Presentation: 02 February 2026

IWCA SOC Sequestration Compilation Project: Initial findings

i. Introduction

International Wineries for Climate Action (IWCA), in conjunction with The Porto Protocol Foundation (PP), Asociación de Viticultura Regenerativa (Association of Regenerative Viticulture, AVR), and the Regenerative Viticulture Foundation (RVF), initiated the Soil Organic Carbon (SOC) Sequestration Compilation Project, in the context of climate change and the industry's decarbonization efforts based on science-based actions, as an innovative line of work, a very concrete lever for action that can transform vineyards into carbon sinks.

This project was born in response to the lack of consensus and standard methodologies in this area, all of which are necessary for validation under ISO14064 criteria and incorporation into carbon inventories. The following document aims to compile the general results of various Soil Organic Carbon (SOC) sequestration projects across IWCA member wineries and IWCA Partners in a standardized way, by using a common template. This enables better comparisons across projects and provides a clearer way to highlight the key elements common to any SOC sequestration project. The following fields must be completed by every participating winery:

- Project Name
- Presented by
- Project Description & Goal
- Location
- Project dates: start, end, edition
- Soil Carbon Sequestration Calculation Methodology:
  - Frequency of sample measurements
  - Number of samples per hectare or plot
  - Depth of samples
  - sampling tool/method
  - sample repetition for statistical matters
- Conclusions of the SOC project (ideally, carbon sequestration results)

This compilation is a structured comparative analysis that focuses on commonalities and differences, considering methodologies, locations, and results, without yet making a judgment of quality, but only comparative observation.

Ultimately, the goal of this initiative is to set a precedent and evolve edition after edition with the aim to:

- Establish a robust, science-based benchmark for SOC sequestration projects within the wine sector.
- Facilitate knowledge sharing and best practices among international wineries.
- Become a tool to ensure a better harmonization of the methodologies followed to calculate the SOC sequestration.
- Support the transition to more sustainable and climate-resilient viticulture by quantifying and promoting soil carbon enhancement strategies.

To maintain credibility and scientific rigor, IWCA distinguishes clearly between Soil Organic Carbon (SOC) and Soil Organic Matter (SOM). Only SOC provides a robust, climate-relevant measure of soil carbon sequestration, while SOM remains an important agronomic and ecological indicator.

Table 1. SOC and SOM characteristics.

Criteria	SOC	SOM
What it measures	Carbon stored in soil	Total organic material in soil (includes nutrients & biomass)
Climate relevance	Direct (Suitable for climate claims)	Indirect
Typical unit	% C, t C/ha, t CO_2e/ha	% organic matter
Sensitivity to management	Medium–High (slow change)	High (can fluctuate faster)
Role in IWCA	Primary metric	Complementary indicator

Since IWCA seeks to contribute to the creation of a sectoral bridge for wine with the guidelines of the GHG Protocol, the IWCA considered "The Land Sector & Removals Initiative (LSRI) Guidance - GHG Protocol- Project Overview" on its review, which acknowledges that agricultural soils and perennial systems, such as vineyards, have the potential to achieve significant carbon removals, provided these removals are accurately measured, documented, and monitored- all these are addressed in the project. With the IWCA's close alignment to this framework, the groundwork for the work outlined below has been established. Thus, IWCA awaits the official launch of the guide, which will undoubtedly contribute to the discussion.

ii. Definitions

- **Soil Organic Matter (SOM):** The total organic material in soil, including carbon, nutrients, microbial biomass, and organic residues at various stages of decomposition. SOM is an indicator of soil health and functionality; it also contributes to carbon sequestration (Lal, 2004), but it is not a direct measure of carbon sequestration.
- **Soil Organic Carbon (SOC):** Specifically refers to the carbon component of soil organic matter. It indicates the amount of carbon stored in the soil, making it a crucial metric for climate change mitigation, expressed as a concentration or stock (e.g., % C, t C/ha). SOC is the metric used to quantify carbon sequestration and the climate-mitigation potential of soils.
- **Carbon Sequestration (in soils):** The process by which atmospheric carbon dioxide is captured and stored in soils through biological and physicochemical processes, typically quantified using SOC measurements.
- **Sampling Depth:** The vertical extent of soil sampled for SOC or SOM analysis. Sampling depth significantly affects reported carbon stocks and must always be disclosed.
- **In-setting:** The use of emission reductions or removals within a company's own value chain to support climate targets. In the context of soil, in-setting requires robust SOC measurement and conservative assumptions.
- **Off-setting**: Neutralization, either total or partial, in an organization's greenhouse gas emissions by acquiring carbon credits or equivalent certificates generated by projects inside or outside its own value chain, such as forestry, energy, or carbon capture projects developed by third parties.

While offsetting may contribute to global climate mitigation efforts, IWCA prioritizes real, measurable emissions reductions and removals within the winery's own value chain. As such, offsetting cannot substitute internal action nor be used to demonstrate compliance with IWCA membership requirements.

iii. Working material

This compilation comprises sixteen SOC sequestration projects from ten IWCA and/ or the Porto Protocol Foundation and/or the Association of Regenerative Viticulture Members across Europe and the Americas.

This review included only projects with results or very close to achieving results. Similarly, IWCA has received feedback from numerous wineries that will present results of ongoing projects in the next edition. The projects are concentrated in established wine-producing regions, mainly:

- Spain: Alma Carraovejas, Can Feixes, Clos Mogador, Familia Torres, and Jean Leon.
- France: Domaine Lafage.
- United States:
  - California: Archery Group, Chamisal Vineyards, Jackson Family Wines, Paicines Ranch Vineyard, and Pine Ridge Vineyards.
  - Maryland: Dodon Vineyard.
- Mexico: Clos de Tres Cantos Vineyards
- Chile: Concha y Toro, Don Melchor, and Miguel Torres Chile.

In all cases, these are commercial vineyards in operation, not isolated experimental plots. Mediterranean or semi-arid conditions predominate.

All projects aim to quantify the carbon sequestration capacity of vineyard soils and assess the impact of regenerative practices compared with conventional management methods. There is also a common interest in ensuring that the results are usable for in-setting strategies, not just for academic research.

iv. Projects review

Upon initial review, in general terms, it can be observed that the compilation of projects is diverse and can be categorized into three main methodological groups:

- Direct SOC Measurement Projects: These projects focus on directly measuring soil organic carbon (SOC).
- Biological/Functional Indicator Projects: Most of these projects do not measure SOC directly, they provide insights into carbon stabilization potential.
- Exploratory Biological/Functional Indicator Projects: These are useful for exploration purposes but are not suitable for climate accounting.

The following table synthesizes the collected information to highlight differences and similarities among the projects.

Table 2. General review: main differences and similarities among the projects.

Practices	**Common Practices** • Use of cover crops. • Incorporation of plant-based organic matter (such as pruning and vegetable residues) into the soil • Reduced tillage. • Soil management aimed at increasing organic matter.
Methodology	• **Empirical basis:** all projects are based on actual soil measurements, not purely modelled estimates. • **Shared objective:** to quantify the impact of carbon farming practices on soil organic carbon (SOC) sequestration.
	Variable level of scientific rigour: • Some projects take an exploratory approach, while others are referential. • Some projects are conducted in collaboration with universities or research centres (for greater methodological control). • Others are internal winery initiatives with a more operational focus.

	Frequency, numbers, and depth of sampling: • Maximum measurement depth: >60 cm • Minimum measurement depth:0-10 cm Some use clear baselines + periodic sampling. Others present more specific or partial data. Some lack formal control plots.
	Time horizon: • Short-term projects (1–3 years). • Long-term projects (>5 years), with greater robustness for inferring trends.
	Results: SOC as a central metric, expressed directly or indirectly as, • Soil carbon stock, • Change in SOC over time, or • Conversion to CO_2e for communication purposes. and even in measurement units, for example: • t C/ha/year, • t CO_2e/ha/year, • % increase in SOC, • absolute changes without temporal normalization.
Location	**High soil and climate variability:** • Volcanic soils (Chile), • Calcareous and clayey soils (Spain), • Alluvial and sandy soils (California). • Variable temperatures and precipitation, affecting decisions such as water regime (rainfed vs irrigated). **Significant differences in:** • Water regime (rainfed vs irrigated), • Average annual temperature, high level factors not always available. • Historical management practices.
SOC rate	Not applicable.

However, no project contradicts the central hypothesis that these practices improve conditions for increasing or stabilizing SOC, except for the findings of Alma Carraovejas, which indicate that the organic carbon stock in its soil as neutral.

The analysis of this winery did not detect a statistically significant increase, reflecting the soil's actual dynamics and heterogeneity. The possible reasons for these results, according to the documents analyzed here (Schultz 2022, INRA 2020, Payen 2021, all can be found in chapter viii of this document), may be due to:

- Short time horizon: as SOC changes are slow to report, while in the early years of transition to low-tillage or regenerative practices, temporary SOC losses can be observed.
- Climate and extreme events: droughts, heat waves, or heavy rains accelerate carbon mineralization.
- Depth and redistribution of carbon: There may be losses at 0–30 cm and gains at greater depths (which are not always measured).
- High baseline effect: Soils with high initial SOC have less room for increase and greater variability.
- Recent management changes: The system has not yet reached a new equilibrium.
- When measuring, it is crucial to prioritize trajectories and methodological consistency over absolute values.

These results are consistent with the scientific literature and highlight the slow, non-linear, and context-dependent nature of soil carbon dynamics. Including such outcomes strengthens the robustness and credibility of the SOC compilation.

Table 3. SOC sequestration summary

Winery / Project	Country	Sampling depth	Indicator reported	SOC stock (t C/ha)	Δ SOC	SOC trend
Alma Carraovejas (VITICOS)	Spain	0–30 cm	SOC stock (field measurements)	Reported	~0	Neutral
Can Feixes – VITINEGRE (CF)	Spain	0–20 cm	SOC stock (field measurements)	Reported	+	Positive
Concha y Toro	Chile	0–30 cm	SOC stock (model + field data)	Reported	Variable	Variable
Clos Mogador – VITINEGRE (CM)	Spain	0–20 cm	SOC stock (field measurements)	Reported	+	Positive
Clos de Tres Cantos	Mexico	0–30 cm	SOC stock (field measurements)	Reported	+	Positive
Don Melchor	Chile	0–30 cm	SOC stock (field measurements)	Reported	~0	Neutral
Domaine Lafage (Biochar)	France	0–30 cm	SOC stock (field measurements)	Reported	+	Positive
Familia Torres – VITINEGRE (FT)	Spain	0–20 cm	SOC stock (field measurements)	Reported	+	Positive
Jackson Family Wines	USA	0–30 cm	SOC stock (field measurements)	Reported	+	Positive
Jean Leon – VITINEGRE (JL)	Spain	0–20 cm	SOC stock (field measurements)	Reported	+	Positive
Miguel Torres Chile	Chile	0–30 cm	SOC stock (field measurements)	WIP	NA	NA

v. Scientific review

Although there are few scientific papers and technical reports focused on characterising SOC sequestration in vineyards, this project has compiled several that include, in their conclusions, a specific figure on carbon sequestration, as presented in Chapter vi.

- Overall, the studies reviewed in this project support the notion that carbon farming practices can improve SOC, while reinforcing that the results should be interpreted as context-dependent ranges rather than standard factors, in line with the IWCA methodological approach.

- For this literature review, it is important to clarify that it is not possible to classify SOC results (t C /ha) as unique and directly comparable values without reconstructing each study under the same assumptions.
    - Identify whether the values provided correspond to stock (t C/ha) or rate (t C/ha/year).
    - Identify whether the values provided correspond to reported, estimated, or non-comparable data.
    - Establish conceptual measurement depth: 0-30 cm

- Based on the scientific literature reviewed, vineyard soils typically present SOC stocks between 30 and 80 t C/ha when measured at 0–30 cm depth. Values outside this range are uncommon and require careful methodological review. IWCA therefore interprets SOC results primarily as trajectories over time within realistic ranges, rather than as absolute comparable figures across projects.

