MACROAGGREGATES CARBON STORAGE POTENTIAL IN BRAZILIAN OXISOL UNDER LONG-TERM NO-TILL

Ademir de Oliveira Ferreira[1], *Joao Carlos de Moraes Sá*[1], *Clever Briedis*[1]
[(1)] *Av. Carlos Cavalcanti, 4748, Universidade Estadual de Ponta Grossa, Ponta Grossa, Brazil*

INTRODUCTION

- ✓ In long-term no-till associate with cropping systems to keep the soil permanent covered leads to increase carbon (C) into the macroaggregates
- ✓ The potential of C storage in macroaggretes has a lack of knowledge in terms of the relationship between texture and soil organic carbon fractions.

MATERIALS AND METHODS

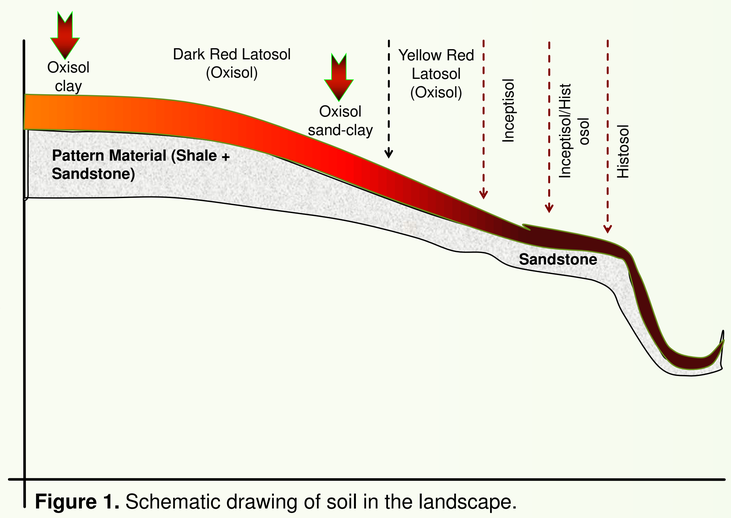

Figure 1. Schematic drawing of soil in the landscape.

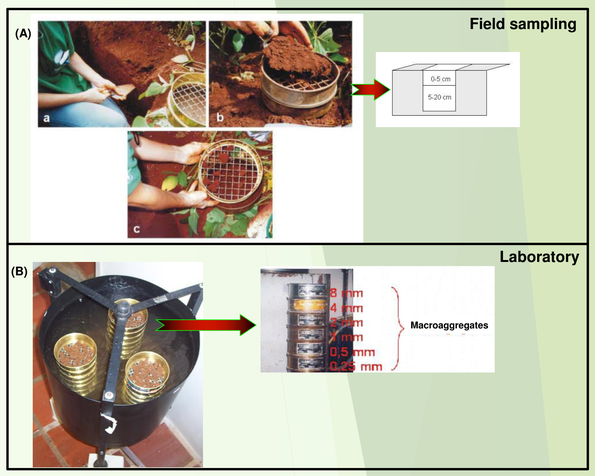

Figure 2. (A) Details of the stages of the sampling procedure in the field (pre-treatment): a) trenches; b) block of soil; c) aggregate size (adapted from Madari, 2004).
(B) The detail of the wet sieving procedure using Yoder (adapted by Castro Filho et al.1998).

RESULTS

Table 1. TOC (%) in of size classes of aggregates in a clay and sand-clay Oxisol under long-term no-till.

Textural	Depth	Attributes	Size classes of aggregates, mm					
Class	cm	(%)	19-8	8-4	4-2	2-1	1-0.5	0.5 – 0.25
Oxisol	0-5	Aggregate size class	75.85	2.70	2.42	2.14	3.60	4.57
clay		TOC in each size class	86.36	2.66	2.60	2.27	2.97	3.15
	5-20	Aggregate size class	74.63	2.70	2.25	2.47	3.97	4.35
		TOC in each size class	85.59	2.80	2.34	2.43	3.62	3.23
Oxisol	0-5	Aggregate size class	71.75	2.85	2.43	2.25	3.39	4.72
Sand-clay		TOC in each size class	83.98	3.06	3.00	2.75	3.53	3.69
	5-20	Aggregate size class	73.09	2.99	2,56	2.44	3.12	3.70
		TOC in each size class	85.93	3.16	2.75	2.62	2.92	2.61

