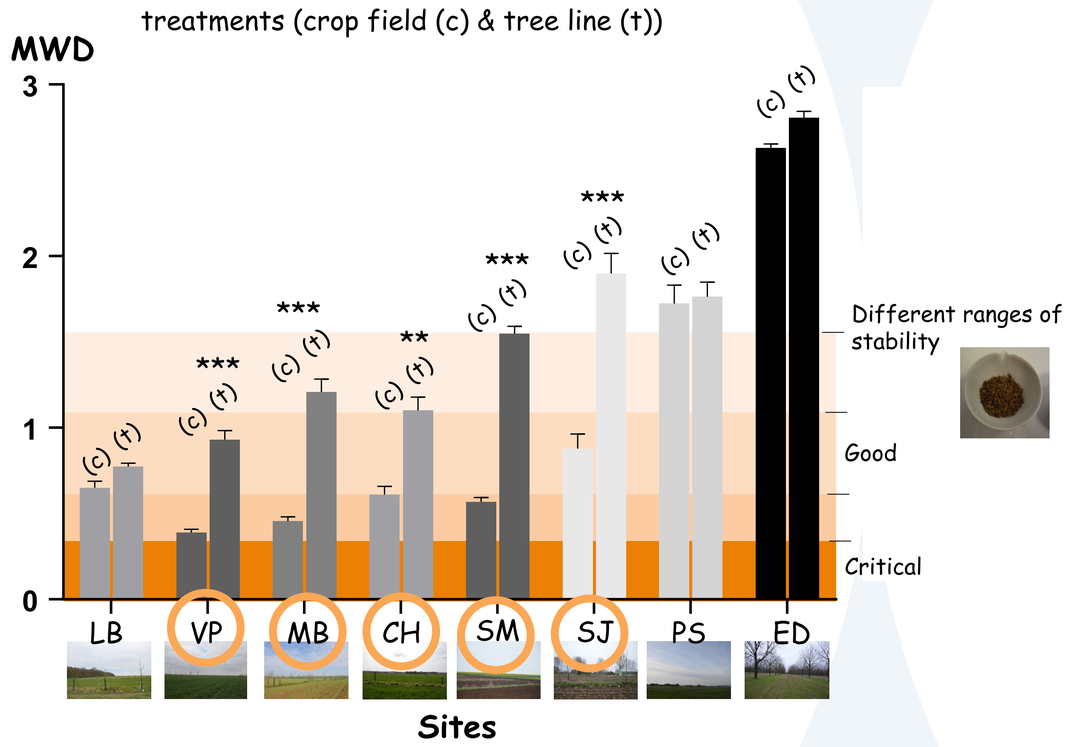
- ***Do the presence of a tree line improve soil aggregate stability ?***
- ***What are the mecanisms underlying ?***

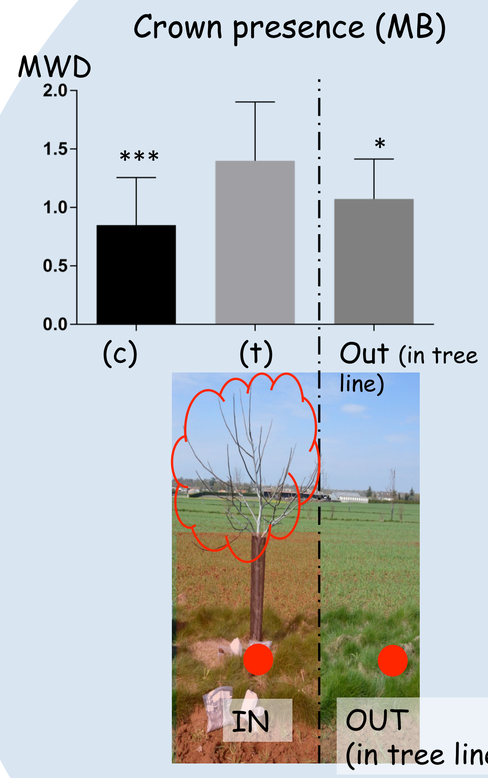
Are there effects of the tree line on soil aggregate stability ?

