Counting Carbon on Mineral Soils

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20th June 2024
Teagasc Ashtown

VistaMilk

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Farmers for Climate Action

Terrain-AI

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Food and the Marine

NASCO

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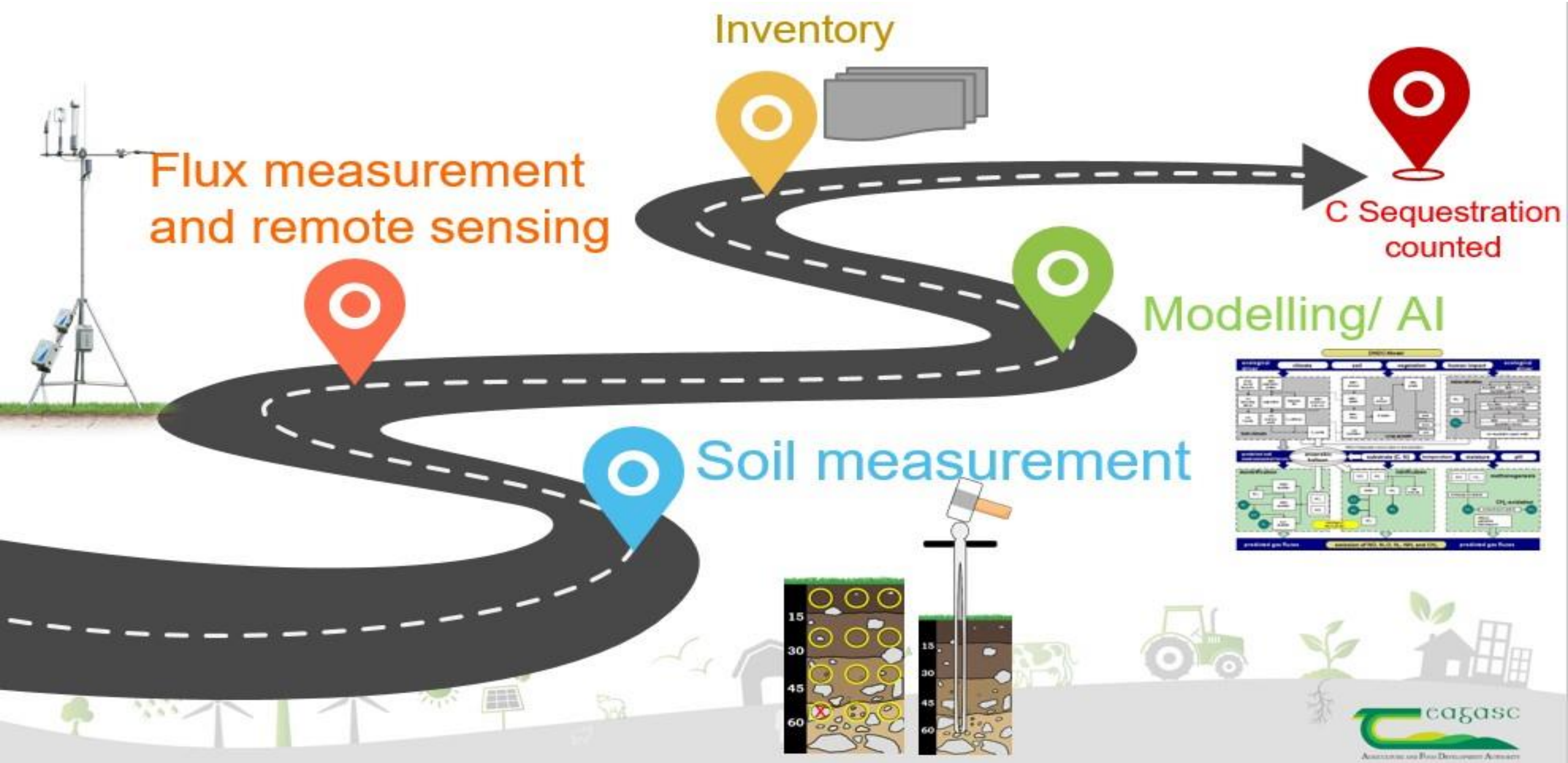
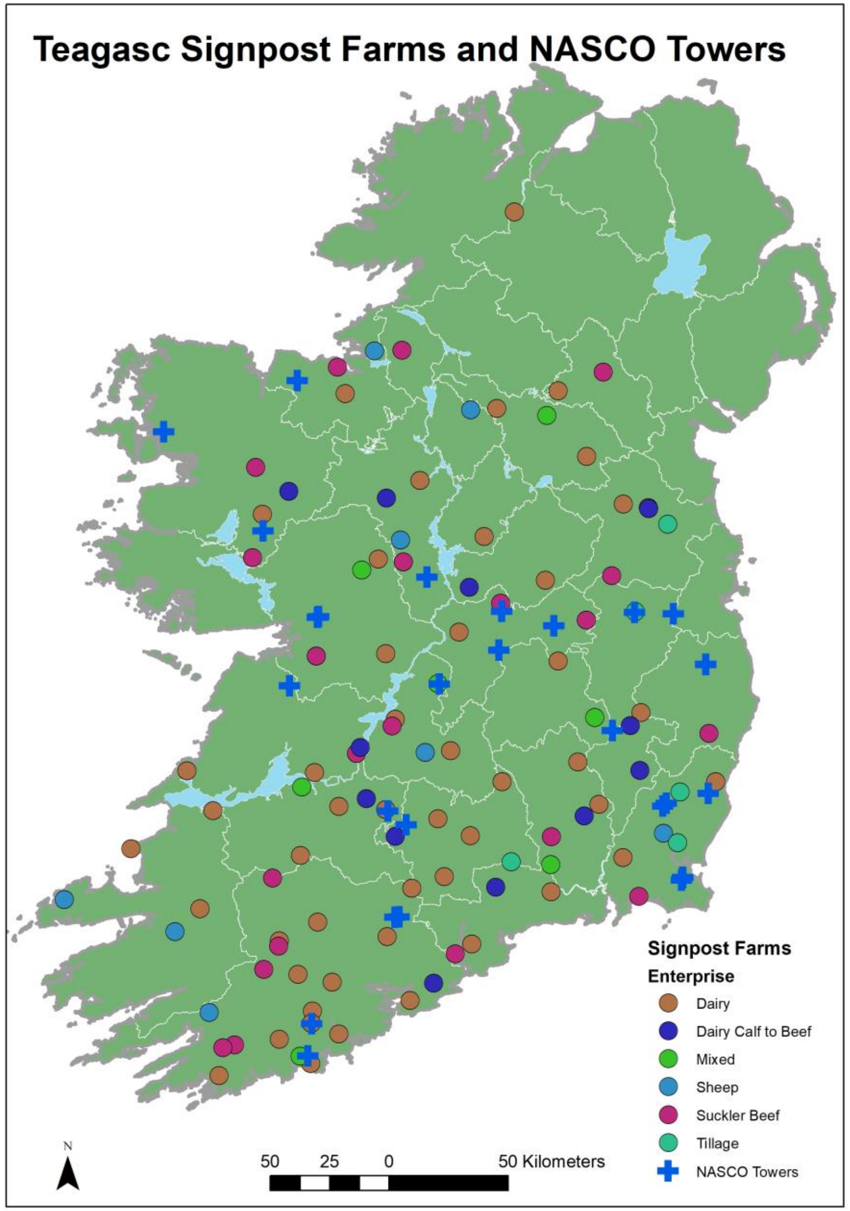
Teagasc roadmap to C sequestration accounting



