

# Diagnosis of soil quality and evaluation of the impact of viticultural practices on soil biodiversity in a vineyard from southwestern France



Viticulture is facing two main issues, climate change and agroecological transition. In both cases, soil quality is seen as a lever to move towards a more sustainable viticulture. However, soil biological quality is little considered in the implementation of viticultural practices.

The Gascogn'Innov project (2017-2022) aims to acquire technical knowledge on the impact of viticultural practices on soil biology from a dynamic way, and to test a methodology to integrate information provided by the soil bioindicators to manage farming systems.

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## METHOD: A PARTICIPATIVE APPROACH FOR SOIL QUALITY ASSESSMENT

**Gascogn'Innov: an Operational Group (OG)** funded by the EIP-AGRI. It brings together 13 winegrowers from the South-West of France (Gascony), scientists, advisors and technicians, around a project focused on viticultural soil biological functioning.

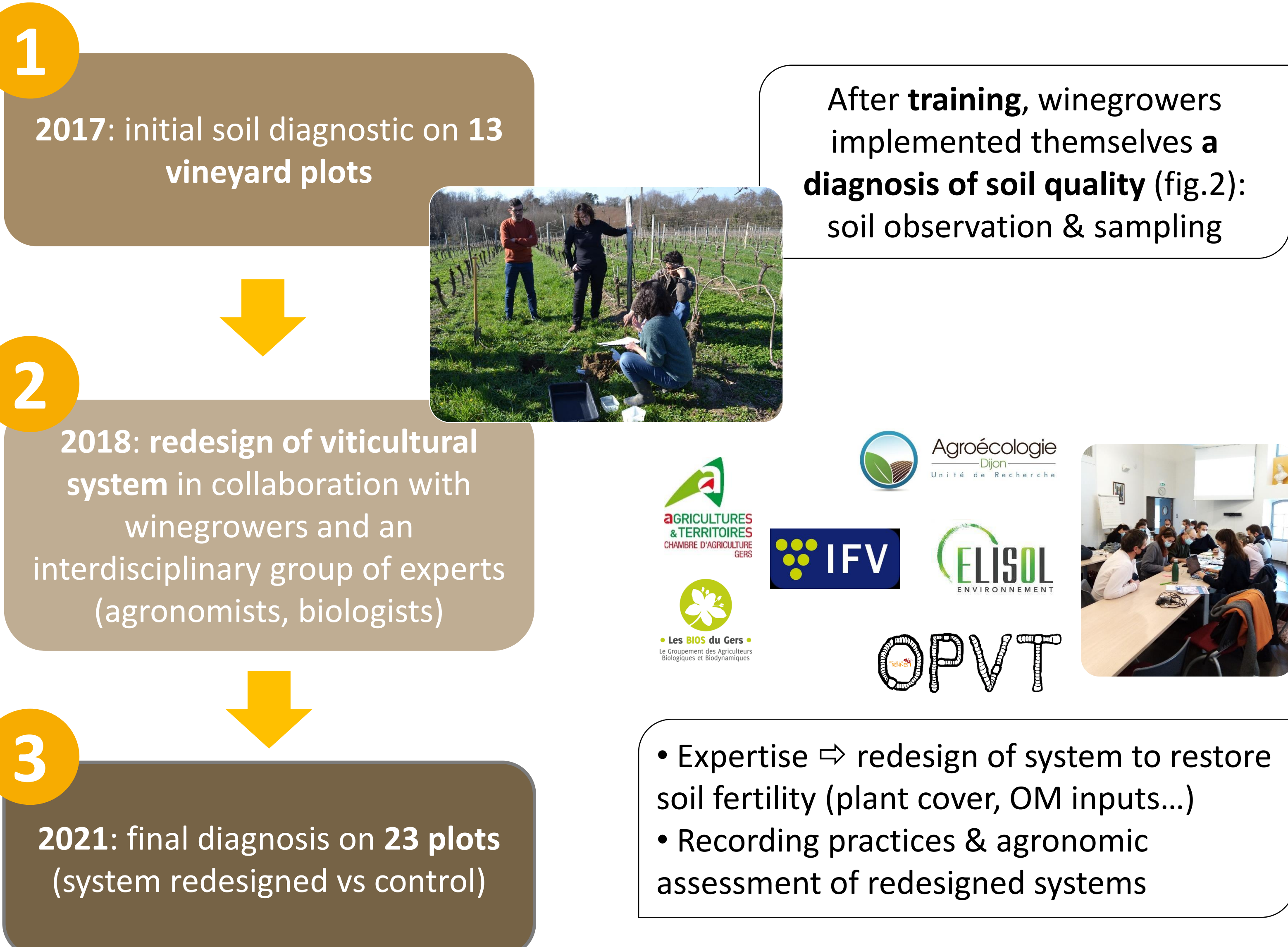


Figure 1. The Gascogn'Innov project approach

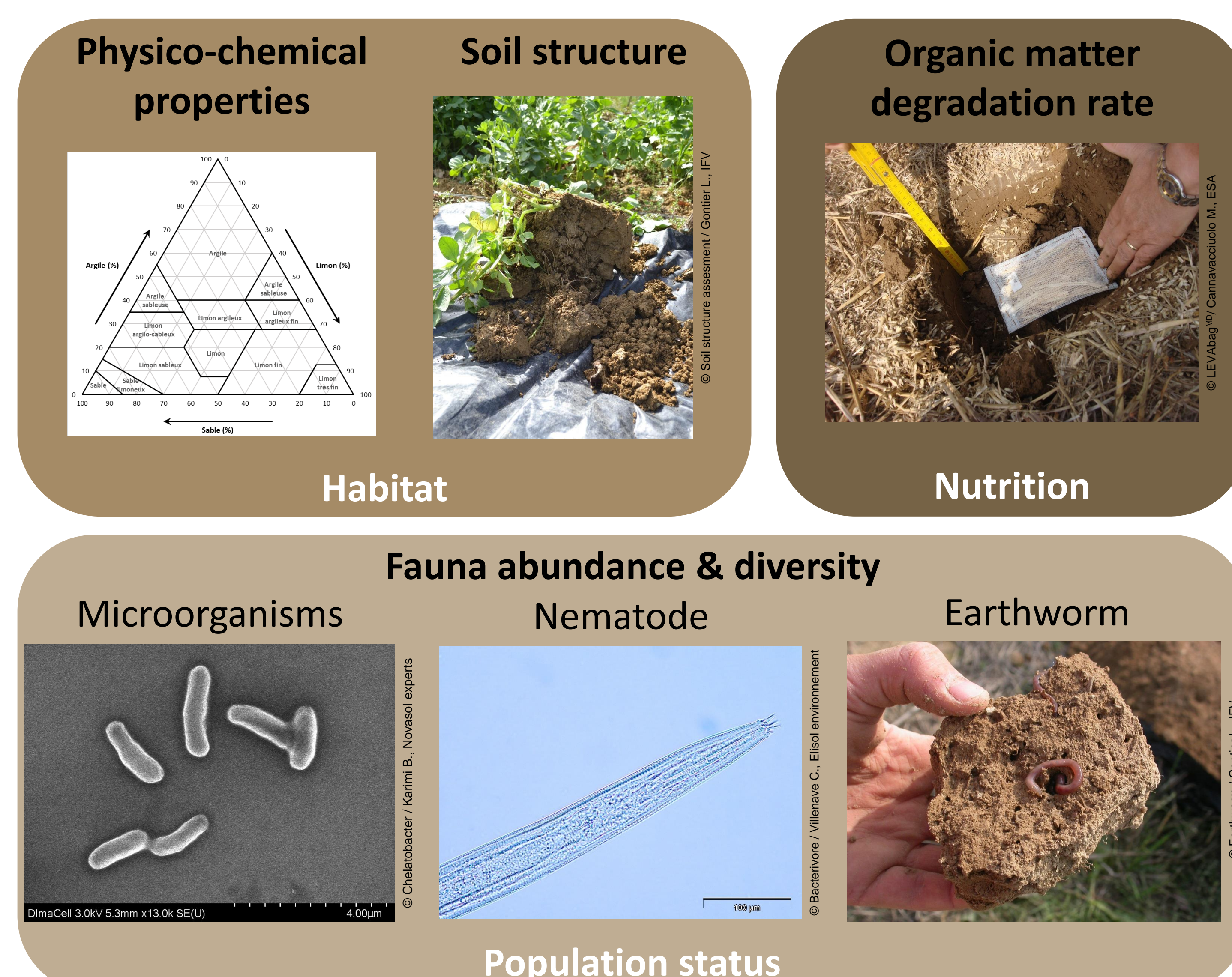


Figure 2. Set of indicators related to soil biological quality implemented in the project (Cannavacciuolo et al. 2017)