  - Values within 30–80 t C/ha are fully consistent with the literature.
  - Small changes (±1–3 t C/ha/year) are to be expected even under good management, according to the reviewed literature.
  - Negative or neutral results do not invalidate regenerative practices if: the time horizon is short, there were extreme weather events, and the initial SOC was high.
- Practices combined like use of cover crops, organic amendments, no tillage, and other soil management aimed at increasing organic matter, lead to SOC accumulation in vineyard soils, depending on the climate (F.T. Payen, A. Sykes, M. Aitkenhead et al., 2020). On the other hand, pruning residues is associated with lower SOC contributions.
- F.T. Payen, A. Sykes, M. Aitkenhead et al., 2020 explicitly set a depth frame (30 cm).

vi. IWCA Methodological note

This methodological note clarifies the distinction between Soil Organic Carbon (SOC) and Soil Organic Matter (SOM) to ensure consistency, transparency, and scientific integrity in IWCA-related soil carbon discussions, reporting, and potential in-setting considerations.

- SOC is the primary metric for assessing soil carbon sequestration, supporting climate-related claims, and informing potential in-setting strategies.
- SOM is considered a complementary indicator, useful for understanding soil health, fertility, and agronomic performance, but not sufficient on its own to quantify climate impact.

A commonly used approximation is **SOC ≈ SOM / 1.724**

IWCA recognizes this as a general conversion factor that may vary with soil type, climate, and management. Therefore:

- Direct measurement of SOC is preferred.
- Conversions from SOM to SOC should be clearly disclosed, justified, and treated with caution.

At the same time, given the diverse maturity levels of the projects, IWCA humbly proposes an initial approach to classifying methodologies.: Tier 1, Tier 2, and Tier 3. All tiers add value; however, a winery may have different projects across tiers simultaneously, which must be explicitly specified.

Table 4. IWCA Tiers proposal.

Criteria	Tier 1	Tier 2	Tier 3
Objective	Exploratory	Applied	Referential
Methodological description	Basic	Documented	Documented
Sampling depth	0–30 cm	0–30 cm / 0-60 cm	0- 60 cm
Control	No	Yes	Yes
Time horizon	<2 years	2 years minimum	3 or more years
Repeatability	Limited	Consistent	Statistical
Comparability	No	Yes	High

vii. Conclusion

- The compilation clearly demonstrates strong and growing interest from wineries and the wine sector in soil carbon sequestration, as reflected by the number of completed and ongoing projects.
- Across the compilation, projects consistently indicate a positive or neutral SOC trend under regenerative vineyard management, confirming the overall direction of impact.
- The projects analysed have highly variable SOC rates, which are not comparable with each other; however, fluctuating values were observed between:
    - California: 1.3 t C/ha/year
    - Chile: 0.00- 3.04t C/ha/year
    - Mediterráneo: 0.37- 2.27 t C/ha/year
- There is broad implicit consensus that SOC responds slowly and that sequestration outcomes are highly context-dependent, influenced by local soil, climate, and management conditions.
- While most projects report relative increases in SOC, a limited number show no significant change or localized SOC losses, underscoring the importance of long-term monitoring and robust methodology.
- The compilation highlights those specific regenerative practices, particularly cover crops and biochar, are associated with improved conditions for increasing and stabilizing SOC.
- Methodological heterogeneity across projects—especially regarding sampling depth, treatment of spatial variability, and study duration—prevents direct numerical comparisons and the derivation of a single, standardized SOC sequestration value.
- As a result, this compilation cannot support a universal SOC sequestration factor applicable across wineries, nor enable comparison of results without normalization for depth and time.
- Nevertheless, the portfolio provides substantial value by allowing the identification of realistic SOC sequestration ranges, the classification of projects by methodological robustness (IWCA Tiers), and the definition of best practices and pathways toward harmonization.
- Although the number of projects remains limited, this further highlights the innovative and pioneering role of the wineries already engaging in soil carbon research within a rapidly evolving field.
- The IWCA SOC Sequestration Compilation closely aligns with the principles and emerging guidance of the GHG Protocol Land Sector and Removals Initiative Project Overview. Both frameworks recognize soil organic carbon as a legitimate and climate-relevant carbon removal, emphasize primary measurements, transparency, and conservative assumptions, and acknowledge the context-dependent nature of soil carbon dynamics. While IWCA adopts a sector-specific, tiered, and learning-oriented approach, the GHG Protocol provides a global accounting framework. Together, they are complementary rather than conflicting.

viii. SOC Sequestration Scientific literature review- bibliography

AENOR-IRTA. (2020). *Guía de buenas prácticas agrarias CARBOCERT: Secuestro de carbono y mejora de los suelos en cultivos agrícolas mediterráneos*. AENOR & IRTA.

GHG Protocol. (2024). *Land Sector and Removals Initiative: Project overview*. World Resources Institute & World Business Council for Sustainable Development.

INRA. (2020). *Stocker du carbone dans les sols français*. Institut National de la Recherche Agronomique.

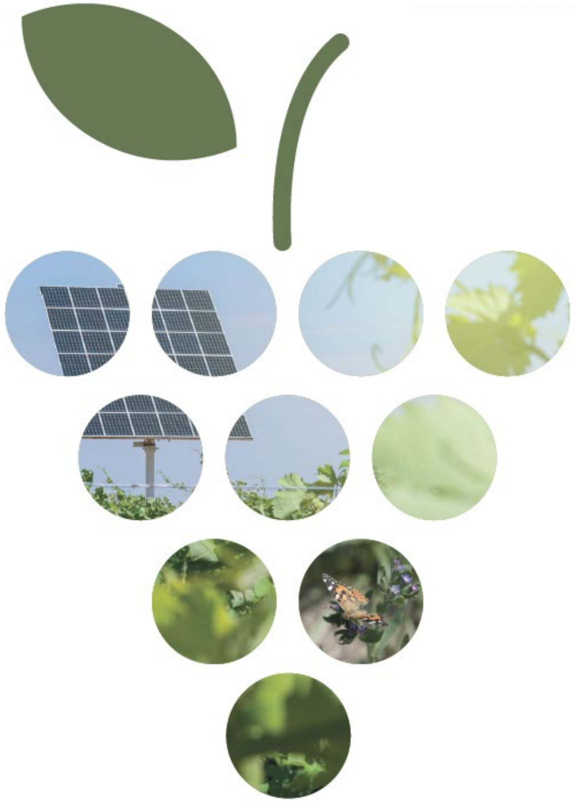
Payen, F. T., Sykes, A., Aitkenhead, M., Alexander, P., Moran, D., & MacLeod, M. (2021). Soil organic carbon sequestration rates in vineyard agroecosystems under different soil management practices: A meta-analysis. *Journal of Cleaner Production, 290*, 125736. https://doi.org/10.1016/j.jclepro.2021.125736

Schultz, H. R. (2022). Soil, vine, climate change: The challenge of predicting soil carbon changes and greenhouse gas emissions in vineyards and is the 4 per 1000 goal realistic? *OENO One, 56*(2), 251–263. https://doi.org/10.20870/oeno-one.2022.56.2.5447

Vicente-Vicente, J. L., et al. (2016). Soil carbon sequestration rates under Mediterranean woody crops using recommended management practices: A meta-analysis. *Agriculture, Ecosystems & Environment, 235*, 204–214. https://doi.org/10.1016/j.agee.2016.10.015

Wolff, M. W., et al. (2017). Minimum tillage of a cover crop lowers net GWP and sequesters soil carbon in a California vineyard. *Soil and Tillage Research, 175*, 33–41. https://doi.org/10.1016/j.still.2017.08.003

ix. Annex: Projects resume.



Leading the transition to a

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International Wineries for Climate Action

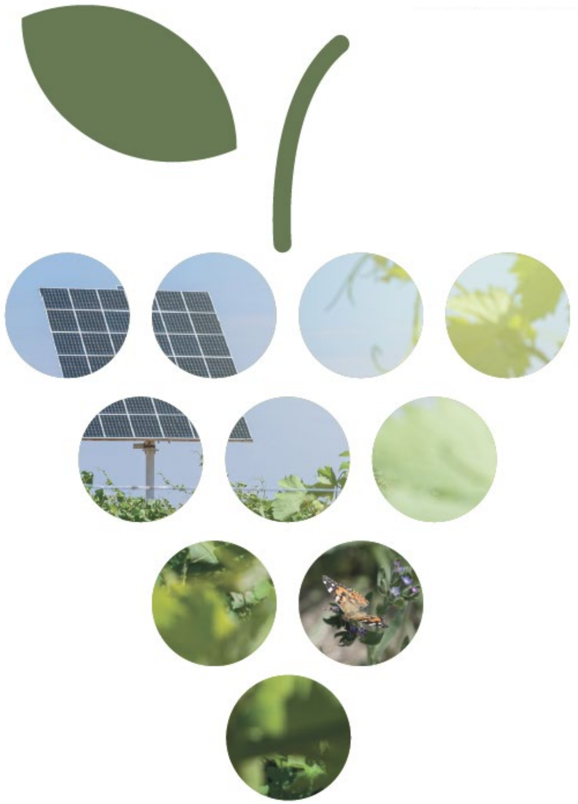
Compilation of Soil Organic Carbon (SOC) Sequestration Projects

Filling instructions:

- Complete all fields and do not remove any of them.
- Keep all the necessary information on one page.
- The size of the boxes and letters can be adjusted according to your needs if they do not impair the legibility of any of the other boxes.
- Information can be inserted making use of tables and logos.

Disclaimer: The wineries participating to the SOC Sequestration Compilation must make sure that the information shared with IWCA for this specific project is not confidential, and can be shared, exposed, printed without any harm to themselves or any other third parties. IWCA is not responsible for the data shared on behalf of the wineries.

ix. Annex: Projects resume.



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Compilation of Soil Organic Carbon (SOC) Sequestration Projects

Index

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: ***(Winery Logo)***

Project Name: ***(input here)***
Website Project: ***(input here)***

Location: ***(Country, Region)***

Project Description & Goal: ***(input here) context***

Project Members: ***(input here: are there other wineries or partners?)***

Project Start Date: *MM/YYYY*
Project End Date: *MM/YYYY*

Date of slide edition *MM/DD/YYYY*
Person in charge: ***(Name, role, and contact information)***

Soil Carbon Sequestration Calculation Methodology:
Please detail, at least

- Frequency of sample: *(annual, biennial)*
- *Number of samples per hectare or plot*
- *Depth of samples*
- *sampling tool/method*
- *sample repetition for statistical matters*
- *Other details*

(for example: type of soil and climate conditions, average annual production, years of life, management, etc).

Conclusions: *(input here, if there are scientific publications, Soil Organic Carbon (SOC) sequestration*

Sources: data results (Mg CO_2eq /ha/year), and the paper's link, in case.

