Combining grapevine yield, soil quality and service crops: results from a three-year on-farm experimentation in the Mediterranean region

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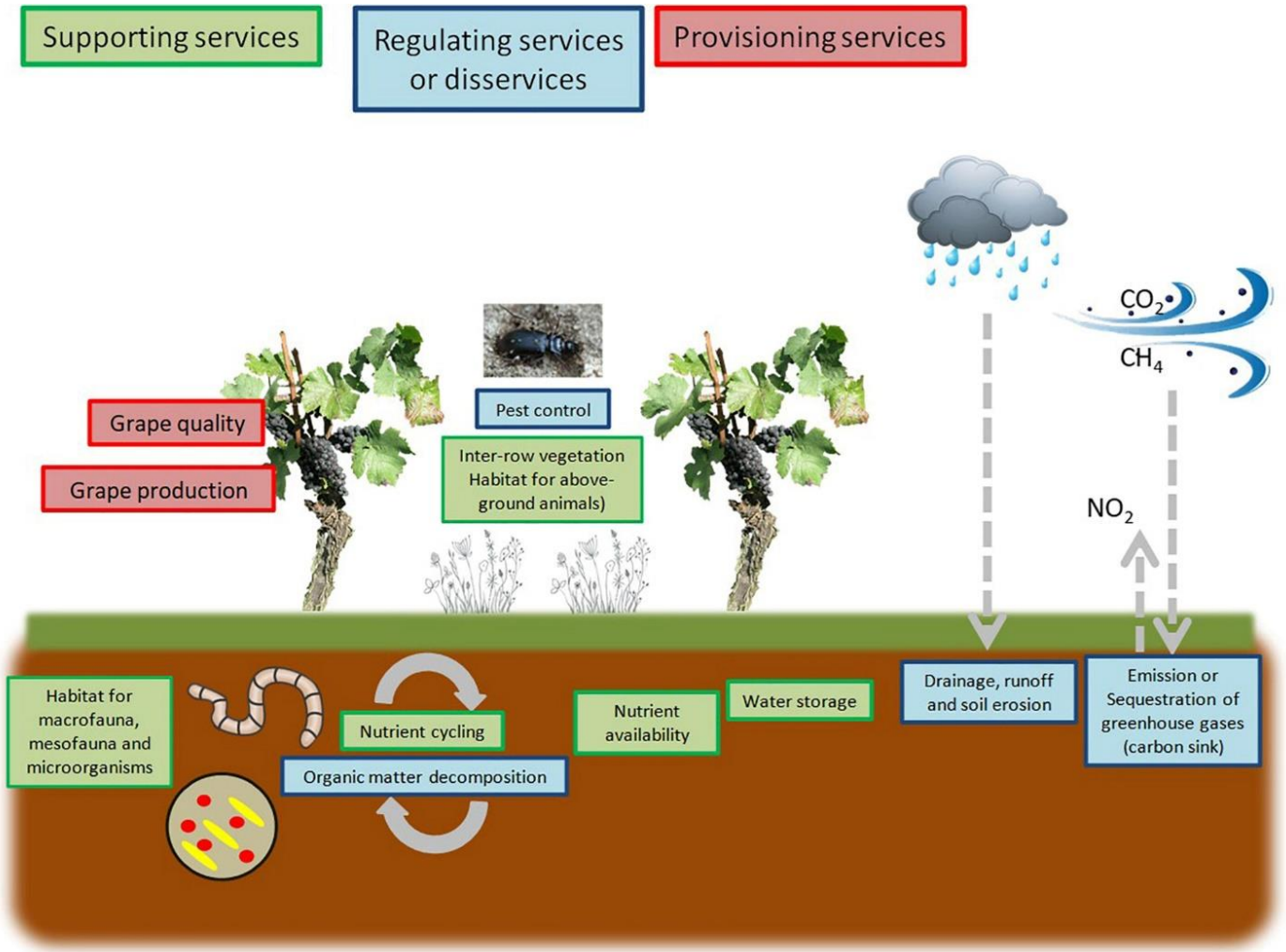
18th Congress of the European Society for Agronomy in Rennes, France

Context: vineyard soils quality

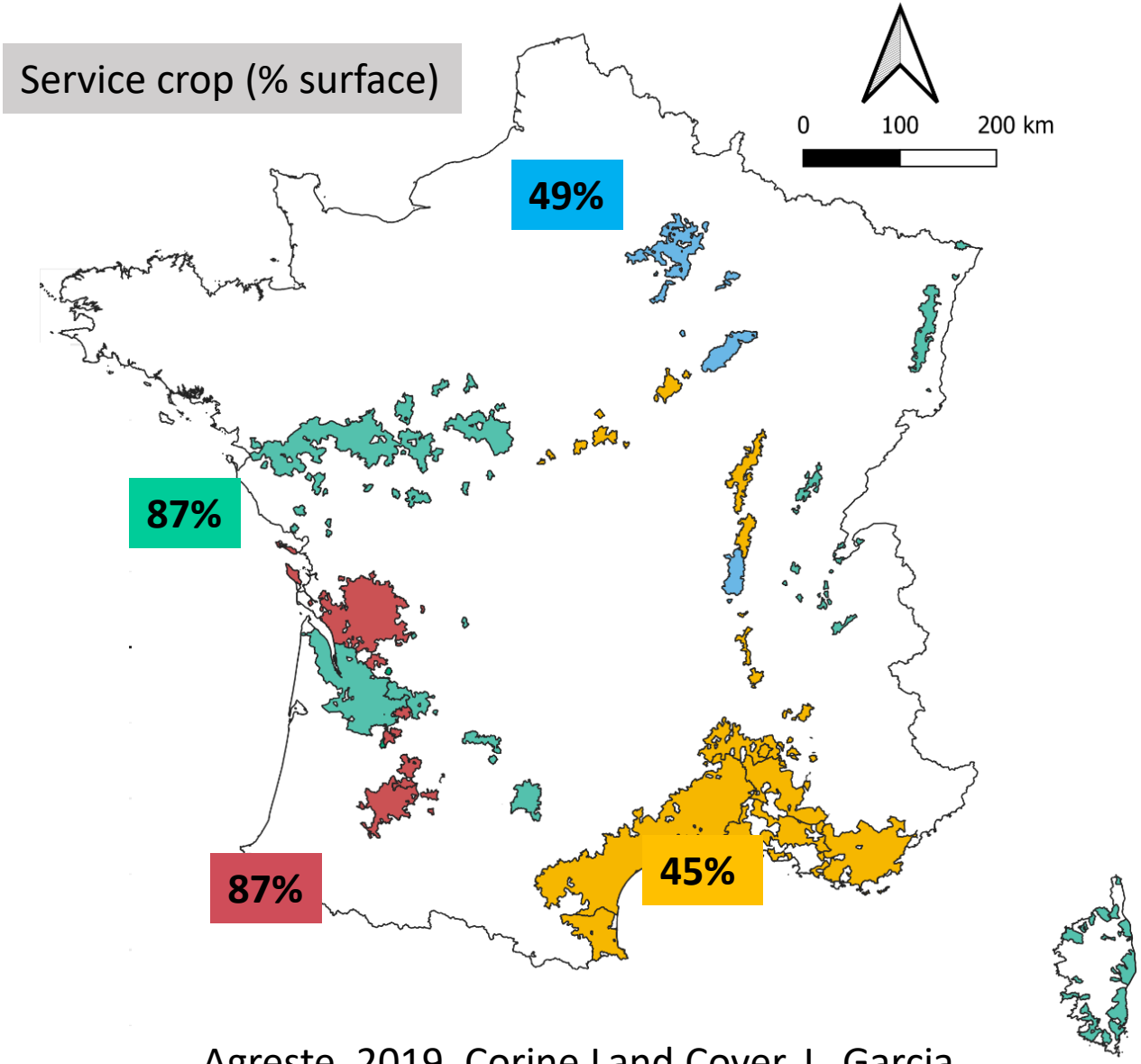
- **Enhancing soil organic matter** is crucial for sustainable viticulture, particularly in Mediterranean regions

