TRUESOIL Project:
reduced tillage effects on soil organic matter and greenhouse gas emissions under ambient and reduced rain conditions

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1. Introduction

Reduced tillage (RT) is a widely applied practice often found to increase **organic carbon (OC) sequestration** in the topsoil compared to **conventional tillage (CT)**. However, it is unclear how reduced tillage and the associated organic matter might affect **greenhouse gas (GHG)** emissions, especially under a **changing climate**.
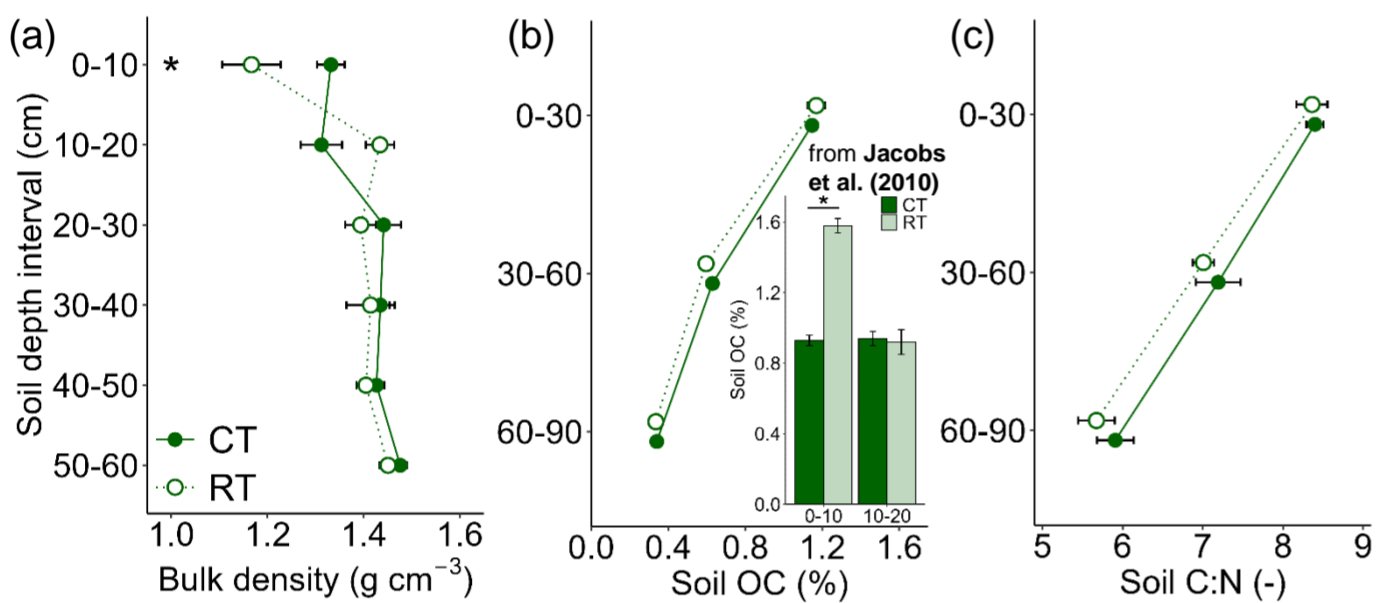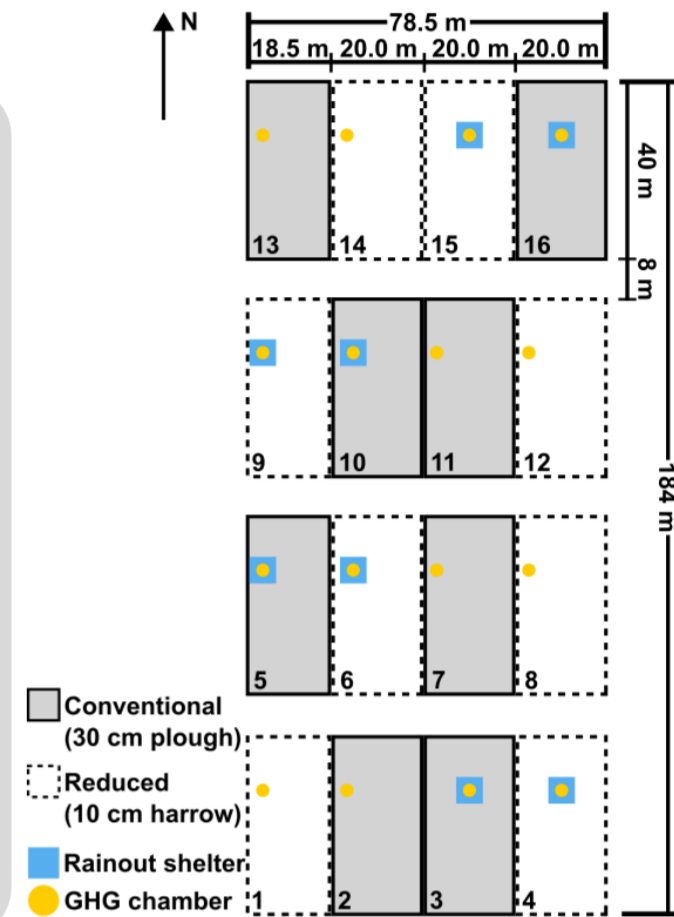
Fig 1. Soil bulk density (a), organic carbon (b) and carbon to nitrogen ratio (c) over depth. Asterisks indicate significant differences. Sample size n =6 for BD and 8 for OC & C:N.
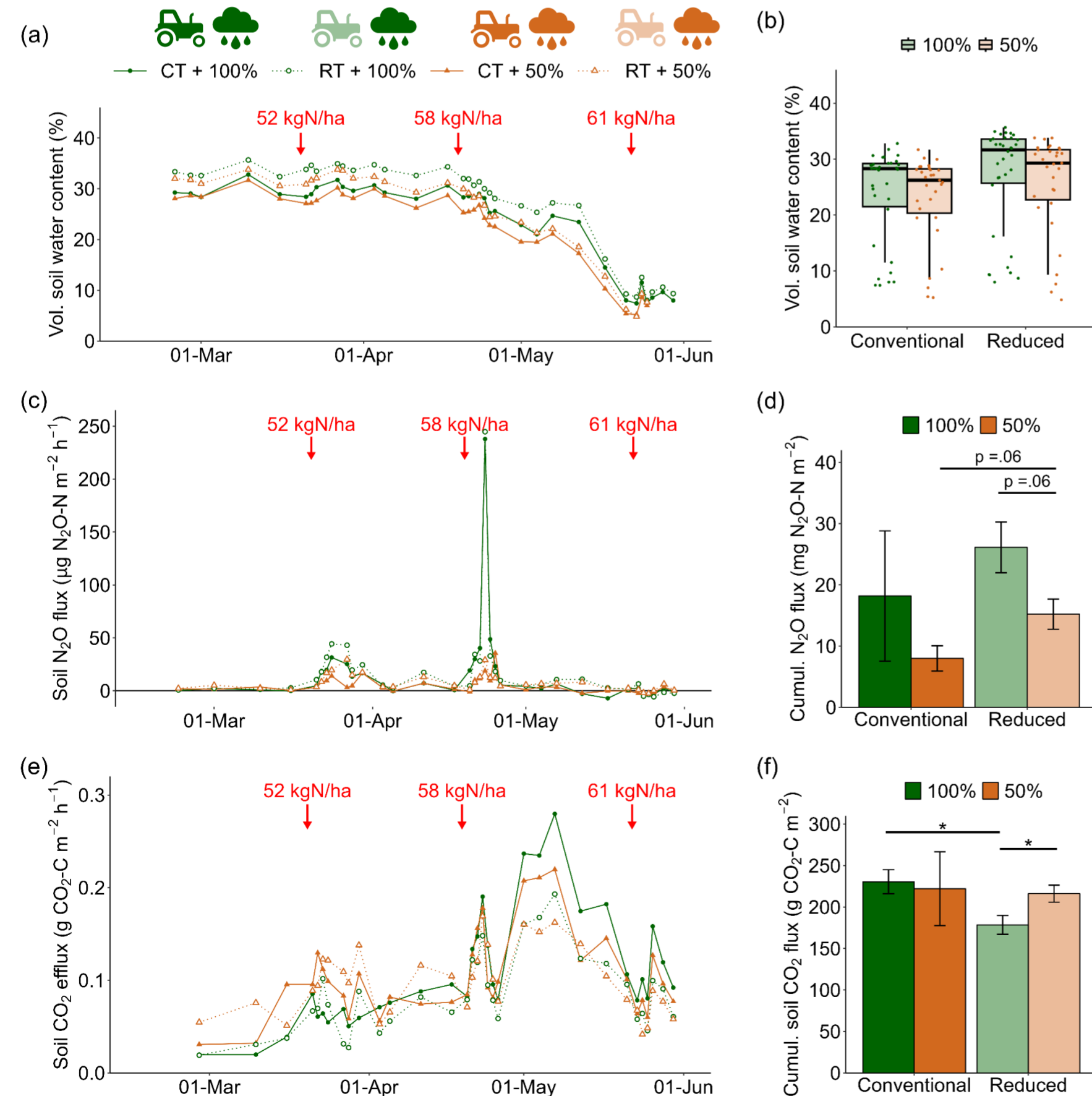
2. Design

