

RE-CORD

Renewable Energy Consortium for Research & Demonstration



DECARBONIZZAZIONE, TRANSIZIONE ENERGETICA: A CHE PUNTO SIAMO? CARBON FARMING E BIOCHAR COME RISORSA PER LE FILIERE AGROALIMENTARI: QUALI OPPORTUNITA'?

LA TRANSIZIONE ECOLOGICA AL CENTRO DELLE POLITICHE LOCALI
Montemurlo 14 Marzo 2024

Tommaso Barsali

Head of Proposals & Senior Agronomist



Politecnico
di Torino



UNIVERSITÀ
DEGLI STUDI
FIRENZE

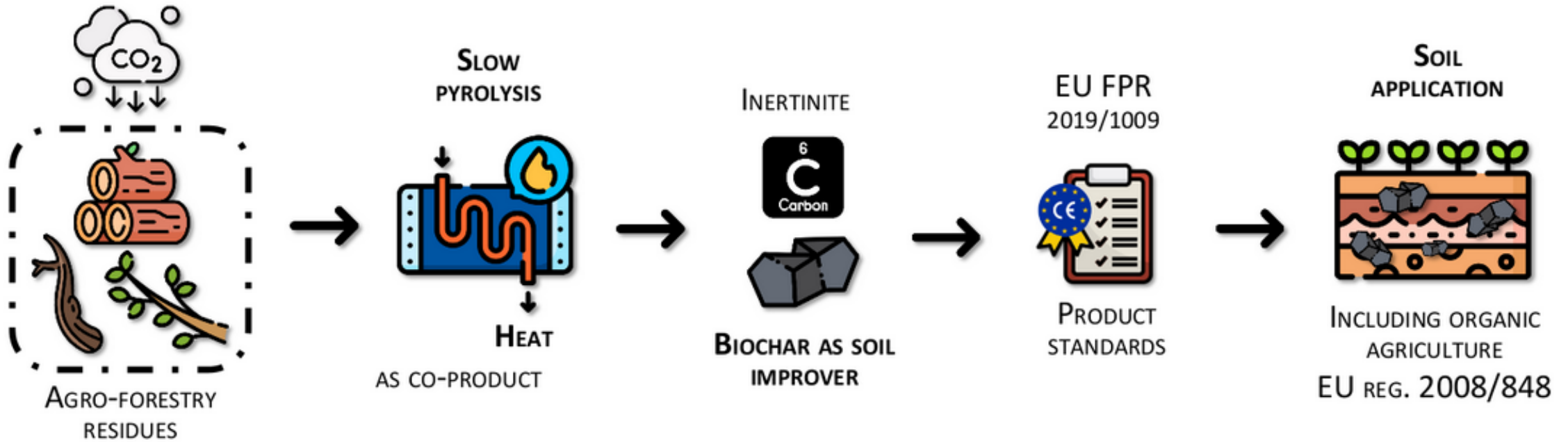
IL BIOCHAR



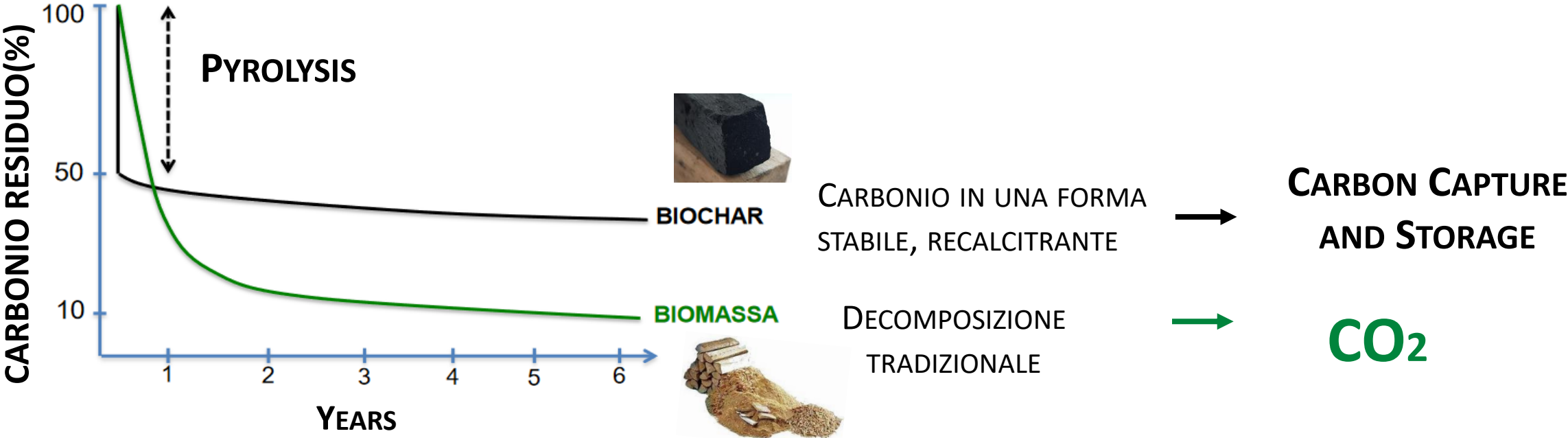
Il Biochar è il prodotto della **conversione termochimica** di materiale organico in assenza o limitata presenza di ossigeno



