



Soil Health in Vineyards

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Today's Discussion

- 01 What is Soil Health and why is it important for grape production?

- 02 How to manage for building healthy vineyard soils?

- 03 How to assess soil health in vineyards?

Why study Soil Health?



(a)



(b)

Image: (a) Soil erosion at end of vineyard rows. (b) Soil erosion in newly planted vineyard (Figure 2 from Roy et al., 2017.)

Vineyard soils in Mediterranean & semi-arid regions are strongly susceptible to **erosion** and **degradation** . [Battany et al., 2000](#), [Smith et al., 2008](#)



(a)



(b)

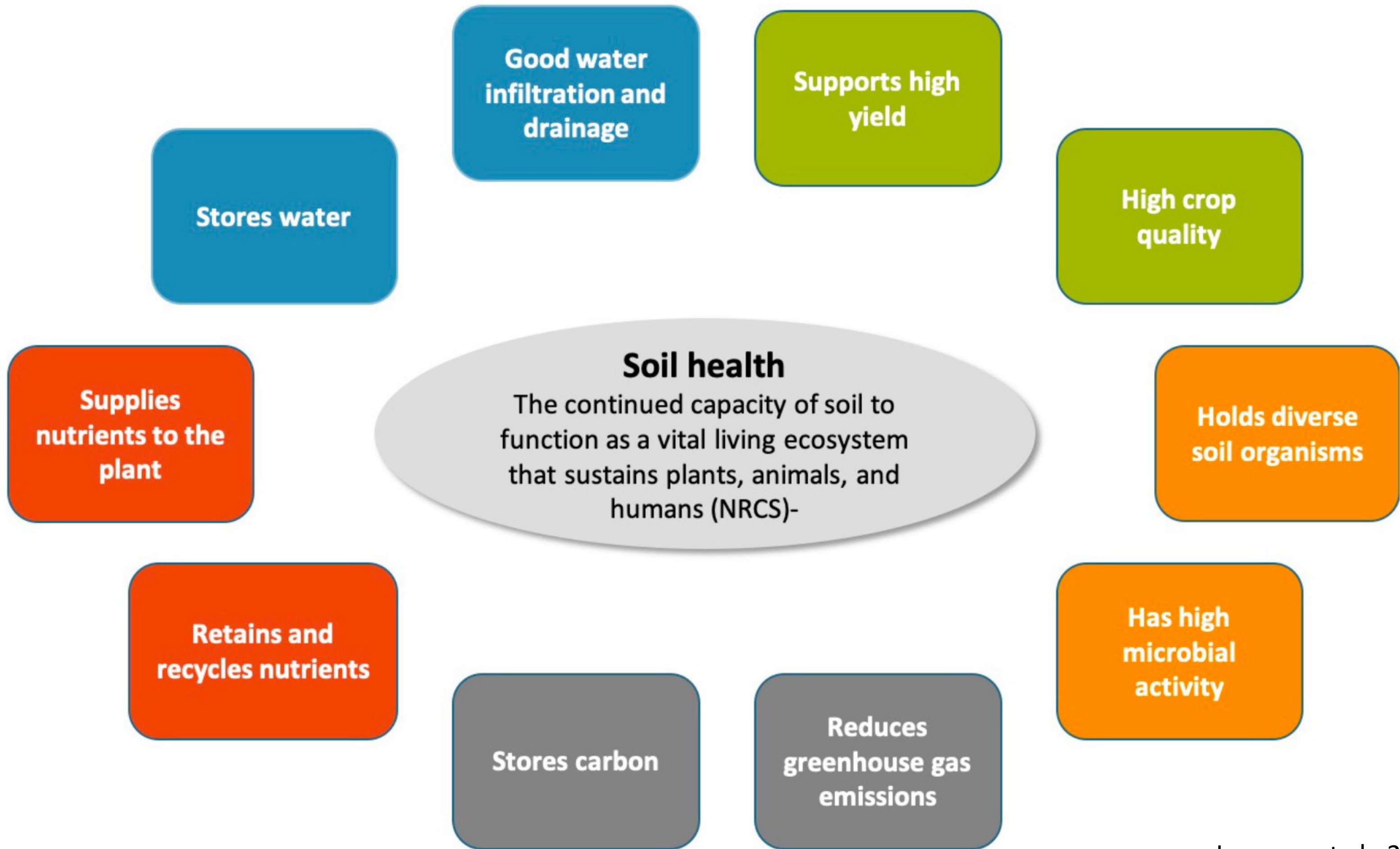
Image: (a) Soil erosion at end of vineyard rows. (b) Soil erosion in newly planted vineyard (Figure 2 from Roy et al., 2017.)