Roy et al., 2017

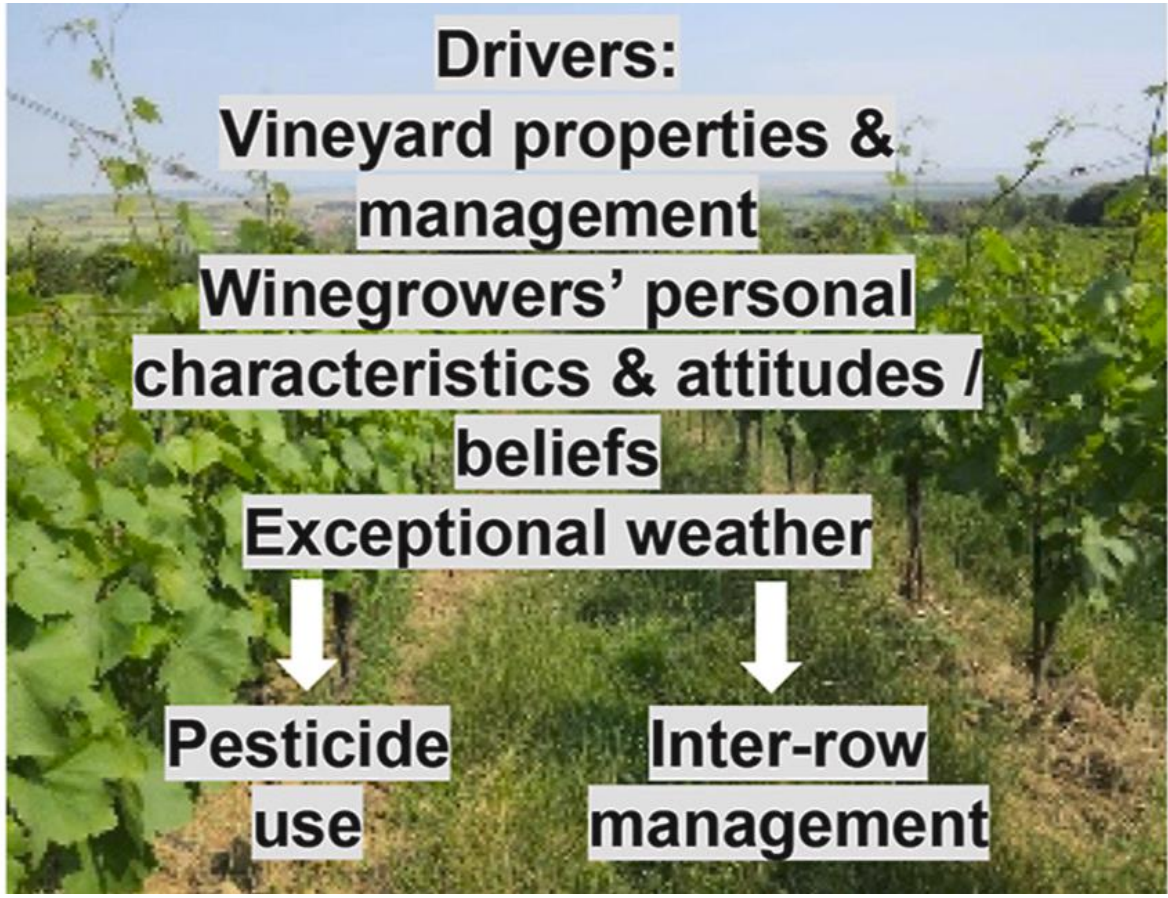


Giffard et al., 2022

Context: soil management practices



Agreste, 2019, Corine Land Cover, L. Garcia

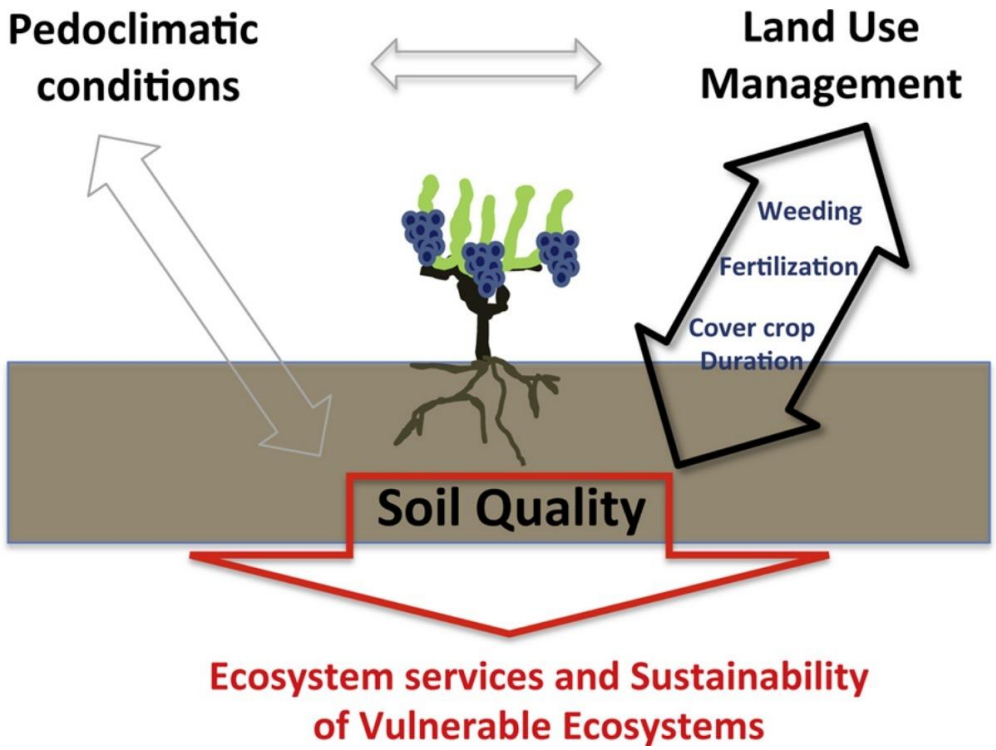


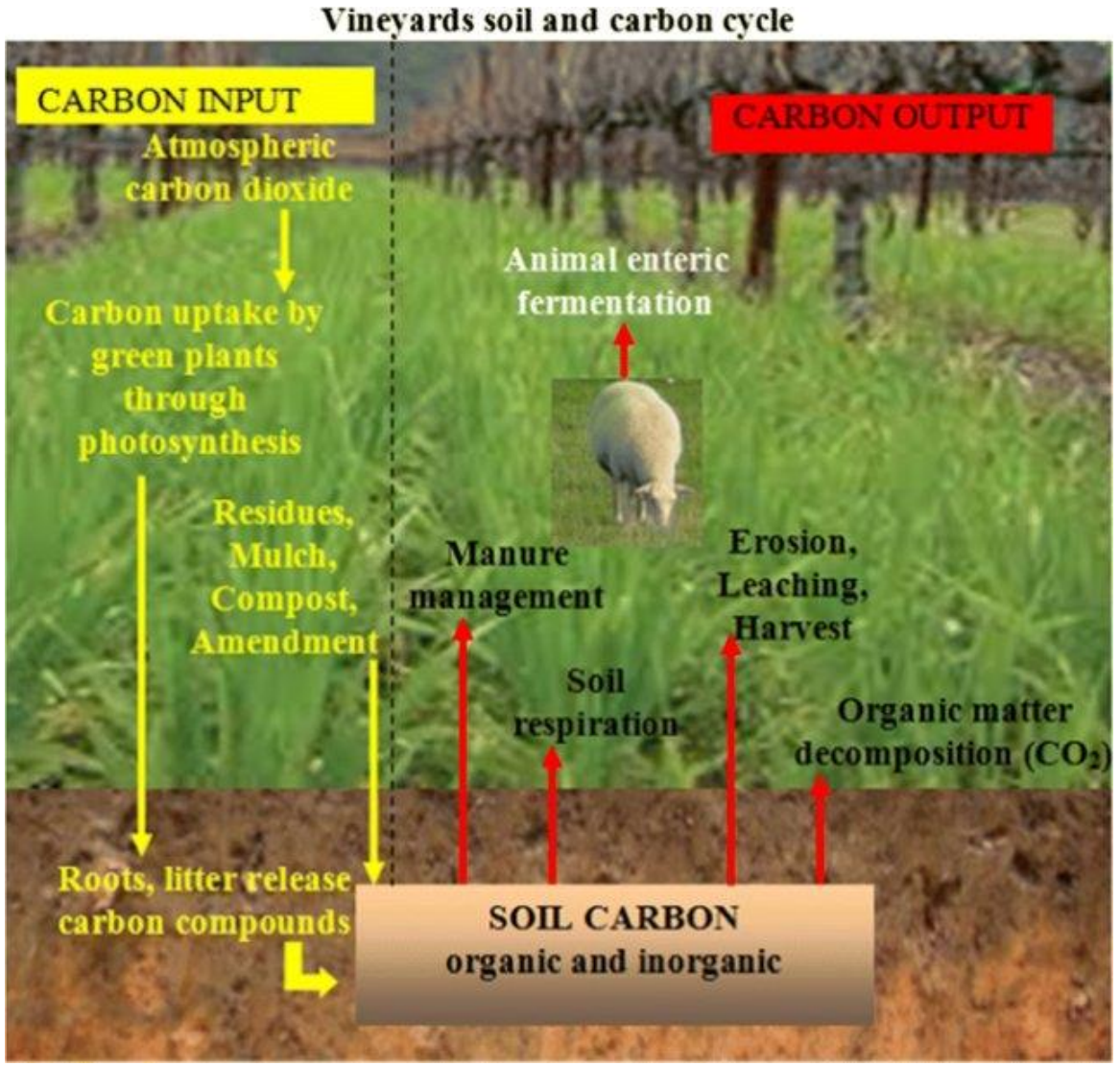
Chen et al., 2022

BAN GLYPHOSATE FOR GOOD

Context: organic amendments

- **Organic amendments** applied to enrich soil and recycle nutrients
- **Challenges** persist in their implementation: €, equipment, time





Cataldo et al., 2021, Nistor et al., 2018, Salome et al., 2016

Research question driven by Mediterranean winegrowers: can we enhance soil organic matter while maintaining yield by introducing winter service crops in vineyards?

