

GASCOGN'INNOV- Diagnosis of soil quality and evaluation of the impact of viticultural practices on soil biodiversity

Short description of the OG

Viticulture is facing two major changes – 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 aims to acquire technical knowledge on the impact of viticultural practices on soil biology from a dynamic way through a participative approach involving farmers, researchers and advisors. In the framework of the project, a methodology was implemented to integrate information provided by the soil bioindicators to manage farming systems.

Benefits

The main added ecological value for the farmer addressed by the OG: acquires knowledge to perform diagnosis of soil quality himself, improve fertility of its soils, better understanding of their global functioning and of the impact of their practices on it. Bio-indicators of soil quality should be included to manage a sustainable technical itinerary

Stage of implementation

GASCOGN'INNOV is over (2017-2022)

Applicability box

Theme

Soil health – biodiversity – cover crop / green manure

Context

Geographical coverage: south of France, Gascony context (near Toulouse)

Soil specification: several test plots with different soil types

Application time

Depends on the indicator considered

Required implementation time

Depends on the indicator implemented

Period of impact

All year

Equipment

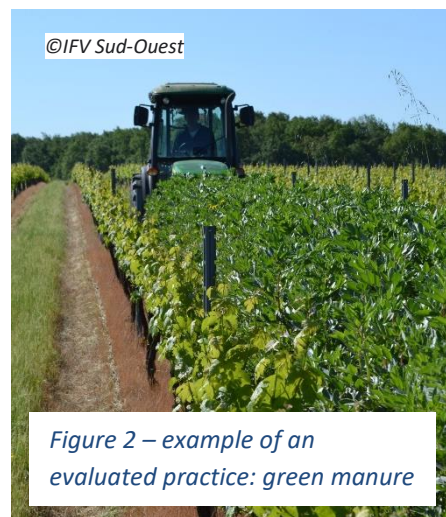
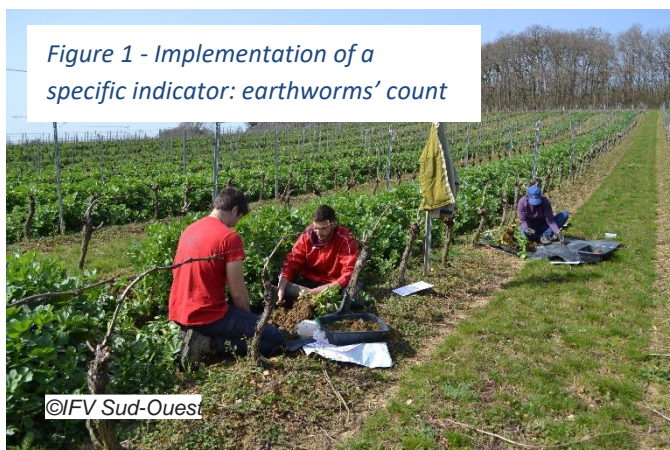
Depends on the indicator implemented

Main achieved or expected results

- **At the wine grower level:** detailed characterization of the biological functioning of the soil on each plot, and of its evolution over the time. Link age with the cropping system.
- **At the OG level:** Creation of a **regional data base on the quality of viticultural soils** that allows the positioning in relation to national reference systems.
- **Evaluation of the effect of practices on soil biology according to soil types thanks to a set of indicators.**

A set of indicators of soil biological quality have been evaluated in the project: microorganisms (bacteria and fungi abundance and diversity), fauna (abundance and diversity of nematodes and earthworms), physico-chemical characteristics, soil structure assessment and degradation rate of organic matter. Based on a network of 13 plots that have been subject to an initial diagnosis in 2017, several agronomical practices to restore soil fertility were

experimented to redesign the cropping system (for instance plant cover, organic matter inputs, reduction of herbicides, mineral fertilizers). System redesign was made in collaboration between winegrowers and an interdisciplinary group of experts (agronomists, biologists). Several indicators were measured on vine and soil at each vintage to assess vine health and productivity. One of the observed results: decreasing the intensity of tillage and increasing the duration and diversity of grass coverage tends to increase the abundance of all the organisms studied.



