Practices to capture carbon in the soil

Topic
Technical efficiency

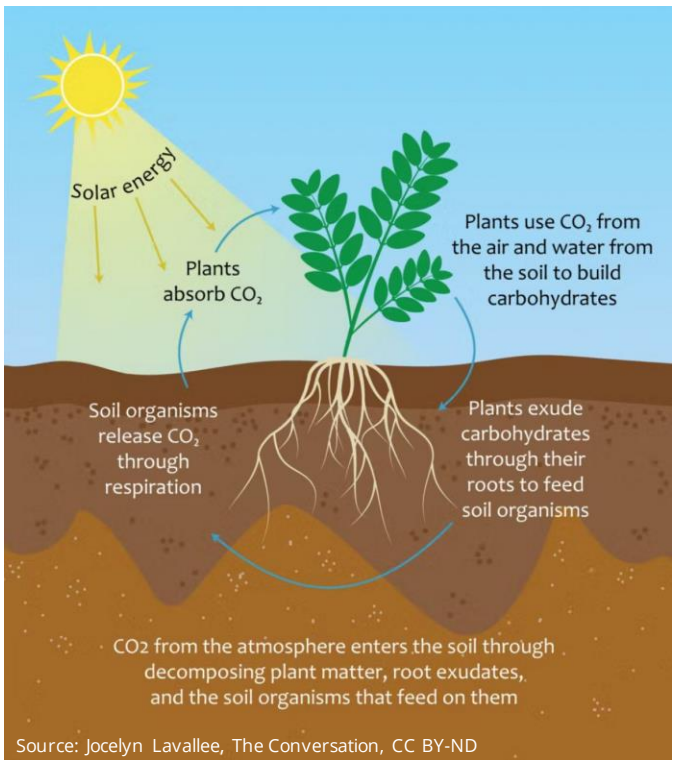
Topic
Environment

Background

Climate resilience is one of today's major challenge and carbon management is important to succeed on it. Indeed, carbon sequestration in the soil is an important lever. This sequestration is closely dependent of soil organic matter level. Some agricultural practices are benefit for it like no tilling and permanent vegetal cover.

How does it work?

Fundamental principle of carbon sequestration :



At farm system level, the most important is to **return everything to the soil** :

- **Exported crops** (maize silage, straw, grass, forage catch crop) must **came back through manure** spread on land
- For sale crop, **maximize residues incorporation** (no selling of straw outside of the farm or balanced by manure purchase)

How to do it ?

The main goal is to have a high soil organic matter (OM) level

To improve carbon sequestration in a soil, we need organic matter in it. Higher is MO content, higher resilient is the soil.

Humic assessment is a good tool to manage organic soil stock and adapt technical operations

Two levers should be activated to maintain/improve OM level :

- **Conservation tillage**

Less soil is tilled, lower carbon is destocked. It's important to use no tilling practices like direct seeding, strip till or shallow tillage.

- **Permanent vegetal cover**

Soil need to be covered all year so vegetal cover between two crop is necessary. Cover should be choosing depending to previous crop and humic assessment:

- High N-credit > cover with cruciferous to capture nitrogen and let it lignified to stock carbon
- Low N-credit = cover with legumes to enrich the soil in nitrogen