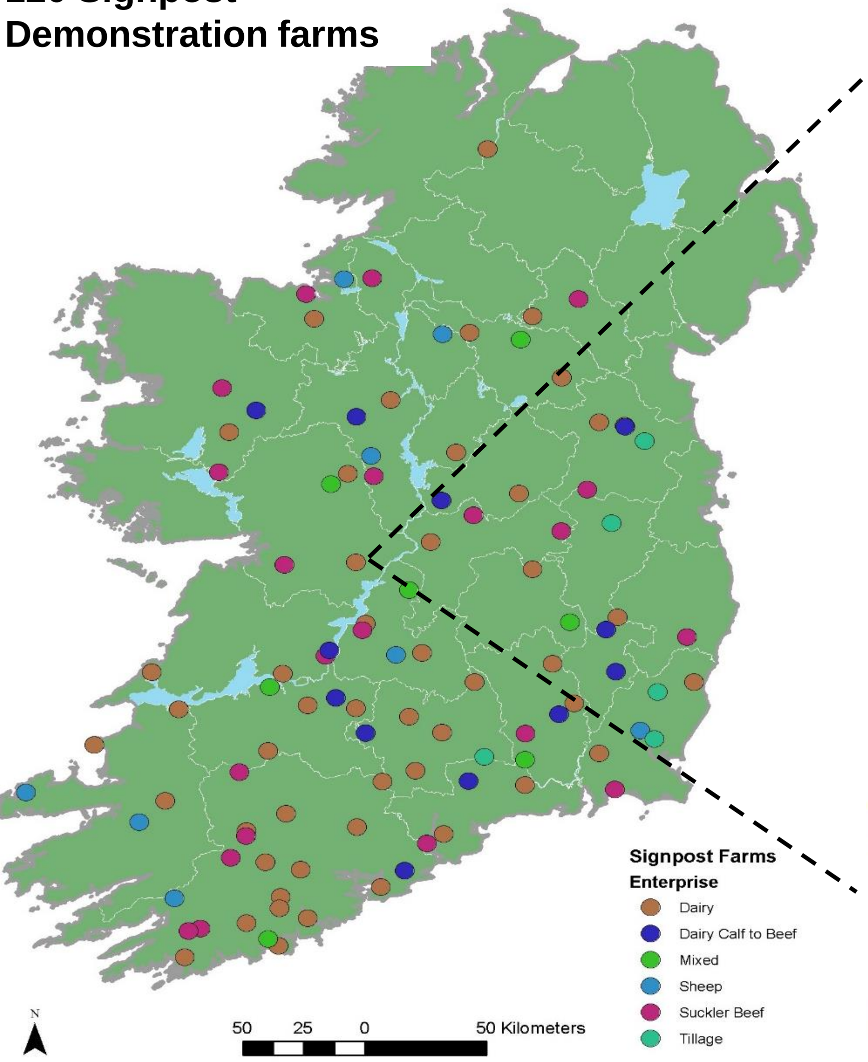
Signpost Farms and NASCO Towers



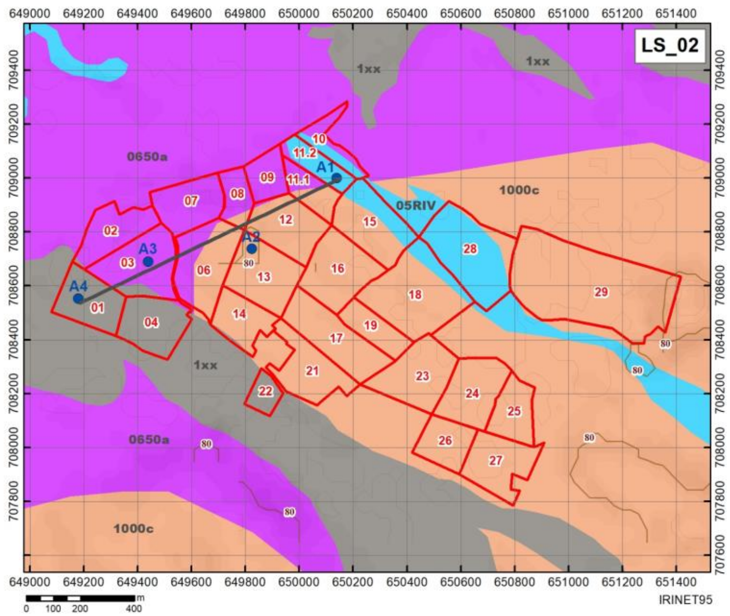
Deep Soil sampling of Signpost farms

Signpost Farms – Long term Soil C Stocks changes

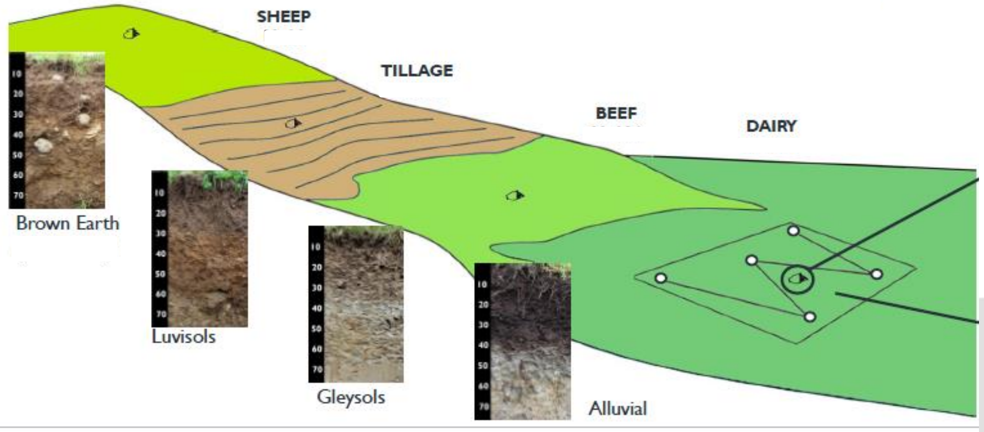
120 Signpost Demonstration farms



Spatial & Activity Data



Landscape distribution



Soil Data

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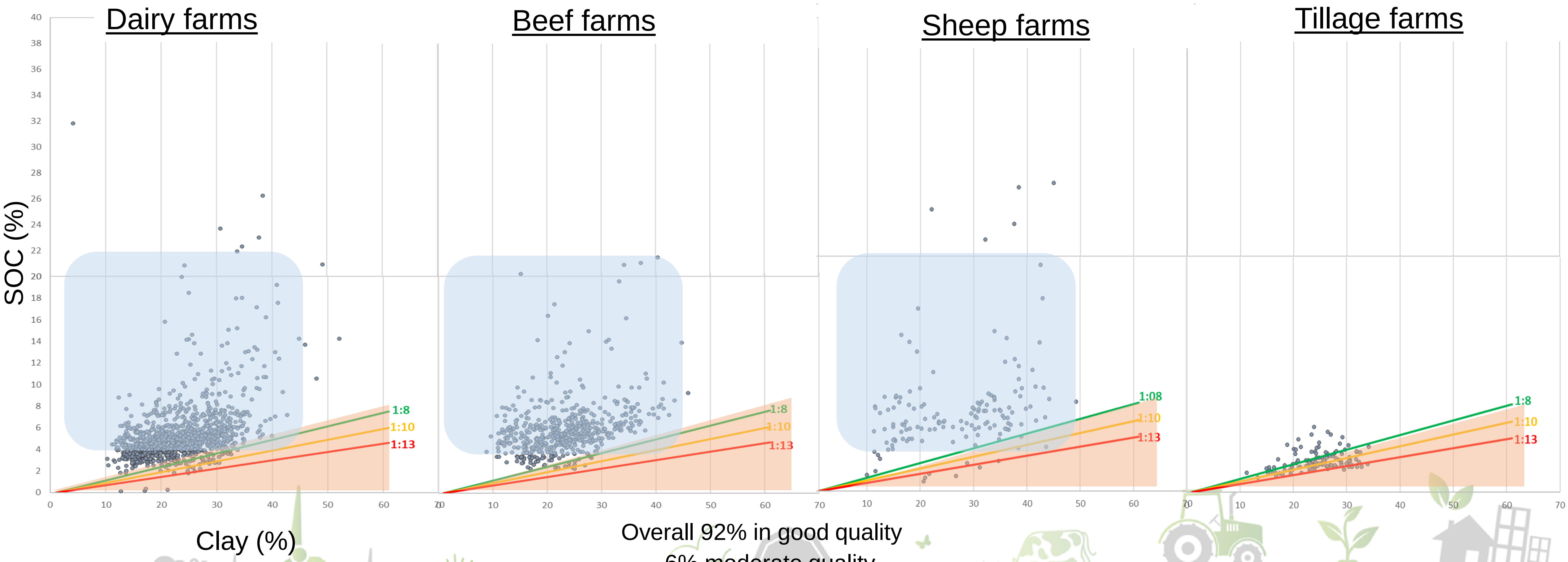
What are our findings from Signpost? - 1

>1/8 v. good 1/8 good 1/10 moderate 1/13 degraded

Soil Quality- SOC : Clay

index of soil quality gives us an understanding of the C that is bounded into minerals, specifically finer minerals such as Clay



Overall 92% in good quality
6% moderate quality
<1% poor quality
Most of the moderate and poor are associated to tillage activities.