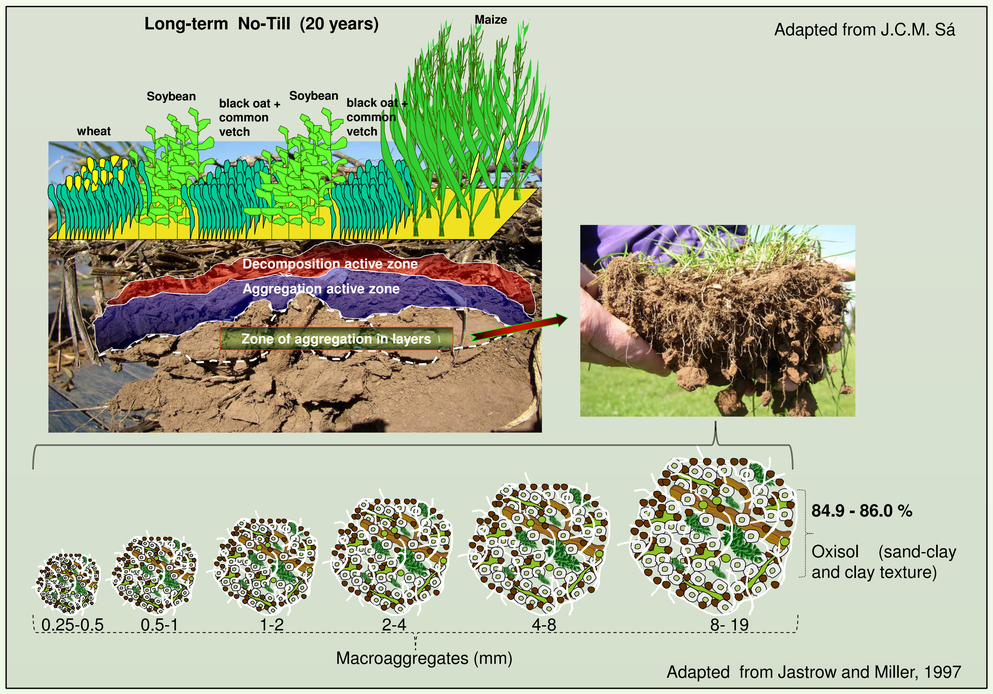

Figure 3. Schematic diagram illustrating the effect of long-term no-till on soil macroaggregation.

Table 2. Regression equations between the variation of TOC (Δ TOC§) and variation of POC (Δ POC§) with delta SR (stratification ratio)§§.

Pools (type)	Textural Class	Classes of aggregates (mm)	Equation	R^2	Significance level
TOC	Oxisol	19-8	Δ TOC = 5.80 + 6.71 Δ SR	0.43	0.02
	Sand-clay	8-4	Δ TOC = -0.76 + 4.98 Δ SR	0.31	0.06
		4-2	Δ TOC = -1.16 + 6.10 Δ SR	0.36	0.04
		2-1	Δ TOC = -193 + 1.89 Δ SR	0.12	0.26
		1-0.5	Δ TOC = -0.28 + 3.96 Δ SR	0.25	0.09
		0.5-0.25	Δ TOC = -0.68 + 5.12 Δ SR	0.62	0.002
	Oxisol	19-8	Δ TOC = 1.49 + 7.31 Δ SR	0.40	0.02
	clay	8-4	Δ TOC= 1.08+ 4.14 Δ SR	0.16	0.18
		4-2	Δ TOC = -2.26 + 1.56 Δ SR	0.09	0.35
		2-1	Δ TOC = -2.76 + 4.70 Δ SR	0.14	0.21
		1-0.5	Δ TOC = -0.89 + 2.53 Δ SR	0.03	0.55
		0.5-0.25	Δ TOC = -0.55 + 3.60 Δ SR	0.40	0.02
POC	Oxisol	19-8	Δ POC = 0.18 + 1.60 Δ SR	0.28	0.07
	sand-clay	8-4	Δ POC = -0.83 + 1.78 Δ SR	0.18	0.17
		4-2	Δ POC = 0.49 + 2.46 Δ SR	0.64	0.001
		2-1	Δ POC = -0.20 + 1.09 Δ SR	0.17	0.18
		1-0.5	Δ POC = -0.36 + 1.59 Δ SR	0.47	0.01
		0.5-0.25	Δ POC = 1.26 + 2.74 Δ SR	0.54	0.006
	Oxisol	19-8	Δ POC = -1.70 + 3.23 Δ SR	0.41	0.01
	clay	8-4	Δ POC = -0.77 + 2.37 Δ SR	0.25	0.09
		4-2	Δ POC = -1.46 + 5.20 Δ SR	0.49	0.01
		2-1	Δ POC = -0.29 + 0.79 Δ SR	0.04	0.51
		1-0.5	Δ POC = -0.38 + 2.92 Δ SR	0.44	0.01
		0.5-0.25	Δ POC = -0.15 + 2.77 Δ SR	0.56	0.005

§ Delta TOC (Δ TOC) and delta POC (Δ POC) represents the accumulated C calculated by difference from stock: C stock in E_2 - C stock in E_1; §§delta SR (0-5: 5-20 cm) represents the variation of SR between the E_2–E_1.

CONCLUSION

- ➢ The 8-19 mm size macroaggregates represented 86.0 and 84.9 % of soil mass of all aggregates l size classes of sand-clay and clay Oxisol respectively.
- ➢ A close linear relationship between C sequestration rate and the soil C stratification ratio was R^2=0.78** and R^2=0.81** for sand-clay and clay texture, respectively.
- ➢ Our results support that the statement of macroaggregation is the main way to sequester C.