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Crop rotation and soil organic carbon saturation

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www.agroscope.ch | une bonne alimentation, un environnement sain



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Role of Soil Organic Carbon (SOC)



www.4p1000.org

1) Historical role

- soil fertility (e.g. water and nutrient supply) → food security

2) Recent role

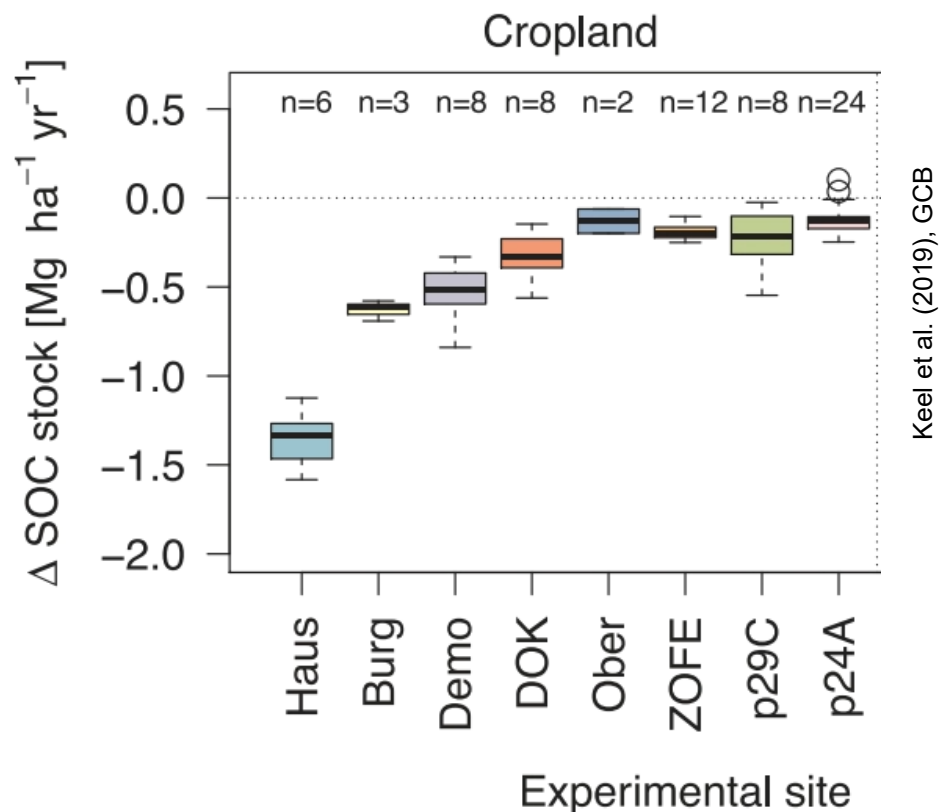
- CO₂ sink by SOC accumulation → Climate change mitigation
- Soil resilience to extreme climatic events → Climate change adaptation

How to increase SOC and how much can be stored?



C sink capacity of cropland

Cropland soils are losing SOC



SOC depletion in croplands
=
C sequestration potential
if
the C sink is re-filled

At which reference could we aim?

