

How much Carbon Can be Sequestered by Organic-based Cropping Systems in MI Soils?

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Introduction

- Soil organic systems have a potential to increase C sequestration by soils.
- Reduction in atmospheric CO₂ contributes an important component to the effort of reducing global warming.
- Providing organic producers with extra benefits from carbon credit trading?

Objectives:

- To compare the quantities of total C in
 - Organic management with a winter leguminous cover crop and
 - Conventional (chisel plow) management with chemical inputs
 - No-till management with chemical inputs
- To identify topographical and soil conditions that lead to most rapid and effective C sequestration in organic management.
after long-term (>16 years) implementation.

Study Site:

Long Term Ecological
Research Plots at KBS,MI

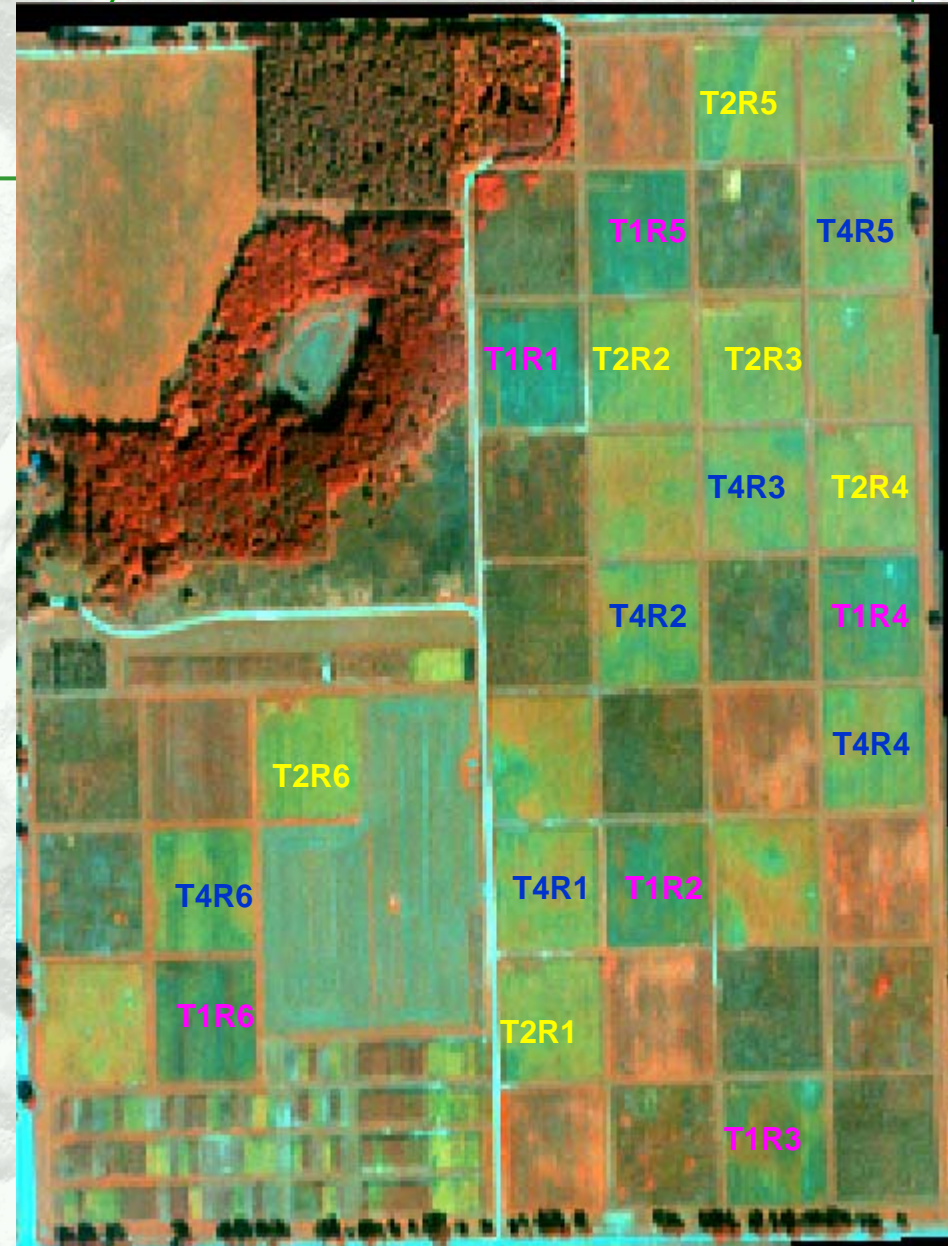
Treatments studied:

