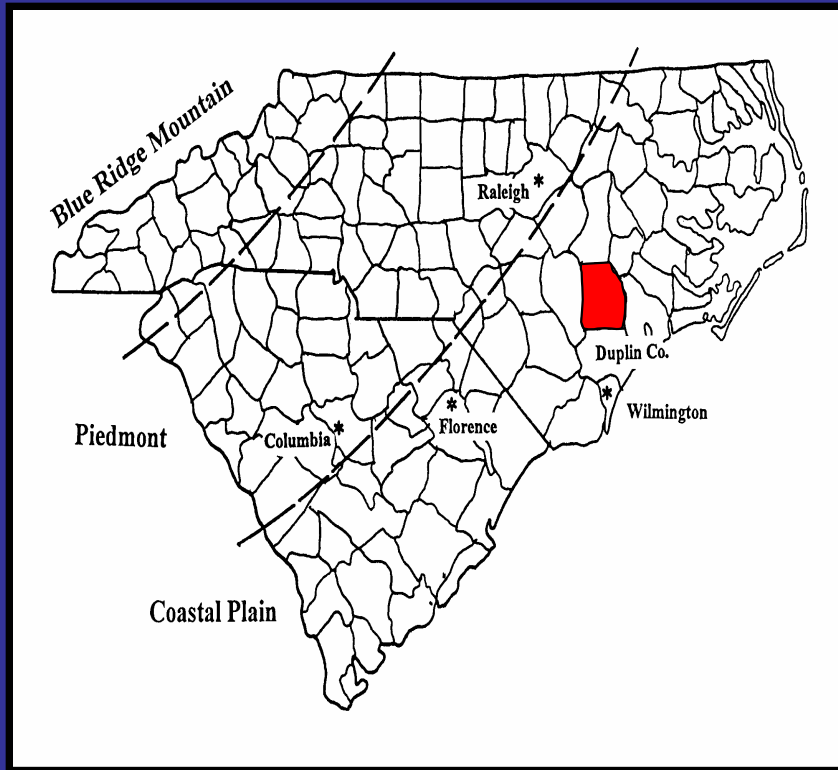


# Utilization of Conservation Tillage Practices to Rebuild Organic Carbon Levels in a Sandy, Coastal Plain Soil

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## Geomorphology of SC



Soils are sands to loamy sands and are extensively weathered.

## Soils in Coastal Plain region



**Norfolk series**  
(Typic Kandudult)



**Lakeland series**  
(Typic Quartzipsamment)



# Past conventional tillage research efforts have shown:

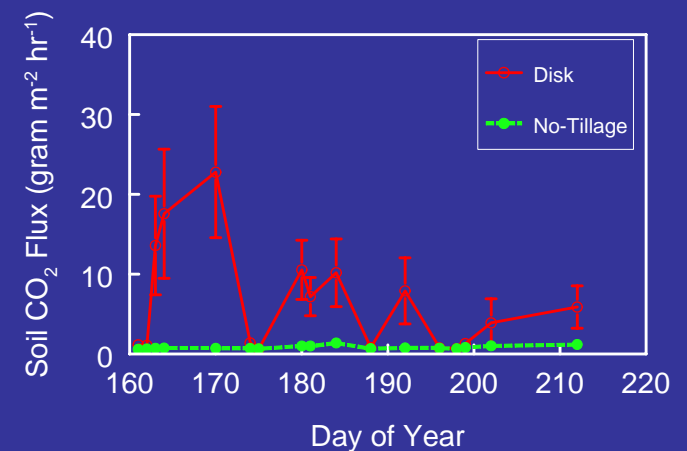


**Mean SOC contents (%) under conventional tillage at PDREC after 2 years**

Depth (cm)	time (yrs)		
	0	1	2
0 to 3	0.80	0.65	0.92
3 to 15	0.65	0.65	0.67



## Soil CO<sub>2</sub> flux measurements



**Can conservation tillage rebuild SOC contents in the Coastal Plain region?**





# Long-term tillage & crop management research plots

- ▲ Started in 1979 by Dr. Doug Karlen

- ▲ 20 plots equally divided between conservation and conventional tillage management

- ▲ each plot is 0.14 ha and contains the Norfolk soil series

- ▲ crop rotations consisted:

  - 1980s -- corn + wheat

  - 1990s – corn + wheat + cotton/beans

  - 2000s – corn + wheat + beans + rye

- ▲ crop yields, crop residue and soil samples are collected & examined



# Soil sampling at the long-term tillage plots



Mr. Bobby Fisher, USDA-ARS

Soil cores collected annually to 90-cm



Cores are divided by depth and SOC content measured.