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: Archery Summit

Project Name: ***Measurement of Soil Organic Matter***
Website Project: *n/a*

Location: *California, USA*

Project Description & Goal: Every other year we are measuring our soil organic matter

Project Members: *The Project is managed by Archery Summit staff*

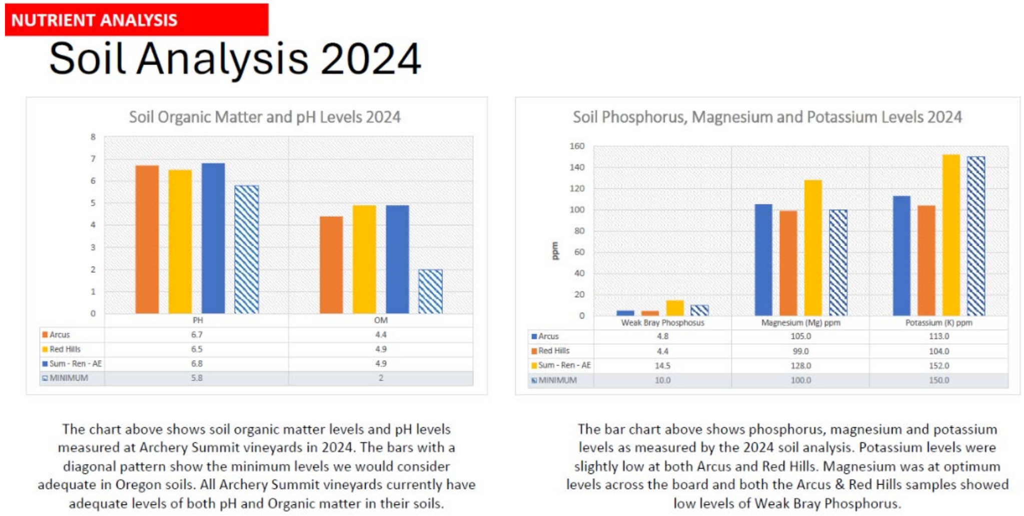
Project Start Date: ***01/01/2024***
Project End Date: None

Date of slide edition ***08/12/2025***
Person in charge: *Kimberly Abrahams, Winemaker, Archery Summit, kim.abrahams@archerysummit.com*

Soil Carbon Sequestration Calculation Methodology:
Please detail, at least

- Frequency of sample: *Biennial*
- *Number of samples per hectare or plot: 1 composite sample per vineyard*
- *Depth of simples: 1 foot*
- *sampling tool/method: Soil Probe*
- *sample repetition for statistical matters: 4 simples per vineyard, mixed and then a composite taken*
- *Other details: Jory soil, cool climate, organic spray program, planted anywhere between 1973 - 2022*

Conclusions: See Chart



INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: CHAMISAL VINEYARDS ESTD 1973

Project Name: ***Measurement of Soil Organic Matter***
Website Project: ***n/a***

Location: USA, San Luis Obispo CA

Project Description & Goal: *We measure SOM as a percentage every year to track increases in Organic Matter and track the overall health of our soils.*

Project Members: *The Project is managed by Chamisal Vineyards staff*

Project Start Date: 01/01/2024
Project End Date: None

Date of slide edition ***08/21/2025***
Person in charge: *Brianne Engles, Winemaker, Chamisal Vineyards, Brianne.engles@chamisalvineyards.com*

Soil Carbon Sequestration Calculation Methodology:
Please detail, at least

- Frequency of sample: Annually
- *Number of samples per hectare or plot: 1 composite sample per soil type*
- *Depth of samples: 10 inches*
- *sampling tool/method: soil probe*
- *sample repetition for statistical matters: 4 samples per soil type and mixed as a composite.*
- *Other details: Salinas Clay Loam, Sandy Loam, Shaley Loam*

Conclusions: ***2024 Haney Soil Testing Results:***

Salinas Clay Loam (B block): SOM%: 4.3%; Organic Carbon: 227 ppm
Sandy Loam (D block): SOM%: 3.4%; Organic Carbon: 244 ppm
Shaley Loam (F block): SOM%: 4.0% ; Organic Carbon: 275 ppm

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: PINE RIDGE VINEYARDS

Project Name: *Haney Soil Health Analysis*
Website Project: *N/A*

Location: Napa Valley, CA, USA

Project Description & Goal: *Measuring soil health*

Project Members: *The Project is managed by Pine Ridge Vineyards staff*

Project Start Date: *7/29/2024*
Project End Date: *TBD*

Date of slide edition *08/21/2025*
Person in charge: *Gustavo Avina* gustavo.avina@pineridgewine

Soil Carbon Sequestration Calculation Methodology:
Please detail, at least

- Frequency of sample: *biennial*
- *Number of samples per hectare or plot One sample per block or a convination of two blocks in one sample depending on block size.*
- *Depth of samples 6 inches*
- *sampling tool/method Digging with a shevol.*
- *sample repetition for statistical matters 4-6 samples in different áreas of the block- mixed and then we took a portion of the soil to send it to the lab.*
- *Other details Soil was dry.*

Conclusions: *(input here, if there are scientific publications, Soil Organic Carbon (SOC) sequestration*

Date Rept	Grower	Field ID	Sample ID 1	1:1 Soil pH	1:1 Soluble Salt	Excess Lime	Organic Matter	CO2-C	H2O Total N	H2O Organic N	H2O Total Organic C	H3A Nitrate	H3A Ammonium
7/31/2024	PINE RIDGE VINEYARDS	ANDRUS ESTATE	BLK 1	7.7	0.26	NONE	4.7	199.17	23.78	15.93	200.32	4.98	5.75
7/31/2024	PINE RIDGE VINEYARDS	ANDRUS ESTATE	BLK 2&3	7.4	0.29	NONE	3	40.66	42.4	10.5	143.57	21.6	39.2
7/31/2024	PINE RIDGE VINEYARDS	ANDRUS ESTATE	BLK 5&6	7.6	0.28	NONE	4.6	55.44	30.49	19.3	216.6	8.25	5.96
7/31/2024	PINE RIDGE VINEYARDS	ANDRUS ESTATE	BLK 7	7.4	0.32	NONE	3.4	53.99	34.22	17.04	195.11	15.3	2.43
7/31/2024	PINE RIDGE VINEYARDS	ANDRUS ESTATE	BLK 9	7.7	0.29	LOW	5.7	119.44	27.95	20.45	251.77	4.57	5.77
7/31/2024	PINE RIDGE VINEYARDS	ANDRUS ESTATE	BLK 10	7.5	0.39	LOW	5.4	115.22	27.85	21.3	312.18	4.14	4.31
7/31/2024	PINE RIDGE VINEYARDS	ANDRUS ESTATE	BLK 12&15	7.7	0.36	LOW	6	133.11	31.4	17.71	216.31	11.2	5.28
7/31/2024	PINE RIDGE VINEYARDS	ANDRUS ESTATE	BLK 14&16	7.2	0.16	LOW	7	119.3	50.89	22.22	230.99	25.8	6.99
7/31/2024	PINE RIDGE VINEYARDS	MCKINNON	BLK 1&2	7.5	0.19	NONE	2.2	28.98	39	10.1	99	27.2	2.57
7/31/2024	PINE RIDGE VINEYARDS	MCKINNON	BLK 3	7.5	0.16	NONE	2.9	42.79	35.6	10.47	139.83	23.1	2.41
7/31/2024	PINE RIDGE VINEYARDS	MCKINNON	BLK 4	7.4	0.19	NONE	4	37.24	30.64	14.7	162.87	14	2.86
7/31/2024	PINE RIDGE VINEYARDS	LAS POSADAS	BLK 1,3,4	7.4	0.06	NONE	3.9	43.34	20.52	7.43	87.09	11.1	2.36
7/31/2024	PINE RIDGE VINEYARDS	LAS POSADAS	BLK 5	6.9	0.05	NONE	4.3	54.41	18.06	6.06	78.59	10	2.21
7/31/2024	PINE RIDGE VINEYARDS	RUTHERFORD RIDGE	BLK 15,16,17	7.4	0.16	NONE	4	32.6	42.25	15.4	161.42	24.2	2.41
7/31/2024	PINE RIDGE VINEYARDS	RUTHERFORD RIDGE	BLK 4&5	7.6	0.2	NONE	4.1	37.26	34.64	15.01	159.58	17	2.17
7/31/2024	PINE RIDGE VINEYARDS	RUTHERFORD RIDGE	BLK 14	7.3	0.08	NONE	4.8	22.95	24.79	11.18	123.31	11.4	2.02
7/31/2024	PINE RIDGE VINEYARDS	RUTHERFORD RIDGE	BLK 18	6.8	0.12	NONE	4.4	37.8	43.71	16.42	165.26	24.6	4.38
7/31/2024	PINE RIDGE VINEYARDS	RUTHERFORD RIDGE	BLK 13	7.1	0.19	NONE	4.6	26.54	39.05	14.06	133.32	22.8	1.36
7/31/2024	PINE RIDGE VINEYARDS	RUTHERFORD RIDGE	BLK 21	7.2	0.16	NONE	4.9	45.55	43.13	17.92	186.18	23.2	2.61
7/31/2024	PINE RIDGE VINEYARDS	OLIVE POND	BLK 1&2	7.3	0.46	NONE	2.4	34.86	34.95	14.82	158.19	17.8	3.2
7/31/2024	PINE RIDGE VINEYARDS	LOCKED HORNS	BLK 1&2	7.5	0.15	NONE	3.2	37.05	23.53	11.72	149.92	9.81	2.23
7/31/2024	PINE RIDGE VINEYARDS	DOS OLIVOS	VILLAGE 2	7.5	0.26	NONE	2.8	36.89	29.55	15.11	171.74	12.3	4.07
7/31/2024	PINE RIDGE VINEYARDS	DOS OLIVOS	GRAND CRU	7.6	0.25	NONE	3.3	26.69	46.69	14.16	136.08	29.9	3.02
7/31/2024	PINE RIDGE VINEYARDS	DOS OLIVOS	PREMIER CRU	7.6	0.19	NONE	2.7	30.68	35.2	15.77	170.75	17.2	3.18
7/31/2024	PINE RIDGE VINEYARDS	DOS OLIVOS	VILLAGE 1	7.5	0.31	NONE	2.6	23.42	39.01	13.09	123.47	24	1.93
7/31/2024	PINE RIDGE VINEYARDS	STAGS CROWN	4-Jan	7.7	0.27	NONE	3.7	32.04	42.36	19.6	215.04	20.3	2.52
7/31/2024	PINE RIDGE VINEYARDS	CIRCLE HILL	1A, 1B	7.6	0.24	NONE	3.7	14.37	35.82	15.54	160.31	18	2.68
7/31/2024	PINE RIDGE VINEYARDS	CIRCLE HILL	2	7.5	0.17	NONE	2.8	27.07	24.68	12.15	152.04	10.2	2.89
7/31/2024	PINE RIDGE VINEYARDS	CIRCLE HILL	3	7.3	0.15	NONE	3.6	63.99	27.74	17.36	214.76	8.22	2.46
7/31/2024	PINE RIDGE VINEYARDS	BUHMAN	BLK 1A, 2A	7	0.21	NONE	3.1	24.17	36.47	15.05	173.09	19.2	2.04
7/31/2024	PINE RIDGE VINEYARDS	BUHMAN	BLK 5	7.1	0.16	NONE	4.4	190.19	37.47	18.54	254.03	15.7	5.14
7/31/2024	PINE RIDGE VINEYARDS	BUHMAN	BLK 7	6.6	0.17	NONE	3.5	33.29	39.39	16.57	190.2	20.6	2.29
7/31/2024	PINE RIDGE VINEYARDS	BUHMAN	BLK 17	6.9	0.23	NONE	4	34.55	49.62	14.2	177.23	32.9	2.46

