



Carbon Farming – two years of experience

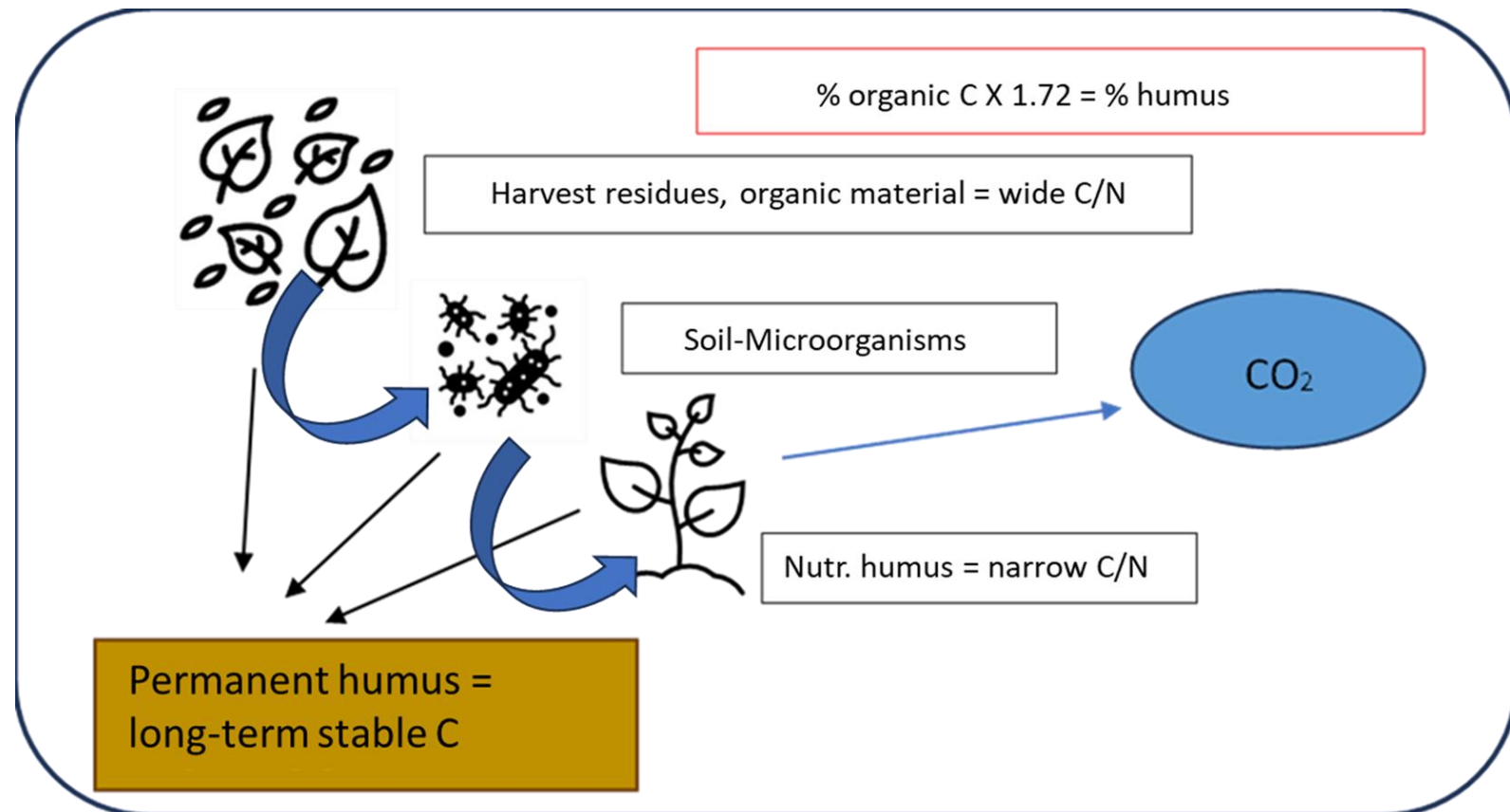
Trials, results & biological background





THE IDEA OF CARBON FARMING

- Contribute to climate neutrality
- Capturing CO₂ from the air and deploying it into soil
- By carbon farming practices





USED TECHNIQUES

- A.1 External organic fertilization
- A.2 Relocation of harvest
- B.1 Additional cover crop
- B.2 Diversification of crop
- B.4 Agroforestry
- C.1 Reducing tillage
- C.4 Liming/gypsum effects