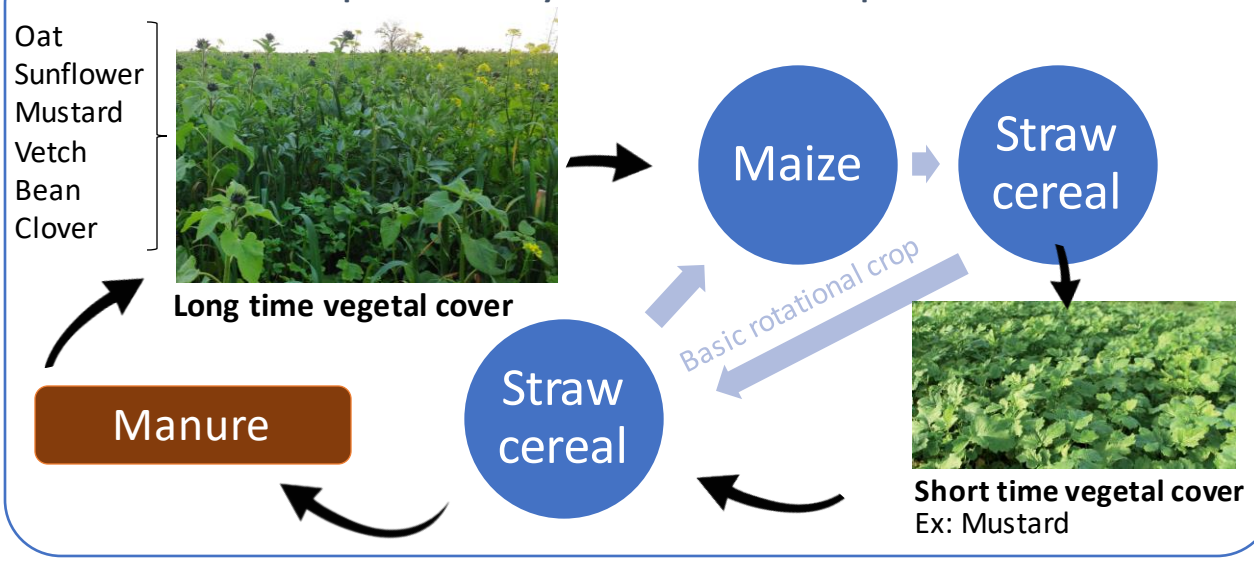
Practices advantages

- Improve carbon sequestration
- High MO content and permanent cover = better resilience of the soil to extreme weather event (ie drought)
- Vegetal cover benefits to carbon sequestration but also for soil structure and broke crops pets or fungal soil disease cycle (like mustard between two straw cereal)
- Conservation tillage practices reduced fuel use = ↓carbon emissions

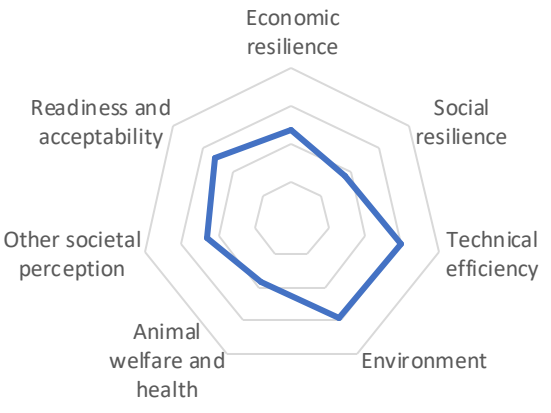
Be careful, especially on these points

- Choice of cover depending to previous crop and humic assessment
- Impact of direct seeding practices on soil machineries farm management that can lead to significant investment
- Soil management depending to your region (climate, pedologic context, soil texture) and your rotational crop ("easier" with cereals but "harder" with industrial crops growing into the soil)

Example into a dairy farm's rotational crop like this:



Assessment of method - Expert



Quotes of farmers :

All the levers activated on our dairy farm allowed us to reduce the carbon footprint to 92g of CO^2/l of milk and save 20 000 €/year

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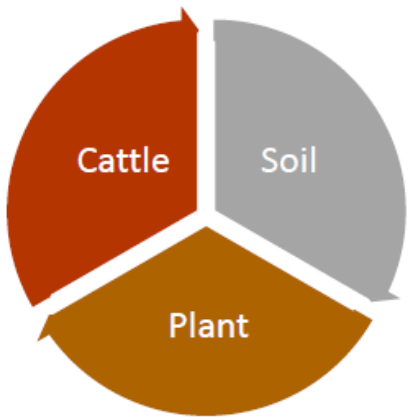
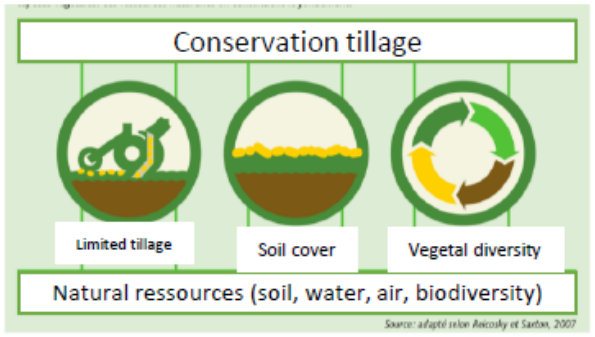
Conservation tillage & other practices

Goals :
- On the cattle : to have older cows
- Improve feed self sufficiency
- Improve soil fertility

Principle :





Practice n°1 : Cover crop management

Mix common vetch, tansy phacelia, flax, horsebean, crimson clover

After harvest	Before 10th march	April	April
•Manure spreading •Cover crop sowing	•**Destruction** •Frost effect •1L glyphosate	•Seedbed (5cm) •With a rotary harrow	•Maize •Machine to localize the fertilizer •Cultipacker to settle soil

Practice n°2 : Cereal-protein mixture for silage

Mix 1 = 70 kg rye, 4 kg clover, 20kg hairy vetch
Mix 2 = 80kghorsebean, 30kg winter oat, 20kg clover, 25kg common vetch

- Sowing 15-20 sept
  - Mix 1
    - Harvest 15 april
    - Followed crop : maize cob
  - Mix 2
    - Harvest 15-20 may

Practice n°3 : Temporary grassland

Hybrid ryegrass and red clover

➔ To manage foaxtail in wheat crop, to produce quality forage if possible

Practice n°4 : Maize cob

➔ To concentrate energy in the ration, compatible with grass or protein forage