Healthy Soils create resilient vineyards



Source: Justin Sullivan, BBC news

What is Soil Health?





What is soil health for vineyards?

AVF Grant to study vineyard soil health in:

- **Napa Valley**
- **Paso Robles**
- **Lodi**





What is soil health for vineyards?

Goals:

1. Understand motivations, actions and barriers related to soil health management
2. Assess the variability of soil health indicators across soil types

Goal 1: Grape Grower Semi-structured Interviews – Napa Valley

Perceptions on vineyard soil health

- Summer 2020
- 16 interviews
- Zoom
- Inductive Coding



Organic matter Self sustaining

Healthy vines **Balanced**

infiltration No erosion

Soil microbes **Soil life**

Minimal inputs **Sufficient nutrients**

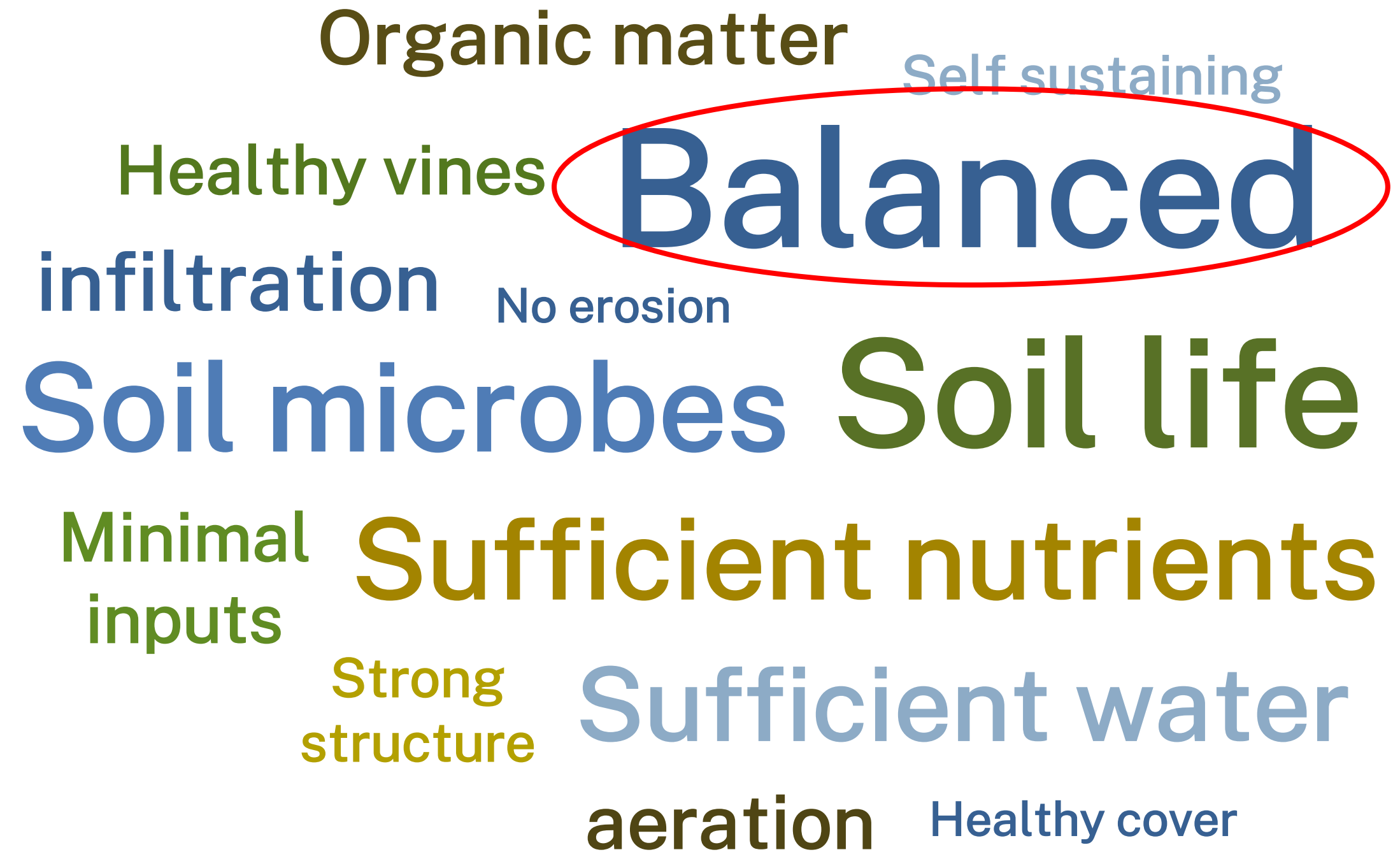
Strong structure **Sufficient water**

aeration Healthy cover

Goal 1: Grape Grower Semi-structured Interviews – Napa Valley

Perceptions on vineyard soil health

- Vigor control
- Medium - low fertility (N)
- Soil Physical Properties
 - Coarse soil texture
 - Good infiltration
 - Sufficient water retention



Results: a healthy vineyard soil is
**balanced, resilient and
sustainable**

How can we manage for healthy vineyard soils?

- 01 **Increasing Soil Organic Matter**
Composts
- 02 **Reducing Disturbance**
No-till or reduced tillage
- 03 **Increasing Biodiversity:
Maintaining living plant cover**
Cover crops or natural cover

How can we manage for healthy vineyard soils?

Increasing Soil Organic Matter

Compost application increases nutrients in the soil but benefits vine health and doesn't have negative impacts in vine balance and grape quality (Wilson et al., 2021).



How can we manage for healthy vineyard soils?

Reducing Disturbance

Benefits of no-till are mostly observed in long-term trials (Melero et al., 2018, Gonzalez-Maldonado et al., in preparation).

Mowing instead of tilling can benefit pigment accumulation in red winegrapes (Lee and Steenwerth 2013)



How can we manage for healthy vineyard soils?