Trials within 18
months from
spring 2023 to
autumn 2024



**CARBON 4
SOIL QUALITY**

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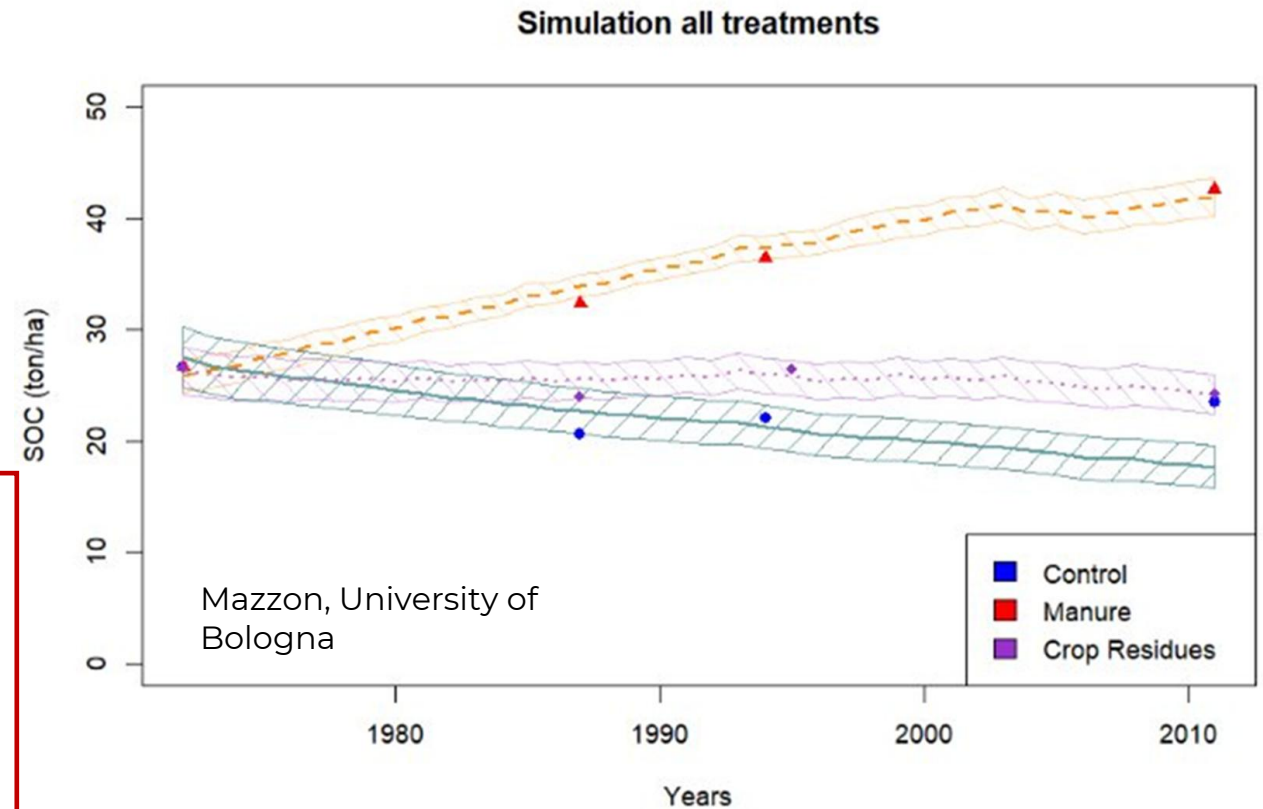
EXTERNAL ORGANIC FERTILIZERS

1) 30 years trials in Slovenia (KIS)

Three variants:

- Control
- Farmyard manure
- Incorporation of plant biomass

- **Increase of SOC far stronger if lower initial SOC**
- **Manure application and biomass incorporation increase SOC**
- **Manure > biomass**