- Tillage + chemical inputs (T1)
- No-till + chemical inputs (T2)
- Certified Organic: Tillage + Cover crops (T4)

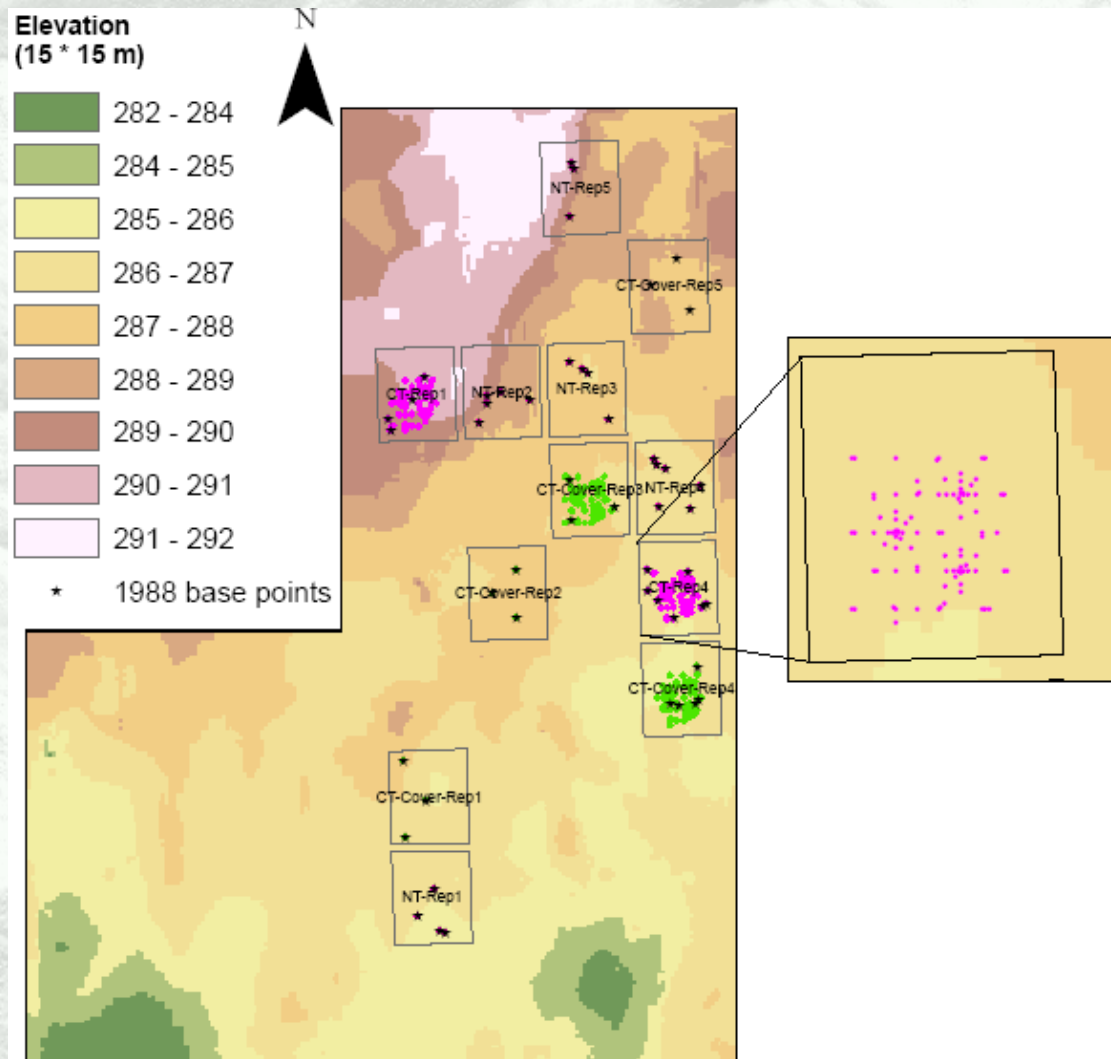
Crop Rotation:

Main crops: corn-soybean-wheat
Cover crops: hairy vetch or red clover

Lay out of the LTER Main site

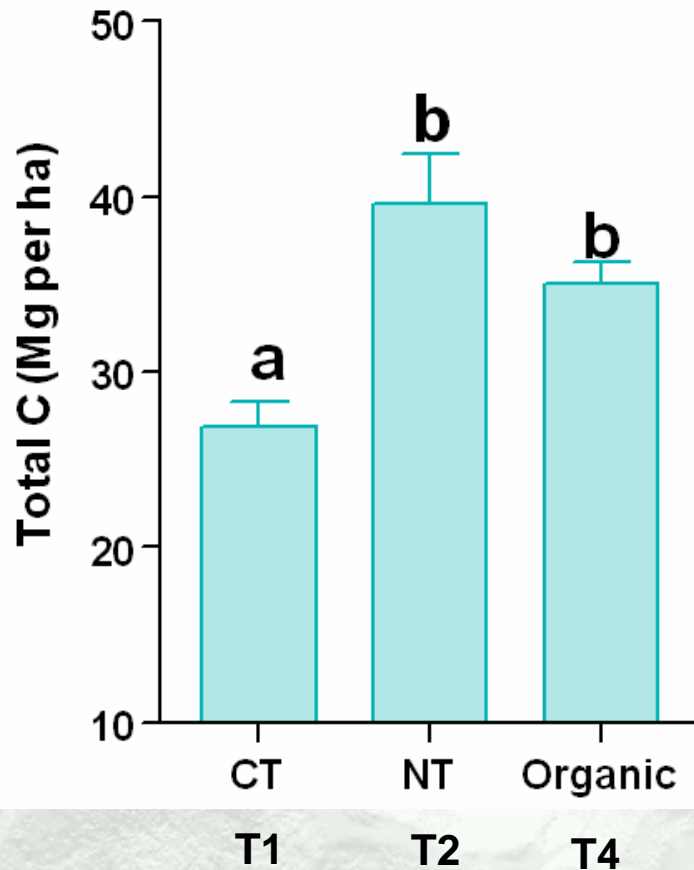


Layout of the experimental site along with soil sampling locations and elevation map

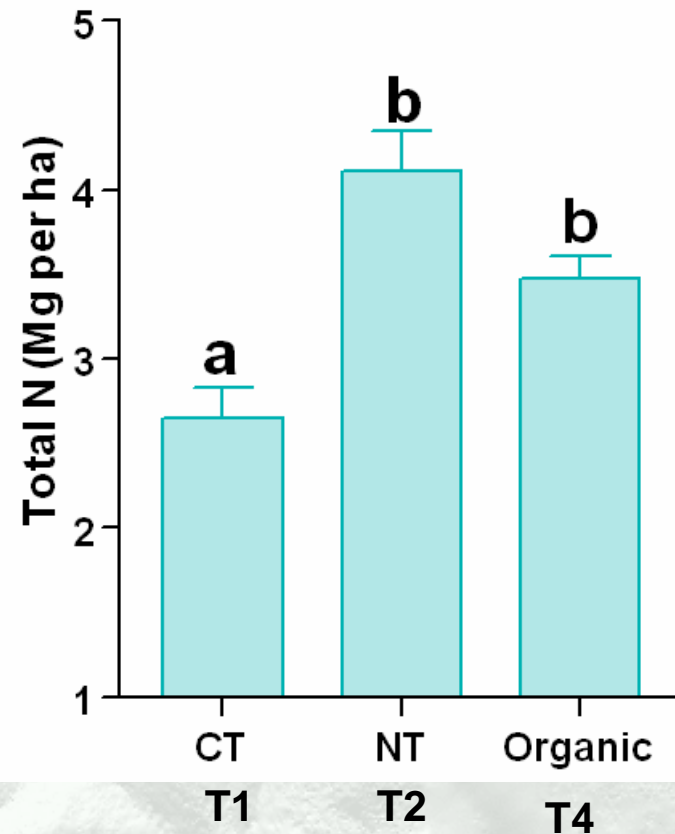


Results: Total C and N in the three studied management systems after 17 years of experiment