Il termine **Biochar** si riferisce a un **carbone vegetale** utilizzato come **ammendante dei suoli** con la capacità di **stoccare carbonio a lungo termine** nel suolo



IL CARBONIO ORGANICO DEL BIOCHAR



Il tasso di degradazione del biochar incorporato al suolo è stimato essere pari a 0.3% all'anno (IPCC)

➔

Dopo 100 anni dopo l'applicazione al suolo, il 74% del carbonio originario nel biochar potrebbe essere ancora considerato come carbonio sequestrato

LA POROSITA' E IL DEL BIOCHAR



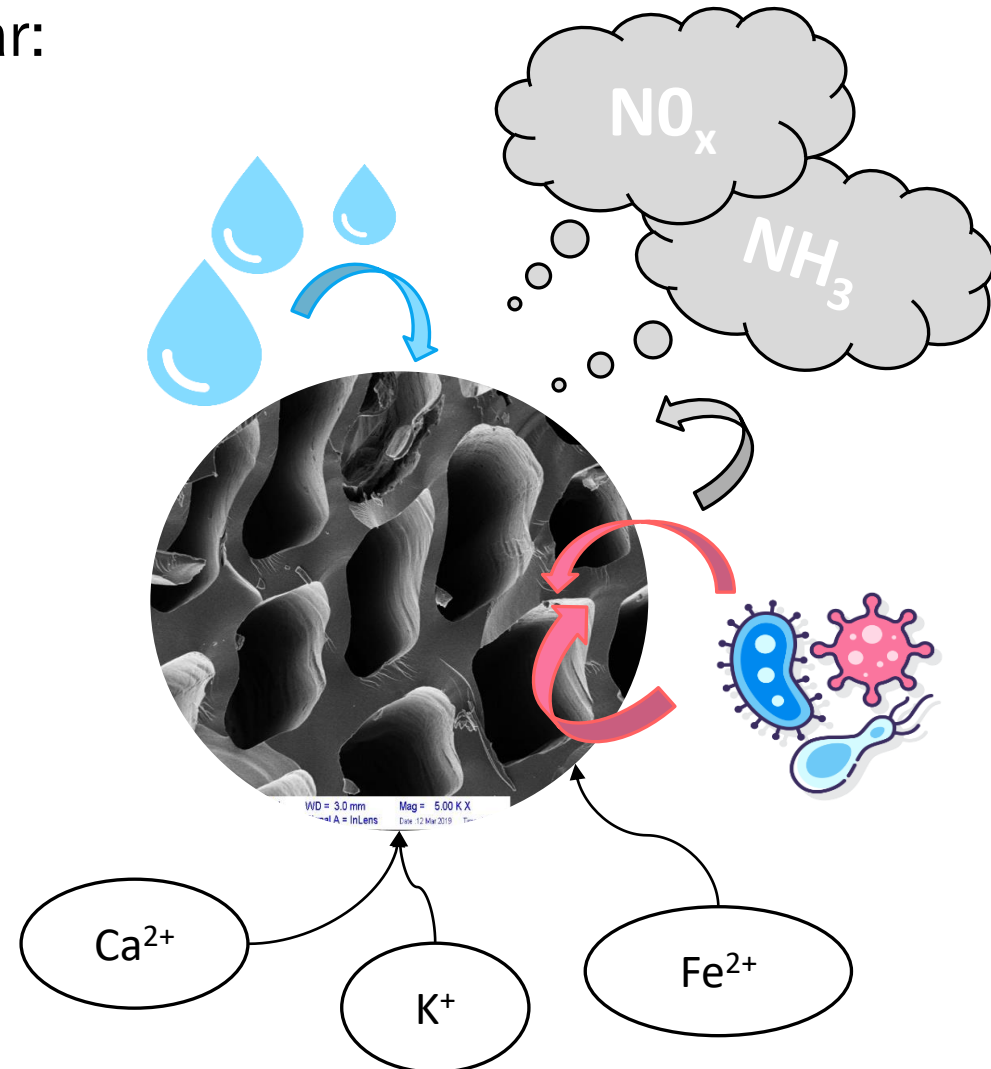
Tre tipologie di porosità caratterizzano il biochar:

- ▣ Macroporosità (>50 nm)
- ▣ Mesoporosità (50 – 2 nm)
- ▣ Microporosità (< 2nm)

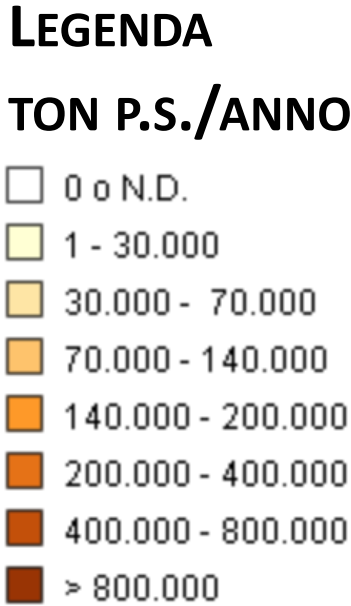
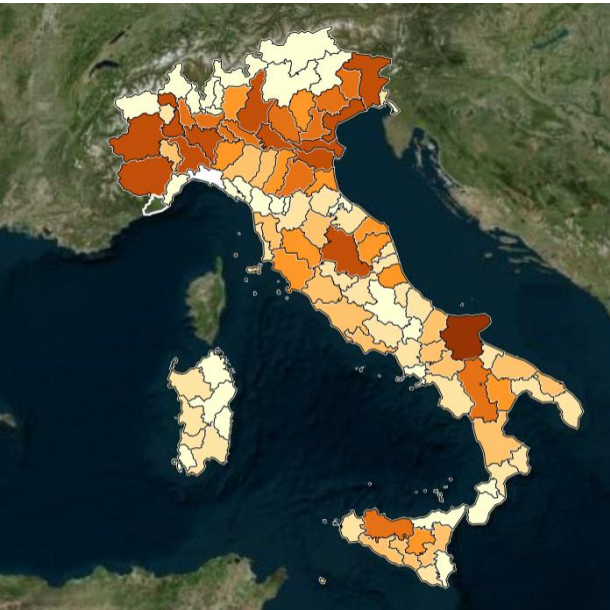