Higher soil aggregate stability in 5 sites => increment from critical to good levels of stability

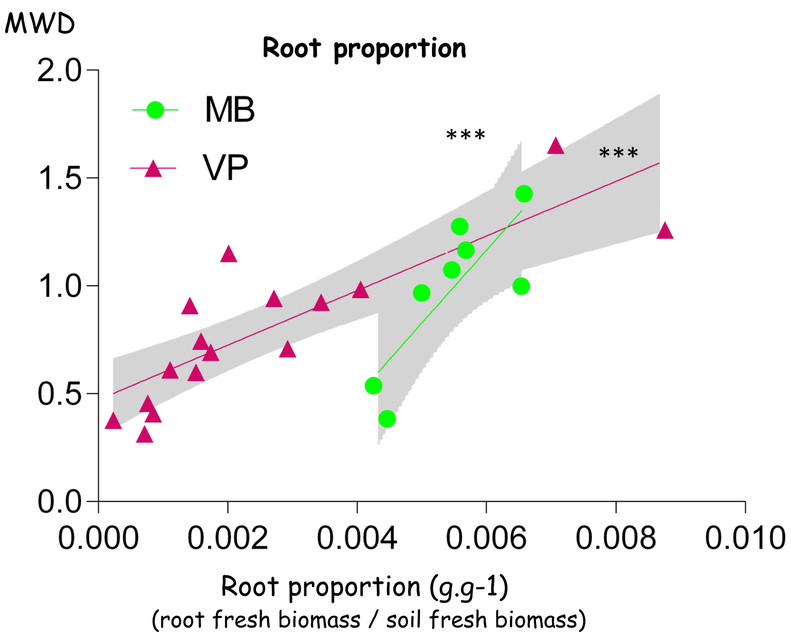
No difference between soil aggregate stability in tree-line and crops field in 3 sites (ED, LB & PS)

Aggregate stability (Mean Weight Diameter, **MWD**) in different sites and different treatments (crop field (c) & tree line (t))



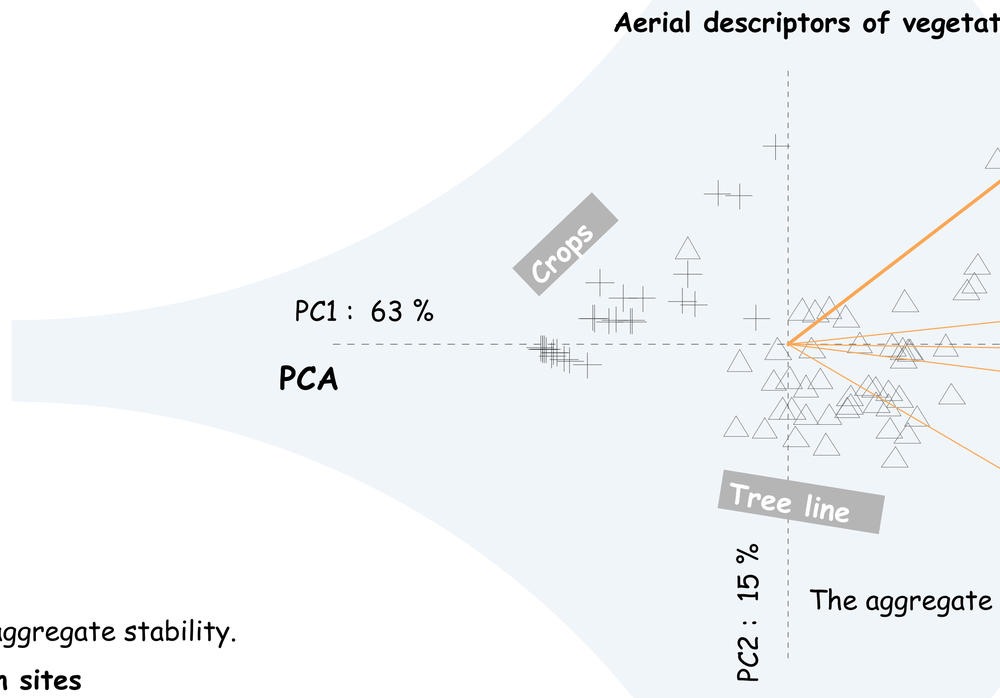


What factors drive the soil aggregate stability ?



The root proportion in the soil is **positively linked** with the aggregate stability.

The strength of the relationship **differ between sites**



The aggregate stability is positively corelated with all the indicators **of a perennial vegetation cover**

Then... what next ?

. **Most of sites are too young** to reveal a distance effect to the line => **new sampling design with hedges** ➔

- From mature hedges
- Progressive sampling from 0 to 9 m.
- Several depths: from 0 to 2.10 m.

. Next analysis to better explain our results : Soil **organic matter** content /**Root** morphological traits / Microbial activity & **metabolic diversity**

1. Graf F, Frei M, (2013) Soil aggregate stability related to soil density, root length and mycorrhiza using site-specific Alnus incana and Melanogaster variegatus s.l. Ecol. Eng. 57: 314-323.
2. Le Bissonnais Y, (1996) Aggregate stability and assessment of soil crustability and erodibility: I. Theory and methodology. European Journal of Soil Science, 47: 425-437
3. Pérès G, Cluzeau D, Menasseri S, Soussana JF, Bessler H, et al. (2013) Mechanisms linking plant community properties to soil aggregate stability in an experimental grassland plant diversity gradient. Plant Soil 373: 285-299.