Field ID	Sample ID 1	H3A Inorganic Nitrogen	H3A Total Phosphorus	H3A Inorganic Phosphorus	H3A Organic Phosphorus	H3A ICAP Potassium	H3A ICAP Calcium	H3A ICAP Aluminum	H3A ICAP Iron	H3A ICAP Sulfur	H3A ICAP Zinc	H3A ICAP Manganese	H3A ICAP Copper	H3A ICAP Magnesium	H3A ICAP Sodium	% MAC
ANDRUS ESTATE	BLK 1	10.73	95.23	85	10.23	130.34	1143.85	96.99	32.12	34.84	2.6	6.46	0.35	125.81	19.52	99.43
ANDRUS ESTATE	BLK 2&3	60.8	331.48	300	31.48	177.09	1159.34	117.15	45.25	24.11	3.96	5.55	0.24	130.41	46.75	28.32
ANDRUS ESTATE	BLK 5&6	14.21	89.39	80.6	8.79	139.98	875.91	105.68	41.42	33.55	2.42	10.61	0.39	135.81	30.83	25.6
ANDRUS ESTATE	BLK 7	17.73	82.05	72.6	9.45	116.18	766.53	101.3	47.72	24.35	5.86	5.79	0.59	137.11	38.06	27.67
ANDRUS ESTATE	BLK 9	10.34	90.41	79.4	11.01	152.52	1744.56	76.04	29.63	45.82	1.46	4.1	0.38	132.45	23.23	47.44
ANDRUS ESTATE	BLK 10	8.45	93.8	84	9.8	103.42	1316.71	79.05	34.84	43.61	1.66	8.64	0.35	146.37	16.14	36.91
ANDRUS ESTATE	BLK 12&15	16.48	66.54	58.3	8.24	97.25	1397.51	87.34	32.72	30.41	1.54	4.22	0.4	113.5	26.53	61.54
ANDRUS ESTATE	BLK 14&16	32.79	123.48	113	10.48	82.77	1286.86	92.55	47.56	62.24	2.15	6.93	0.41	148.54	39.73	51.65
MCKINNON	BLK 1&2	29.77	54.11	49.7	4.41	94.17	722.55	114.06	78.81	11.31	1.09	29.44	0.51	109.93	48.63	29.27
MCKINNON	BLK 3	25.51	64.09	57.7	6.39	108.65	794.22	130.29	128.73	20.03	2.05	13.14	0.72	174.68	99.65	30.6
MCKINNON	BLK 4	16.86	74.4	69.2	5.2	117.97	839.39	131.08	71.75	5.61	0.82	5.65	0.42	166.59	26.42	22.87
LAS POSADAS	BLK 1,3,4	13.46	24.53	20.8	3.73	108.83	677.93	183.37	34.88	3.01	1.65	10.52	0.21	175.42	11.65	49.76
LAS POSADAS	BLK 5	12.21	46.81	43.9	2.91	127.97	593.48	181.28	55.24	2.51	2.15	7.78	0.28	153.76	20.31	69.23
RUTHERFORD RIDGE	BLK 15,16,17	26.61	55.51	50.3	5.21	87.6	1058.96	140.92	46.58	75.31	1.66	2.75	0.25	181.83	17.81	20.2
RUTHERFORD RIDGE	BLK 4&5	19.17	48.4	44	4.4	83.09	1118.89	114.4	48.5	93.52	0.6	2.2	0.15	185.57	9.06	23.35
RUTHERFORD RIDGE	BLK 14	13.42	73.33	66.7	6.63	198.28	866.98	170.89	55.36	7.81	0.63	3.66	0.11	159.36	13.96	18.61
RUTHERFORD RIDGE	BLK 18	28.98	69.94	63.7	6.24	129.58	845.82	186.75	64.74	7.76	1.01	12.72	0.37	109.01	14.26	22.87
RUTHERFORD RIDGE	BLK 13	24.16	90.27	82.8	7.47	177.81	836.44	146.03	76.38	11.11	1.26	4.77	0.18	183.85	13.01	19.91
RUTHERFORD RIDGE	BLK 21	25.81	85.89	78.8	7.09	192.33	832.89	150.36	52.06	12.98	2.75	9.79	0.26	173.8	17.56	24.47
OLIVE POND	BLK 1&2	21	119.18	111	8.18	176.97	801.92	121.96	75.74	14.99	4.9	18.99	0.8	134.9	67.39	22.04
LOCKED HORNS	BLK 1&2	12.04	165.89	158	7.89	155.14	801.44	114.35	54.22	12.5	22.19	9.32	0.35	141.79	35.97	24.71
DOS OLIVOS	VILLAGE 2	16.37	83.07	74.9	8.17	124.47	950.14	104.65	76.11	31.28	1.37	10.76	0.39	103.76	10.36	21.48
DOS OLIVOS	GRAND CRU	32.92	55.29	48.8	6.49	152.87	969.75	138.38	54.77	19.78	1.63	20.78	0.23	134.46	13.14	19.61
DOS OLIVOS	PREMIER CRU	20.38	76.41	69	7.41	124.04	909.01	117.95	69.15	22.09	1.42	12.88	0.36	130.59	12.76	17.97
DOS OLIVOS	VILLAGE 1	25.93	82.66	73	9.66	95.71	967.71	112.48	65.42	51.41	1.2	5.57	0.35	137.04	18.99	18.97
STAGS CROWN	4-Jan	22.82	158.02	148	10.02	163.89	779.05	155.55	60.48	14.87	2.56	8.72	0.17	167.25	270.55	14.9
CIRCLE HILL	1A, 1B	20.68	121	113	8	137.18	924.02	131.03	48.42	21.86	3.29	9.94	0.16	122.47	31.75	8.97
CIRCLE HILL	2	13.09	126.03	117	9.03	91.53	726.02	129.28	87.15	21.53	2.51	9.73	0.34	195.38	56.12	17.81
CIRCLE HILL	3	10.68	124.33	115	9.33	87.43	749.36	120.92	51.04	19.31	8.64	8.13	0.29	164.8	26.59	29.8
BUHMAN	BLK 1A, 2A	21.24	23.69	18.7	4.99	104.14	781.18	141.2	63.78	24.87	1.78	13.81	0.64	130.77	22.62	13.96
BUHMAN	BLK 5	20.84	21.95	17.2	4.75	96.11	790.06	173.93	46.55	17.8	0.74	5.62	0.46	197.55	32.9	74.87
BUHMAN	BLK 7	22.89	50.52	45.1	5.42	174.61	715.18	153.13	54.27	7.02	2.4	7.47	0.68	133.88	18.19	17.5
BUHMAN	BLK 17	35.36	54.31	49.5	4.81	153.91	843.27	161.81	52.8	15.04	1.99	4.64	0.53	163.52	23.76	19.5

Field ID	Sample ID 1	Organic C:N	Organic N:Inorganic N	Organic N Release	Organic N Reserve	Organic P Release	Organic P Reserve	Soil Health Calculation	Available N	Available P	Available K	Nutrient Value	Traditional N	Haney Test N	Lbs N Difference	N savings	Cover Crop Mix
ANDRUS ESTATE	BLK 1	12.57	2.03	15.93	0	10.23	0	22.2	47.99	219.03	156.41	228.86	8.96	47.99	39.02	40.59	20% Legume 80% Grass
ANDRUS ESTATE	BLK 2&3	13.67	0.33	10.5	0	26.75	4.73	7.99	128.34	751.53	212.5	585.43	38.88	128.34	89.46	93.04	50% Legume 50% Grass
ANDRUS ESTATE	BLK 5&6	11.23	1.72	19.3	0	6.75	2.04	11.81	60.31	200.9	167.98	239.12	14.85	60.31	45.46	47.28	40% Legume 60% Grass
ANDRUS ESTATE	BLK 7	11.45	0.99	17.04	0	7.85	1.61	11	62.58	185.03	139.42	219.9	27.54	62.58	35.04	36.44	40% Legume 60% Grass
ANDRUS ESTATE	BLK 9	12.31	2.73	20.45	0	11.01	0	17.03	55.42	207.94	183.03	244.81	8.23	55.42	47.2	49.08	30% Legume 70% Grass
ANDRUS ESTATE	BLK 10	14.66	3.25	21.3	0	9.8	0	17.98	53.55	215.75	124.1	216.98	7.45	53.55	46.09	47.94	30% Legume 70% Grass
ANDRUS ESTATE	BLK 12&15	12.22	1.29	17.71	0	8.24	0	17.19	61.53	153.03	116.69	192.74	20.16	61.53	41.37	43.03	30% Legume 70% Grass
ANDRUS ESTATE	BLK 14&16	10.4	0.77	22.22	0	10.48	0	16.78	99.01	284	99.32	283.27	46.44	99.01	52.57	54.68	30% Legume 70% Grass
MCKINNON	BLK 1&2	9.8	0.35	10.1	0	3.87	0.54	5.89	71.77	123.21	113	187.81	48.96	71.77	22.81	23.72	50% Legume 50% Grass
MCKINNON	BLK 3	13.36	0.42	10.47	0	5.87	0.52	8.12	64.76	146.21	130.38	199.8	41.58	64.76	23.18	24.11	50% Legume 50% Grass
MCKINNON	BLK 4	11.08	0.92	13.45	1.25	3.57	1.63	8.45	54.55	167.37	141.57	204.5	25.2	54.55	29.35	30.52	50% Legume 50% Grass
LAS POSADAS	BLK 1,3,4	11.72	0.57	7.43	0	3.73	0	6.82	37.6	56.43	130.6	130.36	19.98	37.6	17.62	18.33	50% Legume 50% Grass
LAS POSADAS	BLK 5	12.98	0.5	6.06	0	2.91	0	7.62	32.88	107.67	153.57	160.51	18	32.88	14.88	15.47	50% Legume 50% Grass
RUTHERFORD RIDGE	BLK 15,16,17	10.48	0.57	12.44	2.96	3.16	2.06	8.03	70.29	122.96	105.11	182.21	43.56	70.29	26.73	27.8	50% Legume 50% Grass
RUTHERFORD RIDGE	BLK 4&5	10.63	0.76	14.02	0.99	3.09	1.32	8.42	59.75	108.3	99.71	161.81	30.6	59.75	29.15	30.31	50% Legume 50% Grass
RUTHERFORD RIDGE	BLK 14	11.03	0.82	8.32	2.86	3.7	2.93	5.88	39.14	161.93	237.93	234.15	20.52	39.14	18.62	19.36	50% Legume 50% Grass
RUTHERFORD RIDGE	BLK 18	10.07	0.6	15.02	1.4	4.28	1.96	8.73	79.2	156.36	155.5	232.04	44.28	79.2	34.92	36.32	50% Legume 50% Grass
RUTHERFORD RIDGE	BLK 13	9.48	0.56	11.19	2.86	4.46	3.01	6.73	63.64	200.7	213.37	265.19	41.04	63.64	22.6	23.5	50% Legume 50% Grass
RUTHERFORD RIDGE	BLK 21	10.39	0.71	17.53	0.38	5.2	1.89	10.07	78.02	193.2	230.8	285.41	41.76	78.02	36.26	37.71	40% Legume 60% Grass
OLIVE POND	BLK 1&2	10.67	0.74	13.06	1.76	5.41	2.77	8.13	61.32	267.74	212.36	293.11	32.04	61.32	29.28	30.45	50% Legume 50% Grass
LOCKED HORNS	BLK 1&2	12.79	0.99	11.59	0.14	5.85	2.04	7.88	42.53	376.85	186.17	310.66	17.66	42.53	24.87	25.87	50% Legume 50% Grass
DOS OLIVOS	VILLAGE 2	11.37	1.05	12.98	2.13	5.27	2.91	8.63	52.83	184.39	149.36	214.44	22.14	52.83	30.69	31.92	50% Legume 50% Grass
DOS OLIVOS	GRAND CRU	9.61	0.44	11.11	3.05	3.82	2.67	6.81	79.25	121.03	183.45	229.81	53.82	79.25	25.43	26.45	50% Legume 50% Grass
DOS OLIVOS	PREMIER CRU	10.83	0.81	11.34	4.44	4	3.42	8.06	57.09	167.89	148.84	211.02	30.96	57.09	26.13	27.17	50% Legume 50% Grass
DOS OLIVOS	VILLAGE 1	9.43	0.51	9.93	3.16	5.5	4.16	6.12	64.55	180.54	114.86	207.61	43.2	64.55	21.35	22.2	50% Legume 50% Grass
STAGS CROWN	4-Jan	10.97	0.86	11.68	7.92	4.48	5.54	9.46	62.11	350.7	196.67	324.25	36.54	62.11	25.57	26.59	50% Legume 50% Grass
CIRCLE HILL	1A, 1B	10.32	0.77	5.57	9.97	2.15	5.85	6.2	47.26	264.85	164.62	253.29	32.4	47.26	14.86	15.45	50% Legume 50% Grass
CIRCLE HILL	2	12.52	0.97	8.65	3.49	4.82	4.21	6.96	39.13	280.19	109.84	224.51	18.36	39.13	20.77	21.6	50% Legume 50% Grass
CIRCLE HILL	3	12.37	1.67	17.36	0	8.34	0.99	12.43	50.48	283.69	104.91	235.45	14.8	50.48	35.68	37.11	40% Legume 60% Grass
BUHMAN	BLK 1A, 2A	11.5	0.7	8.4	6.64	2.09	2.9	7.38	53.36	47.82	124.96	139.97	34.56	53.36	18.8	19.55	50% Legume 50% Grass
BUHMAN	BLK 5	13.7	0.98	18.54	0	4.75	0	22.78	70.89	50.47	115.34	154.61	28.26	70.89	42.63	44.34	20% Legume 80% Grass
BUHMAN	BLK 7	11.48	0.73	11.6	4.97	2.84	2.57	8.79	62.08	110.27	209.53	220.05	37.08	62.08	25	26	50% Legume 50% Grass
BUHMAN	BLK 17	12.48	0.4	11.07	3.12	2.81	2	8.42	83.58	120.32	184.69	234.61	59.22	83.58	24.36	25.33	10% Legume 90% Grass

