VITIREGENERE: regenerative viticulture for improving biodiversity and vine management

Summary

In the world of viticulture, more conventional practices have led to loss of fertility, structure and microbiota in vineyards, as well as progressive soil degradation and loss. Regenerative viticulture is an alternative based on improving soil quality in agricultural soils by imitating nature. As a result, “regenerated" soils provide a greater number of ecosystem services, including a greater capacity for stable carbon sequestration, and can contribute to slowing climate change without losing agricultural production capacity. The aim of regenerative viticulture is to improve the quality of the soil, the environment, the vines and, last but not least, the quality of the wine as the final product that reaches the consumer. The aim of regenerative viticulture is to respect the natural balance and biodiversity of both the crops and the environment. Soils are regenerated, both in terms of fertility and structure, the water retention capacity of these soils is increased and vegetation covers are used as a means of increasing atmospheric carbon sequestration and reducing erosion.

In the VITIREGENERE project, different practices of regenerative agriculture will be applied in commercial organic vines in four locations corresponding to 4 different wineries. The aim is to improve the quality of agricultural soils by eliminating mechanical working of the soil, minimising the application of phytosanitary products that have harmful effects on soil microbiota, promoting the growth of vegetation cover to increase carbon sequestration and atmospheric nitrogen uptake in the soil and greater soil microbial diversity that can also promote better nutrient bioavailability for crops. Priority will also be given to the application of natural products, both of organic and microbial origin, with the aim of increasing the total and specific microbial biomass of the soil and its diversity, as well as the sequestration of organic carbon in the soil. An extensive physical-chemical characterisation of the soil will be carried out, as well as a study of the evolution of the total and functional microbial diversity of the soil, using metataxonomy and metagenomics tools in the different regenerative practices, compared with conventional practices, over the course of the project in vineyards on different commercial farms.

The experience gained from this study, with the use of new soil monitoring techniques and methodologies, will allow us to broaden the range of different techniques and practices that can be used in regenerative agriculture and viticulture, and to be able to recommend them to regenerative farmers and winegrowers. In the case of vines, applying and monitoring these regenerative practices will provide new knowledge to improve the crop, the environment and the final quality of the product.

Objectives

The main objective of the project is to demonstrate and validate agronomic practices that contribute to regenerate the health and vitality of agricultural soils for a more sustainable vineyard agriculture, based on the concept of regenerative viticulture, improving crop biodiversity in general and soil biodiversity in particular.

More specifically, regenerative practices are intended to help:

- *Improve the management of fertilisers and phytosanitary products, with a gradual reduction of the products used on vines.*
- Improve rainwater management and increase rainwater harvesting capacity

- *Reduce soil erosion to minimal or non-existent levels and improve soil management*
- *Restore, preserve and increase biodiversity (including microbial), the wine-growing ecosystem in order to better integrate it into the surrounding ecosystems and protect the landscape value of the region.*

The specific objectives are to:

- *Evaluate the application of different agronomic management approaches.*
- *Validate the application and effects of the contribution of micro-organisms to soil microbial diversity.*
- *Assess the autochthonous and allochthonous microbial diversity (fungi and bacteria) (for treating the addiction of microbial populations) of the soil microbiota and its evolution over time, studied through the molecular approach of metataxonomy studies using massive sequencing and relate it to crop management parameters, crop production and soil physical-chemical conditions. Propose new microbial indicators based on soil diversity, soil quality and regenerative practices.*
- *Improve the biodiversity of the environment by planting tree and shrub species around the edges and surroundings of the plots, in order to create an area with high added agronomic, biological, environmental and landscape value, capable of maintaining itself in the most sustainable way possible and contributing to the mitigation of climate change through carbon sequestration, the reduction of greenhouse gas emissions into the atmosphere and an increase in the ecosystem services of the soil.*
- *Draw up a manual of good agronomic practices for the application of regenerative agriculture in wine-growing, establishing indicators to help assess the results of agronomic practices.*

Description of the actions planned in the project

The project will be implemented in different estates that share an approach to management that uses sustainable practices to different degrees, from the biodynamic Appiah of Clos Mogador to the organic one used by Can Feixes, Jean Leon and Torres. The agricultural soils under study appear to have a very high base levels of fertility and imbalances. The same is true regarding the presence of different species and biodiversity in the surroundings of the estates. The results obtained throughout the study will only be comparable within the study plots themselves (at winery level). Due to the different types of plots, the climate of the different areas and the agronomic practices carried out on each plot prior to the study, the results obtained cannot be compared between the estates and wineries that are part of the study.