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Research strategy: the Occitanie region funded the RESAMOVITI project based on On Farm Experimentation with committed winegrowers

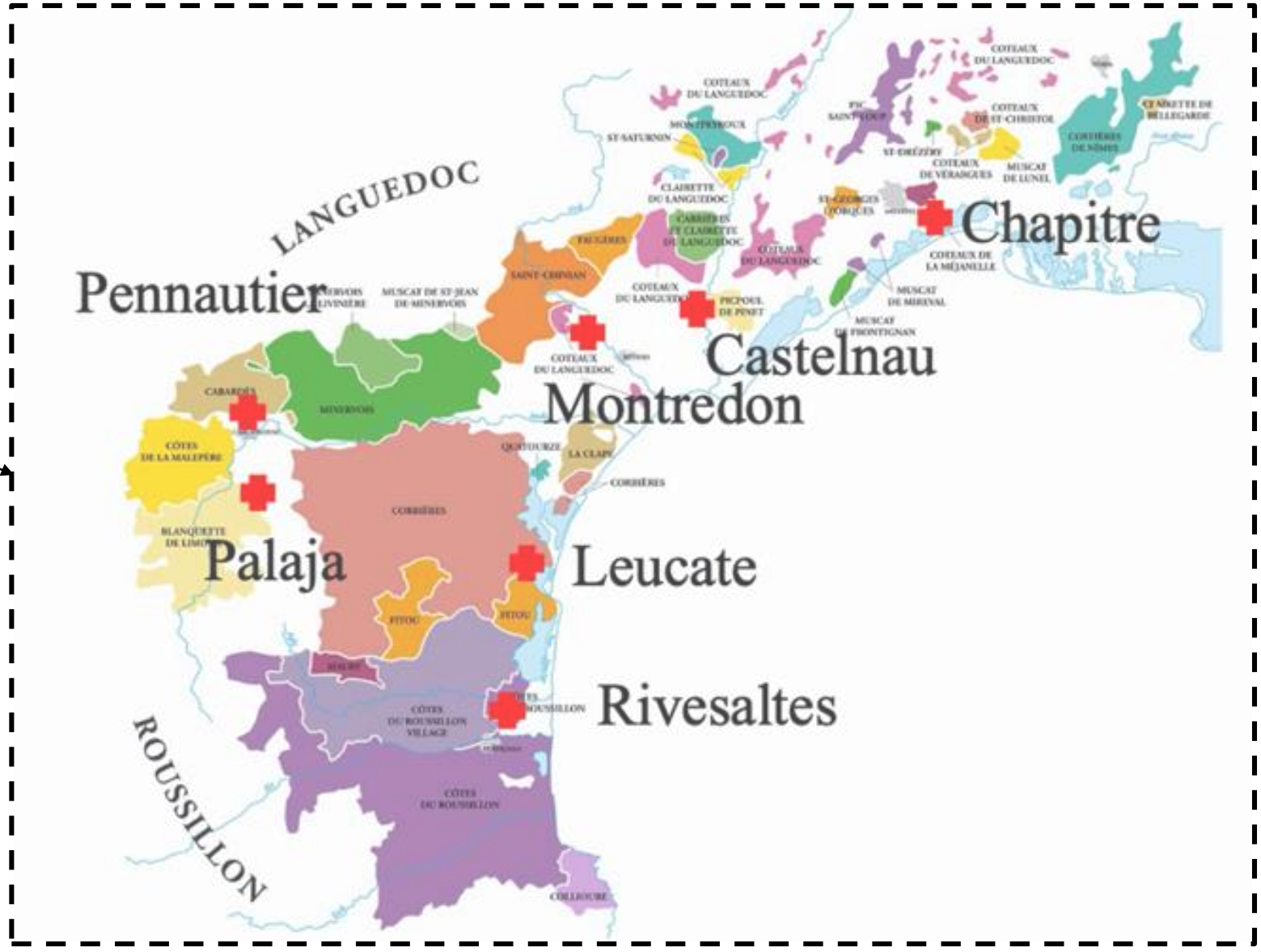
Research group

French viticultural technical institute

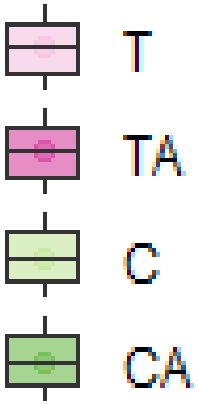
Agro-supply company

Winegrowers group

Materials and Methods: 7 fields



Materials and Methods: 4 modalities



: **T**illed

: **T**illed + **A**mendment

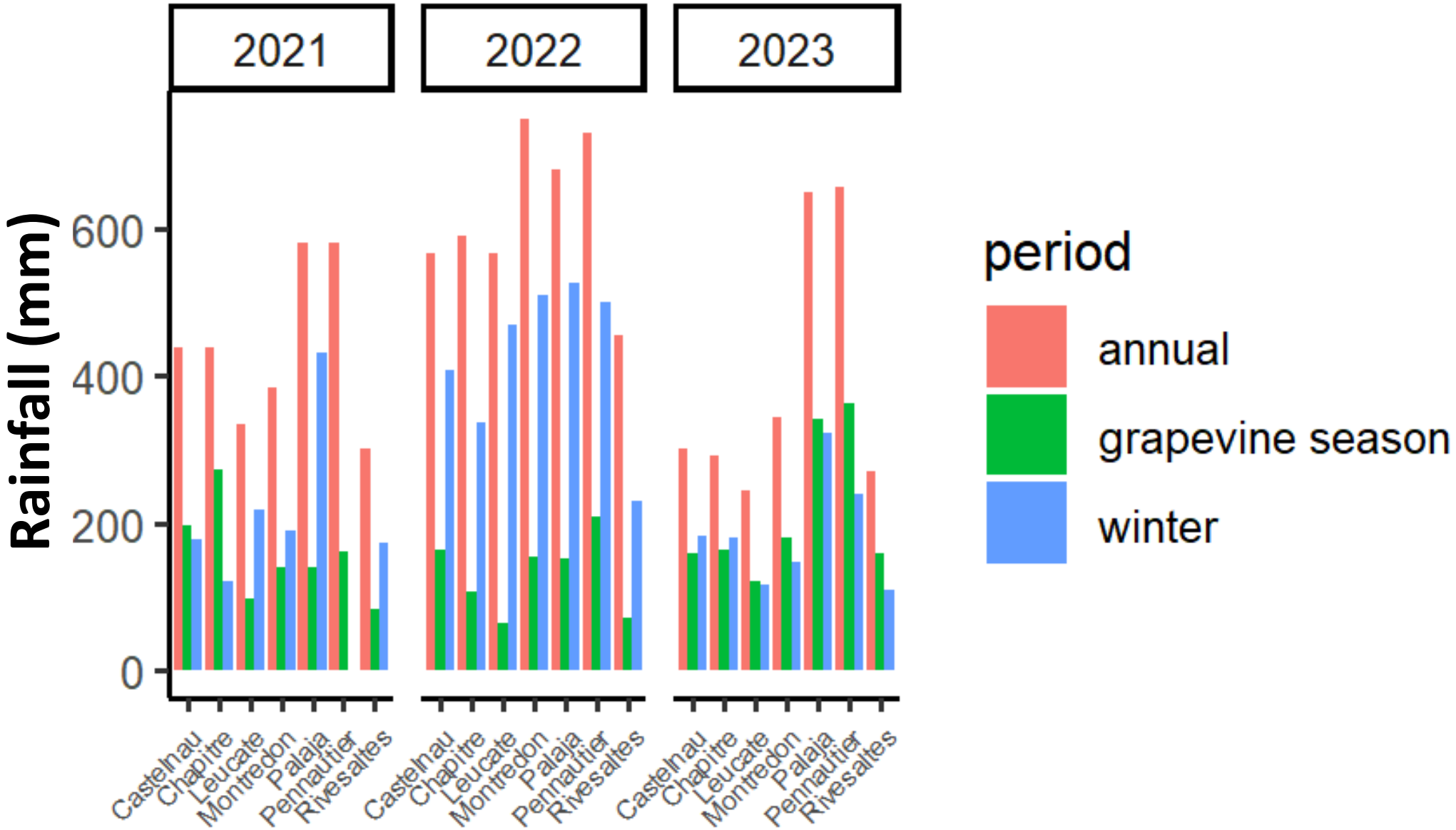
: service **C**rop

: service **C**rop + **A**mendment