Johannes et al., (2017)

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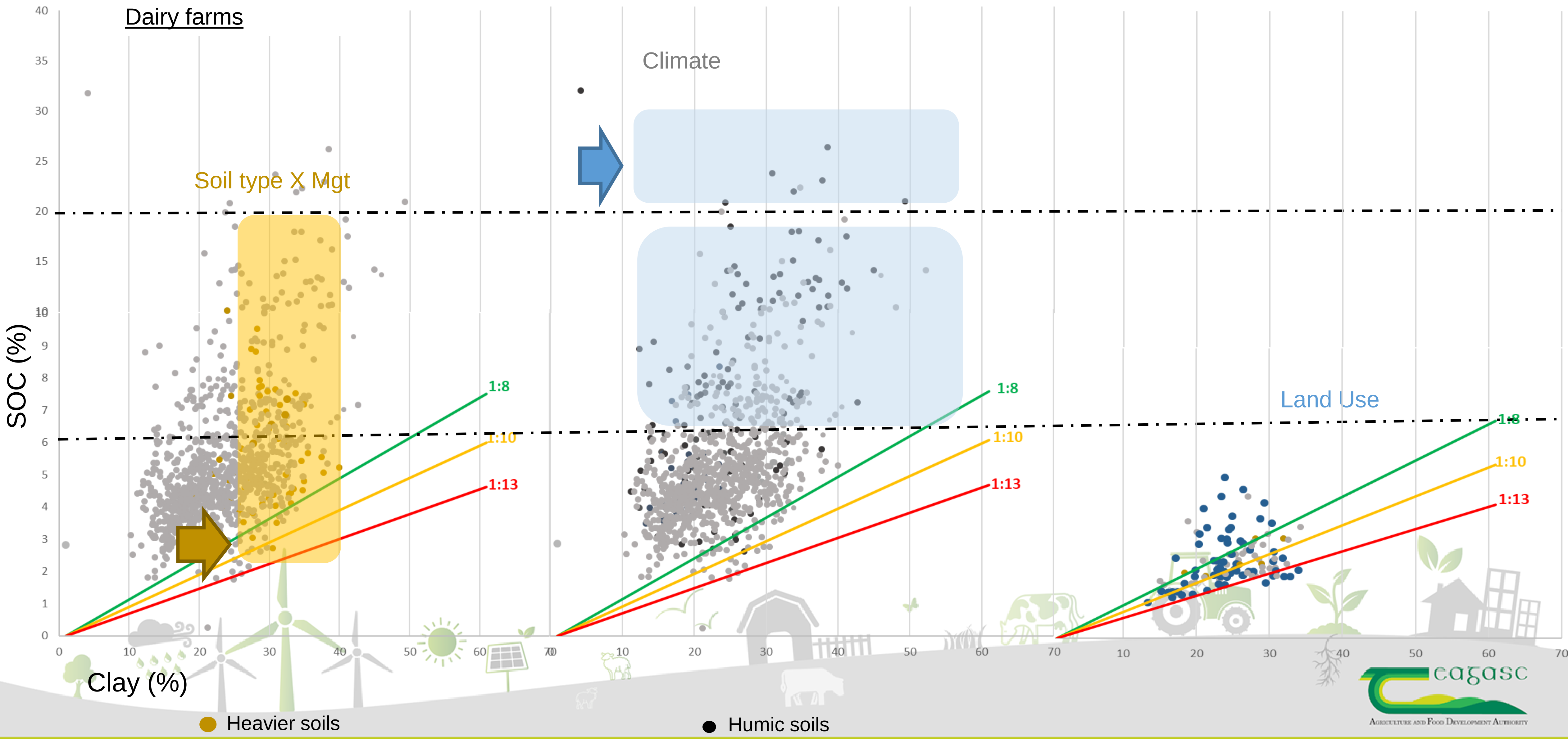
What are our findings from Signpost? - 2

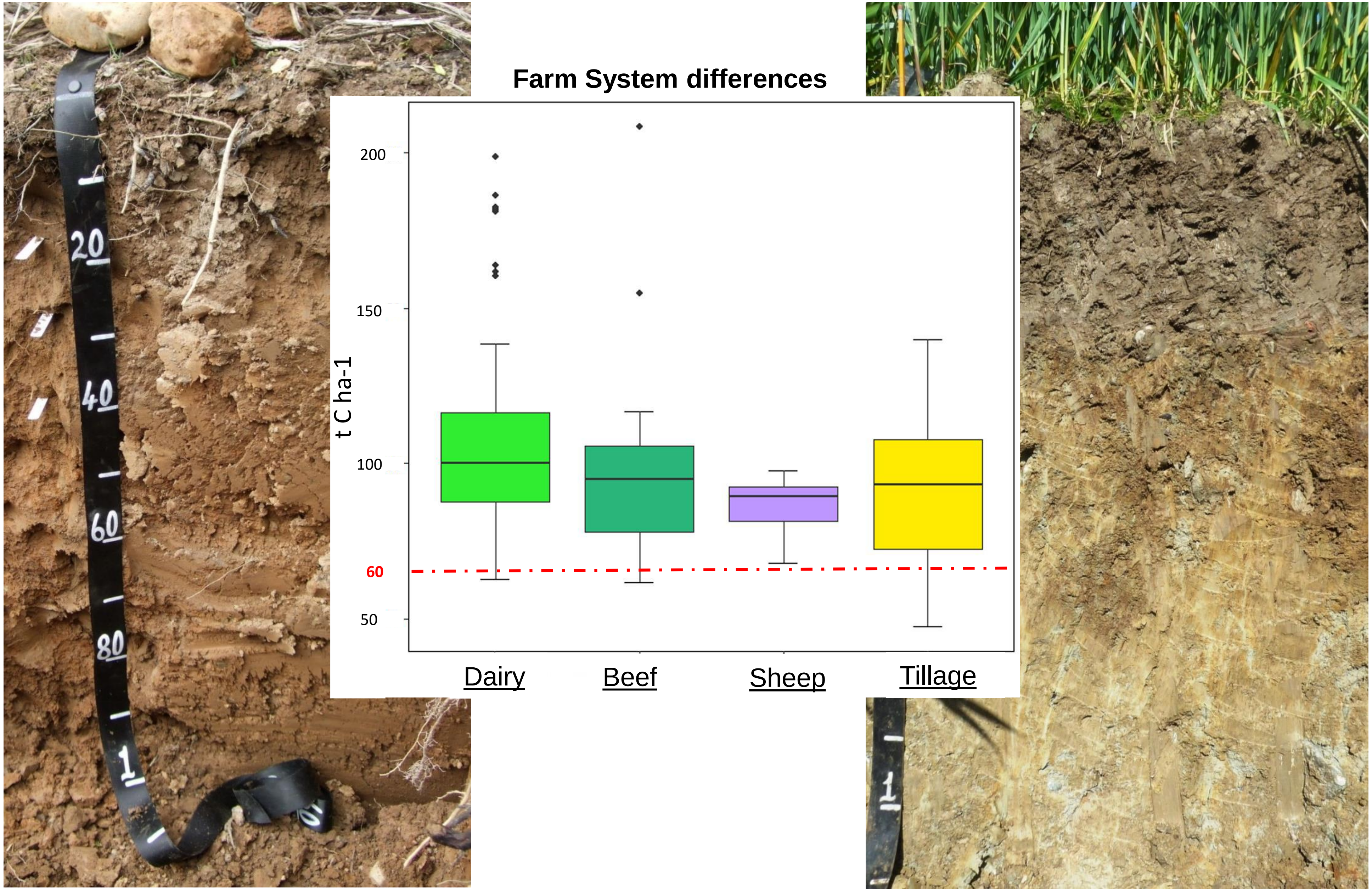
>1/8 v. good 1/8 good 1/10 moderate 1/13 degraded