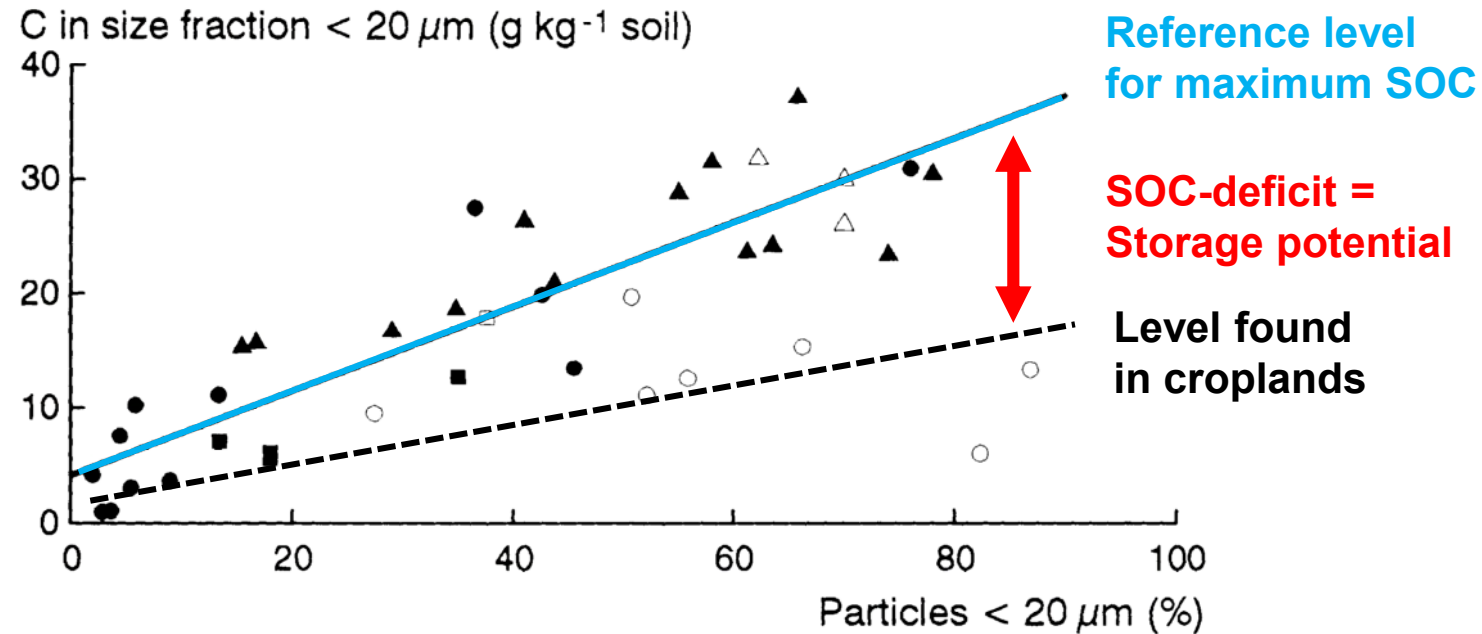


SOC saturation

Hassink (1997), P&S

- **Grasslands** are considered as C-saturated soil
- SOC depends on **soil texture**

→ Relation between SOC in fine pools and soil texture in grasslands



- Does the relationship change in CH?
- Are grasslands really saturated in SOC?
- What are the factor influencing SOC-deficit in croplands?