Increasing Biodiversity: Maintaining living plant cover

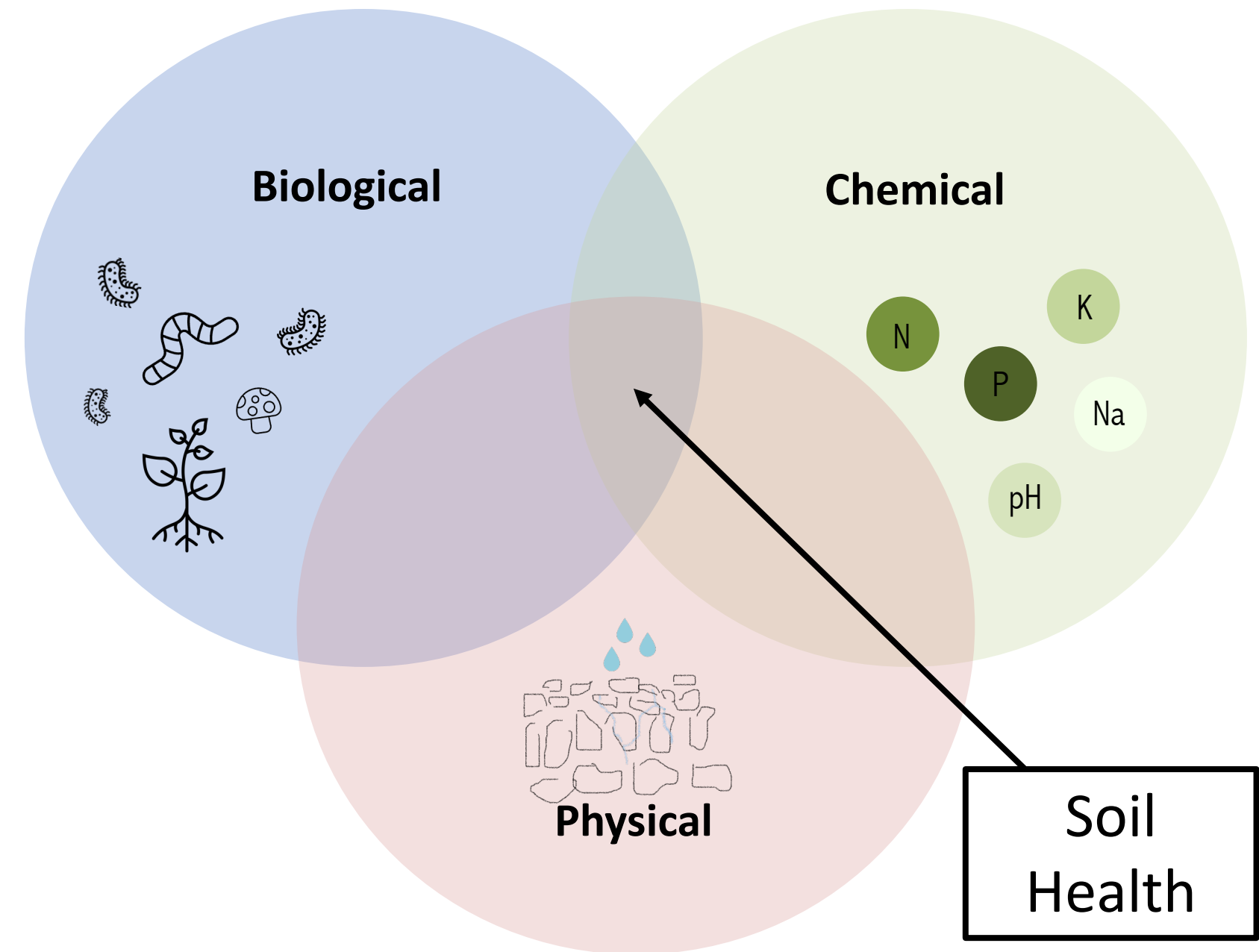
Can promote increased juice soluble solids, anthocyanins, and other phenolic components and decreased titratable acidity and pH in wine grapes (Guerra and Steenwerth 2012).

Increases organic matter and microbial functions
(Lee and Steenwerth 2008)

Can benefit water use efficiency in vineyards
(Novara et al., 2021)