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: PINE RIDGE VINEYARDS

Conclusions: *(input here, if there are scientific publications, Soil Organic Carbon (SOC) sequestration*

luble Salt	Excess Lime	Organic Matter	CO2-C	H2O Total N	H2O Organic N	H2O Total Organic C	H3A Nitrate	H3A Ammonium	H3A Inorganic Nitrogen	H3A Total Phosphorus	H3A Inorganic Phosphorus	H3A Organic Phosphorus	H3A ICAP Potassium	H3A ICAP Calcium	H3A ICAP Alumin
0.26	NONE	4.7	199.17	23.78	15.93	200.32	4.98	5.75	10.73	95.23	85	10.23	130.34	1143.85	9
0.29	NONE	3	40.66	42.4	10.5	143.57	21.6	39.2	60.8	331.48	300	31.48	177.09	1159.34	11
0.28	NONE	4.6	55.44	30.49	19.3	216.6	8.25	5.96	14.21	89.39	80.6	8.79	139.98	875.91	10
0.32	NONE	3.4	53.99	34.22	17.04	195.11	15.3	2.43	17.73	82.05	72.6	9.45	116.18	766.53	1
0.29	LOW	5.7	119.44	27.95	20.45	251.77	4.57	5.77	10.34	90.41	79.4	11.01	152.52	1744.56	7
0.39	LOW	5.4	115.22	27.85	21.3	312.18	4.14	4.31	8.45	93.8	84	9.8	103.42	1316.71	7
0.36	LOW	6	133.11	31.4	17.71	216.31	11.2	5.28	16.48	66.54	58.3	8.24	97.25	1397.51	8
0.16	LOW	7	119.3	50.89	22.22	230.99	25.8	6.99	32.79	123.48	113	10.48	82.77	1286.86	9
0.19	NONE	2.2	28.98	39	10.1	99	27.2	2.57	29.77	54.11	49.7	4.41	94.17	722.55	11
0.16	NONE	2.9	42.79	35.6	10.47	139.83	23.1	2.41	25.51	64.09	57.7	6.39	108.65	794.22	13
0.19	NONE	4	37.24	30.64	14.7	162.87	14	2.86	16.86	74.4	69.2	5.2	117.97	839.39	13
0.06	NONE	3.9	43.34	20.52	7.43	87.09	11.1	2.36	13.46	24.53	20.8	3.73	108.83	677.93	18
0.05	NONE	4.3	54.41	18.06	6.06	78.59	10	2.21	12.21	46.81	43.9	2.91	127.97	593.48	18
0.16	NONE	4	32.6	42.25	15.4	161.42	24.2	2.41	26.61	55.51	50.3	5.21	87.6	1058.96	14
0.2	NONE	4.1	37.26	34.64	15.01	159.58	17	2.17	19.17	48.4	44	4.4	83.09	1118.89	1
0.08	NONE	4.8	22.95	24.79	11.18	123.31	11.4	2.02	13.42	73.33	66.7	6.63	198.28	866.98	17
0.12	NONE	4.4	37.8	43.71	16.42	165.26	24.6	4.38	28.98	69.94	63.7	6.24	129.58	845.82	18
0.19	NONE	4.6	26.54	39.05	14.06	133.32	22.8	1.36	24.16	90.27	82.8	7.47	177.81	836.44	14
0.16	NONE	4.9	45.55	43.13	17.92	186.18	23.2	2.61	25.81	85.89	78.8	7.09	192.33	832.89	15
0.46	NONE	2.4	34.86	34.95	14.82	158.19	17.8	3.2	21	119.18	111	8.18	176.97	801.92	12
0.15	NONE	3.2	37.05	23.53	11.72	149.92	9.81	2.23	12.04	165.89	158	7.89	155.14	801.44	11
0.26	NONE	2.8	36.89	29.55	15.11	171.74	12.3	4.07	16.37	83.07	74.9	8.17	124.47	950.14	10
0.25	NONE	3.3	26.69	46.69	14.16	136.08	29.9	3.02	32.92	55.29	48.8	6.49	152.87	969.75	13
0.19	NONE	2.7	30.68	35.2	15.77	170.75	17.2	3.18	20.38	76.41	69	7.41	124.04	909.01	117
0.31	NONE	2.6	23.42	39.01	13.09	123.47	24	1.93	25.93	82.66	73	9.66	95.71	967.71	11
0.27	NONE	3.7	32.04	42.36	19.6	215.04	20.3	2.52	22.82	158.02	148	10.02	163.89	779.05	15
0.24	NONE	3.7	14.37	35.82	15.54	160.31	18	2.68	20.68	121	113	8	137.18	924.02	13
0.17	NONE	2.8	27.07	24.68	12.15	152.04	10.2	2.89	13.09	126.03	117	9.03	91.53	726.02	12
0.15	NONE	3.6	63.99	27.74	17.36	214.76	8.22	2.46	10.68	124.33	115	9.33	87.43	749.36	12
0.21	NONE	3.1	24.17	36.47	15.05	173.09	19.2	2.04	21.24	23.69	18.7	4.99	104.14	781.18	1
0.16	NONE	4.4	190.19	37.47	18.54	254.03	15.7	5.14	20.84	21.95	17.2	4.75	96.11	790.06	17
0.17	NONE	3.5	33.29	39.39	16.57	190.2	20.6	2.29	22.89	50.52	45.1	5.42	174.61	715.18	15
0.23	NONE	4	34.55	49.62	14.2	177.23	32.9	2.46	35.36	54.31	49.5	4.81	153.91	843.27	16

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: FAMILIA TORRES Desde 1870

Project Name: VITIREGENERE
Website Project: VITIREGENERE: regenerative viticulture for improving biodiversity and vine management | EU CAP Network]

Location: *Catalonia, Spain*

Project Description & Goal: *Regenerative viticulture for the improvement of biodiversity and vineyard management. To evaluate the application of different agronomic management method. To validate the application and effects of microorganism addition on soil microbial diversity. To evaluate microbial diversity and its evolution over time. Improving the biodiversity of the environment.*

Project Members: Jean Leon, Clos Mogador, Familia Torres, Can Feixes Huguet, INNOVI Clúster Vitivinícola Català, IRTA Institute of Agrifood Research and Technology

Project Start Date: *05/2022*
Project End Date: *09/2024*

Date of slide edition *08/05/2025*
Person in charge: *Eva Bertran, R&D Microbiology Technician, ebertran@torres.es*

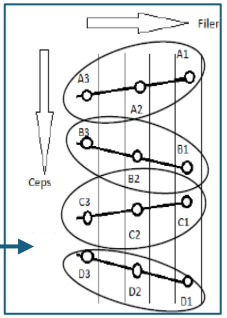
Soil Carbon Sequestration Calculation Methodology:

*Laboratory Method for SOC analysis: Potentiometric titration C511 0079. Based on BOE-A-1976-6778 (Spain). Funes et al. 2019**

$$SOC = Bd \cdot (Occ/100) \cdot 10000 \cdot Th \cdot (1-S) \cdot (1/1000)$$

Bd is the bulk density of the soil (g cm-3),
OCc is the soil organic carbon concentration (%)
Th is the depth of the sample in cm and S is the stoniness

Sampling tool/method:
Soil samples are taken at 0-20 cm depth.
In the middle of the row.
In total we have 12 samples/plot.
The samples are taken annually.



Edaphological characteristics: Loamy-clay. Soils have good drainage and water retention capacity around 25%.

* Funes, I., Savé, R., Rovira, P., Molowny-Horas, R., Alcañiz, J.M., Ascaso, E., Herms, I., Herrero, C., Boixadera, J., & Vayreda, J. (2019). Agricultural soil organic carbon stocks in the north-eastern Iberian Peninsula: Drivers and spatial variability. The Science of the total environment, 668, 283-294.

Conclusions: *The use of plant covers together with other regenerative techniques has allowed to observe increases in the carbon stock [2,27-0,37 MgCO2eq/ha/yr]. However. a two-year project is too short a time to find significant differences.*

CTRL: ecologic management
AR: regenerative management

loc	plot	SOC0 (kg C/m^2)	SOC_1 (kg C/m^2)	SOC (kg C/m^2 year)	Reduction GHG (Mg CO2eq/ha year)
TORRES	CTRL	1,92	1,71	-0,10	-3,85
	AR	2,94	3,00	0,03	**1,19**

Negative GHG reduction values indicate GHG emissions and positive GHG sequestration values

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: CAN FEIXES HUGUET

Project Name:* *VITIREGENERE
Website Project: VITIREGENERE: regenerative viticulture for improving biodiversity and vine management | EU CAP Network]

Location: *Catalonia, Spain*

Project Description & Goal: *Regenerative viticulture for the improvement of biodiversity and vineyard management. To evaluate the application of different agronomic management method. To validate the application and effects of microorganism addition on soil microbial diversity. To evaluate microbial diversity and its evolution over time. Improving the biodiversity of the environment.*

Project Members: JEAN LEON; FAMILIA TORRES; INNOVI Clúster Vitivinícola Català; CLOS MOGADOR; CAN FEIXES HUGUET; IRTA Institute of Agrifood Research and Technology

Project Start Date: *05/2022*
Project End Date: *09/2024*

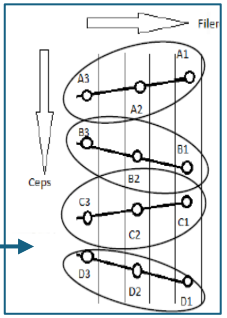
Date of slide edition *08/05/2025*
Person in charge: canfeixes@canfeixes.com

Soil Carbon Sequestration Calculation Methodology:
*Laboratory Method for SOC analysis: Potentiometric titration C511 0079. Based on BOE-A-1976-6778 (Spain). Funes et al. 2019**

$$SOC=Bd\cdot(Occ/100)\cdot 10000\cdot Th\cdot(1-S)\cdot(1/1000)$$

Bd is the bulk density of the soil (g cm-3),
OCc is the soil organic carbon concentration (%)
Th is the depth of the sample in cm and S is the stoniness

Sampling tool/method:
Soil samples are taken at 0-20 cm depth.
In the middle of the row.
In total we have 12 samples/plot.
The samples are taken annually.



Edaphological characteristics: loamy-clay texture, the soils have good drainage and water retention capacity (between 20% and 25%) in all treatments

* Funes, I., Savé, R., Rovira, P., Molowny-Horas, R., Alcañiz, J.M., Ascaso, E., Herms, I., Herrero, C., Boixadera, J., & Vayreda, J. (2019). Agricultural soil organic carbon stocks in the north-eastern Iberian Peninsula: Drivers and spatial variability. The Science of the total environment, 668, 283-294.