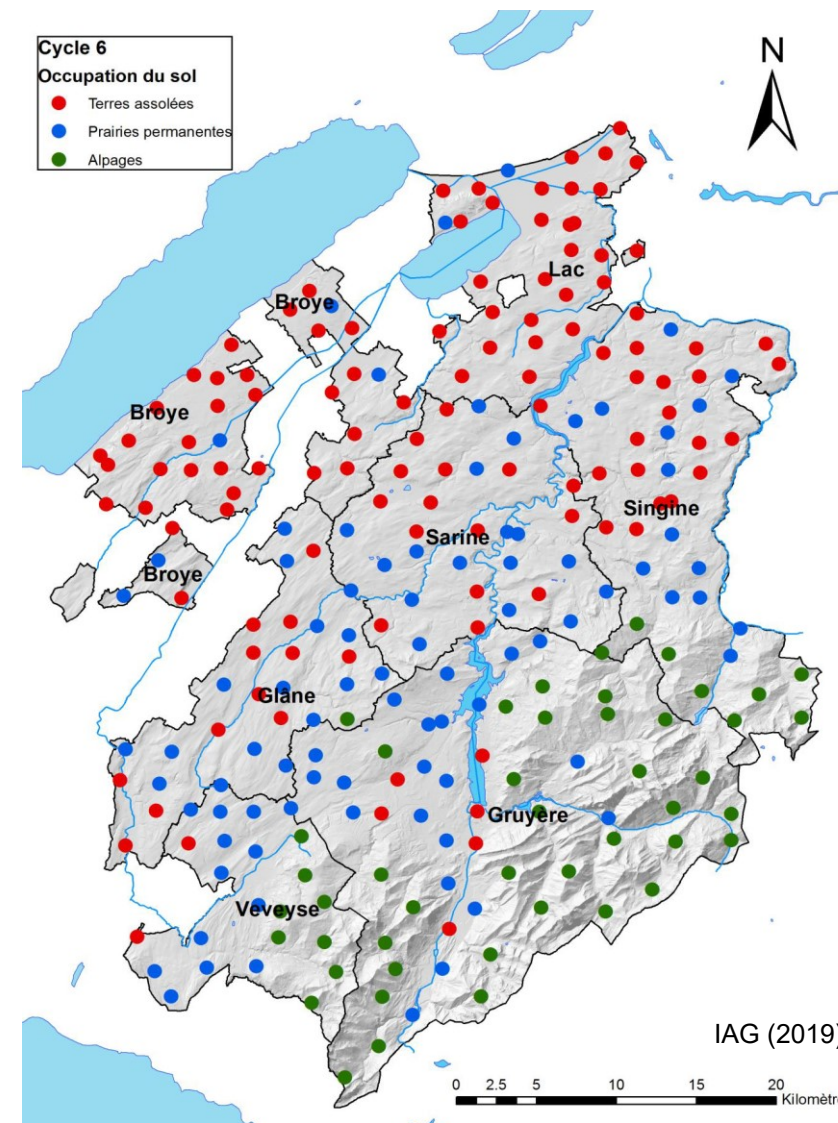
FRIBO network



ETAT DE FRIBOURG
STAAT FREIBURG

Grangeneuve

- 250 sites
- Established in 1987
- Managed by Grangeneuve Institute
- Measurements every 5 years
- Soil quality parameters (0-20 cm)



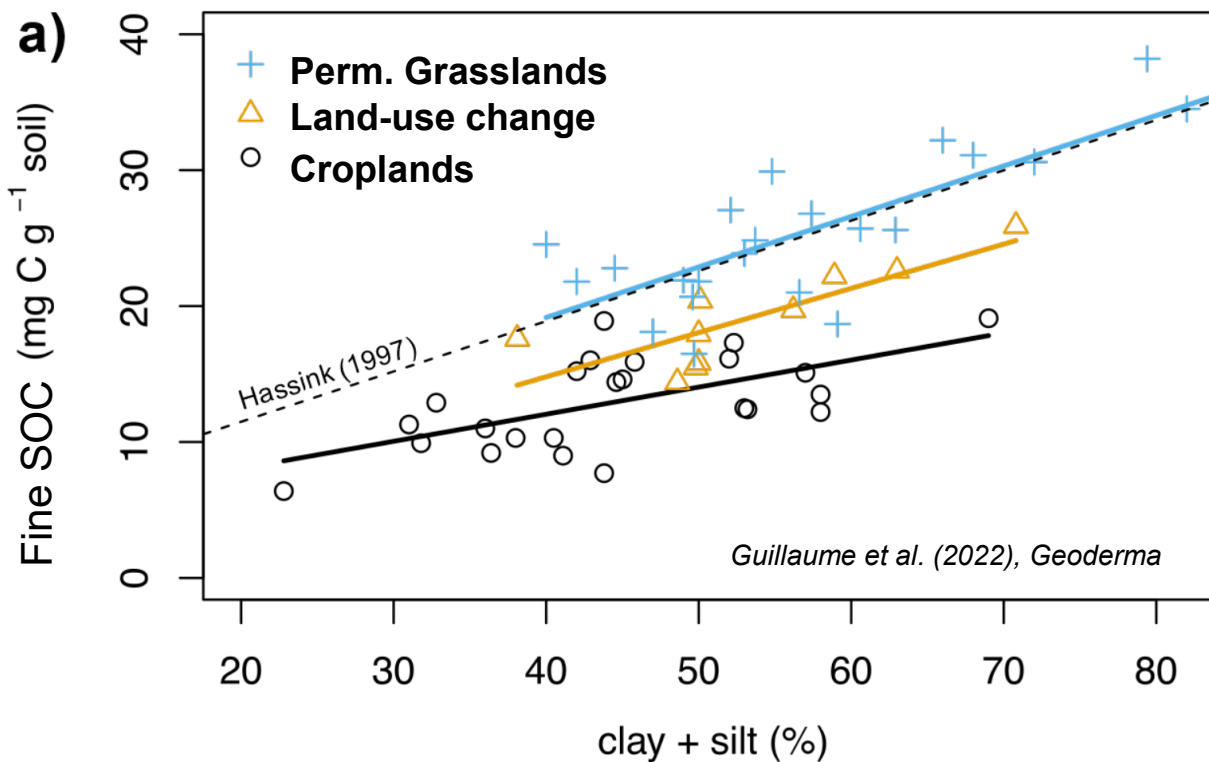


SOC-deficit in croplands

- Same as Hassink (1997)