Sown Mixture: 50% faba bean, 15% wild oat, 10% oat, 15% vetch, 5% clover, 5% radish.
Organic Amendment: Vegethumus (Frayssinnet), 1,5 t/ ha/ year.

Grapevine, service crop and soil monitoring during the 3 years

Materials and Methods: 3 contrasted years

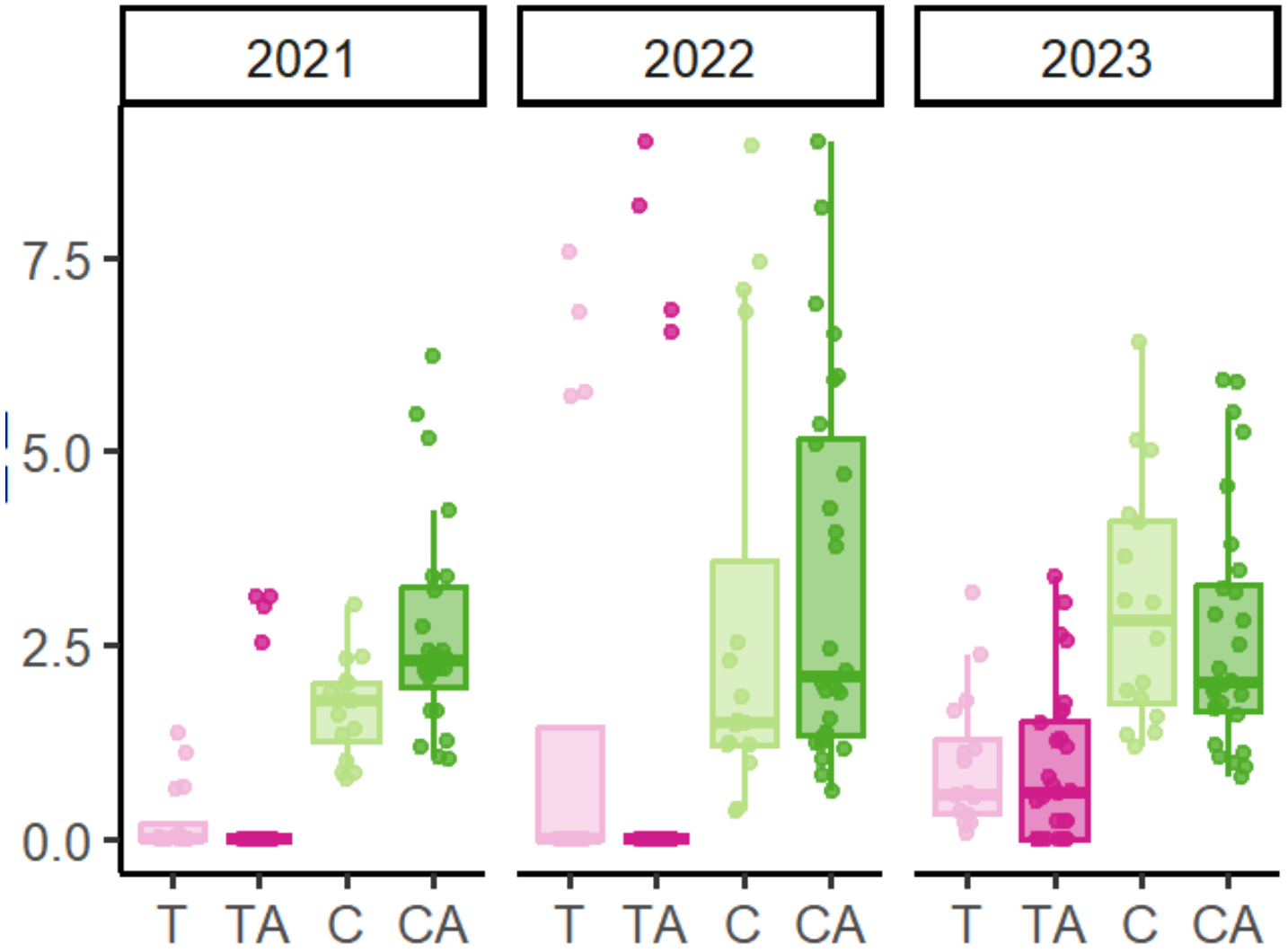


Fields

Results: service crop production (t/ha)

from sown and spontaneous vegetation

- Highly variable between years
- Determined by sowing date and climate post sowing
  (Lebreton et al., 2023)
- From 0,5 to 8 t/ha for sown species
- Problem of spontaneous vegetation control in some fields