Conclusions: *The use of plant covers together with other regenerative techniques has allowed to observe increases in the carbon stock [1,04 MgCO2eq/ha/yr]. However, a two-year project is too short a time to find significant differences.*

CTRL: ecologic management
AR: regenerative management

loc	plot	SOC0 (kg C/m^2)	SOC$_1$ (kg C/m^2)	SOC (kg C/m^2 year)	Reduction GHG (Mg CO2eq/ha year)
CAN FEIXES	CTRL	1,50	1,48	-0,01	-0,35
	AR	2,61	2,67	0,03	**1,04**

Negative GHG reduction values indicate GHG emissions and positive GHG sequestration values

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: CLOS MOGADOR

Project Name:* *VITIREGENERE
Website Project: *(*VITIREGENERE: regenerative viticulture for improving biodiversity and vine management | EU CAP Network*])*

Location: *(Catalonia, Spain)*

Project Description & Goal: ***Regenerative viticulture for the improvement of biodiversity and vineyard management. To evaluate the application of different agronomic management method. To validate the application and effects of microorganism addition on soil microbial diversity. To evaluate microbial diversity and its evolution over time. Improving the biodiversity of the environment.***

Project Members: Jean Leon, Familia Torres, INNOVI Clúster Vitivinícola Català, Clos Mogador, Can Feixes Huguet, IRTA Institute of Agrifood Research and Technology

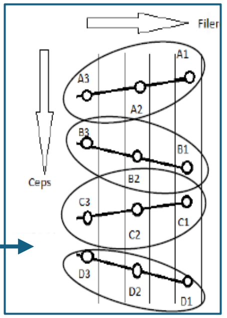
Project Start Date: ***05/2022***
Project End Date: ***09/2024***

Date of slide edition ***08/05/2025***
Person in charge: ***closmogador@closmogador.com***

Soil Carbon Sequestration Calculation Methodology:
Laboratory Method for SOC analysis: Potentiometric titration C511 0079. Based on BOE-A-1976-6778 (Spain). Funes et al. 2019*

SOC=Bd·(Occ/100)·10000·Th·(1-S)·(1/1000)
Bd is the bulk density of the soil (g cm-3),
OCc is the soil organic carbon concentration (%)
Th is the depth of the sample in cm and S is the stoniness

Sampling tool/method:
Soil samples are taken at 0-20 cm depth.
In the middle of the row.
In total we have 12 samples/plot.
The samples are taken annually.



Edaphological characteristics: loamy-sandy texture the soils have good drainage and water retention capacity (between 20% and 25%)

* Funes, I., Savé, R., Rovira, P., Molowny-Horas, R., Alcañiz, J.M., Ascaso, E., Herms, I., Herrero, C., Boixadera, J., & Vayreda, J. (2019). Agricultural soil organic carbon stocks in the north-eastern Iberian Peninsula: Drivers and spatial variability. The Science of the total environment, 668, 283-294.

Conclusions: The use of plant covers together with other regenerative techniques has allowed **to observe increases in the carbon stock [0,37 MgCO_2eq/ha/yr]**. However, a two-year project is too short a time to find significant differences.

CTRL: ecologic management
AR: regenerative management

loc	plot	SOC0 (kg C/m^2)	SOC$_1$ (kg C/m^2)	SOC (kg C/m^2 year)	Reduction GHG (Mg CO2eq/ha year)
CLOS MOGADOR	CTRL	1,93	1,91	-0,01	-0,21
	AR	3,11	3,13	0,01	**0,37**

Negative GHG reduction values indicate GHG emissions and positive GHG sequestration values

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: JEAN LEON

Project Name: VITIREGENERE
Website Project: [VITIREGENERE: regenerative viticulture for improving biodiversity and vine management | EU CAP Network]]

Location: *Catalonia, Spain*

Project Description & Goal: *Regenerative viticulture for the improvement of biodiversity and vineyard management. To evaluate the application of different agronomic management method. To validate the application and effects of microorganism addition on soil microbial diversity. To evaluate microbial diversity and its evolution over time. Improving the biodiversity of the environment.*

Project Members: Jean Leon, Familia Torres, Clos Mogador, Can Feixes, INNOVI Clúster Vitivinícola Català, IRTA Institute of Agrifood Research and Technology

Project Start Date: *05/2022*
Project End Date: *09/2024*

Date of slide edition *08/05/2025*
Person in charge: *Eva Bertran, R&D Microbiology Technician, ebertran@torres.es*

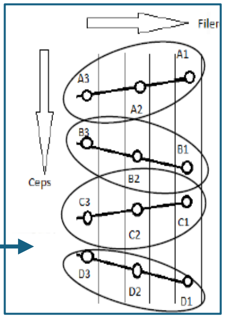
Soil Carbon Sequestration Calculation Methodology:

*Laboratory Method for SOC analysis: Potentiometric titration C511 0079. Based on BOE-A-1976-6778 (Spain). Funes et al. 2019**

$$SOC = Bd \cdot (Occ/100) \cdot 10000 \cdot Th \cdot (1-S) \cdot (1/1000)$$

Bd is the bulk density of the soil (g cm-3),
OCc is the soil organic carbon concentration (%)
Th is the depth of the sample in cm and S is the stoniness

Sampling tool/method:
Soil samples are taken at 0-20 cm depth.
In the middle of the row.
In total we have 12 samples/plot.
The samples are taken annually.



Edaphological characteristics: loamy-clay-sandy textures. Soils have good drainage and water retention capacity around 25%.

* Funes, I., Savé, R., Rovira, P., Molowny-Horas, R., Alcañiz, J.M., Ascaso, E., Herms, I., Herrero, C., Boixadera, J., & Vayreda, J. (2019). Agricultural soil organic carbon stocks in the north-eastern Iberian Peninsula: Drivers and spatial variability. The Science of the total environment, 668, 283-294.

Conclusions: *The use of plant covers together with other regenerative techniques has allowed to observe increases in the carbon stock [2,27 MgCO2eq/ha/yr]. However. a two-year project is too short a time to find significant differences.*

loc	plot	SOC0 (kg C/m^2)	SOC$_1$ (kg C/m^2)	SOC (kg C/m^2 year)	Reduction GHG (Mg CO2eq/ha year)
JEAN LEON	CTRL	1,88	1,79	-0,04	-1,57
	AR	1,83	1,95	0,06	**2, 27**

CTRL: ecologic management
AR: regenerative management

Negative GHG reduction values indicate GHG emissions and positive GHG sequestration values

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: VIÑA DON MELCHOR

Project Name: Carbon Fluctuation in Don Melchor Vineyards
Website Project:

Location: *Chile*

Project Description & Goal:

Project carried out by Don Melchor in collaboration with Neutral Farming to understand the fluctuation and sequestration of soil organic carbon (SOC) across all vineyards since 2024.
The study ais to quantify SOC stocks and their temporal variation, establishing a digital soil mapping baseline (DSM) to support long-term monitoring and regenerative management in Chilean vineyards.

Project Members: *Don Melchor & Neutral Farming*

Project Start Date: ***03/2024***
Project End Date: ***10/2025***

Date of slide edition ***21/10/2025***
Person in charge: *Valentina Lira, Corporate Sustainability Manager*

Soil Carbon Sequestration Calculation Methodology:

A simple stratified sampling was performed based on the SCORPAN model (soil, climate, organisms, relief, parent material, and spatial position)
Sampling consisted of 8 soil samples per field, collected at 0-30 cm depth during two campaigns (T0=2024 and T1=2025)
SOC stock was calculated from organic matter (OM) and bulk density (BD) using the formula:
SOC stock = BD x (OM x 0.58) x 30 cm
Due to changes in BD between years, an additional Equivalent Soil Mass (ESM) calculation was applied to ensure comparable results across both periods.

Conclusions:

Overall, the field maintained similar values to the previous year.
However, cover crop practices were implemented in 70 of the 125 hectareas and in associated plots.
In those areas, organic matter increased, bulk density decreased, and consequently SOC stock also increased.
These results indicate that cover crop management has contributed to improving soil structure and enhancing soil carbon sequestration (SOC stock).

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: CONCHA Y TORO DESDE 1883

Project Name: Carbon Fluctuation in Concha y Toro Vineyards
Website Project: -

Location: **Chile**

Project Description & Goal:

Project carried out by Concha y Toro in collaboration with Neutral Farming to understand the fluctuation and sequestration of soil organic carbon (SOC) across all vineyards since 2017.
The study ais to quantify SOC stocks and their temporal variation, establishing a digital soil mapping baseline (DSM) to support long-term monitoring and regenerative management in Chilean vineyards.

Project Members: *Concha y Toro & Neutral Farming*

Project Start Date: *07/2025*
Project End Date: *09/2025*

Date of slide edition *21/10/2025*
Person in charge: *Valentina Lira, Corporate Sustainability Manager*

Soil Carbon Sequestration Calculation Methodology:

Digital Soil Mapping (DSM) based on the SCORPAN model.
Quality control of soil profiles and harmonization to 0-30 depth using splines.
Environmental covariates from Sentines-1/2 , ERA5, MODIS LST, and terrain date were integrated for prediction
Modeling with Light Gradient Boosting Machine (LGBM) validated with R2 > 0.6 and unbiased RMSE.
SOC Stock estimated as: BD x (OM x 0.58) x 30 cm.
Mapped area: 10,798 ha across 54 vineyards in 8 valleys of Chile.

Conclusions:

In 2017, total SOC stock reached 697,364 t C.
By 2020, stocks slightly decreased to 625,014 t.
In 2024, SOC increased significantly to 926,922 t, showing a net gain of +228,000 t C across 10,798 ha.
This trend demonstrates effective soil carbon sequestration driven by regenerative practices and improved soil structure (lower bulk density, higuer organic matter).
The DSM approach ensures consistent monitoring and verification of SOC dynamics over time.

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by : LAFAGE

Project Name : Biochar at Domaine Lafage
Website Project : https://domaine-lafage.com/presse/aout-2024-le-biochar-pour-lutter-contre-la-secheresse/

Location: *Perpignan, France*

Project Description & Goal: *Faced with increasing drought and the decline in soil quality, Domaine Lafage has launched experiments focused on biochar to assess its potential to improve soil health and promote long-term carbon sequestration. The study aims to measure the ability of biochar to increase soil organic carbon, improve soil structure. Our goal is to identify a local, reproducible, and durable solution capable of strengthening the soil resilience of Mediterranean vineyard systems.*

Project Members : *INRAE G-EAU ;*
Alain Deloire, Ancien Chercheur, Physiologie de la vigne, Institut Agro Montpellier ;
Anne Pellegrino, Enseignante chercheuse, Ecophysiologie de la vigne, Insitut Agro Montpellier ;
François Colin, Enseignant chercheur, Hydrologie, Insitut Agro Montpellier ;
Julien Thiery, Chef service Viticulture, CA66 ;

Project Start Date: *11/2021*
Project End Date: *12/2023*

Date of slide edition *14/11/2025*
Person in charge: *Antoine LESPES, Chargé de projet R&D, alespes@domaine-lafage.com & Mathys HALLET, Chargé de misison R&D, mhallet@domaine-lafage.com*

Soil Carbon Sequestration Calculation Methodology:

Trials were carried out on young vines planted in 2022 (3176-21-11 N) on clay–sandy soils (pH 7.4; OM 1.14%; clay 26%; 4,000 vines/ha). Climate context: 304.9 mm (2022), 244.9 mm (2023), 517.9 mm (2024), vs. 476.7 mm long-term average. Vineyard management included two superficial soil cultivations per year.