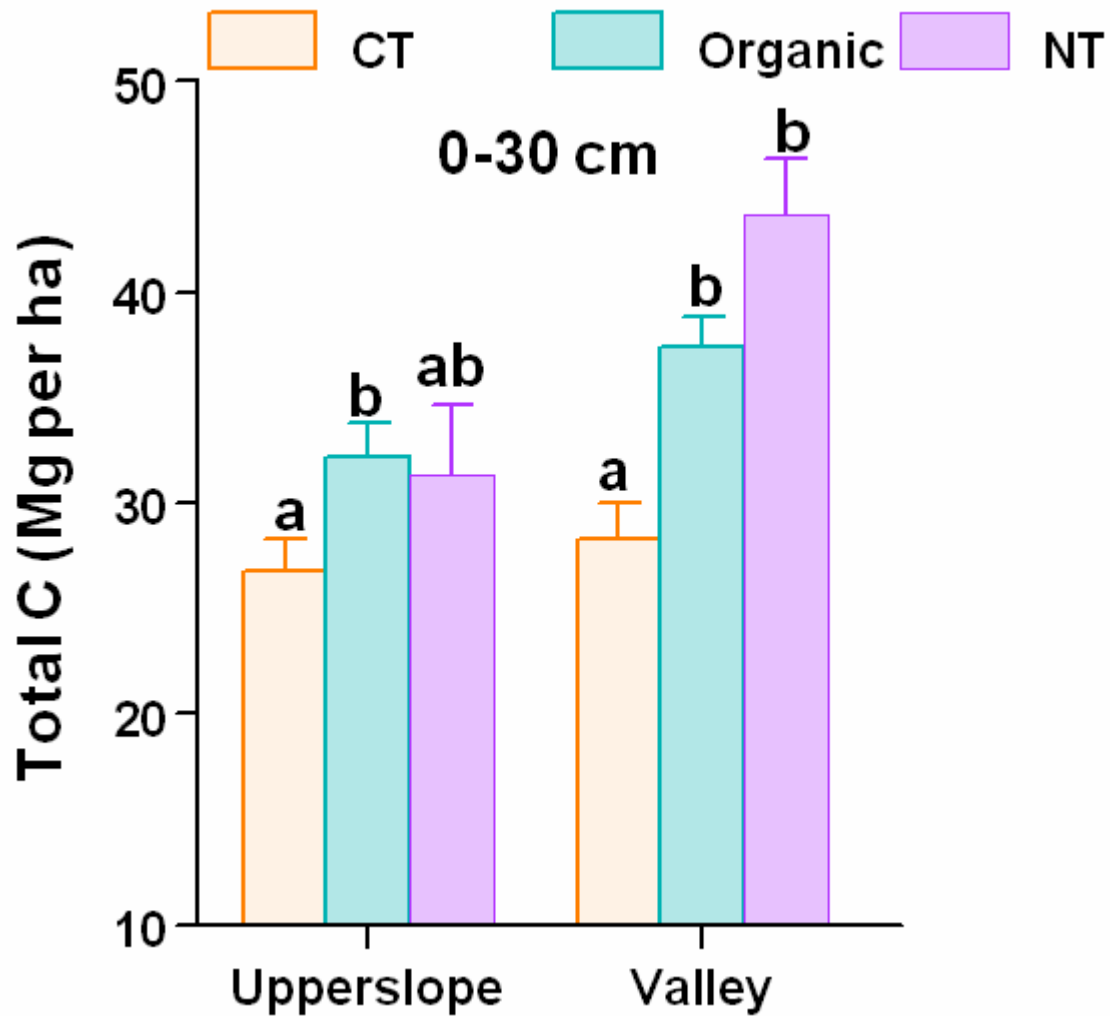
Total Carbon (0-30 cm)