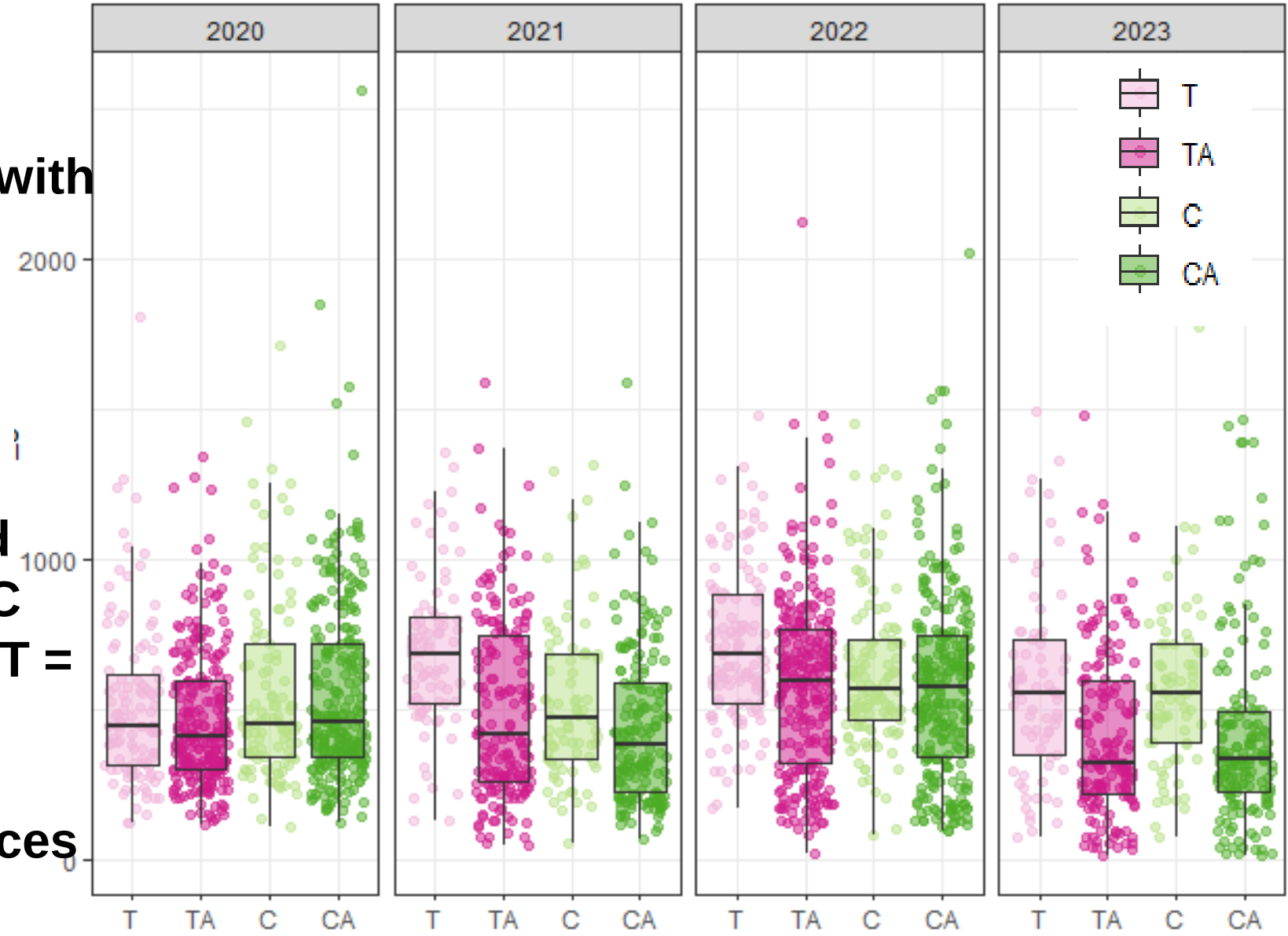


Results: grapevine yield (kg/ vine)

- **Wide range of yields depending on the years.**
- **Year effect only: 2021 < 2023 < 2022.**
- **Yields do not differ across modalities after 1, 2, or 3 years**

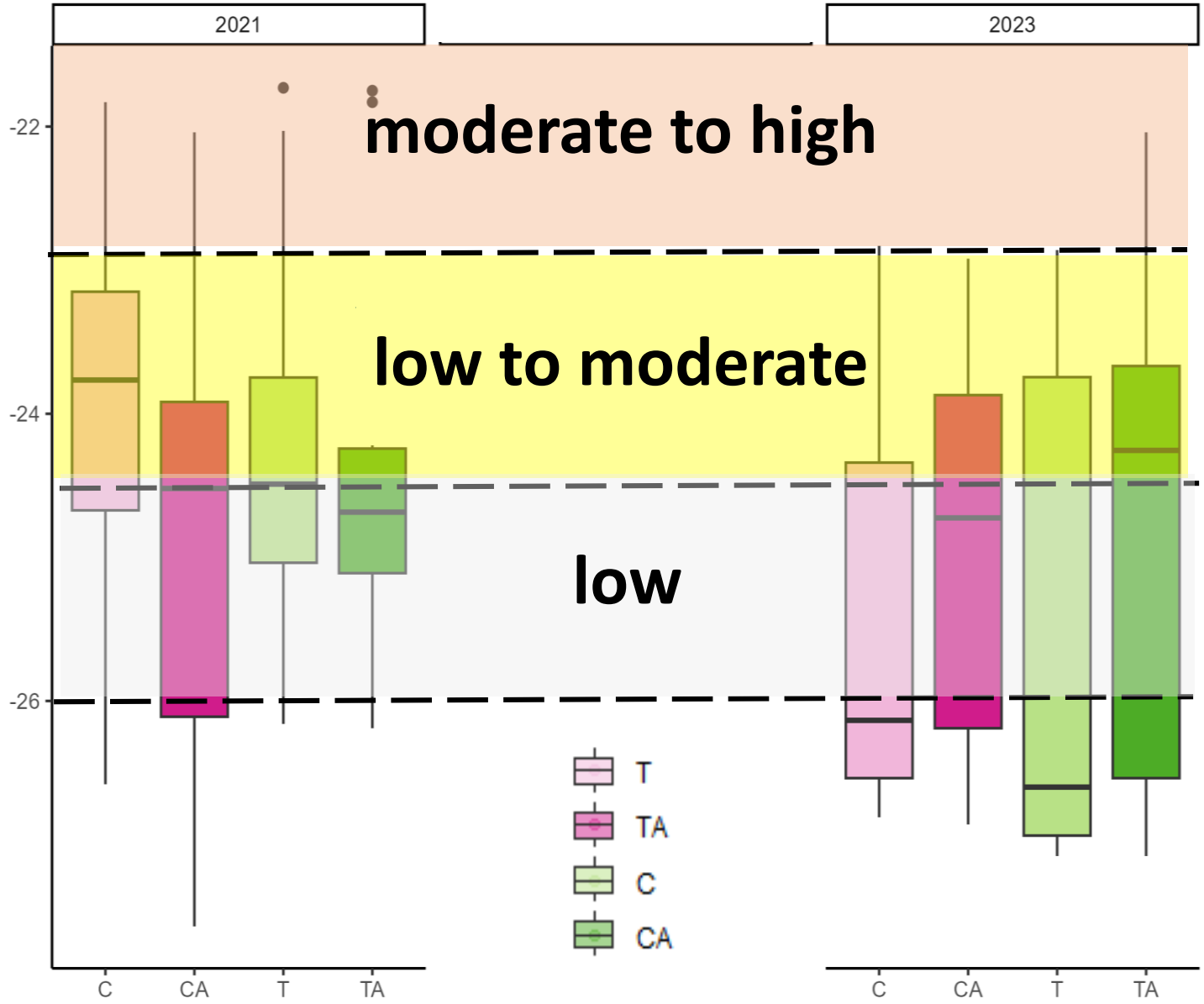
Results: grapevine pruning weight (g/ vine)

