

Soil Quality under Mixed Grassland - Cropland Environments

Soil quality is directly linked to broad societal issues of

- * food production;
- * food security;
- * environmental quality;

through indirect effects on more tangible elements of

- * energy use in food production;
- * global warming; and
- * water quality.

Soil quality is the capacity of soil to function as a provider of key ecosystem services, such as

- * supplying and cycling of nutrients for optimum plant growth;
- * receiving rainfall and storing water for root utilization;
- * filtering water passing through soil to support clean groundwater;
- * storing organic carbon for nutrient retention and mitigating greenhouse gas emission; and
- * decomposing organic matter and xenobiotics to avoid exposures to plants and the environment.

Soil organic matter is a key attribute of soil quality, because it is a source of energy and substrate for microbial activity and diversity.

Surface residue is essential to control water runoff and erosion. Along with undisturbed soil, it contributes to surface soil organic carbon (C) accumulation and an increase in soil quality.

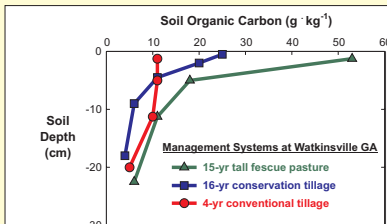
Surface soil organic carbon is a key ingredient that links water quality with soil quality through its influence on soil structure, water infiltration, and nutrient cycling.

Under grassland systems, soil organic C accumulates primarily at the soil surface.

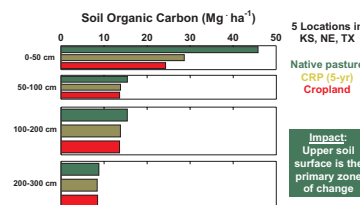
Soil organic C content is highly related to other properties, including water infiltration, soil density, soil structure, and soil biodiversity.

Location of runoff studies having at least 2 of the 3 land uses

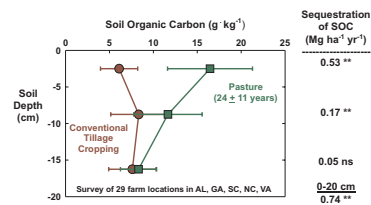
- * Conventional tillage cropland
- * No tillage cropland
- * Grassland



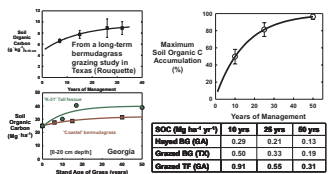
Data from Franzluebbers et al. (1999) Soil Sci. Soc. Am. J. 63:349-355; Franzluebbers et al. (1999) Soil Sci. Soc. Am. J. 63:1687-1694, and Bruce and Langdale (1997) SOM in Temp. Agroecosyst., p. 247-261



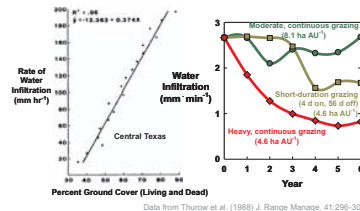
Data from Gebhart et al. (1994) J. Soil Water Conserv. 49:488-492



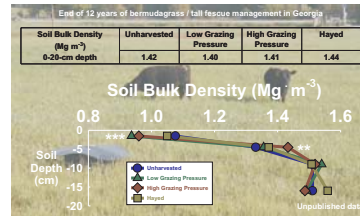
Data from Causarano et al. (2008) Soil Sci. Soc. Am. J. 72:221-230



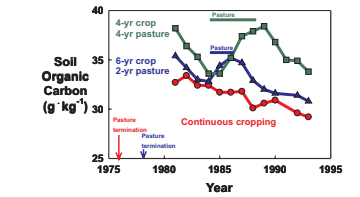
Data from Wright et al. (2004) Soil Biol. Biochem. 36:1809-1816 and Franzluebbers et al. (2000) Soil Biol. Biochem. 32:469-478



Data from Thurlov et al. (1988) J. Range Manage. 41:296-302



Unpublished data

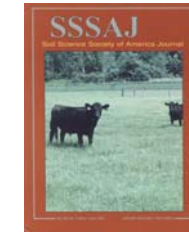
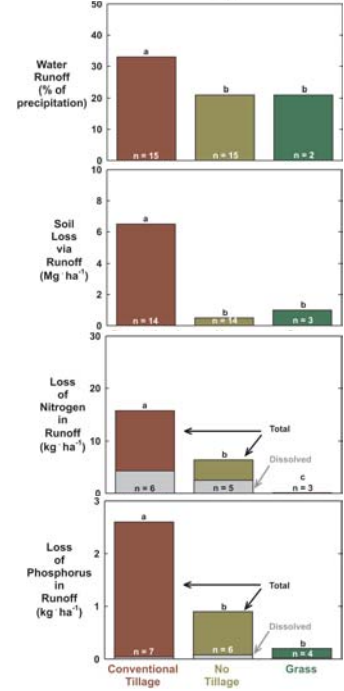


Data from Suddert et al. (1997) Soil Sci. Soc. Am. J. 61:1466-1472

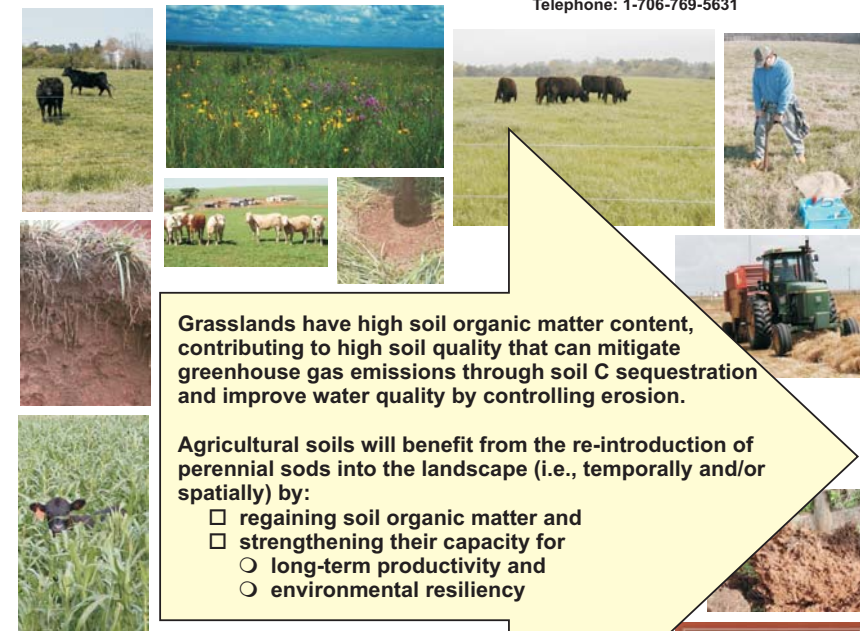
Georgia 1-10-cm depth

	Tilled Cropland	Hayed Pasture	Grazed Pasture	Natural Forest
Microbial Biomass C	584	598	626	495
PLFA	90	105	108	74
1/Simpson's	128	248	210	79
Chao-1	565	938	862	699

Data from Jangji et al. (2008) Soil Biol. Biochem. (in press)



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Grasslands have high soil organic matter content, contributing to high soil quality that can mitigate greenhouse gas emissions through soil C sequestration and improve water quality by controlling erosion.

Agricultural soils will benefit from the re-introduction of perennial sods into the landscape (i.e., temporally and/or spatially) by:

- regaining soil organic matter and
- strengthening their capacity for
 - long-term productivity and
 - environmental resiliency