Existing materials

Videos

Congress - 6^e Assises des Vins du Sud-Ouest:

<https://www.youtube.com/watch?v=k8DWvdVZObA&t=9s>   (Youtube subtitles available)

OG presentation: https://www.youtube.com/watch?v=tjUNi5bhgpl&ab_channel=CLIMED-FRUIT 

Web links

Symposium proceedings - 6^e Assises des Vins du Sud-Ouest: <https://www.vignevin-occitanie.com/wp-content/uploads/2022/05/gascogn-innov.pdf>  

Poster - TERCLIM International Terroir Congress: <https://ives-openscience.eu/12910/> 

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This practice abstract was elaborated in the CLIMED-FRUIT project.

Project website:

<https://climed-fruit.eu/>

(no Gascogn'Innov website)

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Green manure in viticulture

Challenge

Viticulture is particularly sensitive to soil-related factors such as erosion, declining organic matter levels, soil compaction and the loss of soil biodiversity.

Solution

A green manure is a plant cover crop that is returned to the soil to improve its fertility, and which can have a positive influence on all the above parameters, as long as hydro-nitrogen competition is kept under control.

Benefits

- As a soil cover: protects from erosion, improves the physical properties of the soil (water retention capacity, structural stability...)
- Enhances microbiological soil life and contributes to intra-parcel biodiversity
- Reduces rainwater runoff
- By modifying both the stock of mineral nitrogen during its growth phase and the quantities of nitrogen mineralized after its destruction, the green manure can influence the supply of nitrogen to the vine, and thus limit the use of external inputs

Applicability box

Theme

Soil health – biodiversity – cover crop / green manure

Context

In mediterranean conditions: particular attention must be paid to adaptation to the farm context for species selection and technical itinerary because of water competition

Application time

September-April

Required implementation time

Soil preparation + seeding + rolling/ shredding + burying = approximately 7h/ha

Period of impact

October-May

Equipment

Seeds, seeder, roller, chipper, tines/discs tools

Practical recommendation

Soil preparation and seeding: the soil must be sufficiently crumbled to ensure good seed germination. On existing vines, one pass with a rotary hoe or one or two passes with a vibra-cultivator may be sufficient. Seeding is carried out by broadcasting or with a fertilizer spreader, ideally during the harvest period to take advantage of mild temperatures and late summer or autumn rains, or during October/early November by adapting the choice of species. Rolling or light combing of the soil is recommended after seeding.

Green manure destruction: The choice of destruction method depends on the objectives being pursued. Grinding or mowing in spring destroys the aerial parts and allows them to dry out. The presence of green manure can increase the risk of spring frost. This parameter can be considered when deciding on the destruction date. Mowing is useful when vegetation is underdeveloped, or to mulch and maintain the soil without chemical weeding or tillage. The advantage of mulching over grinding is that it slows down the mineralization of organic matter, and limits nitrogen hunger. An alternative solution is to use a specific piece of equipment called a rolofaca, which lays the plant cover on the ground and pinches it to stop the growth. Unlike grinding or mowing, the growth of the plant cover is halted, and the "pinched" part of the plant cover degrades very slowly. Burying the plant cover is optional and should be considered in the light of its objectives: it enables nitrogen to be released quickly and so to be available for the current season. Green manure should be buried according to its moisture content, and never on damp soil. If it is buried 1 to 2 days after mowing or grinding,

decomposition will take place rapidly, with significant mineralization. It can be left to dry for 30 to 60 days. Depending on the species, burial can be carried out in one or two passes using a tine or disc tool.



Figure 3: Examples of green manure in a Mediterranean context (Spain)

Further information

Videos

Web links


Guide: Winegrowing practices & adaptation to climate change in the POCTEFA area:

<https://www.vignevin-occitanie.com/wp-content/uploads/2023/01/guide-vitad-fr-FINAL.pdf> 

<https://www.vignevin-occitanie.com/wp-content/uploads/2023/12/guide-vitad-es-FINAL.pdf> 

Green manure in viticulture: <https://www.vignevin-occitanie.com/fiches-pratiques/les-engrais-verts-en-viticulture-2/>  

Seeding mechanization of green manure: <https://www.vignevin-occitanie.com/fiches-pratiques/mecanisation-du-semis-des-engrais-verts/>  

Green manure destruction: <https://www.vignevin-occitanie.com/fiches-pratiques/destruction-des-engrais-verts/>  

Green manure: species <https://www.vignevin-occitanie.com/wp-content/uploads/2019/02/Fiches-engrais-verts.pdf>

<https://www.vignevin-occitanie.com/fiches-pratiques/les-engrais-verts-en-viticulture-2/>  

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