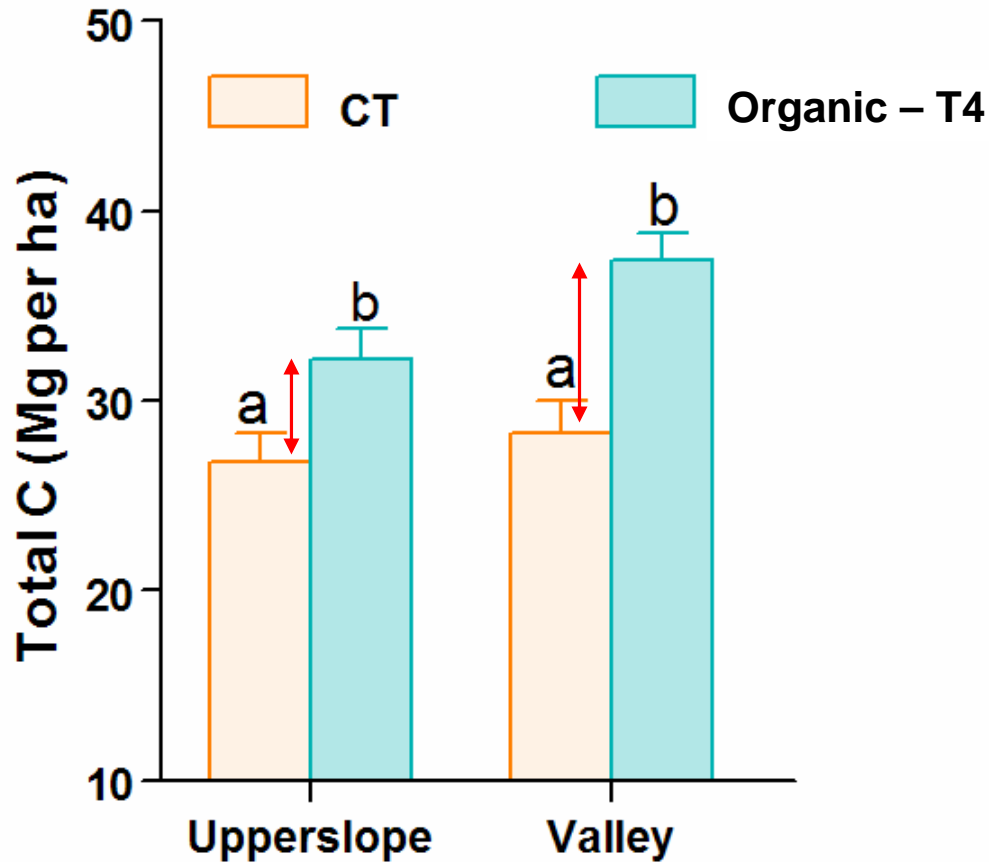
Total Nitrogen (0-30 cm)



Results: Total C in the studied managements at topographical uphill and depressions

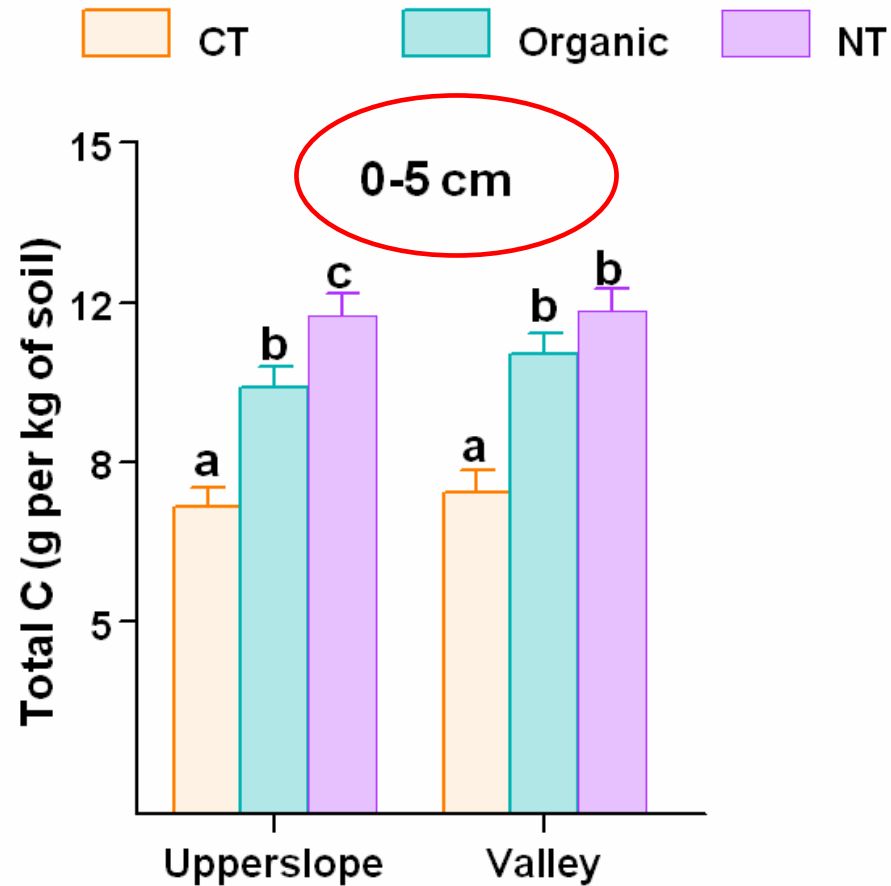


Results: Total C in conventional and organic managements at topographical uphill and depressions

