

Cattle slurry degradability influences soil organic carbon stock dynamics

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Introduction

Organic fertilizers have been identified as a strategy to mitigate climate change. Organic manures are highly variable in their composition and manure handling methods. This variability can affect their decomposability and soil organic carbon (SOC) dynamics over the years. A complex matrix of agents is involved in the transformation of exogenous organic matter (EOM) in manure into SOC.

Objetive

Simulate how decomposable EOM (DEOM) and resistant EOM (REOM) of cattle slurry added to the soil could determine the rate of C that can be stored in soils.

Material and Methods

Lab determinations

4 Cattle slurries

Carbon mineralization (C_{3d})

Fraction of Fibres

Soluble (SOL)

Cellulose (CEL)

Lignin (LIC)

Degradability²

$$IROC = 44.5 + 0.5 SOL + 0.2 CEL + 0.7 LIC + 2.3 C_{3d}$$

(Lashermes *et al.*, 2009)

Resistant exogenous organic matter (REOM)

Decomposable exogenous organic matter (DEOM)

Modelling

Degradability of slurries



Initial SOC
Inputs of carbon¹



Weather



Results

Table 1. Characterization of DEOM and REOM of slurries and reference value of FYM in RothC. Newman-Keuls tests was done for multiple comparisons, same letter represents that there is no significant differences between treatments (P = 0.05).

Treatment	DM (%)	TOC (% DM)	DEOM (% TOC)	REOM (% TOC)	HUM (% TOC)
RothC			49 ^a	49 ^a	2
Slurry 1	7 ^a	42 ^a	50 ^a	43 ^b	7
Slurry 2	12 ^b	51 ^b	50 ^a	42 ^b	8
Slurry 3	9 ^c	47 ^c	63 ^b	33 ^c	4
Slurry 4	9 ^c	46 ^c	63 ^b	32 ^c	5

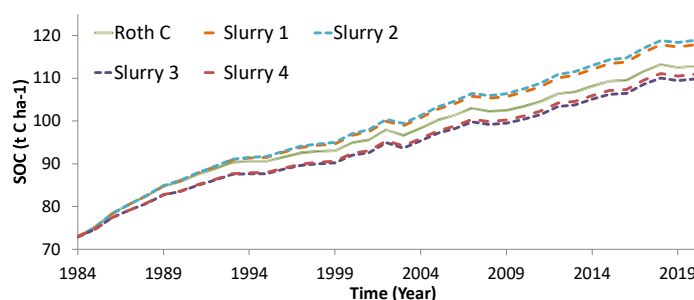


Figure 1. SOC evolution during 1983-2020 simulation of grassland soil. Different lines are simulated treatments with different DEOM and REOM.

Conclusions

Cattle slurries could present differences in their decomposability that affect SOC stock evolution. It is important to take into account for degradability parameters in order to produce better estimates of SOC stock evolution.

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References

- ¹Doblas-Rodrigo *et al.* 2022. Regional Environmental Change, 22.
²Lashermes *et al.*, 2009. European Journal of Soil Science, 60.