Effetto del Biochar asl suolo

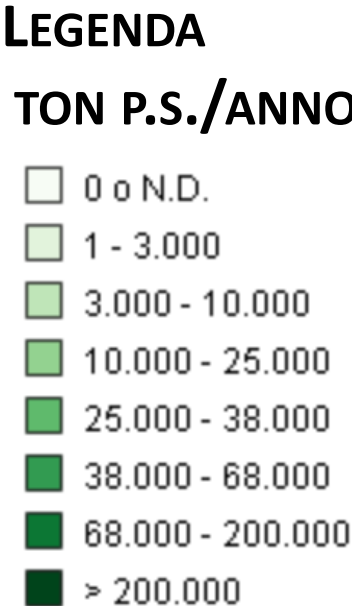
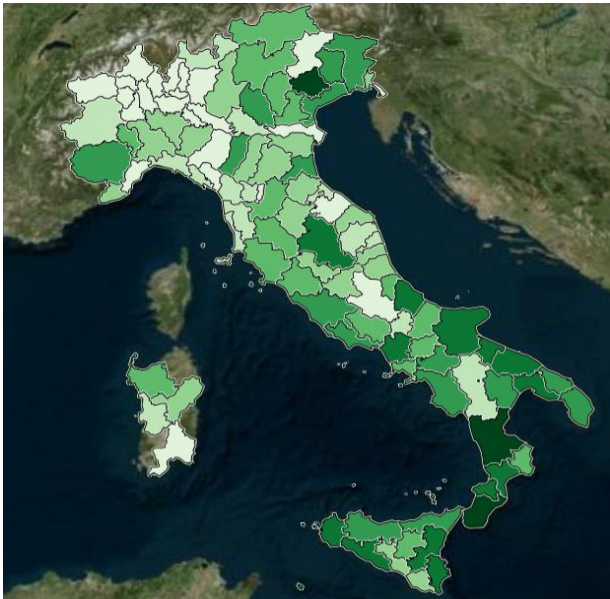
- ▣ Capacità di ritenzione idrica
- ▣ Aumento ritenzione dei nutrienti
- ▣ Habitat ideale per microrganismi
- ▣ Alta capacità di scambio cationico



BIOCHAR FEEDSTOCK



BIOMASSA DA PAGLIA DI CEREALI
14.330.000 TON D.B./ANNO



BIOMASSA DA POTATURE DI ALBERI DA FRUTTO
2.264.000 TON D.B./YEAR



In which conditions can biochar (alone or co-composted) be synergistic in addressing these 3 problems?

1) How can farmers restore marginal lands and soils low in organic carbon?

By adopting and intensifying sustainable agricultural regenerative practices (cover crops, agroforestry, intercrops, perennials, no-till, microorganisms, mulching...) and organic amendments (compost, biochar, green manure...).

2) How can farmers increase water use efficiency in rainfed agriculture?