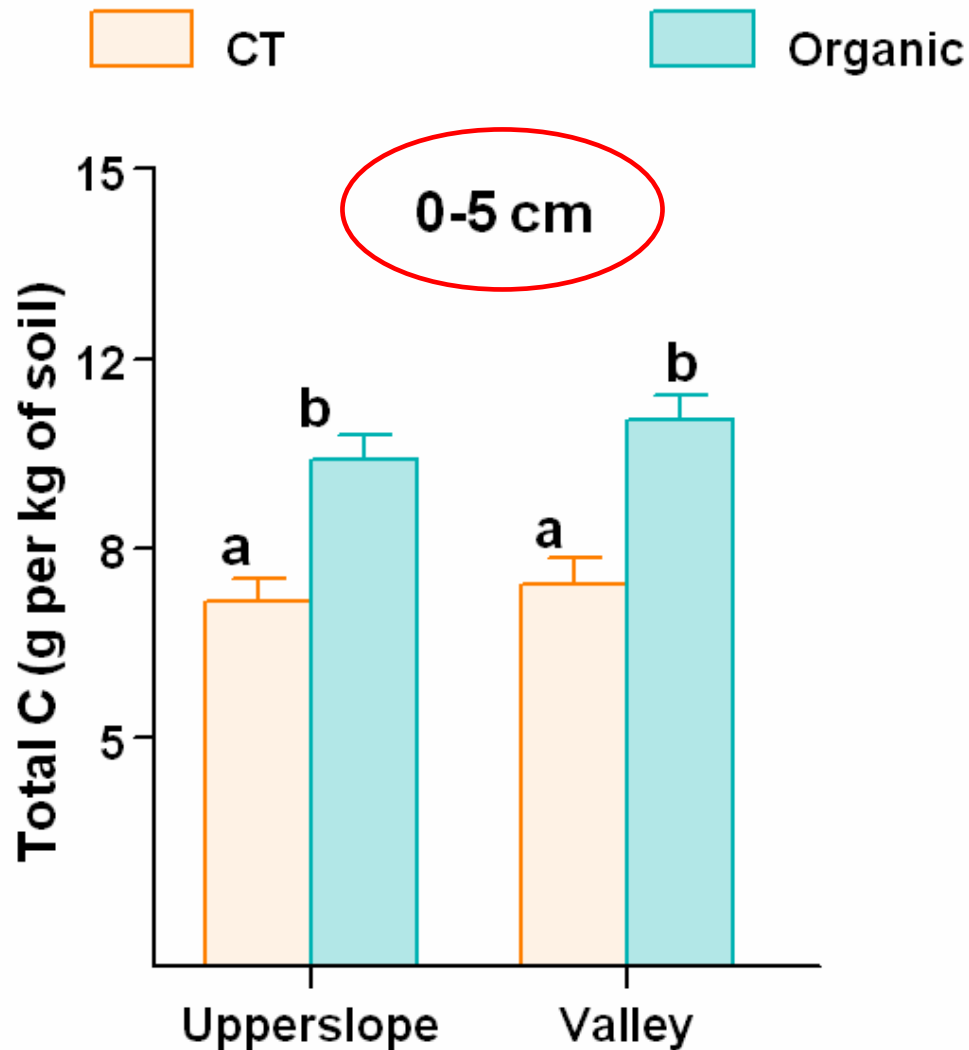


In terms of increasing soil C organic management with cover crops in depressions worked the best.