Crop biomass collected



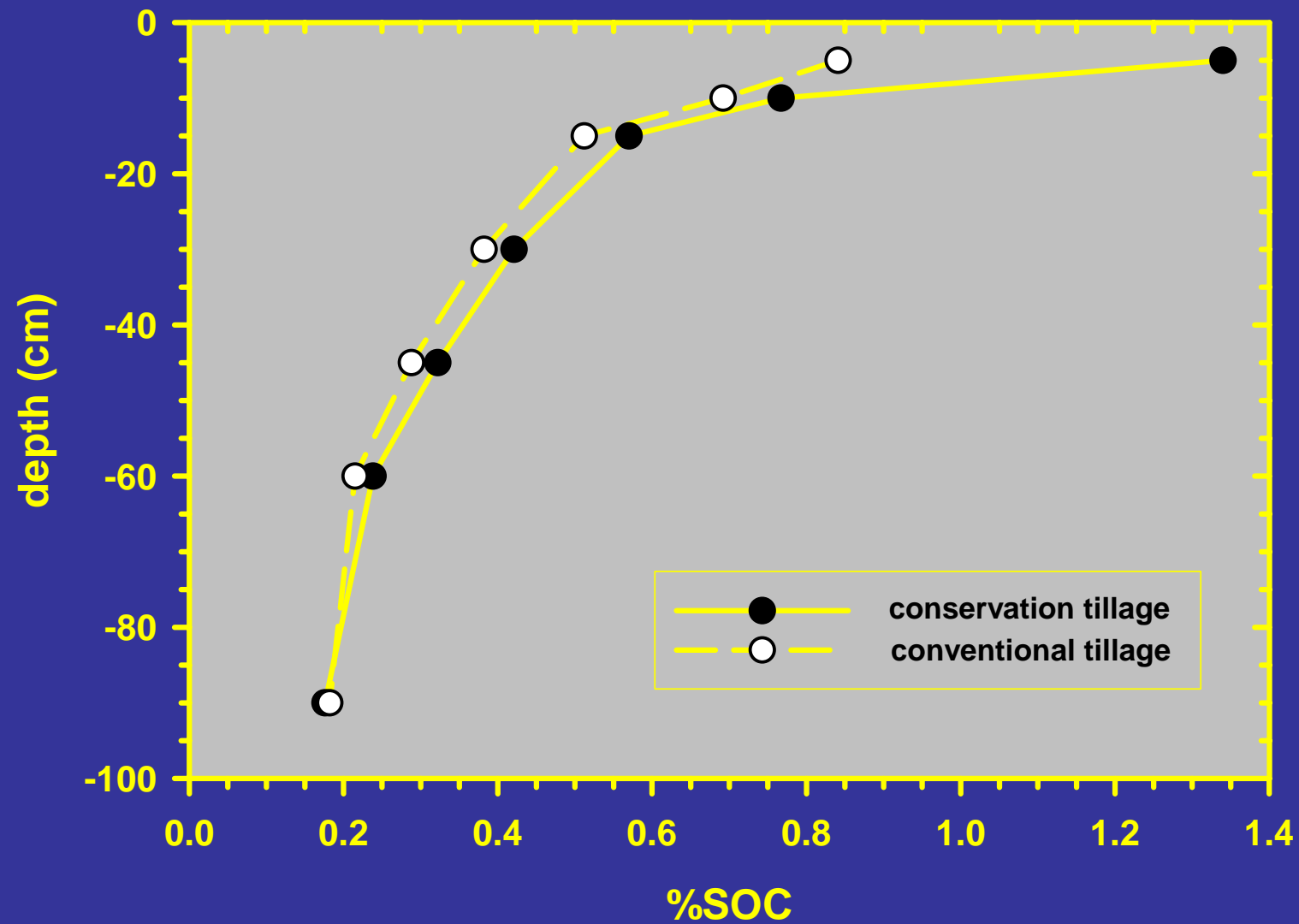
# Data and units

- Work in the 1980s and 1990s determined SOC on a mg/kg basis.