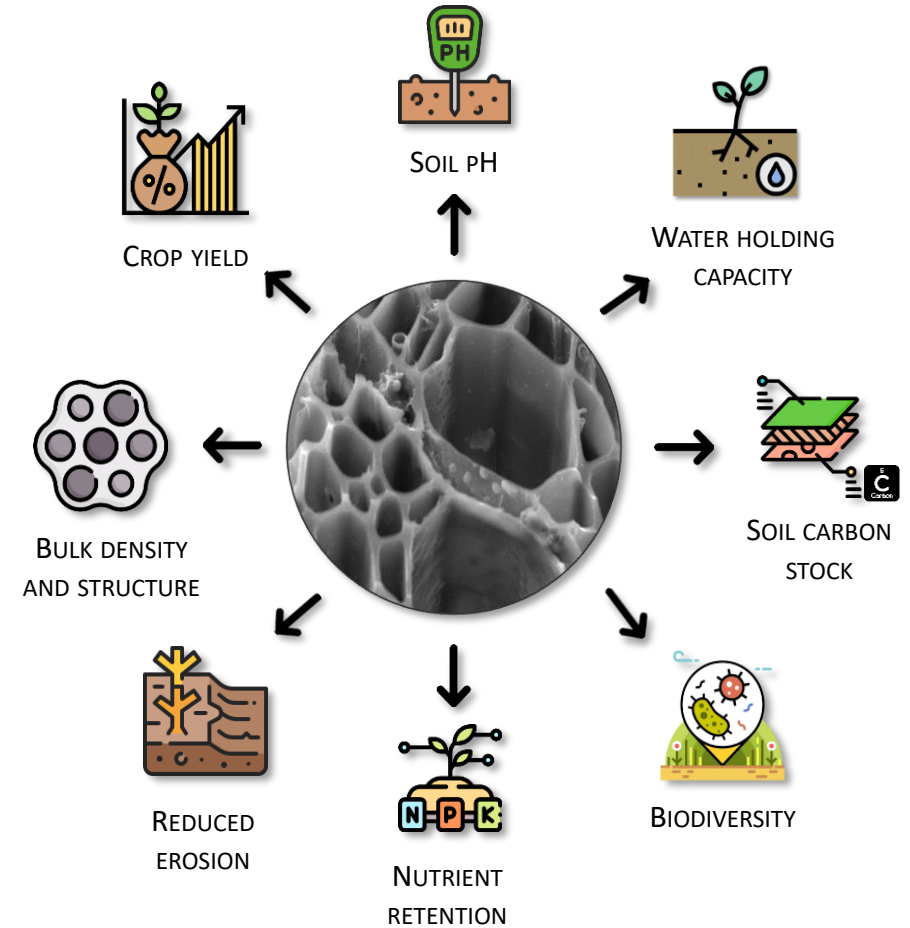
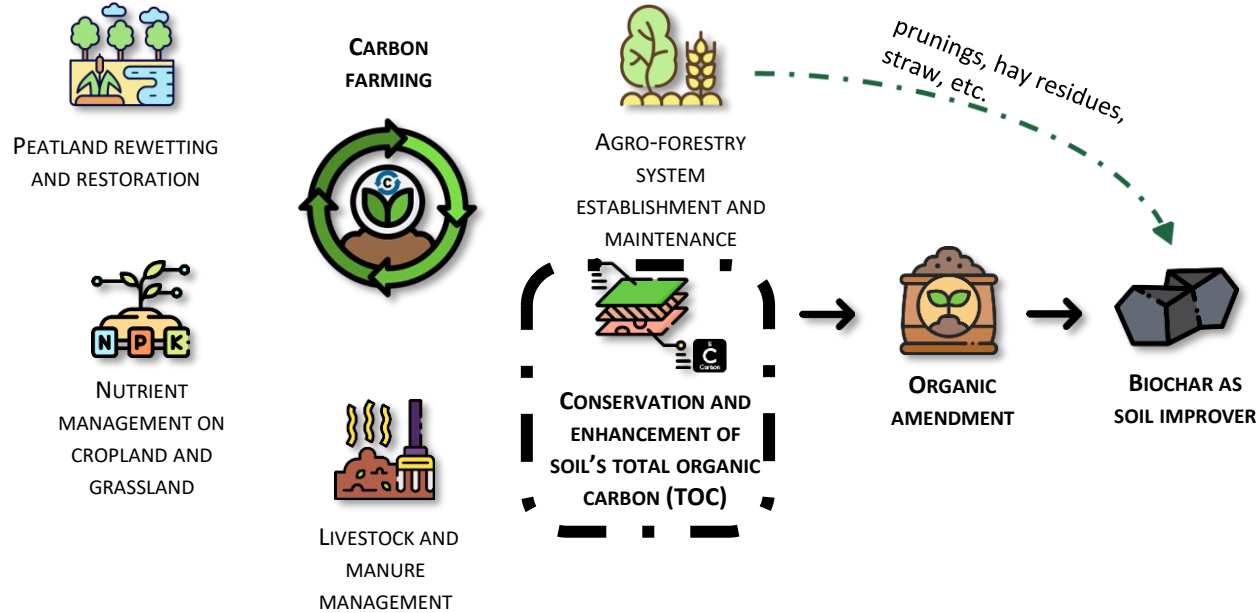
Increase the capacity of soil to retain water available for plant roots, for which soil bulk density, structure, organic matter and porosity are important.

3) Carbon sequestration in soil needs to be long-lived.

Soil carbon is not consumed and/or recalcitrant carbon is introduced through organic amendments.



Biochar is not a one-size-fits-all silver bullet, but it can be successfully deployed synergistically with other solutions.

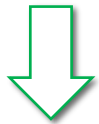


BIOCHAR PER IL CARBON FARMING



Biochar può essere integrato con altre pratiche sostenibili di gestione del suolo

- ❑ Riduzione del disturb del suolo (minimum tillage)
- ❑ Miscelato o co-compostato con sostanza organica (digestato, letame, ..)



