

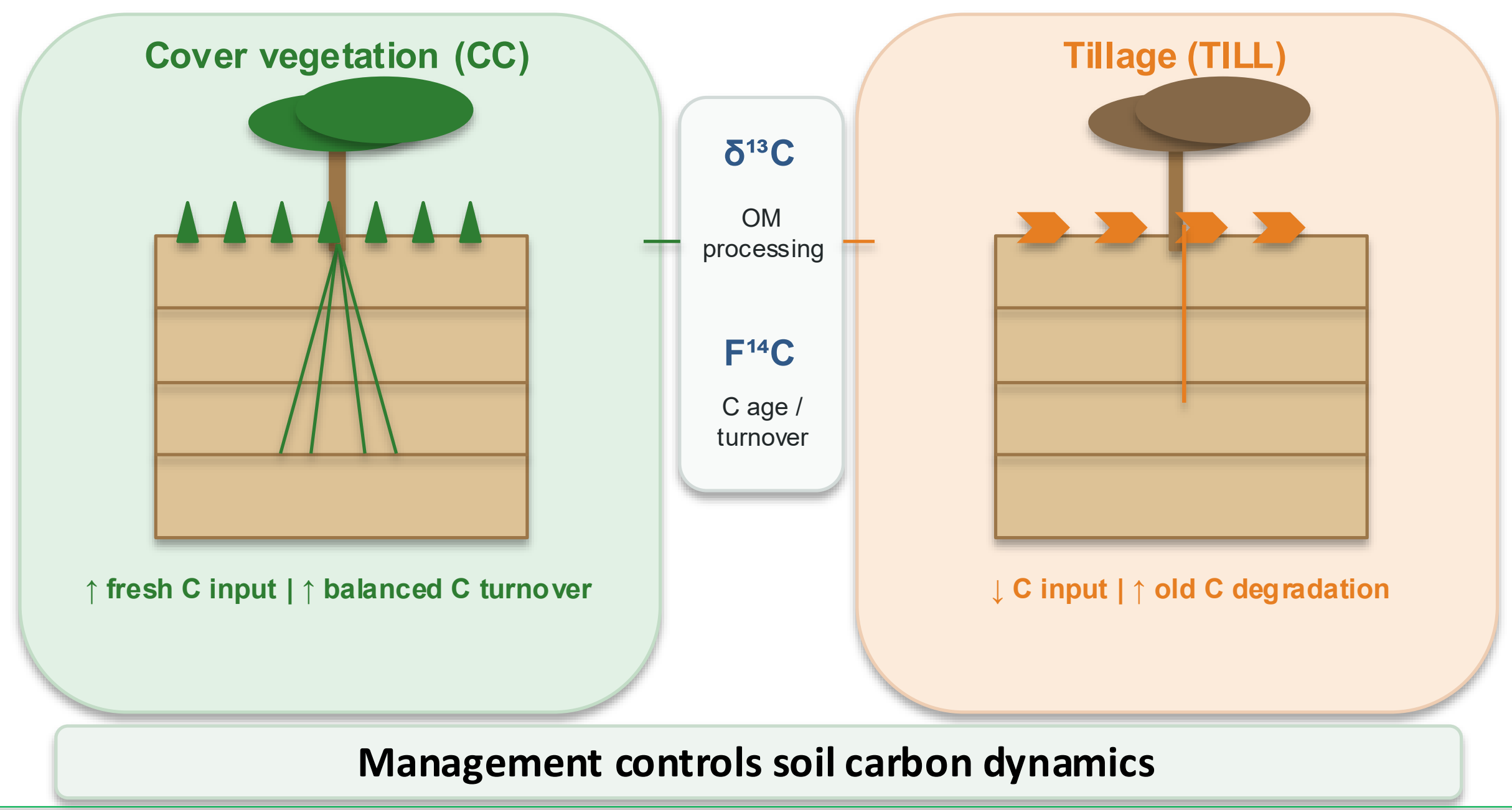
# ASSESSING VINEYARDS SOIL CARBON STORAGE: $\delta^{13}\text{C}$ AND $\Delta^{14}\text{C}$ AS INDICATORS UNDER COVER VEGETATION AND TILLAGE



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## GRAPHICAL ABSTRACT



## INTRODUCTION

**Why vineyards?**  
Soil organic carbon (SOC) supports soil health, agricultural resilience, and climate mitigation.

**Why management matters?**  
Vineyard management:  
 • Cover vegetation → potential SOC gain  
 • Tillage → SOC loss  
 • But impact on carbon turnover is unclear

**RESEARCH QUESTION**  
How do cover vegetation and tillage affect soil carbon storage, source, and turnover in vineyard soils?