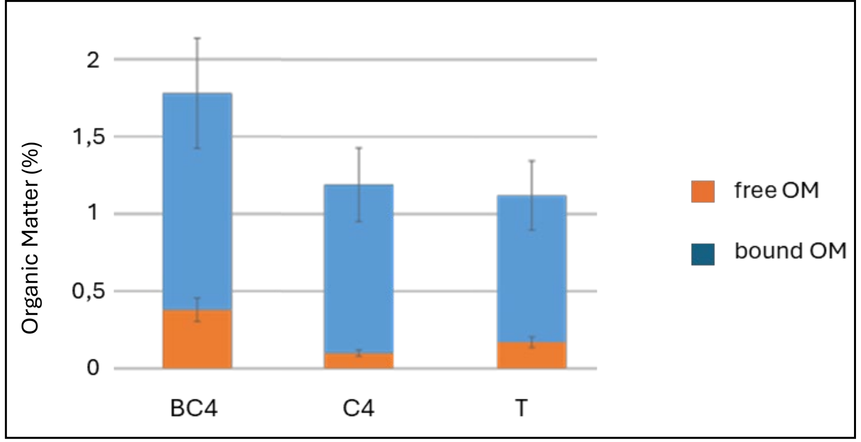
Three treatments were tested: (T) Control; (C4) Compost (4 t/ha); (BC4) Biochar + Compost (4 t/ha biochar + 12 t/ha compost).
- Commercial Biochar characteristics : pH 8.4; bulk density 182 kg/m^3; specific surface area 444 m^2/g; total carbon 94.4% DM; particle size 5–15 mm; EBC-certified.
- Commercial Compost characteristics : OM 25,3 % ; C/N total 12,2.
Biochar and compost were applied to the vine row before planting. Detailed OM and fractionation analyses were performed to quantify SOC changes.

Sampling was conducted at baseline (Jan 2022) and after two years (2024), with triplicate samples per treatment to ensure statistical robustness. Soil was collected at 0–30 cm using a manual corer/auger, corresponding to the main rooting zone of young vines. One biochar sample was also analysed at application. Soil analyses were performed by the TerraMea laboratory using near-infrared spectroscopy (NIRS) as the analytical method.

Conclusions: *(input here, if there are scientific publications, Soil Organic Carbon (SOC) sequestration) :*

The higher biochar rate resulted in a +0.66% increase in soil organic matter, rising from 1.12% to 1.78%, corresponding to 37 t CO_2/ha sequestered. Biochar with compost also increased both free and bound organic matter fractions, indicating a simultaneous rise in biologically active carbon and in long-term stable SOC pools.
Given the inherent stability of biochar, the majority of this carbon is expected to remain stored in the soil over decades to centuries, reinforcing its potential as an effective tool for long-term carbon sequestration and regenerative vineyard management.

Sources :
Internal data results
(SOC change, OM fractionation)



Project number : 010

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: Jackson Family Wines

Project Name: ***Healthy Soils Project***
Website Project: ***N/A***

Location: *Sonoma County, California, USA*

Project Description & Goal:
Goal: *Assess the effect of compost and tillage on soil health and carbon content in vineyards*
Description: *In 2017 Jackson Family Wines was awarded funding through the CDFA for a 5 year demonstration project to assess the effects of compost application and different traditional tillage methods on soil health and soil carbon content in vineyards. Research, data collection, and analysis is done collaboratively by Jackson Family Wines, Sonoma RCD, Santa Rosa Junior College, and the University of California. JFW elected to independently extend this study an additional 5 years to learn more about the long term ability of soil to store carbon.*

Project Members: *Jackson Family Wines in partnership with Sonoma Resource Conservation District (SRCD)*

Project Start Date: *2017*
Project End Date: *2027*

Date of slide edition *12/15/2025*
Person in charge*: Alex Everson, Sustainability Analyst, alexandra.everson@jfwmail.com*

Soil Carbon Sequestration Calculation Methodology:

- Frequency of sample: *Annual sampling of soil carbon beginning in 2018*
- *Number of samples per hectare or plot: 36 samples per block per year (72 samples per year in total)*
- *Depth of samples: Two depths, 0-10 cm and 1-20 cm in the vine row and the tractor row*
- *Sampling tool/method: Soil auger for uniformly mixed samples, sent to external lab for analysis*
- *Measuring: Carbon %, Organic Matter %, Nitrogen %,*
- *sample repetition for statistical matters*

Experiment Design:
2 vineyard blocks and grape varietals (Chardonnay and Pinot Noir)
Sampled in tractor rows and vine rows

- *Tillage Treatment:*
- *Full tillage both rows (T)*
- *Alternate row tillage (RT)*
- *No tillage (NT)*

Compost Addition

- *5 tons/acre*

Baseline Comparison: No compost and alternative row tillage

Conclusions: *(input here, if there are scientific publications, Soil Organic Carbon (SOC) sequestration*
Statistically Significant Results:
Compost increases soil carbon by an increasing amount each year
Based on our analysis the treatments (no till and compost) led to an R^2 value of 0.64 for Carbon, meaning the treatments explained 64% of the increase in soil carbon
No till and compost increased the soil carbon from 2.56% in 2018 to 3.27% in 2025 at the 10 cm Depth
https://sonomarcd.org/new-at-the-rcd/vineyard-soil-health-trial/

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: MIGUEL TORRES Pioneros en Chile desde 1979 Chile

Project Name: Regenerative Viticulture at Viña Miguel Torres Chile
Website Project: *N/A*

Location: *Curicó, Chile*

Project Description & Goal:
Application of regenerative viticulture in dryland fields and search for regenerative agriculture tools to address climate change.

Project Members: *Miguel Torres in partnership with the Agricultural Research Institute (INIA).*

Project Start Date: *2017*
Project End Date: *2027*

Date of slide edition *12/15/2025*
Person in charge*: Leonardo Devoto, Head of Agriculture at Miguel Torres ldevoto@migueltorres.cl and Marisol Reyes, INIA researcher mreyes@inia.cl*

Soil Carbon Sequestration Calculation Methodology:

Estimation of total organic carbon based on the ratio between laboratory-determined content and mass per hectare.

$$C\_org = Db \times 10{,}000 \times PM \times \%C\_org$$

Where Db is the bulk density, %Corg is the organic carbon content determined in the laboratory, and PM is the sampling depth.The same calculation is performed to determine particulate organic carbon (wet sieve separation at 65µm).Determination of seasonal carbon variation by difference between initial and final organic carbon.Sample frequency: Three times per season. Late autumn, early ripening, and post-harvest.Number of samples per hectare or plot: One sample per repetition – four repetitions per treatment.Sample depth: First 6 cm of soil.Sampling tool/method: Samples taken with a 100 cm3 cylinder.Repetition of samples for statistical purposes: One sample per repetition – four repetitions per treatment.Other details: Monitoring under rainfed conditions (without irrigation).Translated with DeepL.com (free version)

Conclusions: *(input here, if there are scientific publications, Soil Organic Carbon (SOC) sequestration*

Work in progress

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: Bodega Marañones

Project Name: ***VITICOS (Innobonos program, IMIDRA, Comunidad de Madrid)***
Website Project: www.bodegamaranones.com/maranones-reservorio-de-carbono-organico

Location: *San Martín de Valdeiglesias, Madrid, Spain*

Project Description & Goal: *Effect of vegetation cover on the ability to increase soil organic carbon in an organic and biodynamic vineyard in the context of climate change . Main objective: improve vineyard soil, measuring fixation of Soil Organic Carbon (SOC) and reducing its tendency to erosion. An in-depth characterization of the soil will be carried out with the aim of determining the amount of SOC stored in the soil and its evolution over time, analyzing in turn the influence that the application of vegetation covers has on the soil's ability to retain carbon and therefore prevent it from being emitted into the atmosphere.*

Project Members:

ALMA CARRAOVEJAS

UNIVERSIDAD POLITÉCNICA DE MADRID

diagnoterra

Project Start Date: *03/2023*
Project End Date: *022025*

Date of slide edition 15/02/2026
Person in charge: *Eva Navascués, R&D director, evanavascues@almacarraovejas.com*

Soil Carbon Sequestration Calculation Methodology:

Laboratory Method for SOC análisis: Potenciometric titration C511 0079. Based on BOE-A-1976-6778 (Spain). Funes et al. 2019

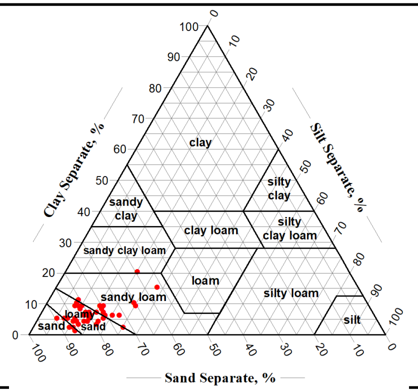
Sampling tool/methods: Total SOC essay.

- *5cm soil sampling rings*
- *0-10cm depth / all horizons (first year)*
- *24 sampling points*
- *Sampled annually*

Sampling tool/methods: Cover crop essay.

- *5cm soil sampling rings*
- *0-10cm depth*
- *3 experimental plots (with different slope gradient class)*
- *3 managements (bare soil, natural spontaneous cover, sowncover) tested at each experimental plot*
- *3 samples per plot and management*
- *Sampled annually*

Vineyard at 650 and 850 meters of altitude, Geology: Hercynian granitic rocks in Sierra de Gredos (Central System).The climate is Mediterranean with dry and hot summer. Different soils. Mainly TYPIC HAPLOXEREPT: soil of the order Inceptisol (poorly evolved soils), characteristic of xeric climates (dry/semi-arid), which presents a horizon of incipient alteration (cambic horizon).



Conclusions: *Total SOC content fluctuates slightly across years due to climatic drivers such as rainfall and erosion. Cover crops are unable to mitigate SOC depletion within a short timeframe. Furthermore, increased slope exacerbates this loss (data not shown). COS data in kg/m².*

Variable	Year			Media
	2023	2024	2025	
MO 10cm (%)	0,97 ± 0,10 (24) a	1,26 ± 0,13 (24) b	1,02 ± 0,11 (24) a	1,08 ± 0,32 (72)
COS 10cm (kg/m²)	0,56 ± 0,19 (24) a	0,75 ± 0,22 (24) b	0,60 ± 0,19 (24) a	0,64 ± 0,21 (72)

Slope	Management	Year			
		2023	2024	2025	Media
< 5	Bare soil	0,87 ± 0,10 (3) a y	0,63 ± 0,13 (3) a x	0,70 ± 0,11 (3) a xy	0,73 ± 0,15 (9) a
< 5	Natural spontaneus cover	0,85 ± 0,09 (3) a x	0,64 ± 0,14 (3) a x	0,73 ± 0,31 (3) a x	0,74 ± 0,20 (9) a
< 5	Sown cover	0,90 ± 0,15 (3) a y	0,53 ± 0,02 (3) a x	0,70 ± 0,11 (3) a xy	0,71 ± 0,19 (9) a
< 5	**All**	**0,87 ± 0,10 (9) B Y**	**0,60 ± 0,11 (9) B X**	**0,71 ± 0,17 (9) C X**	**0,73 ± 0,17 (27) B**

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

Presented by: Clos de Tres Cantos Vitivinicultura Consciencia

Project Name: ***Integrated Soil Management and SOC Sequestration in Clos de Tres Cantos Vineyard***
Website Project: *https://closdetrescantos.com*

Location: *Valle de Guadalupe –Ensenada, Baja California, Mexico*

Project Description & Goal: *This project documents and quantifies Soil Organic Carbon (SOC) sequestration resulting from integrated regenerative soil management practices that have been continuously implemented since 2022 in a vineyard system. The objective is to estimate the amount of carbon already sequestered to date and to establish a robust framework to continue monitoring and enhancing SOC sequestration over time. Implemented practices include winter cover crops (brassicas and grasses), soil fertility management focused on enhancing soil microbiology, and minimum tillage. Results are reported as t CO_2e per hectare per year.*

Project Members: *The Project is managed by Clos de Tres Cantos Vineyard staff.*

Project Start Date: *2022 (initiation of regenerative soil management practices). Formal Carbon Accounting Baseline: 2026 (Year 0 for standardized SOC quantification).*
Project End Date: *Ongoing; Open-ended (minimum monitoring period: 10 years; vineyard life expectancy >20 years).*

Date of slide edition
Person in charge: *Juan José Villacis. Agronomist Ing. juanjosevillacis@gmail.com tel. +52 55 2675 8929*

Soil Carbon Sequestration Calculation Methodology: - Vineyard stratified by soil blocks (6 vineyard blocks).
- Fixed, georeferenced permanent sampling points.
- Annual soil sampling during the same seasonal window.
- One permanent sampling point per hectare, applied in two representative blocks.
- Sampling depth: 0–30 cm.
- Sampling tool: stainless steel soil auger.
- Standard physical and chemical soil analysis including SOC.
- Bulk density measured to calculate SOC stocks (t C ha $^{-1}$).
- SOC compared between baseline year (Year 0) and subsequent years (Year n).