Soil Quality- SOC : Clay
Soil Type differences



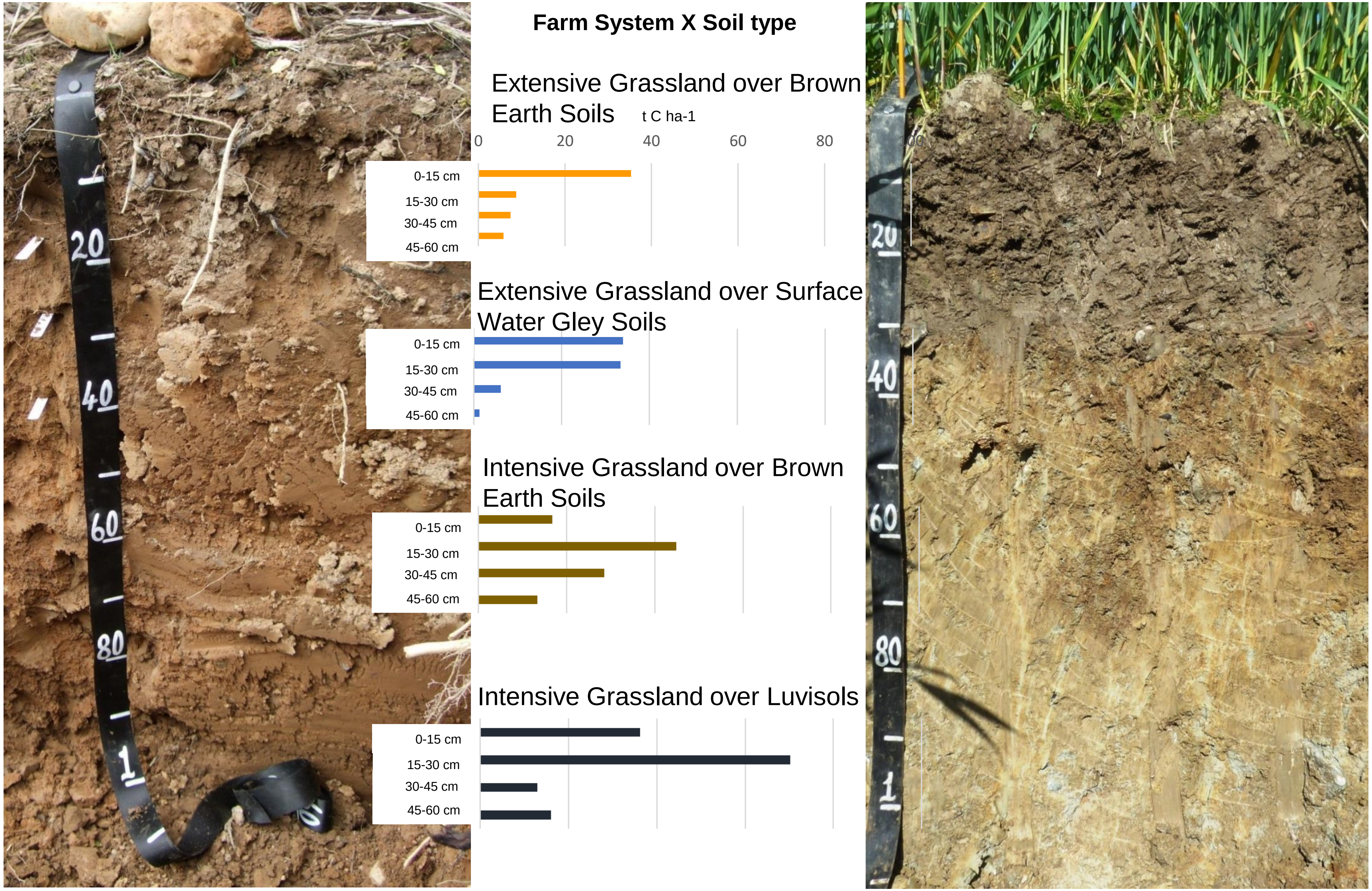
What are our findings from Signpost? - 3