- **High variability**
- **Effect of modality and year, with significant interaction**
- **2020, before the trial, higher pruning weight for CA**
- **2021 and 2022: T and TA had higher pruning weights than C and CA on average, C < CA = T = TA**
- **2023: no significant differences**



Results: water constraint (Delta 13C)

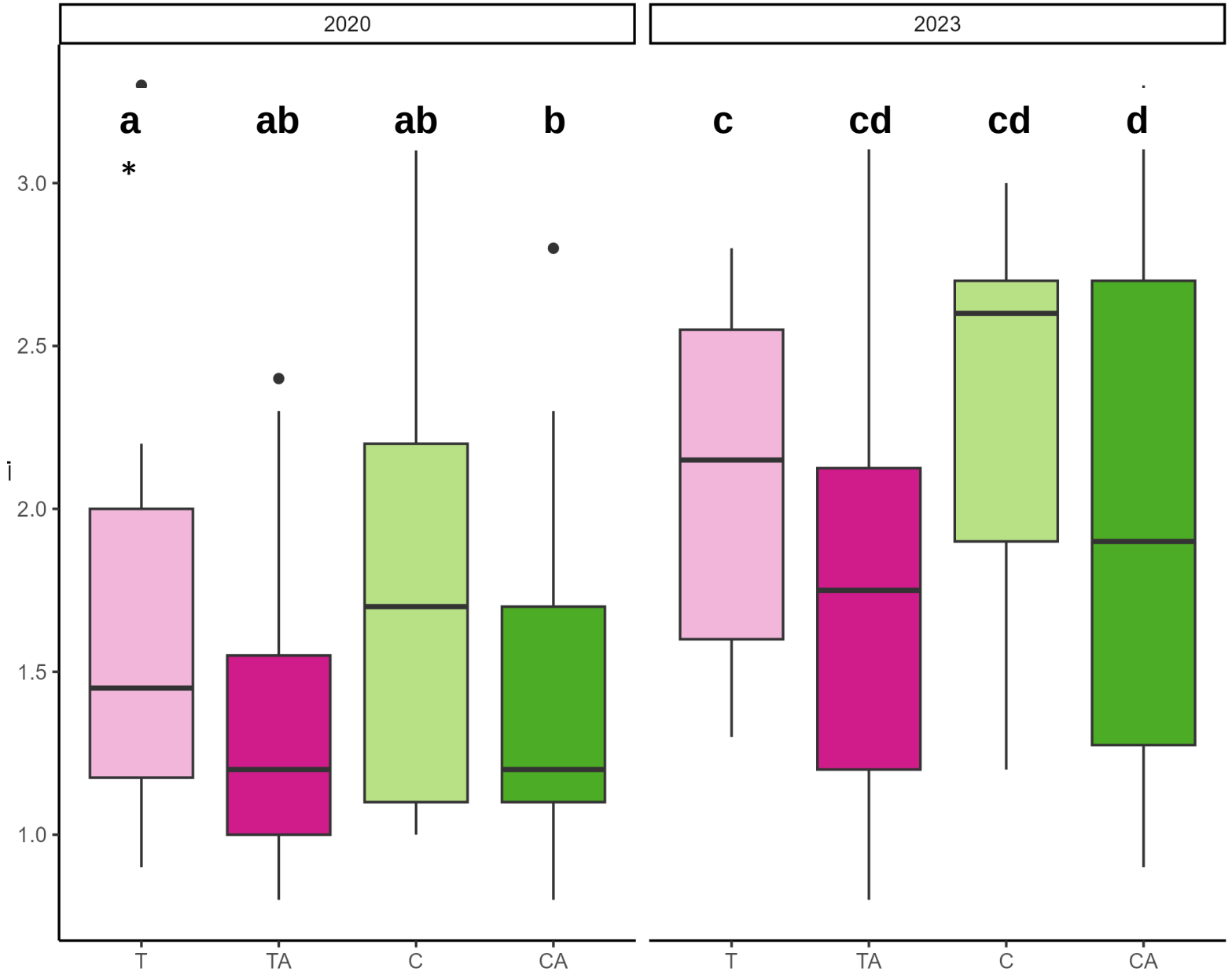
- No effect observed
- Water stress levels are consistent across years and modalities



Results: soil organic matter content (%)

- **General increase of SOM in 3 years**
- **~0,5%**
- **Significant effect of the modality and the year:**

