Soil Organic Carbon Sequestration from Animal Manure Applied to and Dropped onto Pastures

Methods

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Environmental characteristics
- Southern Piedmont Major Land Resource Area
- 18.5 °C - mean annual temperature
- 1250 mm - mean annual precipitation
- 1360 mm - mean annual pan evaporation
- Cecil-Madison-Pacolet dominated soils
  (fine, kaolinitic, thermic Typic Kanhapdults)
- Severely eroded site following tilled cropping

Management variables
- Fertilization regimen
  Phase I (1994-1998) - all supplying 200 kg N · ha-1 · yr-1
  (a) inorganic only
  (b) inorganic + inorganic
  (c) low broiler litter (1x) + inorganic
  (d) high broiler litter (3x)
- Grazing strategy
  (a) unharvested (CRP simulation)
  (b) low grazing pressure (4 Mg ha available forage)
  (c) high grazing pressure (2 Mg ha available forage)
- Hayed monthly

Sampling
- Soil and surface residue sampled at 5, 8, and 12 years of management
- Surface residue mass and C content
- Soil C concentration determined at 0-3, 3-6, 6-12, and 12-20 cm and summed as 0-20 cm
- Bulk density measured to determine total C content
- Soil sampled horizontally in 3 zones:
  (a) 5 m from shade/water (Shade)
  (b) 30 m from shade/water (Mid)
  (c) 80 m from shade/water (Far)

Interpretations
- Soil organic C in the surface 20 cm at the end of 12 years of pasture management averaged 39.4 Mg C / ha compared with an estimated initial value of 29.9 Mg C / ha, suggesting a mean sequestration rate of 0.79 Mg C / ha / yr.
- Manure C input with broiler litter ranged from 0.9 to 2.7 Mg C / ha / yr resulting in mean yearly input values of 0.5 to 2.4 Mg C / ha / yr (averaged across 12 yr) in low and high broiler litter application rate treatments.
- No significant difference in soil organic C could be detected between pastures managed with and without broiler litter application.
- Surface residue was a function of how pasture was managed by harvesting intensity (i.e., haying and grazing pressure).
- Manure C input from cattle grazing directly on pasture increased soil organic C at 5, 8, and 12 years.
- Soil organic C was more positively influenced by cattle manure dropped onto pasture than from broiler litter applied to pasture as supplemental fertilizer.