How to Assess Soil Health in Vineyards



How to Assess Soil Health in Vineyards

1. Soil sampling and testing



2. Observation



How to Assess Soil Health in Vineyards

Soil Organic Matter

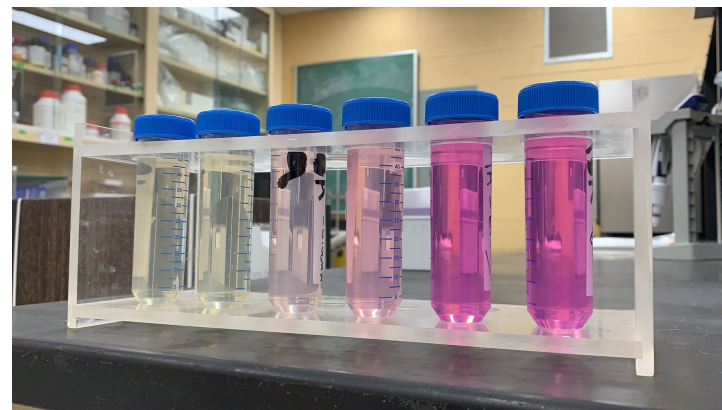
Lab testing

1. SOM %



Combustion at 500°C

2. Active Carbon (POXC)



Oxidation with potassium permanganate

3. POM y MAOM



Imagen: globalsoilbiodiversity.org

Dispersion and separation of soil particles through a 53mm sieve

Observation



How to Assess Soil Health in Vineyards

Soil Physical Properties

Aggregate stability – slake test



Image: agcrops.osu.edu

Penetration Resistance



Image: soils.vidacycle.com

Infiltration



Bulk Density



How to Assess Soil Health in Vineyards

Soil Chemical Properties

Lab testing

Observation

Nutrients (N, P, K, +)
pH and salinity

Nutrient Deficiencies

Salinity signs in soil

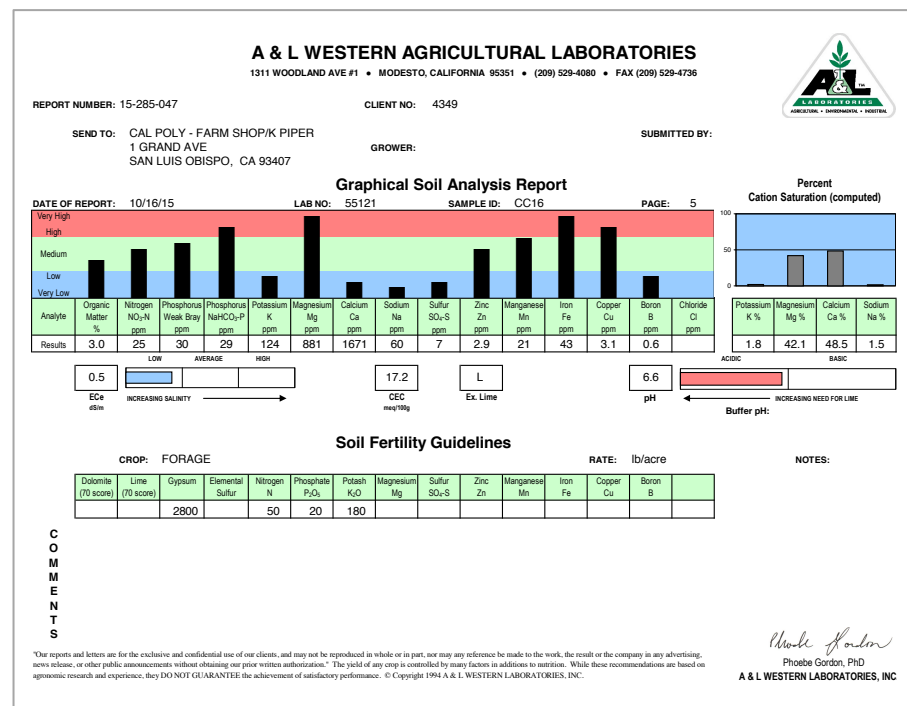


Image: UC ANR



How to Assess Soil Health in Vineyards

Soil Biological Properties

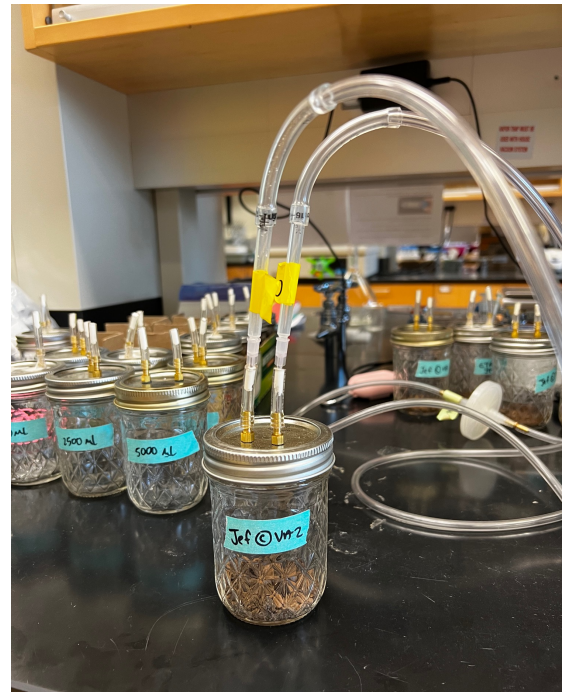
Lab testing

Microbial diversity (DNA sequencing, PLFAs)