Soil C Stocks in depth

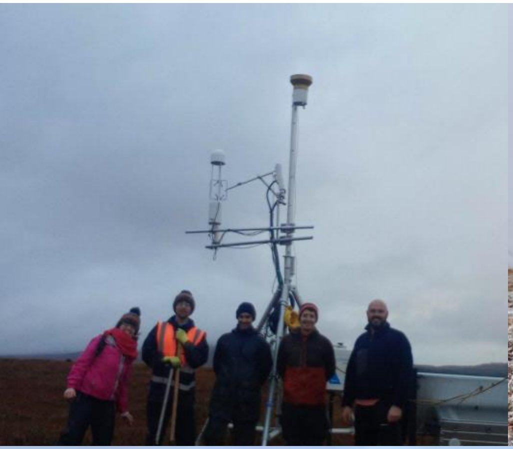


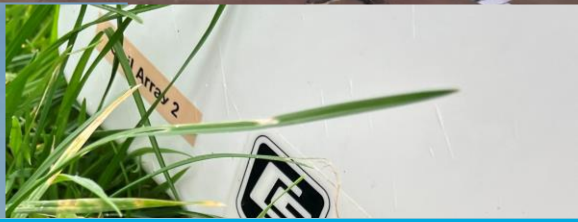
What are our findings from Signpost? – 4

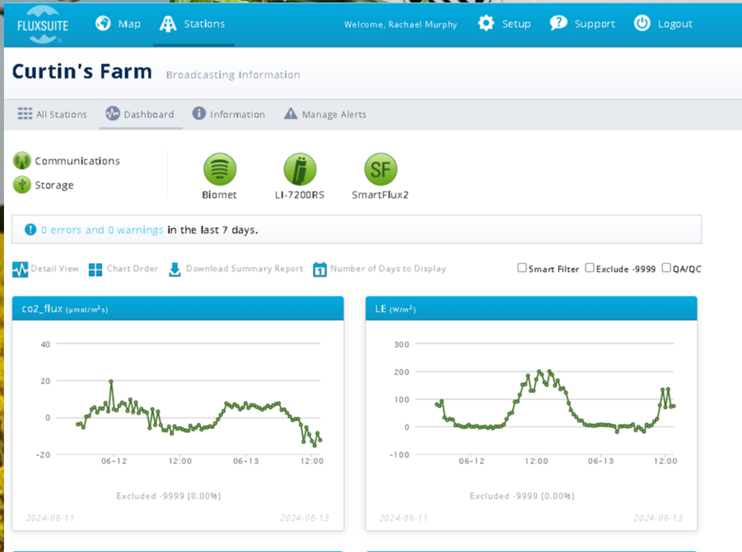
Soil C Stocks in depth



National Agricultural Soil Carbon Observatory







How do we measure short-term carbon stocks?

Gross Primary Productivity (GPP)
C uptake by plants through photosynthesis
(- sign)

Ecosystem respiration (Reco)
C released to the atmosphere by soil and plant respiration
(+ sign)

=
Net Ecosystem Exchange (NEE)

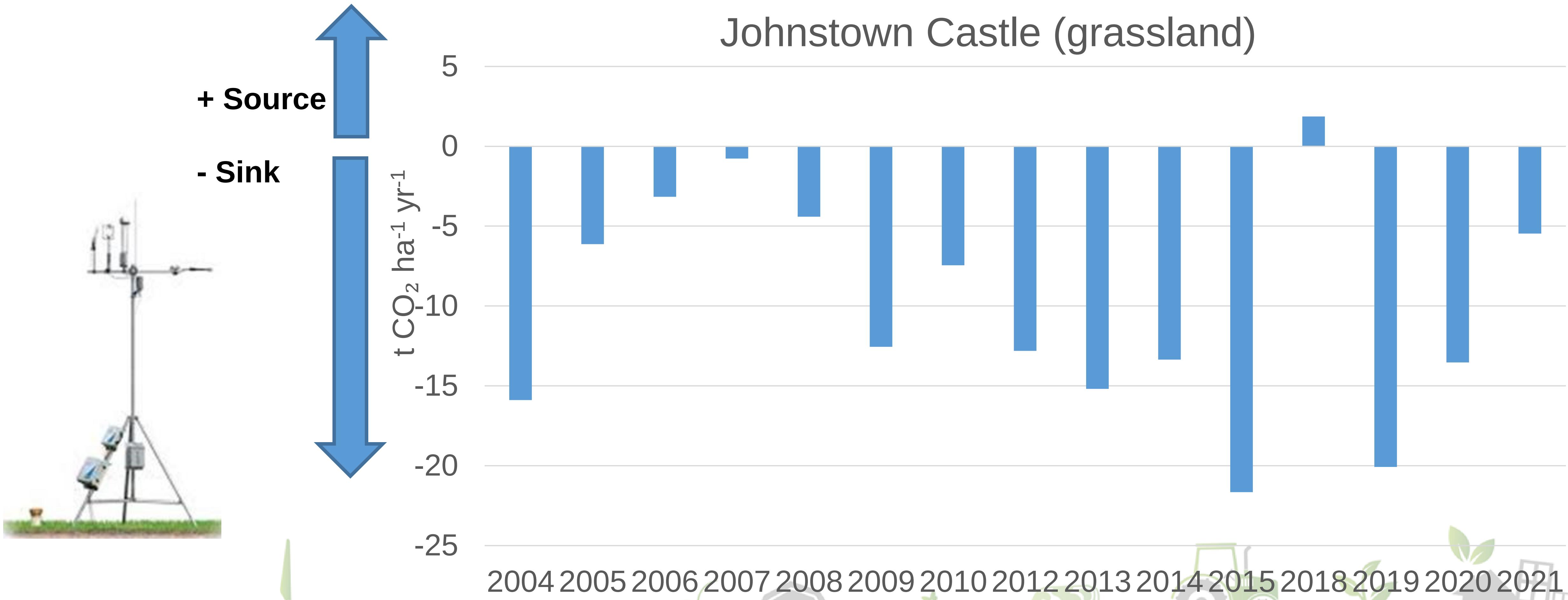
C removed through grass removals (C-Grass)
e.g. grazing, silage cuts , crop harvests etc.