## METHODS

**Study design**

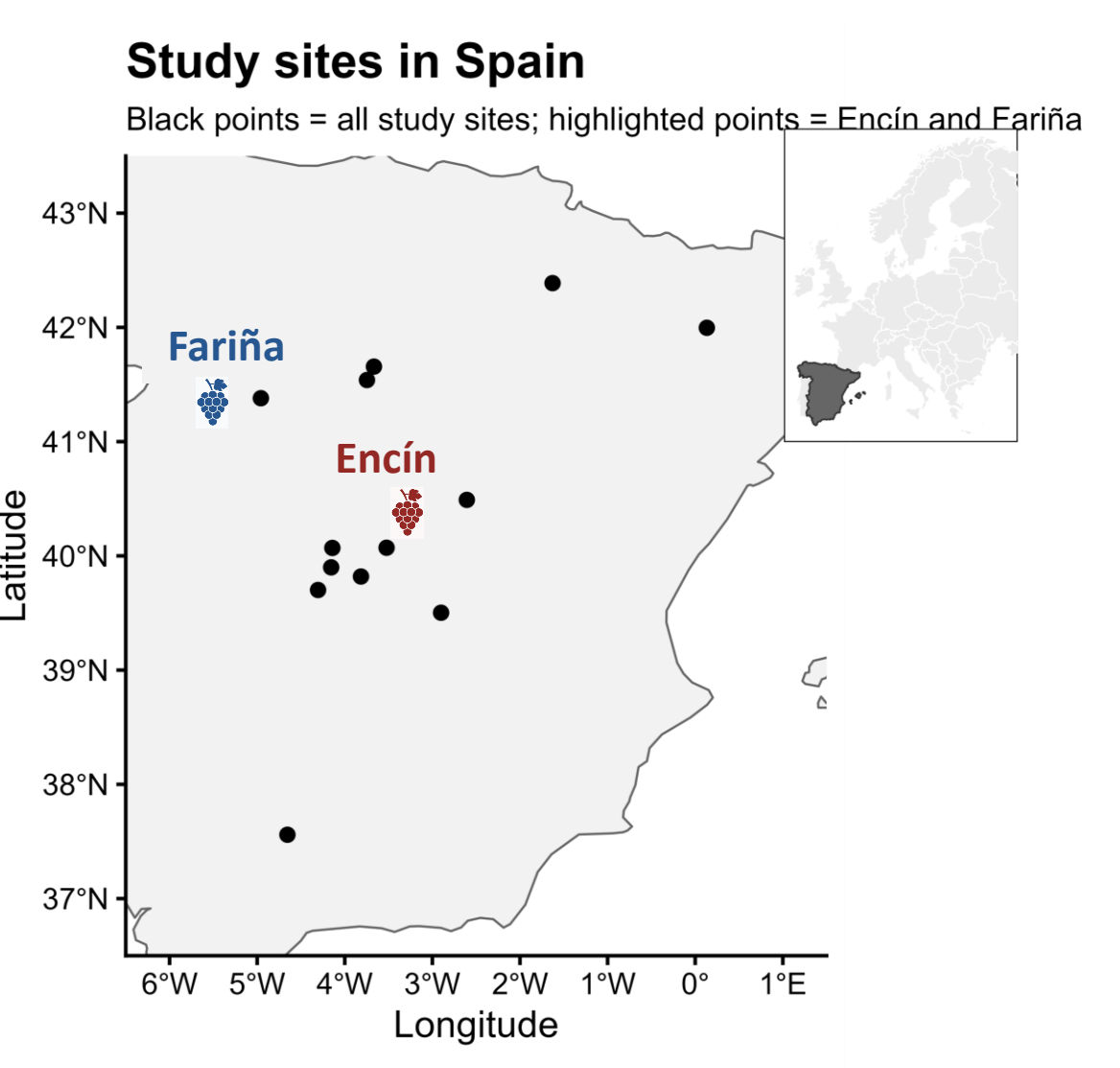
- Paired vineyard sites in Spain
- Two management systems: **cover vegetation (CC)** and **tillage (TILL)**
- Sampling depth: **0–90 cm**