- Croplands strongly depleted in SOC

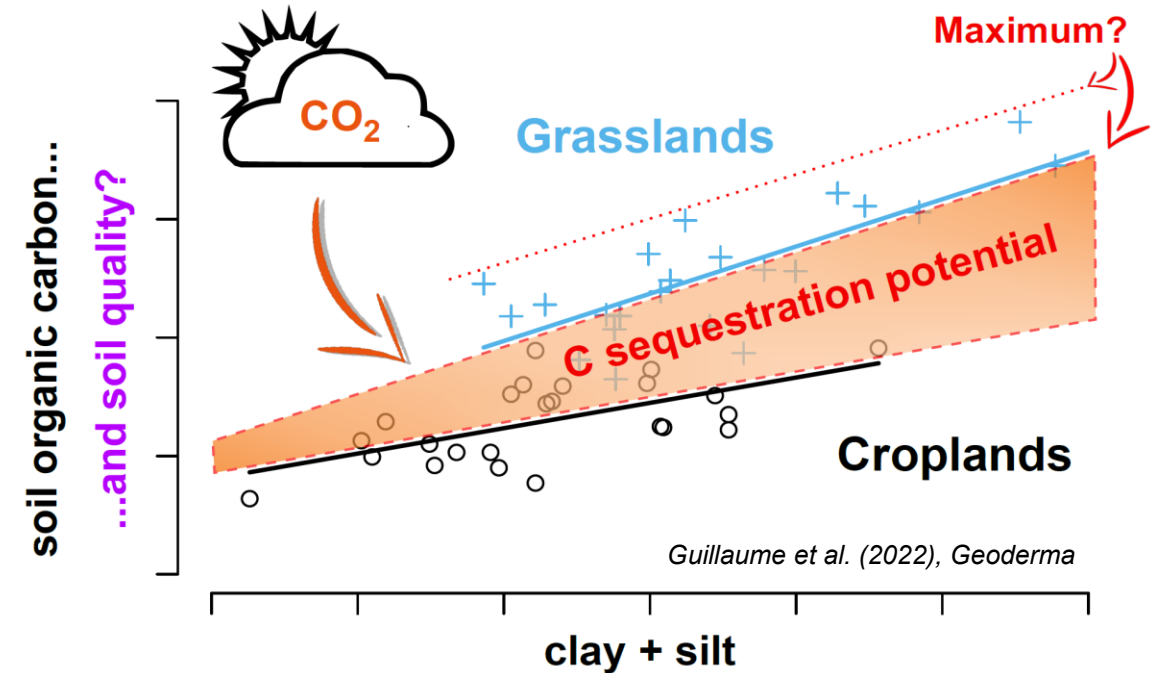
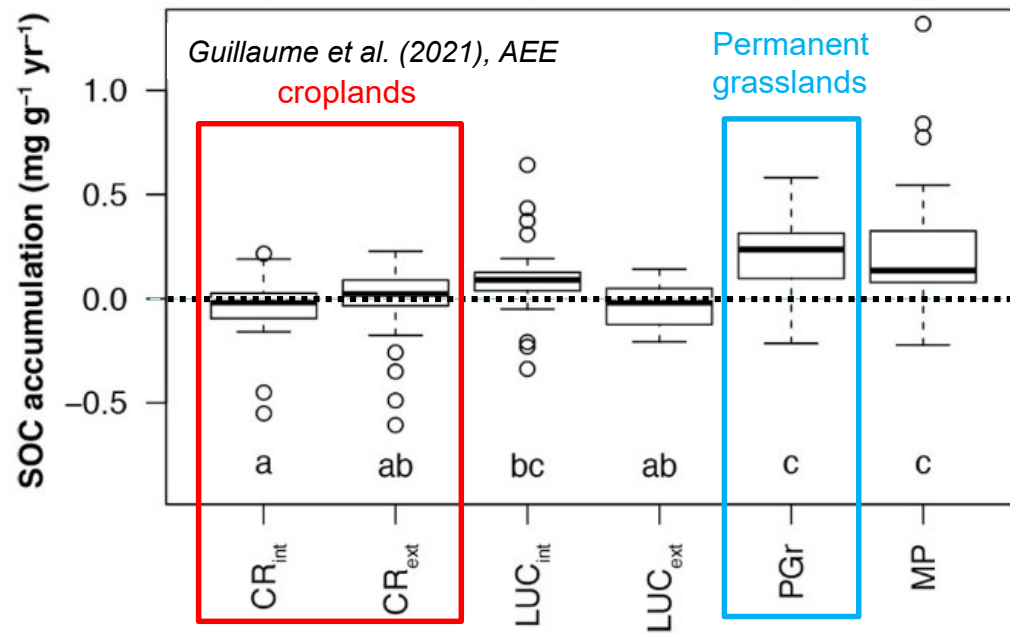


Is it a proof that grasslands are saturated in SOC?