Climate: Semi-arid Mediterranean. Soil type: Sandy clay loam with stoniness. Total area: 1.3 ha. Irrigation: Drip irrigation, 2 L h $^{-1}$ emitters. Management system: Regenerative and agroecological

Conclusions: *The proposed methodology enables consistent and repeatable quantification of SOC changes attributable to integrated soil management practices initiated in 2022. While regenerative management predates formal carbon accounting, establishing a standardized baseline in 2026 ensures methodological rigor and comparability. Historical soil data will be used to estimate accumulated carbon sequestration to date, and the project will continue with long-term SOC monitoring and continuous improvement.*

*SOC stock change results expressed as t CO_2e ha $^{-1}$ year $^{-1}$ (to be calculated). Peer-reviewed literature on SOC sequestration in vineyards and Mediterranean agroecosystems***.***

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

INTERNATIONAL WINERIES FOR CLIMATE ACTION

Presented by: THE VINEYARDS AT DODON

Project Name: Using Natural Processes to Sequester Carbon at The Vineyards at Dodon
Website Project: *www.dodonvineyards.com*

Location: *Maryland, USA*

Project Description & Goal: *The Vineyards at Dodon uses the tools of agroecology to restore ecosystem function, enhance biological diversity, and regenerate soil health. Within the vineyard, we focus on spontaneously growing, diverse native and naturalized grasses and forbs, organic amendments such as composted ramial woodchips supplemented with duckweed and native mycorrhizal fungi from the surrounding woodland, and livestock including sheep, pigs, and fowl. In the landscape, we provide natural (trees and shrubs) and semi-natural (flower strips and bird boxes) hábitat for birds and insects that pollinate the cover crops, reduce mammalian and insect pests, and add natural beauty and vitality.*

Project Members*: The Project is managed by Dodon staff.*

Project Start Date: ***01/2015***
Project End Date: ***ongoing***

Date of slide edition 01/15/2026
Person in charge: *Tom Croghan, Executive Winemaker*

Soil Carbon Sequestration Calculation Methodology:

- *Frequency of sample: Soil simples are taken annually, usually at bloom. We have not assessed above ground carbon, such as that stored in the vines themselves.*
- *Number of samples per hectare or plot. Plots range from 0.1 to 0.6 hectare. Approximately 12 samples are taken from a plot or group of plots.*
- *Depth of simples: 18 inches*
- *sampling tool/method: auger*
- *sample repetition for statistical matters: We do not do replicate simples.*
- *Other details: Vineyard soils are sandy loan, mesic hapludults, marine sediments deposited in the mid-Miocene. They are heavily weathered, with sandy textures giving way to kaolin clay at lower elevations. In its native configuration, our land was probably heavily forested until European settlers arrived in the 16th century. Since at least 1725, our farm was planted in tobacco and then field crops, primarily corn and soy beans. When we began preparing the vineyard in 2008, thesoil organic matter was, on average, 0.3%, and in some parts, SOM was not measureable. The soils were heavily compacted, with up to three layers of plow pan in some áreas. Agricultural operations were not feasible without significant additions of nitrogen and phosphorus fertilizer.*

Conclusions:

Over the past decade, we have observed:

1. *Healthier soils. The soil organic matter has increased 12-fold to 3.8% since 2012. Across our 17-acre vineyard, this is the equivilent of about 300 tons of carbon dioxide removed from the atmosphereand stored in the soil annually. The soil textura is markedly different from other áreas of the property that are not intentionally managed with much better aggregate structure and wáter infiltration. As a result, the vineyard is more resilient to extreme downpours and drought. We have also observed better nutrient turnover, so that we no longer use fertilizer. For many years we adjusted soil pH with lime treatment, but in recent years, the pH has staibilized at 6.8 so additional lime is not needed.*
2. *The vines are more resilient to fungal and insect pest pressure. We have thus reduced chemcial fungicide applications by 30% and nearly eliminated insecticides despite recent introduction of new invasive insect pests such as Spotted Lanternfly.*
3. *More and better wine. Yields have increased 30% since 2020. The wine has more Depth and better acid balance, with titratable acid doubling in the Sauvignon must from 3.8 to 7.8 g/L, and yeast assimilable nitrogen improving by 75%, from 50 ppm to 90 ppm.*

INTERNATIONAL WINERIES FOR CLIMATE ACTION

COMPILATION OF SOIL ORGANIC CARBON (SOC) SEQUESTRATION PROJECTS IN VINEYARDS

PAICINES RANCH

Project Name:* *Paicines Ranch Vineyard
Website Project: https://paicinesranch.com/our-work/vineyard/

Paicines, California USA

Project Description & Goal: *Holistically designed and managed regenerative vineyard created to restore ecosystem health and biodiversity while profitably producing hig h quality wines*

Project Members: *Paicines Ranch and partner wineries including: Margins Wines, A Tribute to Grace, Camins to Dreams, Terah Wines, Stirm Wines, Florez Wines, Living Soils Wines*

Project Start Date: 2014
Project End Date: *NA*

Date of slide edition *2022*
Person in charge: *Kelly Mulville*

Soil Carbon Sequestration Calculation Methodology:

Frequency of sample: every 4-5 years

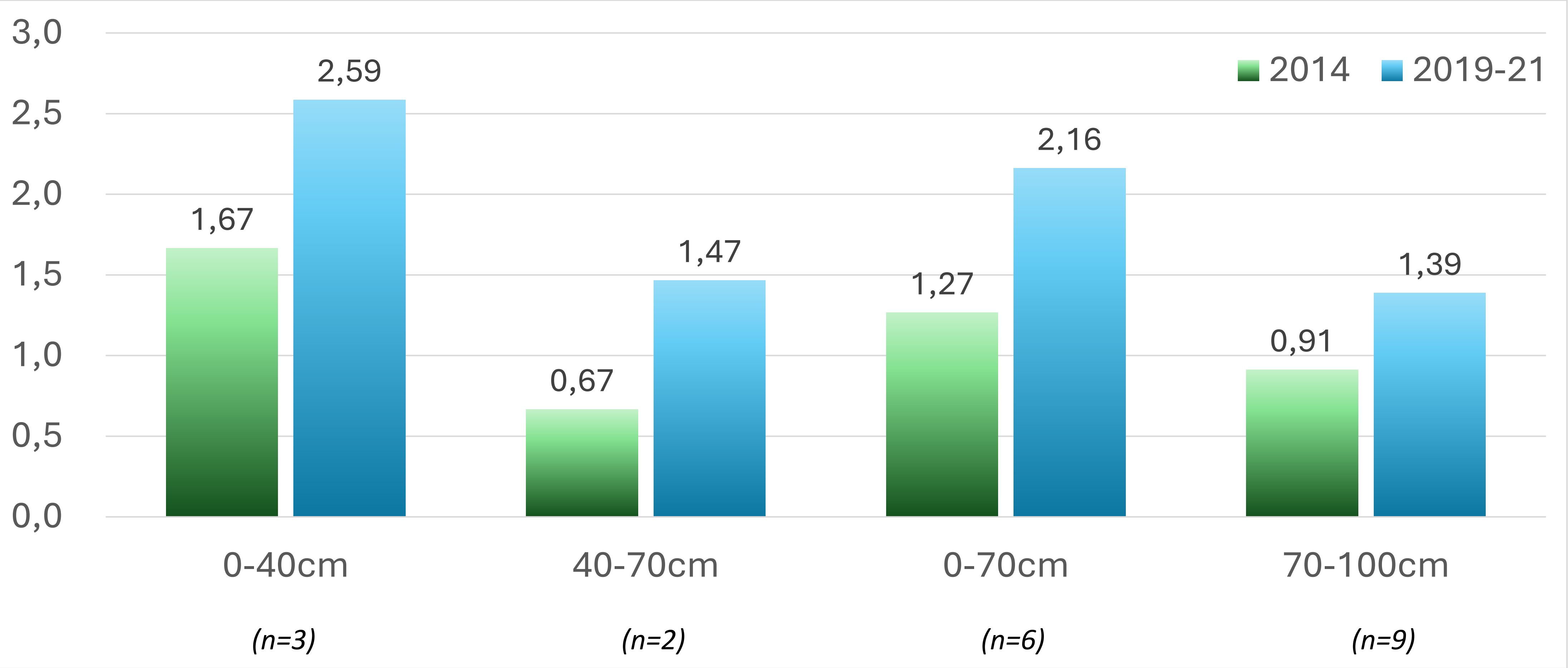
- *Number of samples per hectare or plot: 5*
- *sampling tool/method: Soil core*
- *sample repetition for statistical matters (?)*
- *Other details: Diablo Clay soil, Warm to hot Mediterranean climate, average of 28 cm of rain annually, 17 varieties of wine grapes, high trellis, planned grazing by sheep at any point during the year, certified organic, no cultivation, soil is covered throughout the year by growing, dead or dormant vegetation.*

Conclusions: *(input here, if there are scientific publications, Soil Organic Carbon (SOC) sequestration*

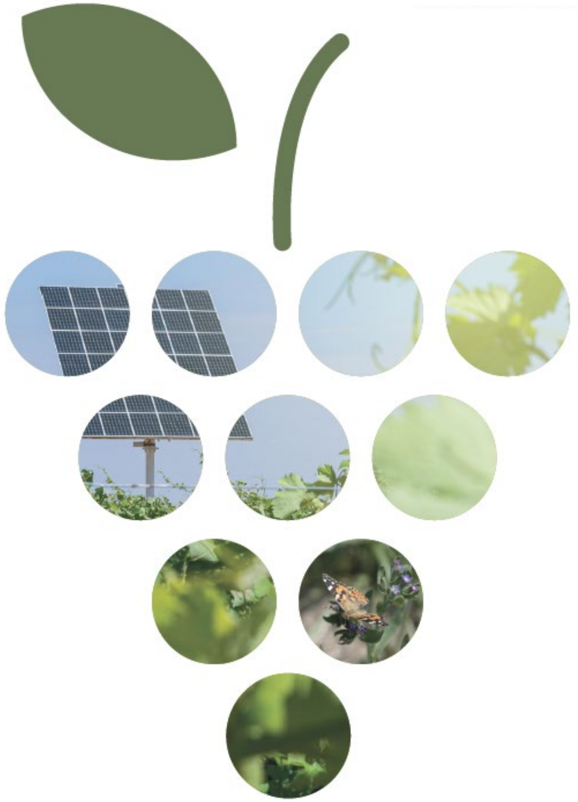
Sources: data results (Mg CO_2eq /ha/year), and the paper's link, in case.

Changes in Vineyard Soil Organic Matter

(Average Across Vineyard)



ix. Annex: Projects resume.



Leading the transition to a

Net Zero Emissions

global wine sector

International Wineries for Climate Action

Compilation of Soil Organic Carbon (SOC) Sequestration Projects

Filling instructions:

- Complete all fields and do not remove any of them.
- Keep all the necessary information on one page.
- The size of the boxes and letters can be adjusted according to your needs if they do not impair the legibility of any of the other boxes.
- Information can be inserted making use of tables and logos.

Disclaimer: The wineries participating to the SOC Sequestration Compilation must make sure that the information shared with IWCA for this specific project is not confidential, and can be shared, exposed, printed without any harm to themselves or any other third parties. IWCA is not responsible for the data shared on behalf of the wineries.