Garte-Süd is a **field trial** comparing CT and RT in a Luvisol (silt =73%, clay =15%, pH =6.6) in central Germany (MAP =618 mm, MAT =9.5°C) running since **1970**.

In 2023, we installed **rainout shelters** (2 m × 2 m) designed to **intercept 50%** of precipitation.

We measure **soil CO_2 efflux** & **N_2O fluxes** with static chambers and portable gas analyzers.

3. Preliminary results

- soil bulk density was lower under RT than CT in the top 10 cm (Fig 1a)

- soil OC did not differ between CT and RT in 30 cm intervals (Fig 1b), but it was higher under RT in the top 10 cm

- soil water content was higher under RT than under CT (Fig 2a)

- N_2O flux was higher under RT than under CT, even though not significantly so (Fig 2d)

- N_2O flux was lower under 50% than 100% rainfall irrespective of tillage intensity (Fig 2d)

- CO_2 efflux was lower under RT than under CT for 100% rainfall conditions (Fig 2f)

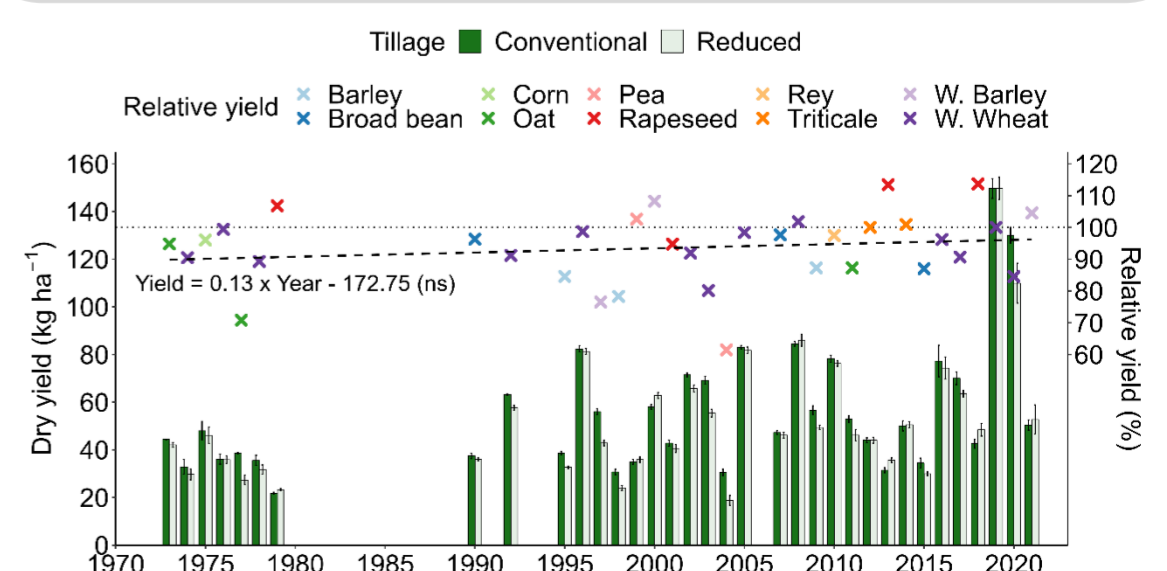- crop yield is often higher under CT than RT (Fig 3) – no evidence of crop or time effect

Fig 2. Vol. soil water content (a, b), soil N_2O fluxes (c, d) and soil CO_2 effluxes (e, f) for tillage (conventional vs reduced) and rain (100% vs 50%) treatments shown over time and as cumulative (with trapezoid method) fluxes or percentiles for SWC. Asterisks indicate differences according to ANOVA test. Sample size n =4.

Fig 3. Dry yield under conventional and reduced tillage and relative yield under reduced tillage over time in Garte-Süd.

Disclaimer: This poster shows work in progress. Final results might differ from those presented here. **References:** Jacobs et al., 2010 (DOI 10.1007/s00374-010-0472-x)