**PRATICHE DI CARBON FARMING
PER AUMENTARE LO STOCK DI
CABRONIO ORGANICO NEI SUOLI**



EU MISSIONS
SOIL DEAL FOR EUROPE



1. Reduce desertification

2. Conserve soil organic carbon stocks

3. Stop soil sealing and increase re-use of urban soils

4. Reduce soil pollution and enhance restoration

5. Prevent erosion

6. Improve soil structure to enhance soil biodiversity

7. Reduce the EU global footprint on soils

8. Improve soil literacy in society

BIOCHAR PER IL CARBON FARMING

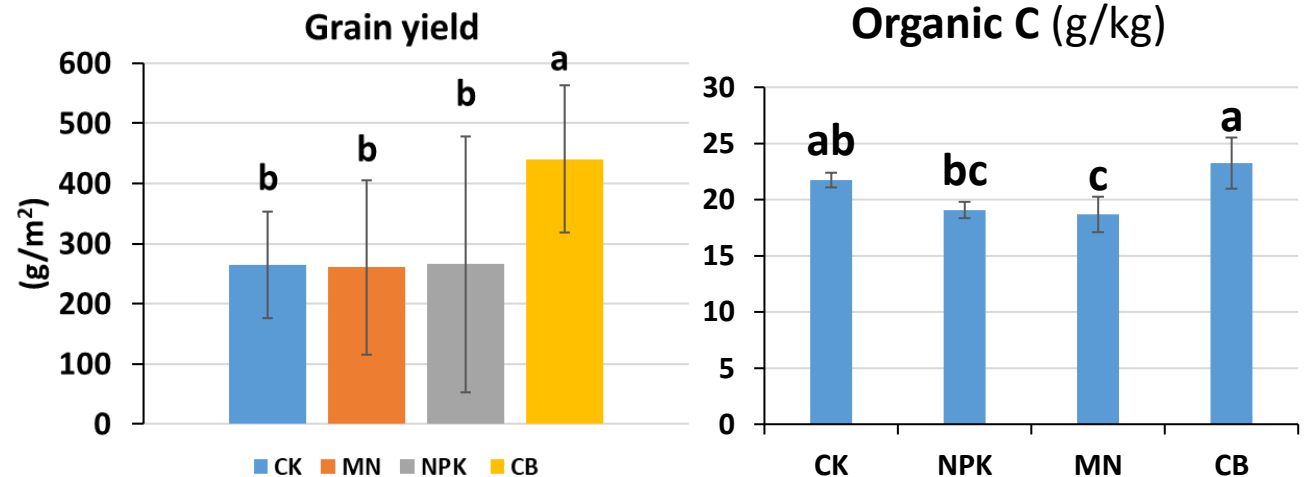


Biochar can be successfully deployed in a wide range of of different situations, especially in sub-acidic/acidic soils, sandy soils and in marginal land prone to drought.

In a 5 years experiment, the one-time addition of relatively small dose of co-composted biochar (3 t/ha equivalent) produced significant results in terms of yield and oil content of the cultivated oleaginous crop *Camelina sativa* (L.).

In organic spring barley cultivated in marginal land in 1 low rainfall year, biochar co-composted with manure (at 1.9 t_{biochar}/ha equivalent rate) produced:

- +40% yield increase (with similar protein content)
- increased carbon stock in soil (BD*TOC)
- improved manure N use efficiency



E GLI AGRICOLTORI?



The adoption of biochar as a carbon farming method for agronomic improvement is very scarce.

Which barriers to biochar deployment as a sustainable agronomic practice and a carbon farming option?

- 1) **Lack of awareness** on pyrolysis technology (not farmers' usual cup-of-tea)
- 2) Need of **technical assistance** for agronomic use (how much, when, which synergies, mechanization)
- 3) High price/low availability of biochar as an external input
- 4) Skepticism on **yield** effect
- 5) Concern about polluting effect (but biochar is in EU Regulation 2019/1009)

Which conditions to upscale biochar?

New cooperation models e.g. a biochar community for feedstock, pyrolysis plants and biochar use (Local Biochar Communities).