## KEY ACHIEVEMENTS

**At the winegrower level:** detailed characterization of the biological functioning of the soil on each plot, and of its evolution over the time. Linkage with the cropping system.

**At the OG level:**

- Creation of a **regional database on the quality of viticultural soils** ⇒ allows the positioning in relation to national reference systems.
- **Evaluation of the effect of practices on soil biology according to soil types:**

	Grass coverage		
	-	+	
	Clay-limestone	Sandy loam	Clay-limestone
Soil biology parameter	Group A plots	Group B plots	Group C plots
Microbial biomass	b	a/b	a
Bacterial species richness	a/b	a	b
Fungal species richness	a/b	a	b
Abundance of free-living nematodes	b	a	a/b
Nematofaunal structure index	a/b	b	a
Nematofaunal index of organic matter degradation route	b	a	a/b
Earthworm abundance	b	a	a
Earthworm species richness	b	a	a/b
Organic matter degradation rate	a	a/b	b
	tillage intensity		
	+	-	

The data treatment using Factor Analysis of Mixed Data (FAMD) and Hierarchical Ascending Classification (HAC) enabled to identify 3 groups, defined by soil physico-chemical properties (clay content, pH, total nitrogen and potassium content) and soil management practices (tillage intensity, grass cover characteristics). Group A and C plots were located on clay-limestone soils, while plots from group B exhibited sandy loam soils, with a pH<8. Duration of grass coverage increased from group A to group C while intensity of tillage decreased.