The planned actions can be summarised in a set of 3 distinct phases:

<u>Phase 1: Choice and initial diagnosis of plots and soil</u>
---- F1.1 Initial diagnosis of the agronomic state of the wineries
---- F1.2 Diagnosis and physical-chemical characterisation of soils over time
---- F1.3 Initial metataxonomic (microbial diversity), metagenomic and functional diagnosis of soil

<u>Phase 2 Definition of the Plan for adaptation to regenerative agriculture</u>
---- F2.1 Definition of the agronomic aspects to be implemented
---- F2.2 Design of the individualised treatment programme per micro-organism
---- F2.3 Production of the different microbial bioconsortia and bioactivators

Phase 3 Implementation and monitoring of the regenerative agriculture measures

Treatments to be carried out:

---- Regenerative Agriculture Plots - 1 (AR1): No or minimal ploughing, application of compost, planting of cover crops, application of natural and mineral amendments, soil decompaction treatments, animal management (introduction and holistic management of animals (hens and sheep) on agricultural plots). Botanical monitoring and promotion of biodiversity in the plot surroundings.

---- Regenerative Agriculture Plots - 2 (AR2): Conventional management with application of microbial consortia produced and selected for each winery based on previous soil metagenomic information.

---- Control Plots - (TEST)). Plot management using current practices (conventional ploughing and no cover crops). Organo-mineral fertilisation.

---- Physical-chemical soil characterisation of AR1, AR2 and TEST during project implementation (flowering/ripening 2022, 2023 and 2024)

---- Characterisation of soil microbial and functional diversity using molecular approaches (metataxonomy and metagenomics). To be carried out in AR1, AR2 and TEST during project implementation (flowering/ripening 2022, 2023 and 2024). Soil physical-chemical parameters and crop management strategies with the greatest influence on soil microbial and functional diversity will be identified.

Expected results and practical recommendations

The aim is to pave the way for the estates under study to be able to practise regenerative agriculture and to obtain positive results in the various areas described below:

- Improved soil fertility.
- Increased organic matter in the soil.
- Improved water retention capacity of the soil.
- Increased atmospheric carbon sequestration.
- Improved nutritional qualities of the final product.
- Reduced use of synthetic products applied in the vineyard.
- Reduced erosion.
- Improved microbial and plant biodiversity, creating a rich environment that goes beyond the crop itself.
- Improved functional microbial diversity of the soil
- Improved social perception of farming/wine-growing

The aim is also to raise awareness of regenerative agriculture and its application. The objective is also to corroborate and distinguish, by means of different analytical parameters, results that were thus far empirical.

Leader of the Operational Group

ORGANISATION: MIGUEL TORRES, SA

Coordinator of the Operational Group

ORGANISATION: INNOVI Association of Innovative Companies

Other members of the Operational Group (grant recipients)

ORGANISATION: JEAN LEON, SL

ORGANISATION: CLOS MOGADOR, SL

ORGANISATION: HUGUET DE CAN FEIXES, SL

Other members of the Operational Group (not recipients of the grant)

ORGANISATION: IRTA - Institute of Agrifood Research and Technology

Subject area(s) of application

☐	Agricultural production system
☐	Agricultural practice
☐	Agricultural equipment and machinery
☐	Livestock farming and animal welfare
☐	Vegetable production and horticulture
☒	Landscape / Territorial management
☐	Pest and disease control
☐	Fertilisation and nutrient management
☒	Soil management
☐	Genetic resources
☐	Forestry
☒	Water management
☐	Climate and Climate Change
☒	Energy management
☐	Waste and by-product management
☒	Biodiversity and environmental management
☐	Food quality/processing and nutrition
☐	Supply chain, marketing and consumption
☐	Competitiveness and agricultural and forestry diversification
☐	General

Geographical area(s) of application

PROVINCE(S)	REGION(S)
BARCELONA, TARRAGONA	Alt Penedès, Priorat

Dissemination of the project (publications, conferences, multimedia, etc.)

News on the progress of the project will be published on the INNOVI.cat website and posted on the social media of INNOVI and the Cluster members.

Project website

https://www.innovi.cat/vitiregenere0/

More information on the project

PROJECT DATES	TOTAL BUDGET
Starting date: July 2021	**Total budget:** €241,680.00
	DACC funding: €111,765.60
Current status: Under way	**EU funding:** €84,314.40
	Own funding: €45,600.00

With funding from:

Project funded through Operation 16.01.01 (Cooperation for Innovation) through the Catalan Rural Development Programme 2014-2022.

Order ARP/113/2021 of 20 May, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ACC/1660/2021, of 27 May, announcing the call for the grant.

Generalitat de Catalunya
Departament d'Acció Climàtica, Alimentació i Agenda Rural

Fons Europeu Agrícola de Desenvolupament Rural:
Europa inverteix en les zones rurals