C returned through excreta or organic fertilization (C-Excreta)
e.g. dung, slurry

C leached out of soil (C-Leached)

C balance g C m^{-2} yr^{-1} = NEE – C-Grass + C-Excreta – C-Leached

What are our findings from NASCO? - 1



- Carbon sink ranging from approx. 0.5 t CO_2 ha^{-1} yr^{-1} to 22 t CO_2 ha^{-1} yr^{-1}

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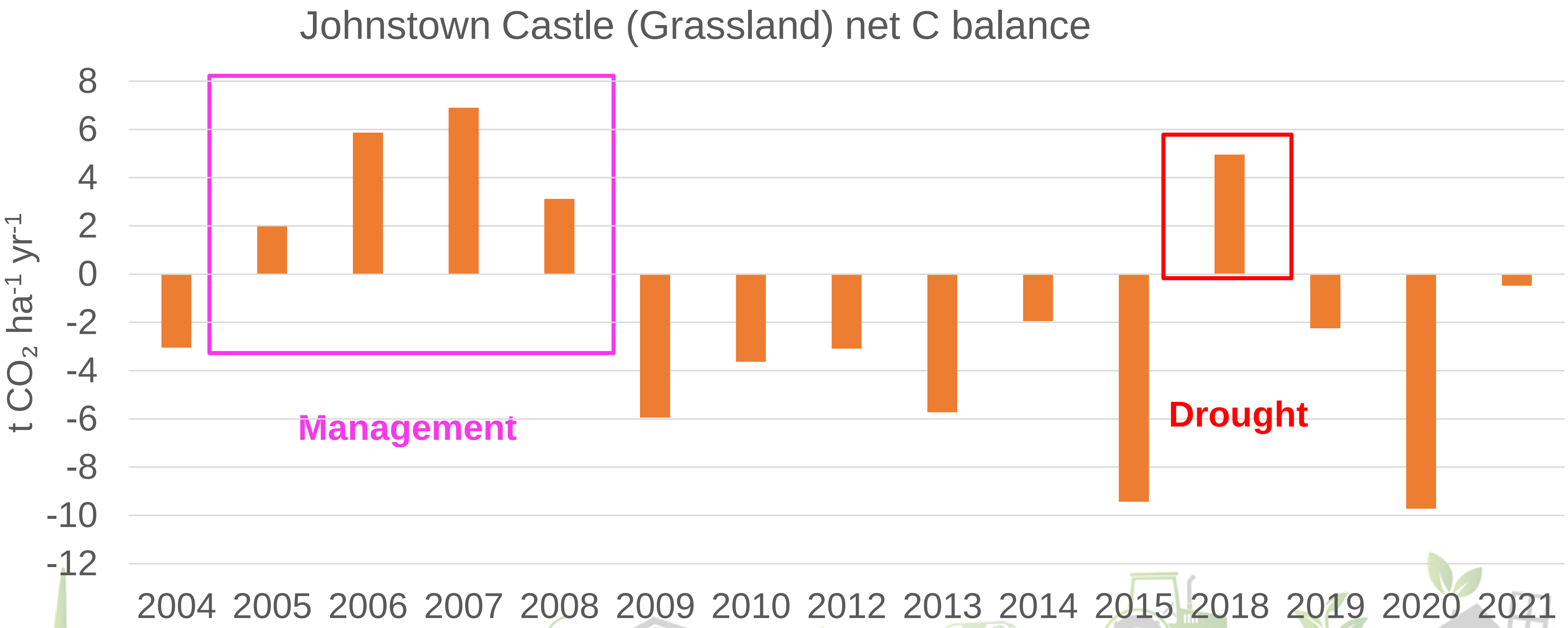
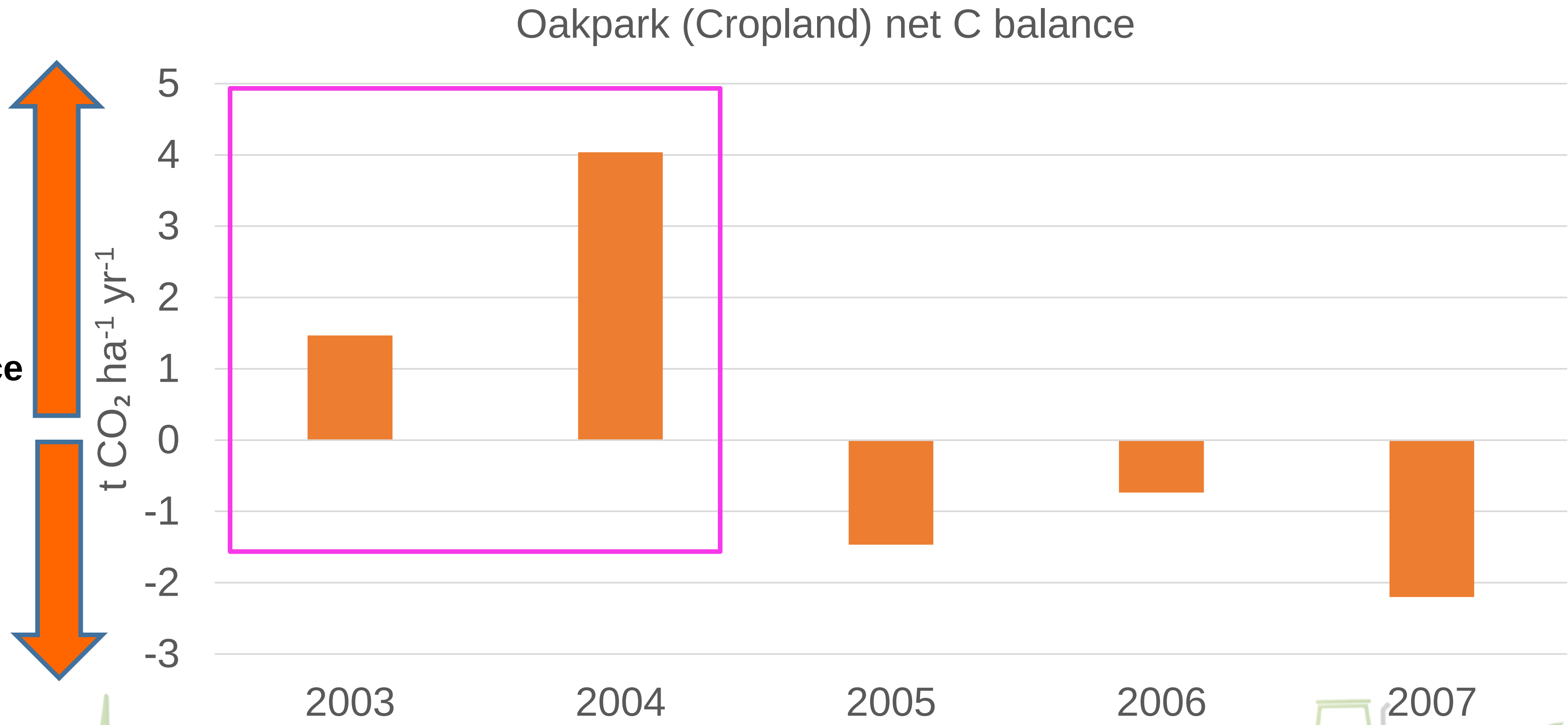
What are our findings from NASCO? - 2