CA>T

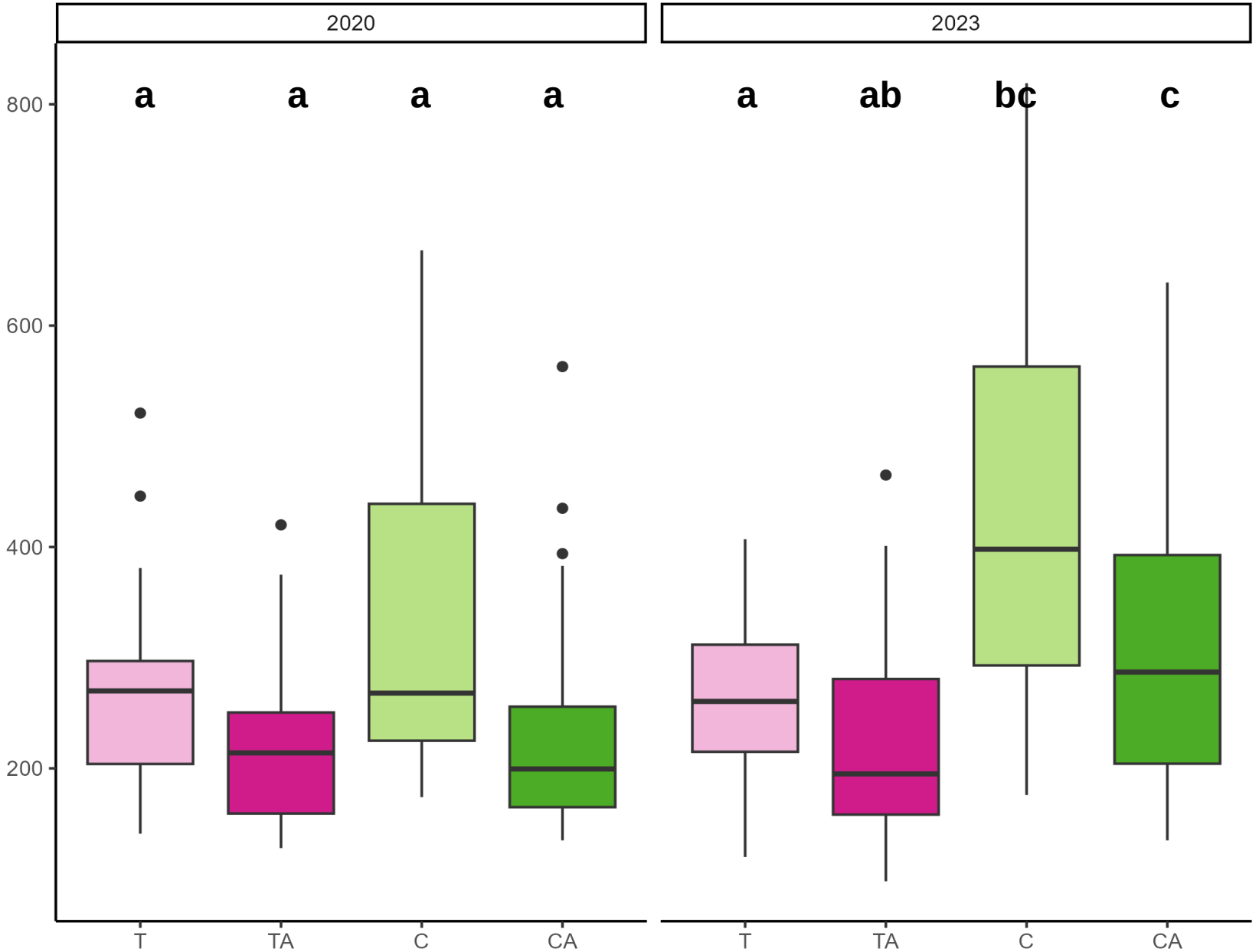


Results: soil microbial activity ($mgCO_2$/ kg)

- **Significantly increased by service crops modalities C and CA**
- **Modality effect in 23:**

  CA>T

Living soils!



Take home messages

Growing winter service crops in the Mediterranean region

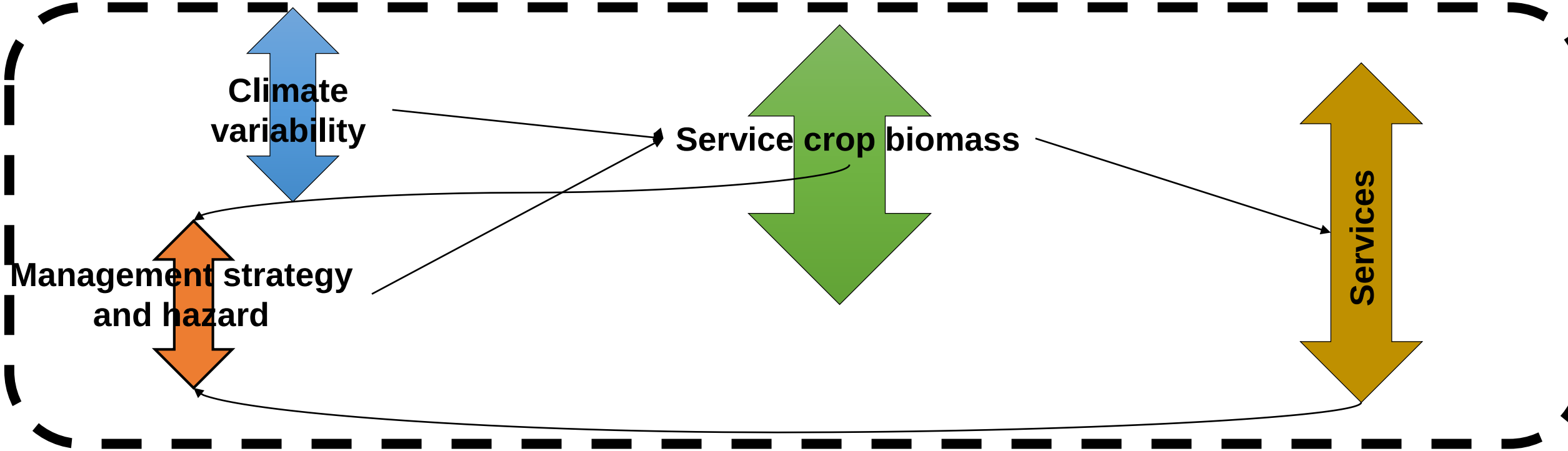
- **is efficient to increase soil organic matter content and soil microbial activity**
- **does not limit yield and grapevine vigor, over a 3-year-old period**
- provides many ecosystem services (Garcia et al., 2018; 2020, 2021)

BUT contrary to organic amendments, service crops effects vary greatly according to biomass production rainfall patterns

How to deal with this uncertainty at the field scale?

Perspectives

- **On Farm Experimentation** to catch variability in agroecological systems
- Service crop multiservice assessment as a function of **biomass production model** *(Garba et al., 2024, Miller et al., 2023)*
- **Decision tree to manage** service crop sowing and termination *(Novara et al., 2021; Garcia et al. 2024)*



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Thank you!

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