2) Italy (UNIBO), 40 years data



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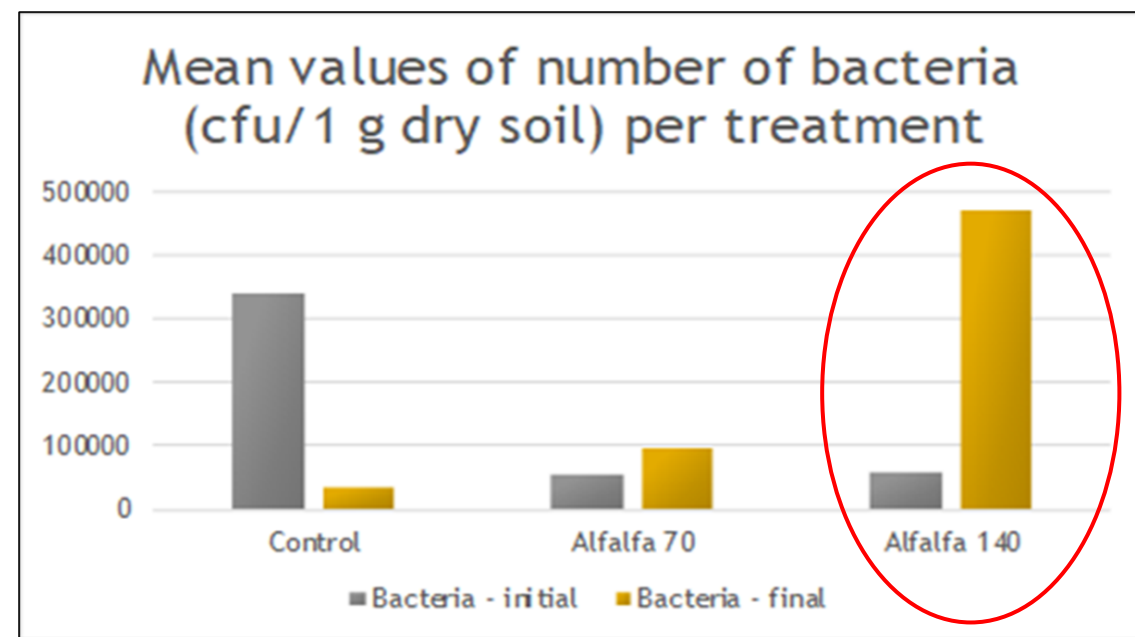


ABOUT MICROORGANISMS

Treatment	Dehydrogenase activity	C biomass	TOC 2024
	[$\mu\text{g TPF/g DM soil/24h}$]	[$\mu\text{g/g}$]	[% DM soil]
A control	11.65	378	0.56
B cattle slurry	19.37	382	0.65