**Measurements**

- Total carbon and organic carbon
- Carbonate content
- $\delta^{13}\text{C}$  as an indicator of organic matter source and processing
- $F^{14}\text{C}$  as an indicator of carbon age and turnover

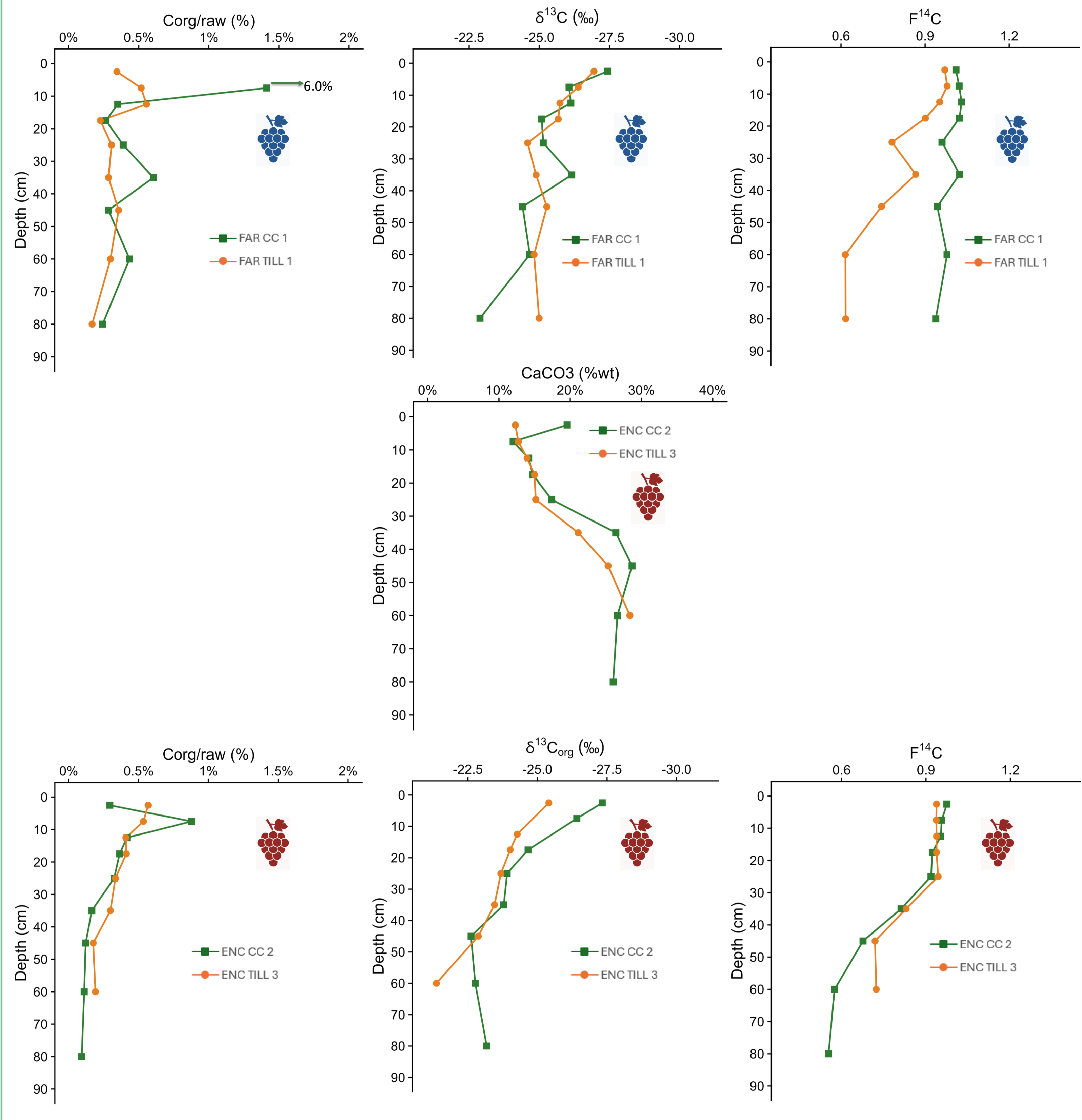
## RESULTS

Only two examples. Two contrasting soil systems: **ENC carbonate-rich soil** and **FAR non-carbonate soil**, having similar duration of CC