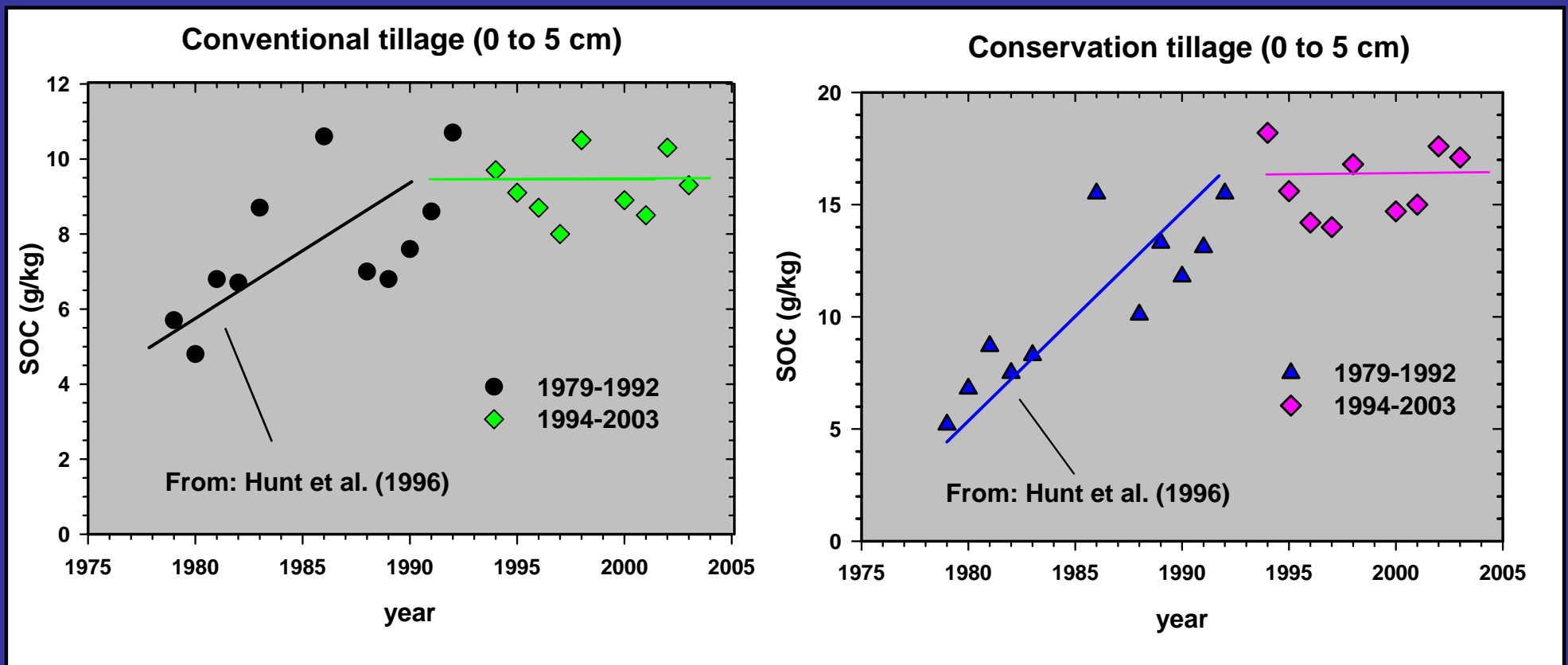
- Starting in 2001, soil bulk densities are collected annually.
- SOC contents are now expressed on a wt/ha basis.