C solid cattle manure	29.78	389	0.58
D digestate	36.26	389	1.35

1) IUNG – PIB, Poland

2) AIO, Croatia; Relocation of harvest residues



Significant increase of C:N in alfalfa 70 and 140



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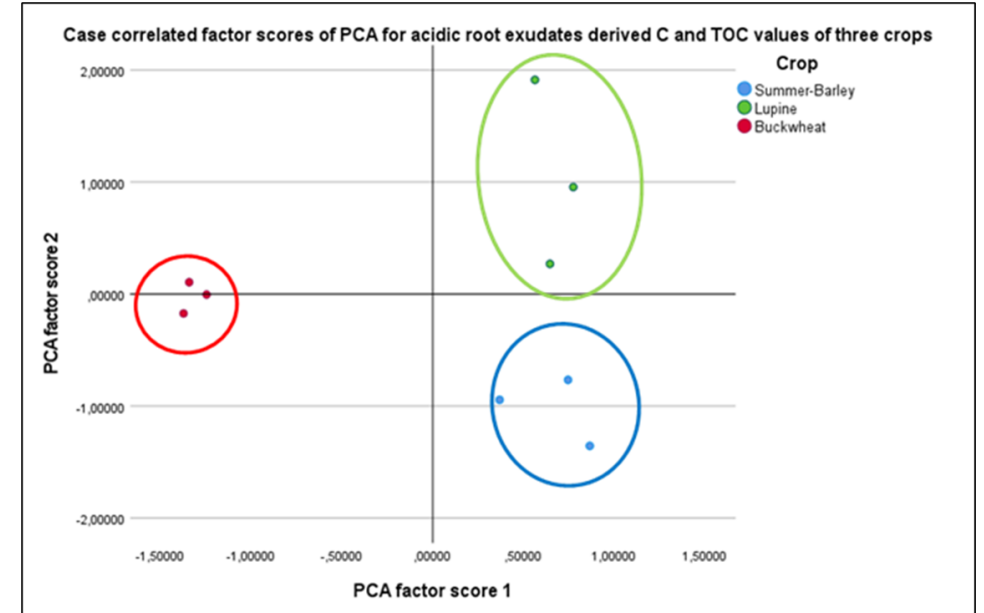
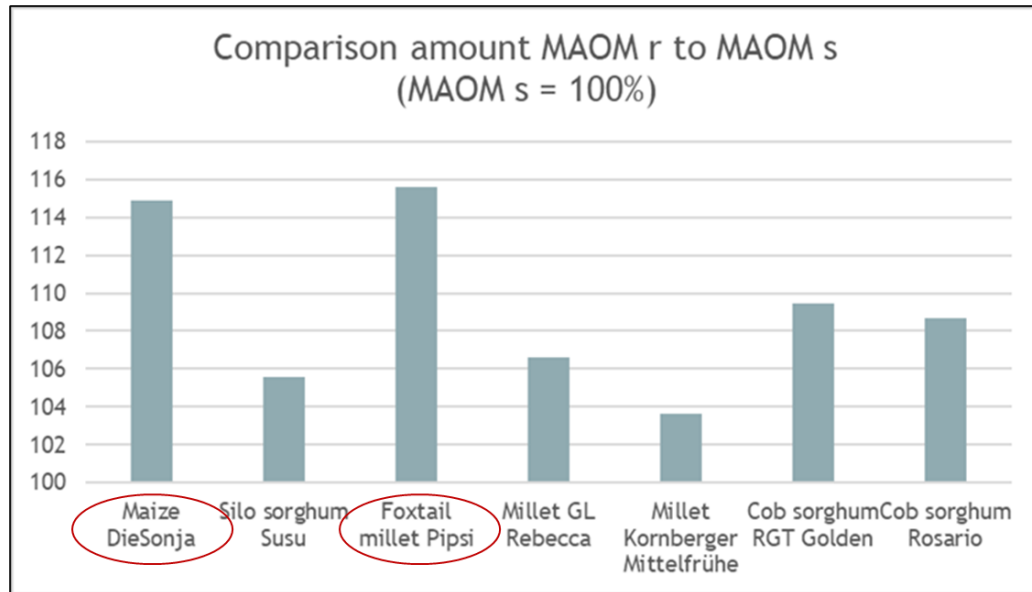