**Fariña (Toro, Zamora)/FAR:** Dystric Arenosol, sandy loam, non-carbonate soil, spontaneous cover crop for 13 years.

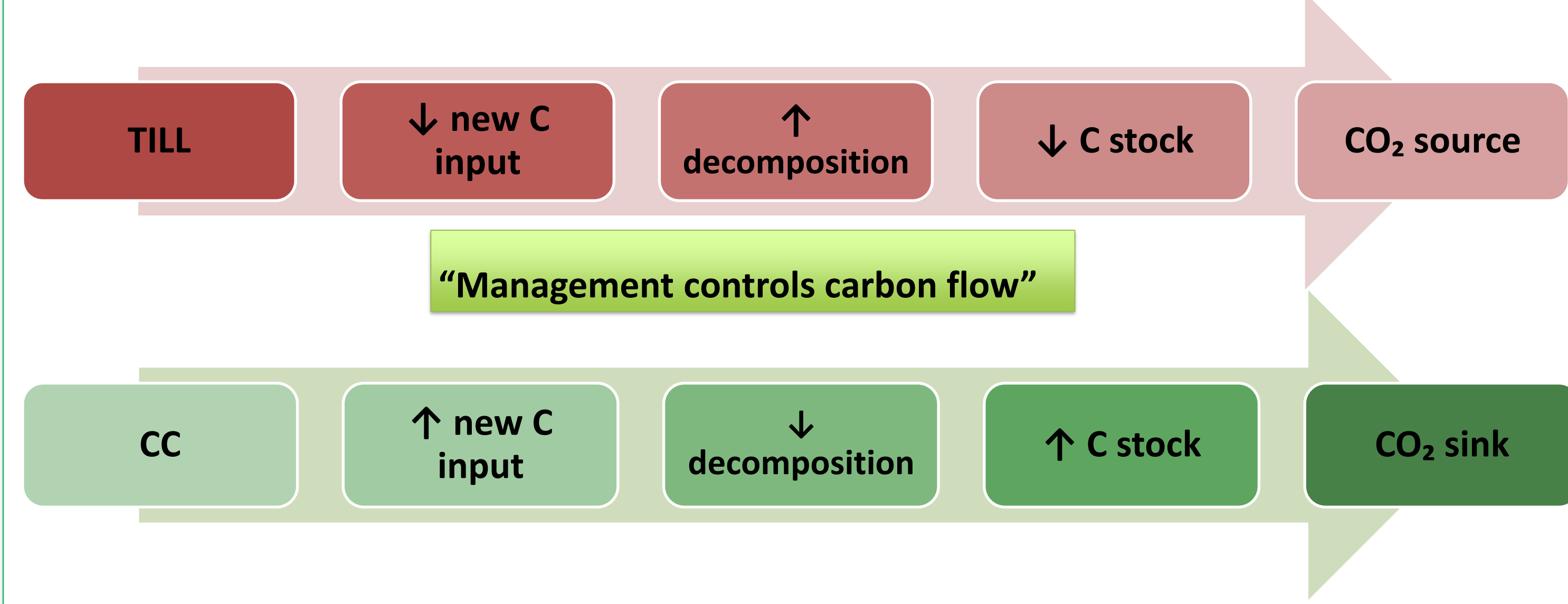
**Encín (Guadalajara)/ENC:** Calcic Luvisol, loamy sand, carbonate-rich soil, spontaneous cover crop for 12 years.



## KEY FINDINGS

- Corg decreases with depth in both systems.
- CC shows higher surface carbon than TILL
- $\delta^{13}\text{C}$  enrichment with depth indicates organic matter degradation, more negative at top for CC represent inputs of fresh OM.
- $F^{14}\text{C}$  shows contrasting carbon turnover
- $F^{14}\text{C}$  decreases with depth, showing older subsoil carbon.
- CC retains a younger carbon signal than TILL.
- Higher renewal of fresher carbon under CC than TILL.
- Soil management impact strongly on soil carbon dynamics.

## CONCLUSIONS



## ACKNOWLEDGMENTS

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