Recent C inputs in different land-use systems in North Florida

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Introduction

- ✓ Land use is a key factor affecting C input in agricultural systems.
- ✓ Assessing recent C inputs provide useful information guiding long-term soil C balance.
- ✓ Physical fractionation of soil organic matter (SOM) by particle density, into light and heavy fractions, has been an important alternative to SOM chemical fractionation.
- ✓ Light SOM fraction represents recent C inputs and it is linked with important soil processes such as mineralization of SOM.
- ✓ CO_2 evolution is an indicator of soil microorganism respiration, which is an additional response that characterize labile soil C.

Objectives

- ✓ This research assessed light fraction SOM and soil CO_2 emission in different land use systems in North Florida including sod-based rotation (SBR), bahiagrass pasture, native vegetation, and conventional tillage.

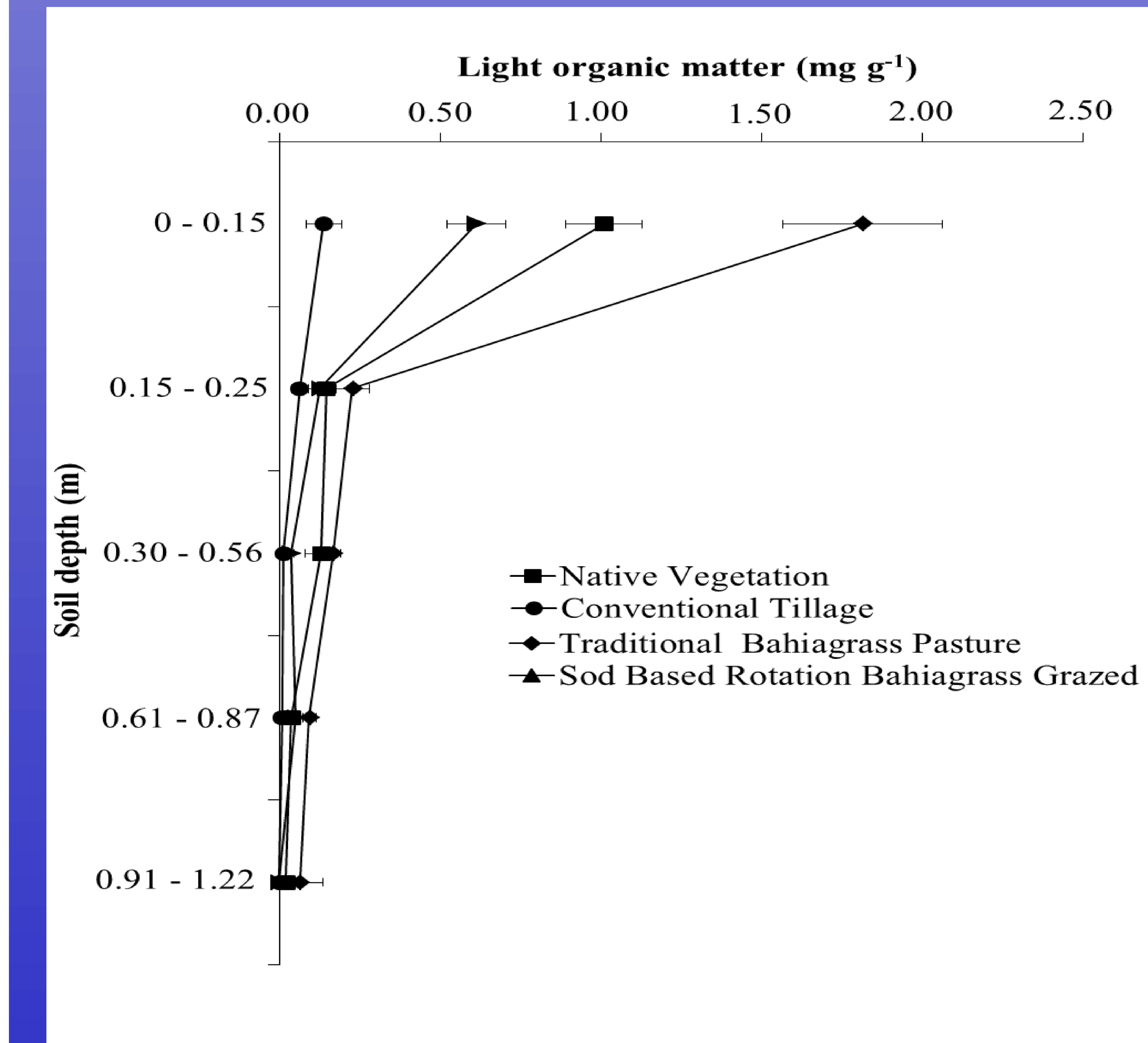
Figure 1. Geoprobe sampling (left) and land-use systems sampled (right)

Methods

- ✓ Land-use systems assessed included: 1) sod-based rotation integrating crops (cotton and peanut) and livestock (bahiagrass pastures); 2) bahiagrass pasture; 3) native vegetation; 4) conventional tillage.
- ✓ Light fraction of SOM determined by density separation (Dubeux et al., 2006)
- ✓ Light fraction was determined in five depths (0 to 0.15, >0.15 to 0.25, 0.30-0.56, 0.61-0.87, and 0.91-1.22 m).
- ✓ CO_2 evolution measured using the soil based respiration method (Harris et al., 1997).
- ✓ $\delta^{13}C$ of evolved CO_2 was determined using the method described by Ramnarine et al. (2012).
- ✓ The atom% ^{13}C was calculated by the equation atom% $^{13}C = [(\delta13C * 1,1056)/1000] + 1,1056$ (Unkovich et al., 2008 and Fry, 2008).
- ✓ Data analyzed using proc mixed from SAS and LSMEANS compared using PDIFF adjusted by Tukey ($P < 0.05$)

Results

Figure 2. Light-fraction organic matter inputs in different land-use systems in North Florida



Results

Table 1. Soil CO_2 emission, $\delta^{13}C$ of emitted CO_2, total C emitted , and Atom% ^{13}C in the emitted CO_2

Land-use systems	Soil CO_2 evolution (mg of C-CO_2 kg^{-1}soil.hour^{-1})	$\delta^{13}C$ in CO_2 (‰)	Total C (mg)	Atom%13C (%)
Conventional Tillage	0.219 a	-15.73 a	11.57 a	1.0882 b
Traditional Bahiagrass pasture	0.542 a	-13.36 b	12.92 a	1.0908 a
Native Vegetation	0.501 a	-16.16 a	11.26 a	1.0877 b
SBR – Bahiagrass 1st yr	0.526 a	-14.88 ab	12.17 a	1.0891ab
SBR – Bahiagrass 2nd yr	0.319 a	-15.10 a	12.25 a	1.0889 b
SBR – Cotton	0.402 a	-15.61 a	13.88 a	1.0883 b
SBR – Peanut	0.387 a	-16.53 a	15.25 a	1.0873 b
SE	0.118	0.51	0.98	0.0006
P	0.4384	0.0085	0.1410	0.0082

Conclusions

- ✓ Light fraction SOM was greater at the shallowest layer (0 to 0.15 cm), reducing its amount and variability in deeper soil layers. Bahiagrass pastures showed the greatest C inputs.
- ✓ Soil microbial respiration did not differ among land use systems.
- ✓ The $\delta^{13}C$ value obtained from the evolved CO_2 was less depleted in the bahiagrass pastures and sod-based rotation system compared to conventional tillage and native vegetation, demonstrating the importance of the C_4 bahiagrass increasing the pool of soil labile C.

References

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