+
C imports
-
C exports
=
C balance



- **Management:** Winter kale = source +6.8 t CO_2 ha^{-1} yr^{-1} ; Grass = sink -5.9 ± 0.83 t CO_2 ha^{-1} yr^{-1}
- **Drought:** Source of C at 4.9 t CO_2 ha^{-1} yr^{-1}

What are our findings from NASCO? - 3

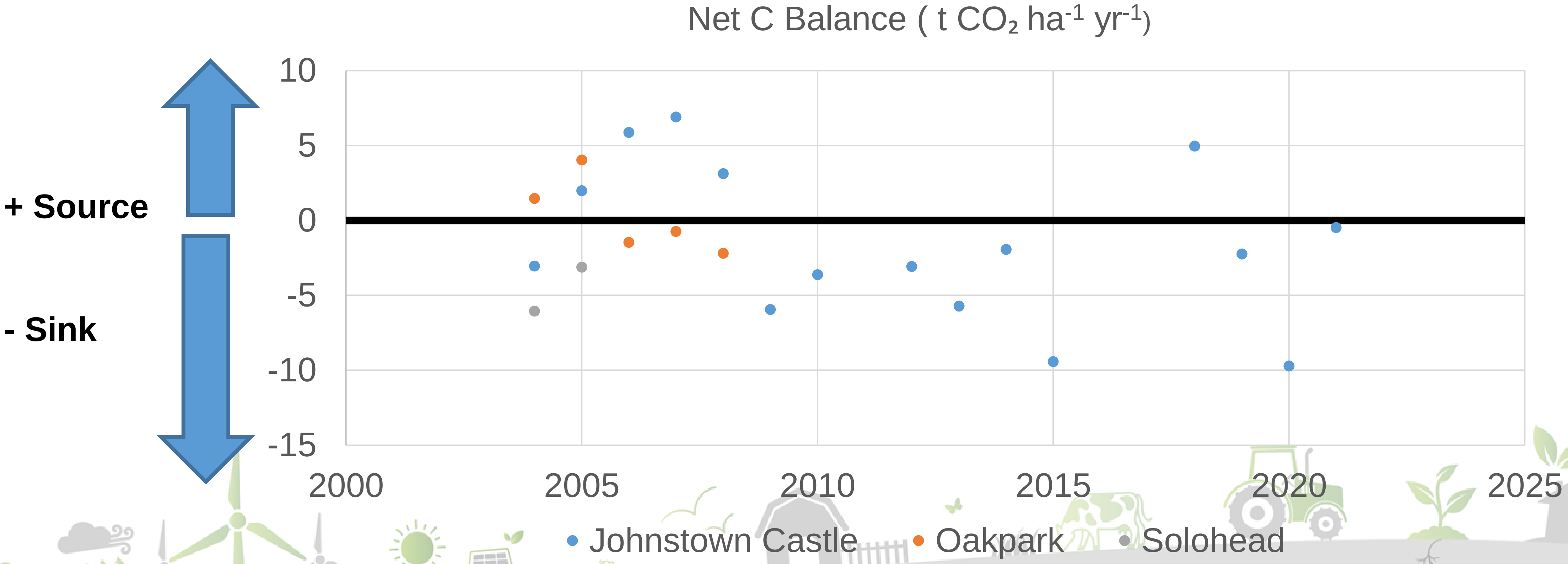


+
C imports
-
C exports
=
C balance

- **Management:** 2003 source of C from inversion tillage ranging from 1.4 – 4.0 t CO_2 ha^{-1} yr^{-1} ; 2005-2007 cover crop of C ranging from 0.7 to 2.2 t CO_2 ha^{-1} yr^{-1}

What are the impacts of these preliminary findings?

- Mean C sequestration is 0.64 tC ha-1 yr-1 or 2.34 tCO_2 ha^{-1} yr^{-1}
- National Inventory Report = 0.1 tC ha^{-1} yr^{-1} or 0.38 tCO_2 ha^{-1} yr^{-1}



What are the take-home messages?

- Soil C of Irish farms is very high relative to EU soils
- Preliminary data shows that managed mineral soils are sequestering more carbon than previously estimated
- Changes C stocks are driven by land-use, soil type, management and climate events
- The gold standard for measuring C stocks accurately involves
    - High resolution C fluxes coupled with management data
    - Measuring C stocks at depth

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