SOC dynamics in FRIBO in the last 30 years

- Grasslands have accumulated SOC → C sequestration potential more important?



What are the factors influencing SOC deficit in croplands?

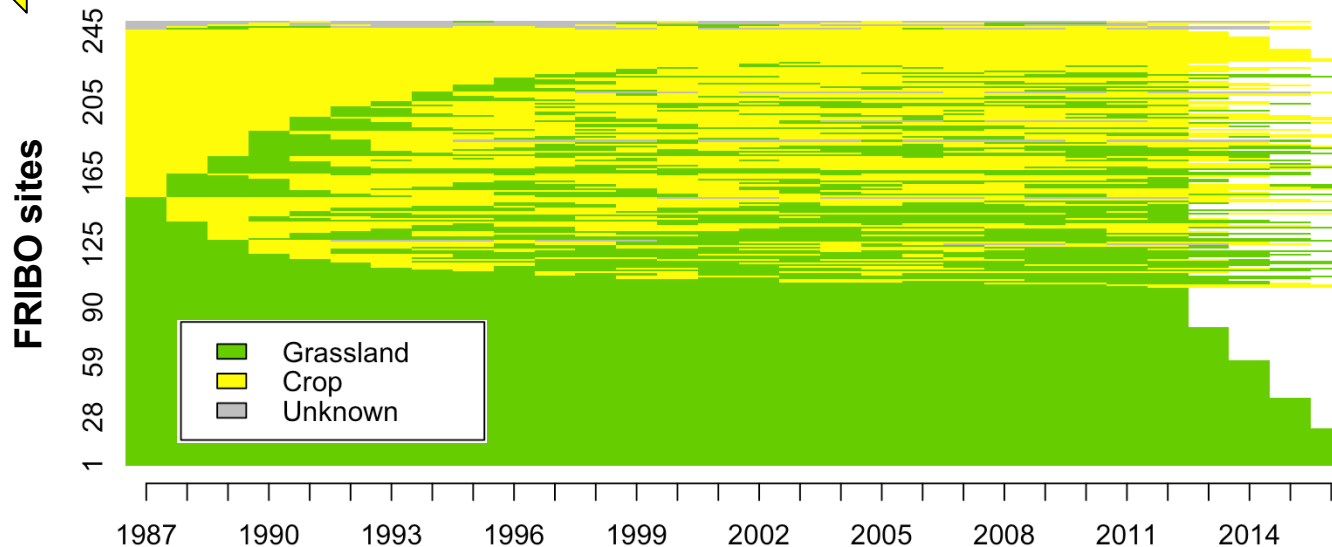


Cropland-grassland continuum



Croplands
crops only

Grasslands
permanent





Impact of temporary grasslands on SOC stocks

- SOC stocks deficit / **accumulation** depends on the **proportion of TG** in the rotation
- Effect down to 50 cm depth

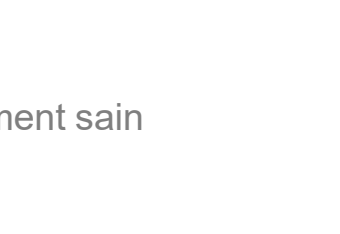
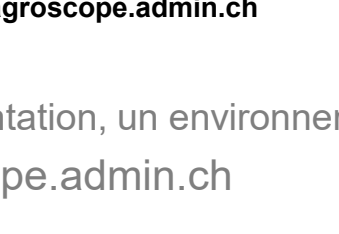
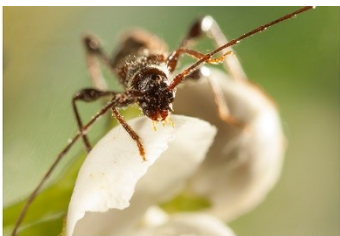
Converting all croplands of FR
into grasslands
would compensate for maximum
1 year of total GHG emissions of FR

Guillaume et al. (under review)

Take home message

- C sequestration in agricultural soils is one of many tools to mitigate climate change
- Importance of temporary grasslands in crop rotations
- Regional planning of crop rotation to enhance soil services at landscape level?
 - Fourrage contre fumier? -





Merci pour votre attention

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