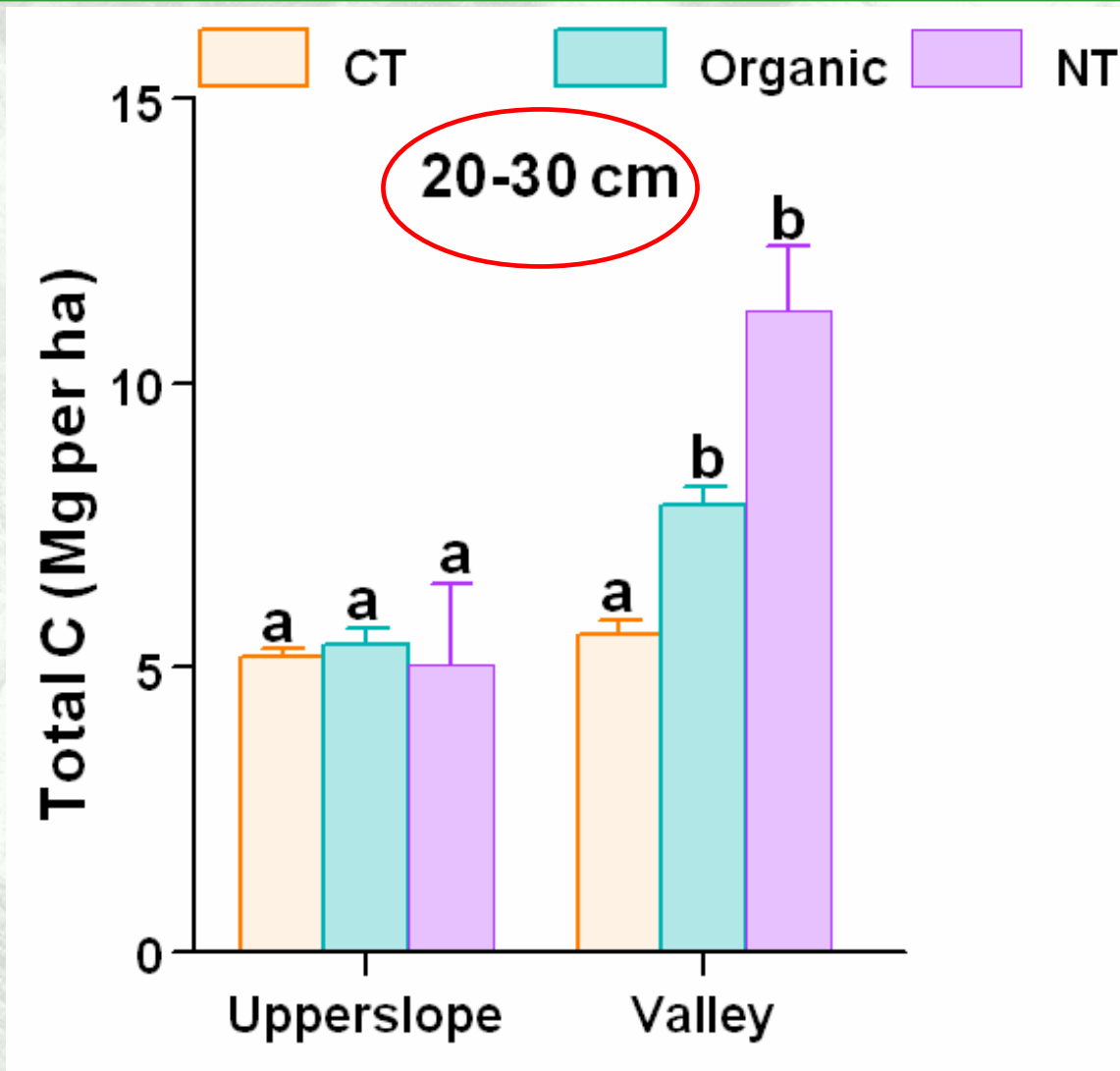
Results: Total C in the studied managements at topographical uphill and depressions