## Grouped mean %SOC in Norfolk soil after 23 years under conservation and conventional tillage

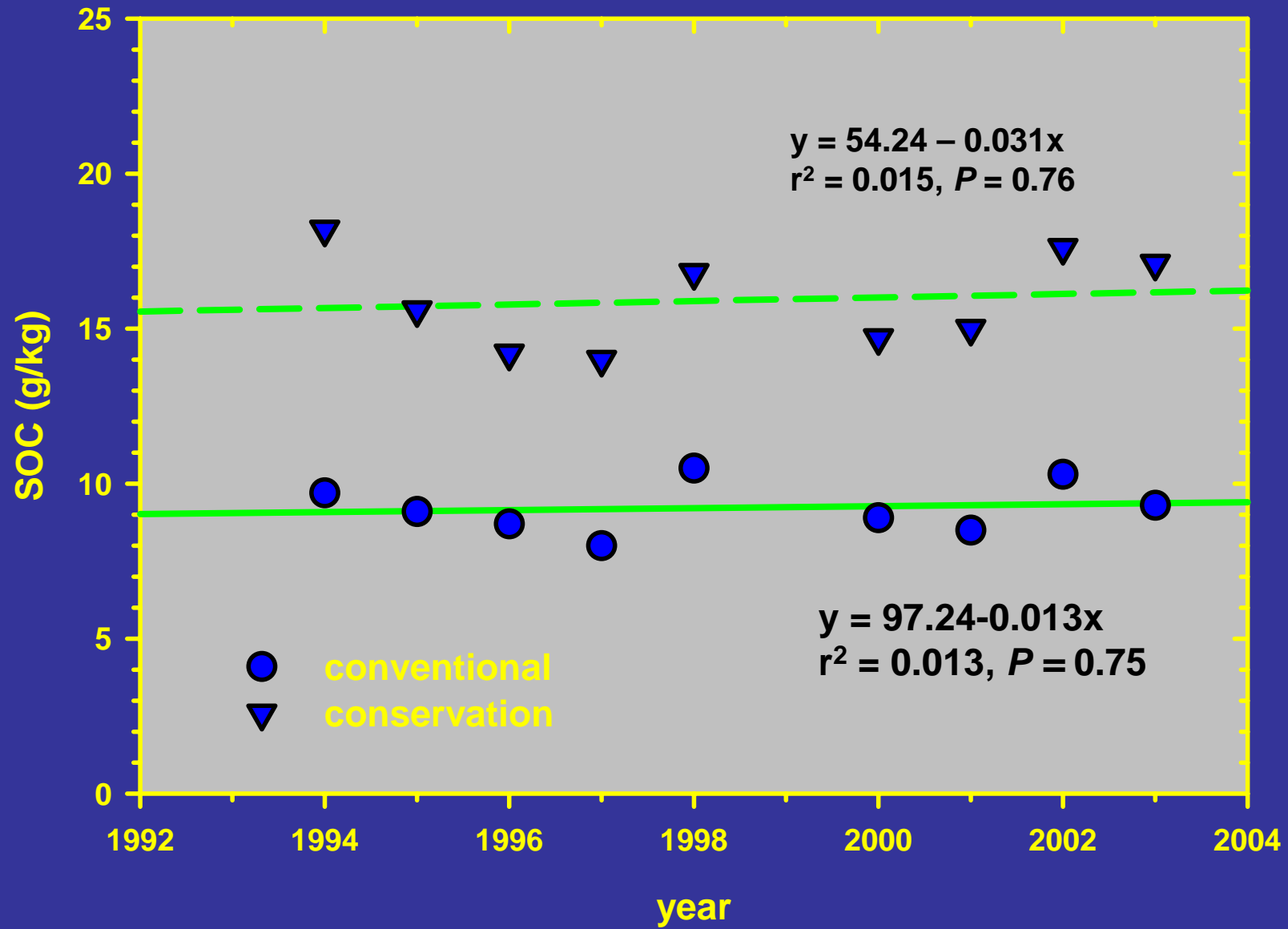




# Annual Norfolk mean SOC contents in 0 to 5 cm depth

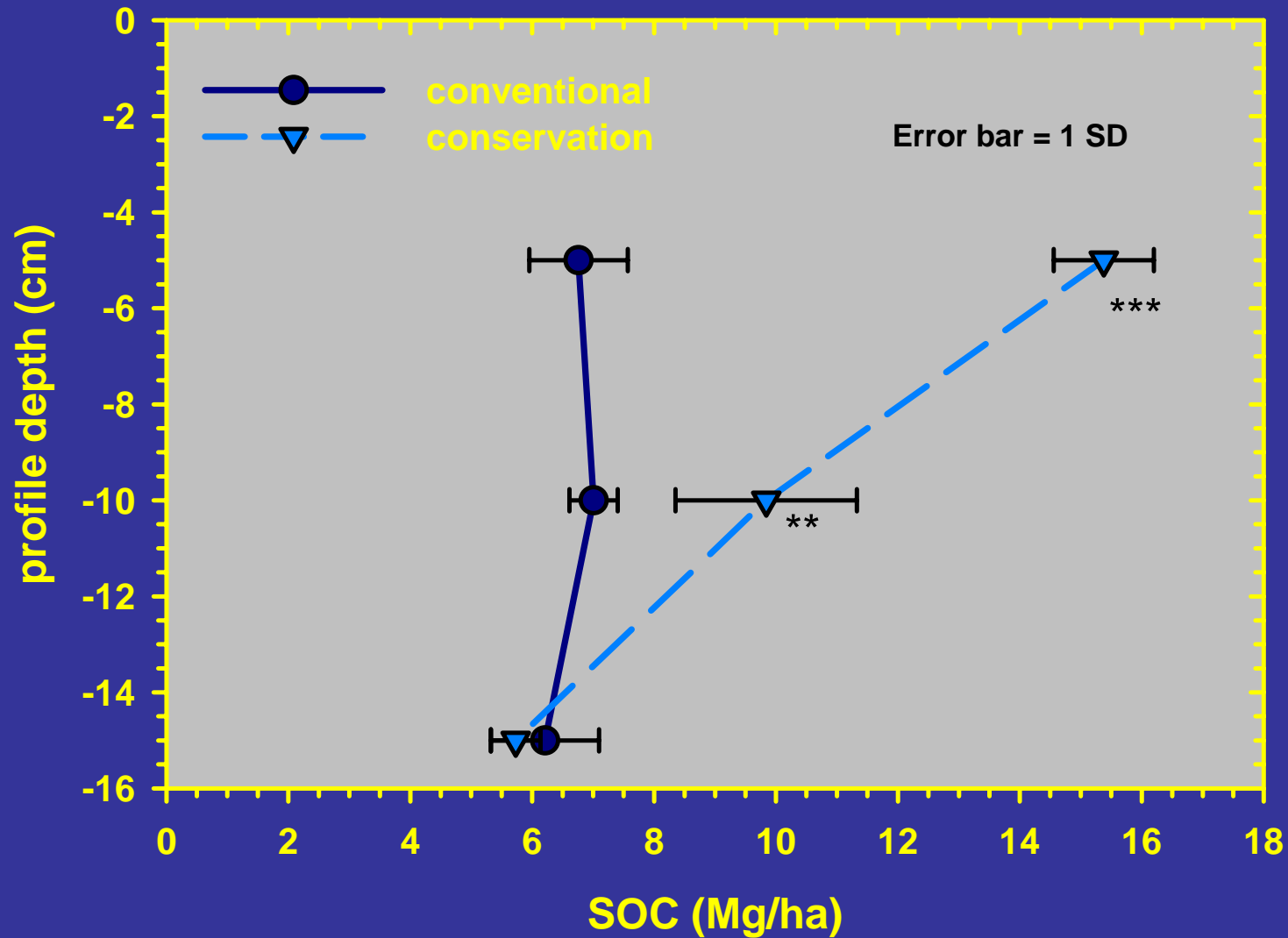


## Annual Norfolk mean SOC contents in the 0 to 5 cm depth

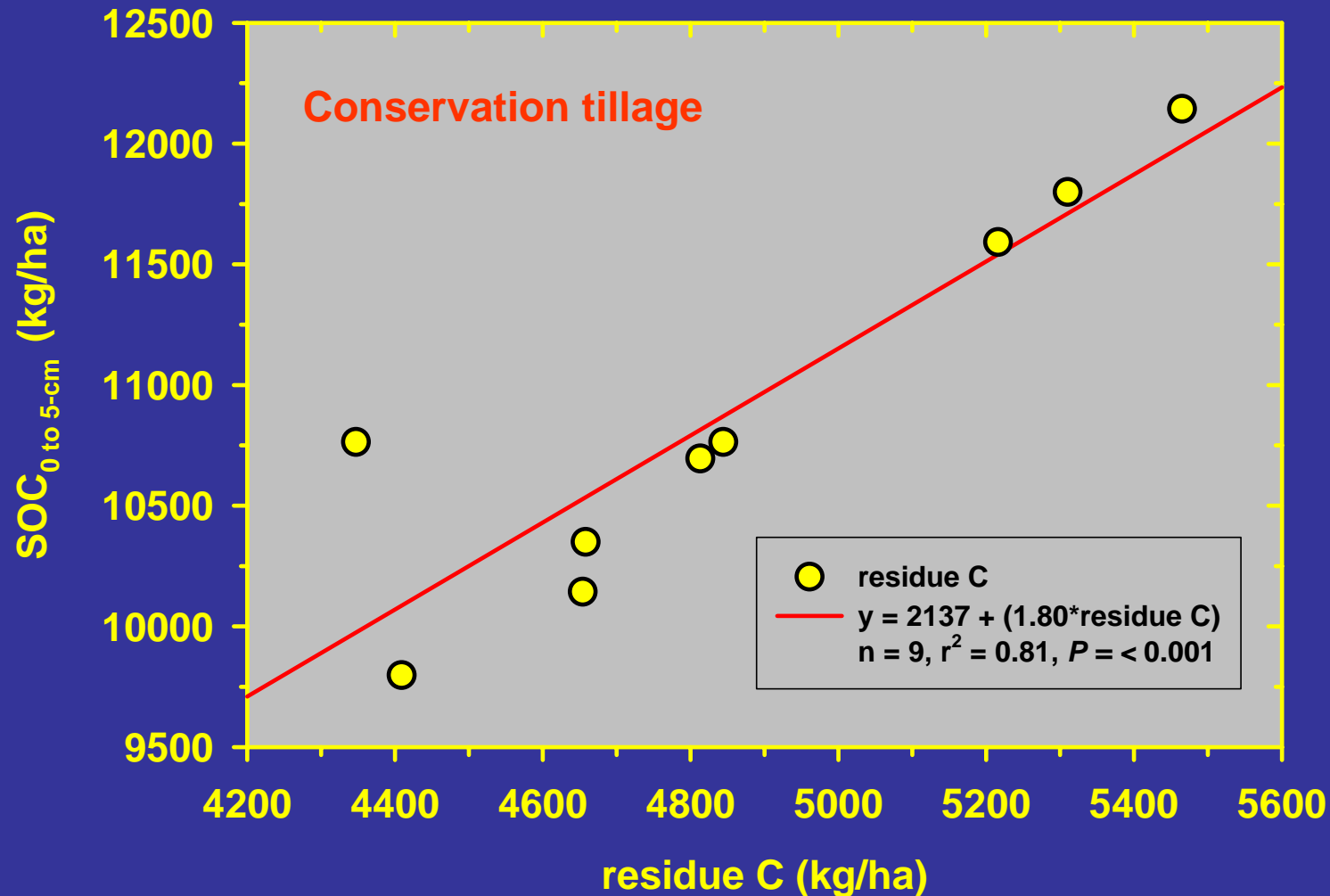




## Mean Norfolk SOC contents (using 2002 data) in the three surface soil depths



Annual mean residue C input vs. mean SOC contents  
in Norfolk soil under conservation tillage (0 to 5 cm)



Assumes that 1 kg residue contains 0.45 kg C and soil bulk densities were 1.34 g/cc.



# Conclusions

- ◆ After 25 years of tillage and crop management, the mean %SOC contents in the Norfolk topsoil (0 to 5 cm deep) under:
  - conservation tillage increased from 5.3 to 15.9 g/kg (+300%)
  - conventional tillage increased from 6.3 to 9.3 g/kg (+150%)
- ◆ The Norfolk soil is in the “C saturated phase of maturity”.
- ◆ Under conservation tillage, the SOC contents (wt/ha) were:
  - significantly higher (0 to 10 cm)
  - and linear related (0 to 5 cm) with residue C input than in soil under conventional tillage.

Thank you for your attention