Comparison of the soil biology data from the group A and C plots indicates that decreasing the intensity of tillage, and increasing the duration and diversity of grass coverage tends to increase the abundance of all the organisms studied, but not systematically their diversity.

◀ Figure 3. Biological soil parameters significantly impacted by plot type (ANOVA, p<0,05). Letters (a, b) indicate the results of Tukey's comparison of means test.

**1<sup>st</sup> CONCLUSIONS:** This project confirmed the value of soil biological quality indicators to drive the sustainability of practices, but also highlighted the key-role of expertise, in both agronomy and soil biology, to help winegrowers to better understand and appropriate their soil quality diagnoses.

### References:

Cannavacciuolo M., Cassagne N., Riou V., Mulliez P., Chemidlin N., Dequiedt S., Villenave C., Cérémonie H., Cluzeau D., Cyllly D., Vian J.-F., Peigné J., Gontier L., Fourrié L., Maron P.-A., D'oiron Verame E., Ranjard L. 2017. Validation d'un tableau de bord d'indicateurs sur un réseau national de fermes en grande culture et en viticulture pour diagnostiquer la qualité biologique des sols agricoles. Innovations Agronomiques 55 (2017), P41-54.

### Acknowledgments:

This project is funded by the Occitanie Region and the Adour-Garonne Water Agency. The authors would like to thank the winegrowers and the cooperatives cellar of the Gascogn'Innov group for their active involvement in the project.