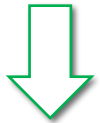
In a business model where foresters and farmers group themselves, to collect feedstock, optimize investment in a cooperative pyrolysis plant and distribute biochar in agricultural fields, the value of the carbon credit generated on the Voluntary Carbon Markets can **return its monetary benefits where the value has been generated.**

BIOCHAR FOR THE CARBON MARKET



CARBON MARKETS CAN BE BROADLY DIVIDED INTO TWO SEGMENTS:

- ❖ **COMPLIANCE MARKETS:** DRIVEN BY BINDING EMISSION REDUCTION TARGETS (E.G. **ETS FOR EU**) OR OTHER TYPES OF REGULATION (E.G. TAX) => **BIOCHAR FOR SOIL APPLICATION IS NOT STILL INCLUDED AS C REMOVAL STRATEGY - DG AGRI GAVE A FAVORABLE OPINION ON THE ENTRY OF BIOCHAR INTO THE ETS**
- ❖ **VOLUNTARY MARKETS:** CORPORATES OR INDIVIDUALS WHO WISH TO OFFSET THEIR EMISSIONS (“VOLUNTARY OFFSETTING”)



NOVEMBER 2022: PROPOSAL FOR A REGULATION THAT ESTABLISHES A VOLUNTARY UNION CERTIFICATION FRAMEWORK FOR CARBON REMOVALS



PERMANENT STORAGE

E.g. Bioenergy with Carbon Capture and Storage (BECCS), Direct Air Carbon Capture and Storage (DACCS)

Industrial leadership for climate-neutral technologies



CARBON FARMING

Soil and forest activities in the scope of the LULUCF Regulation, including: Peatland restoration, agroforestry, sustainable forest management, soil carbon sequestration,

Strong synergies with biodiversity



CARBON STORAGE IN LONG-LASTING PRODUCTS

E.g. wood-based construction materials and other carbon-storing construction products

New European Bauhaus

BIOCHAR FOR THE CARBON MARKET AND FOR THE SOIL MISSION



AUGUST 2023: AMENDMENT PROPOSAL FOR A REGULATION THAT ESTABLISHES A VOLUNTARY UNION CERTIFICATION FRAMEWORK FOR CARBON REMOVALS

Amendment 40
Proposal for a regulation
Article 2 – paragraph 1 – point g

Text proposed by the Commission

(g) ‘permanent carbon storage’ means a carbon removal activity that, under normal circumstances and using appropriate management practices, stores atmospheric or biogenic carbon for *several centuries*, including bioenergy with carbon capture and storage and direct air carbon capture and storage;

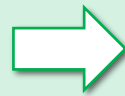
Amendment

(g) ‘permanent carbon storage’ means a carbon removal activity that, under normal circumstances and using appropriate management practices, stores atmospheric or biogenic carbon for *a significant period of time*, including bioenergy with carbon capture and storage, **biochar** and direct air carbon capture and storage;

Amendment 42
Proposal for a regulation
Article 2 – paragraph 1 – point h a (new)

*(ha) ‘carbon farming storage’ means a carbon farming activity that stores atmospheric and biogenic carbon in living biomass, **biochar**, soils and dead organic matter as defined per carbon farming activity in the certification methodology;*

BIOCHAR IS A **VERIFIABLE, MEASURABLE AND STABLE** FORM OF CARBON, **VERY HIGH C-REMOVAL** THRESHOLD AND IS ONE OF THE CHEAPEST WAY TO ENSURE LONG- LIVED CARBON REMOVAL IN AGRICULTURE



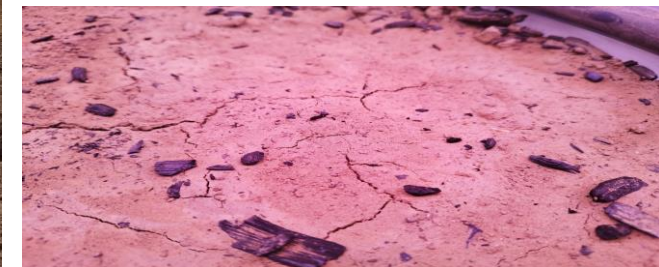
THE USE OF BIOCHAR IN AGRICULTURE SUPPORT THE **EU MISSION SOIL** FOR RESTORING ORGANIC CARBON STOCK IN SOIL IN ARABLE LAND TO COUNTERACT MARGINALIZATION



RE-CORD PROJECTS



[HTTP://WWW.RE-CORD.ORG/](http://www.re-cord.org/)



THANK YOU!

TOMMASO.BARSALI@RE-CORD.ORG