Microbial respiration

Extracellular enzymes

Microbial Biomass Carbon



Observation

Cotton Test



Image: extension.sdstate.edu

Soil microorganisms drive essential soil processes

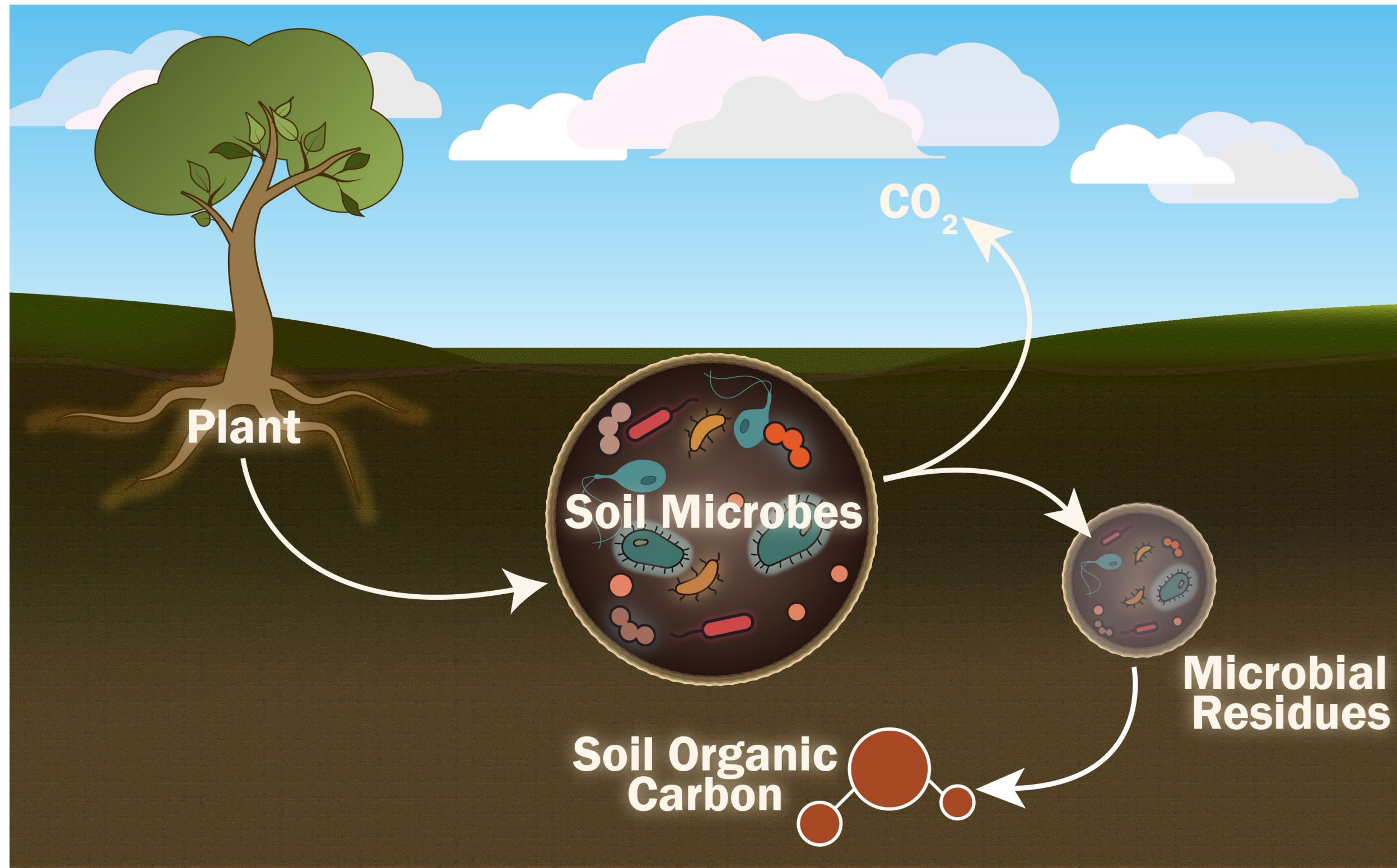


Figure: Chansotheary Dang

Vineyard Soil Health Challenges

Drastic climate changes

High variability of soil types

High variability of biological indicators

We need more information about sustainable/regenerative practices

Combined factors



Benefits of managing for Soil Health

- Creates vineyard resiliency**
- Enhances soil ecosystem services**
- Reduces inorganic inputs**
- Reduces erosion**
- Positive effects in grape production**
- Promote expression of Terroir**

