# Characterisation of soil organic matter from Pensacola bahiagrass pastures grazed for four years at different management intensities

J.C.B. Dubeux, Jr.[1], L.E. Sollenberger[2], N.B. Comerford[2], A.C. Ruggieri[3] and K.M. Portier[2]

[1]*Av. Dom Manoel de Medeiros, S/N, Dois Irmãos, Brazil, Email: dubeux@ufrpe.br, UFRPE/Dept. Zootecnia, Recife, PE, Brazil CEP 52171-900,*[2]*P.O. Box 110500, University of Florida, Gainesville, FL, USA 32611-0500,* [3]*Instituto de Zootecnia, Sertãozinho, SP, Brazil*

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**Introduction** Soil fertility and agricultural system sustainability depend upon soil organic matter (SOM), particularly in the tropics, because of highly weathered soils and low fertiliser inputs. Because of the beneficial effects of SOM on chemical, physical, and biological soil properties, Greenland (1994) suggested that SOM is an indicator of agro-ecosystem sustainability. Pasture management may affect SOM by altering the production/decomposition ratio of residues (Johnson, 1995). The objective of this study was to characterise the SOM of Pensacola bahiagrass pastures grazed for four years at a range of management intensities.

**Materials and methods** Pensacola bahiagrass (*Paspalum notatum*, Flügge) pastures were grazed (2001-2004) at four intensities, defined as the combination of stocking method, N fertiliser, and stocking rate: Continuously Stocked (CS) Low [40 kg N/ha per year and stocking rate of 1.2 animal units/ha (AU = 500 kg live weight)]; CS Moderate (120 kg N and 2.4 AU); CS High (360 kg N and 3.6 AU); and rotationally stocked with 7d grazing period/21d resting period (360 kg N and 3.6 AU). Composite soil samples (0-8 cm) from each pasture were collected in 2004. Particle size distribution was determined on 100 g from each sample by sieving soil into four classes: >250 µm; 150-250 µm; 53-150 µm; <53 µm. SOM density separation was accomplished by decantation and density separation (light and heavy fractions) with water. Physical separation was performed by adapting the methods reported by Meijboom *et al.* (1995), using water instead of Ludox gel. The different class sizes and densities were analysed for C and N by a dry combustion method (Carlo Erba NA-1500 C/N/S analyser).

**Results** Particle size distribution was not affected by management. Average values were 540, 320, 130, and 10 g/kg for the size classes >250 µm; 150-250 µm; 53-150 µm; < 53µm, respectively. Management intensity altered C and N significantly when particle size was >250 µm. Because this is also the most abundant class size in this Spodisol (540 g/kg), changes have significant impact on SOM. Increased management intensity increased both C and N in both density fractions (Figures 1 and 2). Higher residue deposition at more intensive management, mainly below ground residues (roots + rhizomes) with a lower turnover rate, explained the C and N increases.

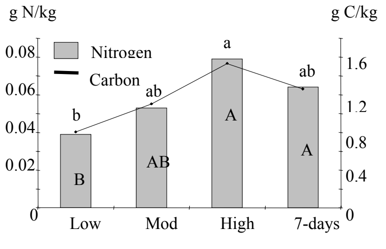


**Figure 1** C and N in the light OM fraction > 250 µm†

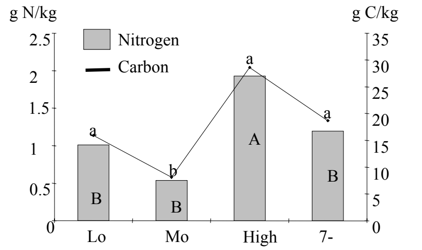


**Figure 2** C and N in the heavy OM fraction > 250 µm†

(† For both figures, upper case letters compare values of N and lower case letters compare values of C, within each density class; means with the same letter do not differ (P>0.10) by the LSMEANS test from SAS)

**Conclusions** Increasing N fertiliser and stocking rate increased C and N in the light and heavy SOM fractions from particles >250 µm. This increase is likely to result in greater C sequestration and soil fertility. Also, the results suggest that changes in SOM concentration can be detected earlier by using the density fractionation technique instead of total SOM determination.

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