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DIVERSIFICATION OF CROP ROTATION

1) In Austria (BFA) and in 2) Germany (ÖBG):
Different crops, Root exudates, Root DM,
TOC and MAOM



- **Large differences** in contribution to carbon sequestration
- Context of **root exudates, micro-organisms** and MAOM?
- **Legumes cause lowered TOC decrease?**



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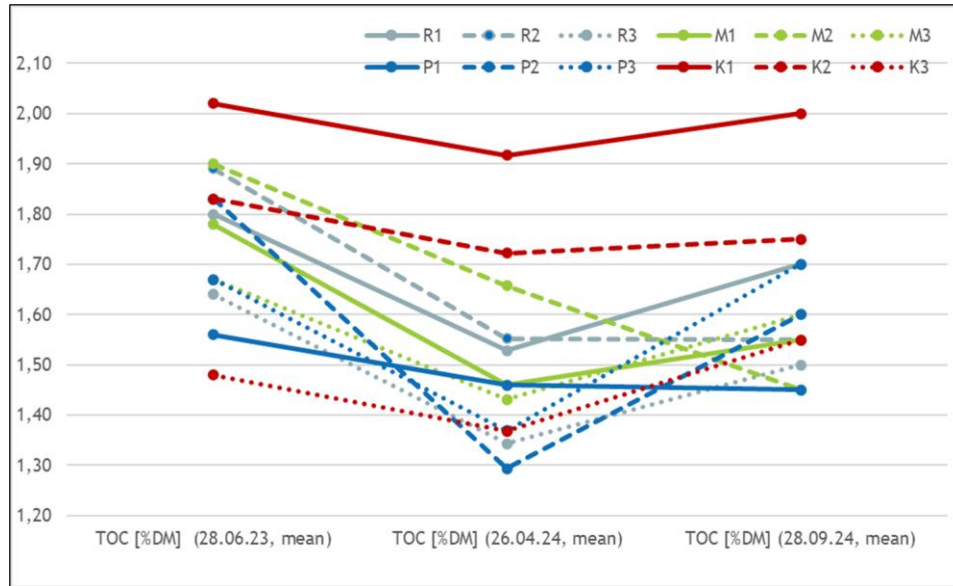
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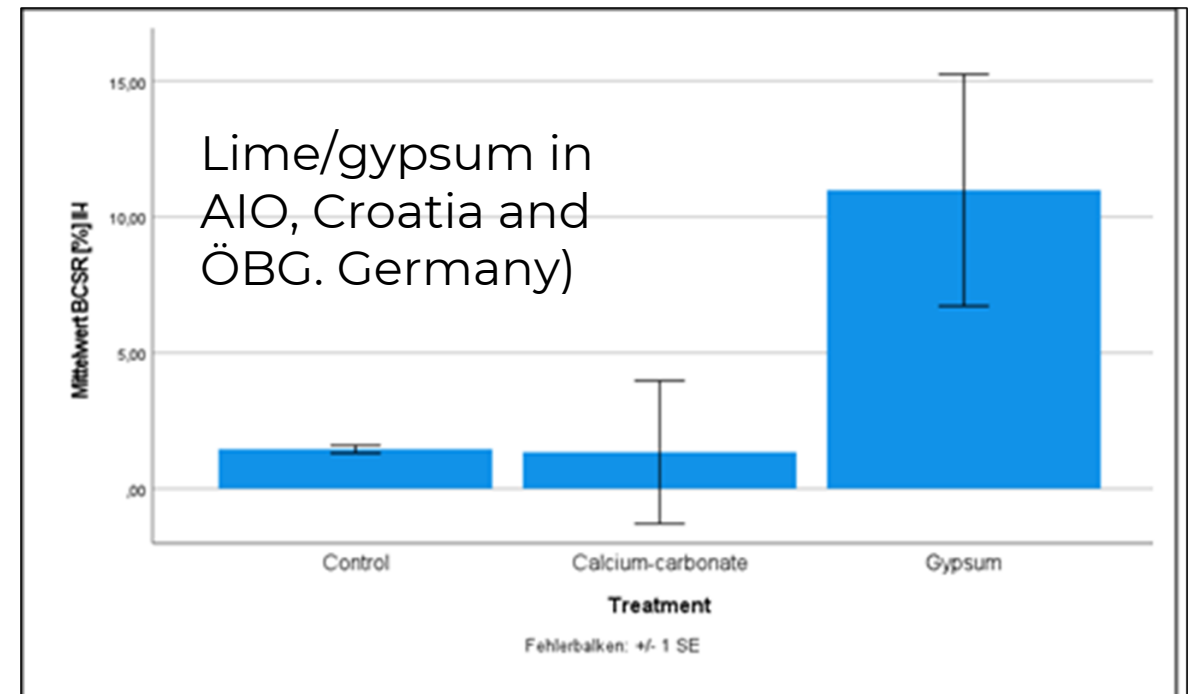
AGROFORESTRY and LIMING/GYPSUM EFFECT



TOC values at different sampling times of the measures

- High influence of season.
- Surprising gypsum effect

Agroforestry systems (IUNG-PIB, Poland and ÖBG, Germany), Different tree species, No short-term differences in TOC between AF/non-AF sites



Mean values of the difference of base cation-saturation rate (BCSR) between 2023 and 2024, with the tendency of **gypsum being the most effective** treatment to **increase BCSR**



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DIFFERENCE TOC BEFORE AND AFTER EXPERIMENT

Techniques	N	Average Change	Unit	Average Change in %	Period
A.1 External organic fertilizer	6	6.80	tons/ha	19.43	Long-term
	3	0.04	% soil DM	2.94	Short-term
A.2 Reloc. harvest residues	3	0.11	% soil DM	17.61	Short-term
B.1 Additional cover crops	4	0.02	% soil DM	2.74	Short-term
B.2 Divers. crop rotation	3	0.19	% soil DM	15.89	Short-term
B.4 Agroforestry	1	-0.18	% soil DM	-10.29	Short-term
C.1 Reducing tillage	4	-0.02	% soil DM	-1.54	Short-term
	1	0.07	% soil DM	5.40	Long-term
C.4 Liming/gypsum effect	2	0.16	% soil DM	12.40	Short-term

Mean TOC % soil DM: Initial: 1.44; end: 1.49; change + 0.05

Mean TOC % change: + 7.18



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TAKE HOME MESSAGES

- *Increase of TOC level by CF methods possible and probable*
- *Big chances for*
 - *Diversification of crop rotation*
 - *Relocation of harvest residues*
 - *Liming/gypsum effect*
 - *Long-term External organic fertilizers*
- *TOC increase not always the same as increase of agronomic aims*
- *Effect on permanent SOC also:*
 - *via micro-organism mass expected*
 - *via root exudates expected*
- *The lower the initial TOC level, the better the chance to increase*
- *Influence of season relevant!*