(Lazcano et al., 2020)

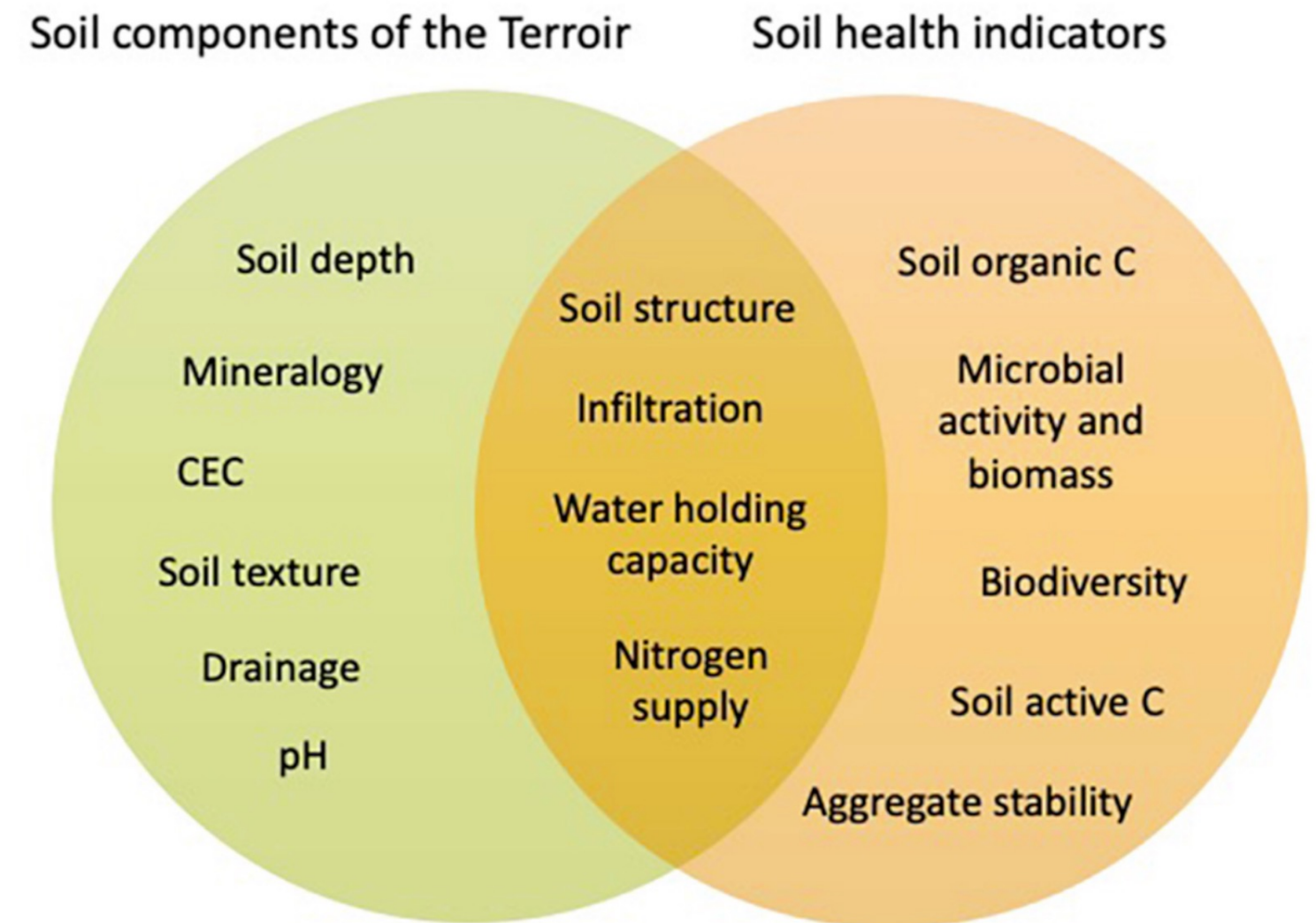


FIGURE 2 | Venn diagram illustrating where soil health and terroir intersect.

Lazcano et al., 2020

Thank you! Questions?

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<https://lazcano.faculty.ucdavis.edu>