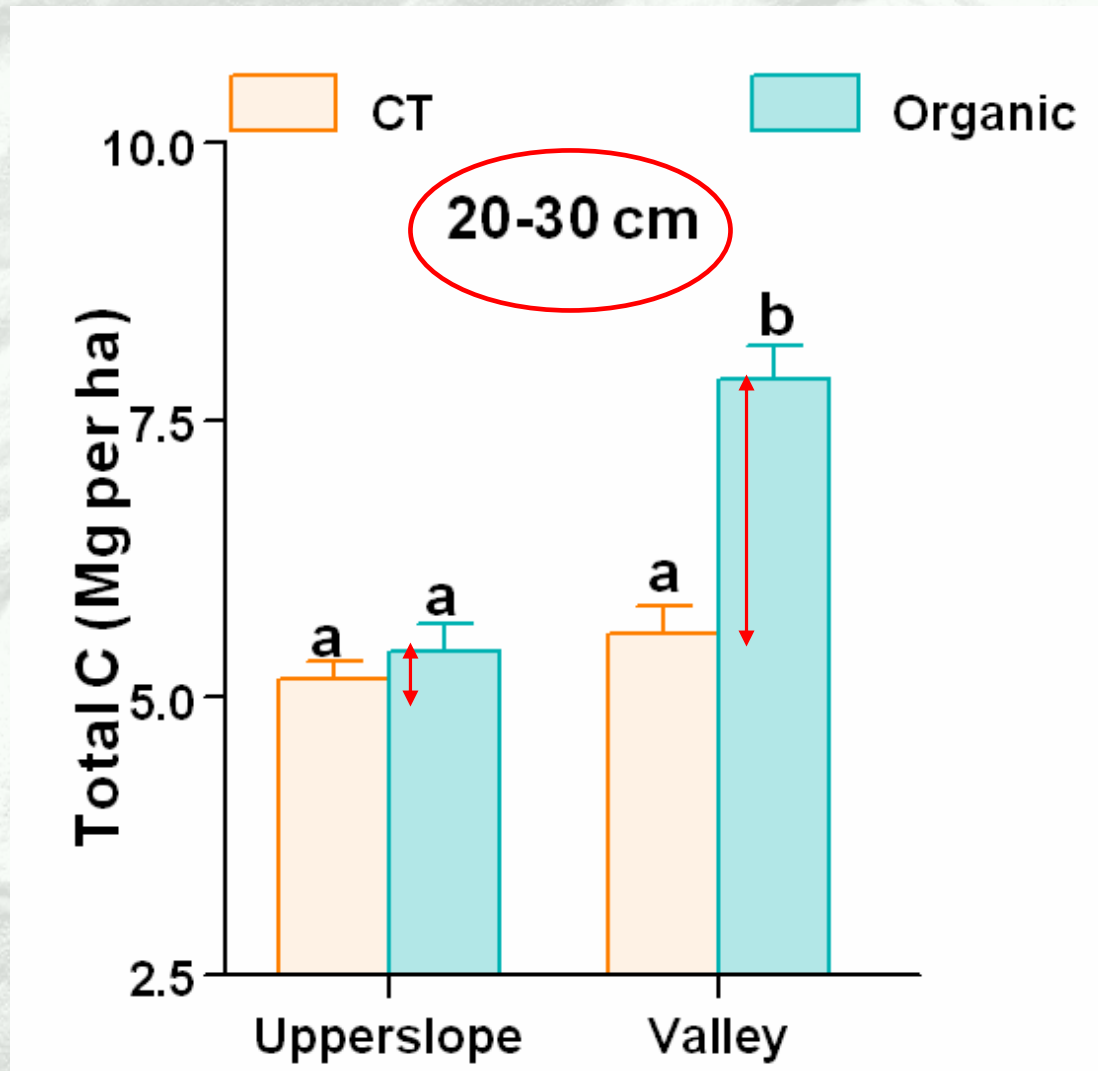
Results: Total C in conventional and organic managements at topographical uphill and depressions



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Results: Total C in conventional and organic managements at topographical uphill and depressions



Conclusions

- Organic system with cover crops was found to be as efficient in increasing soil C and N contents as conventional no-till management.
- Organic system with cover crops had significantly higher C and N levels than conventional chisel-plow management across the entire landscape.
- On average, each year the organic management with cover crops was adding 0.2 Mg/acre more of C to the top 30 cm of soil as compared to the conventional chisel plow.

Conclusions

- However the gains in C due to organic management with cover crops were much more pronounced at the lower topography as compared to slopes and summits.
- At uphill positions each year the organic management with cover crops was adding 0.13 Mg/acre more of C to the top 30 cm of soil as compared to the conventional chisel plow.
- At depression positions each year the organic management with cover crops was adding 0.23 Mg/acre more of C to the top 30 cm of soil as compared to the conventional chisel plow.



Thank you...