LIVING LAB - ONTARIO

Soil Carbon and Nitrogen Research 2022

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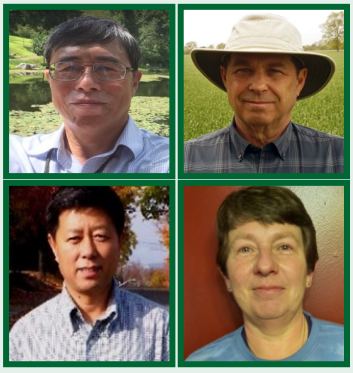


Research Objectives:

- Determine how best management practices affect carbon/nitrogen in soil
- Develop low-cost and easy assay for measuring particulate organic matter
- Model long-term crop production and dynamics of soil carbon and nitrogen in various crop rotations

Pour plus d'informations sur le chercheur d'AAC, en français : Xueming Yang, Ph. D. | Répertoire des scientifiques et des professionnels (science.gc.ca)

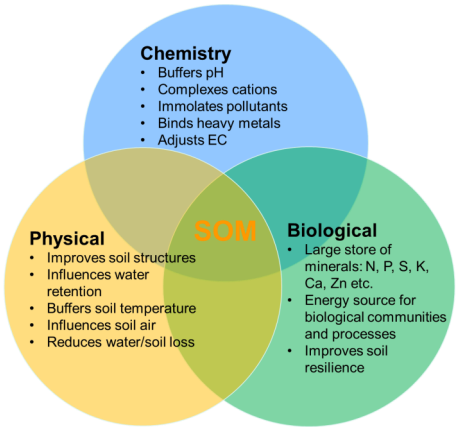
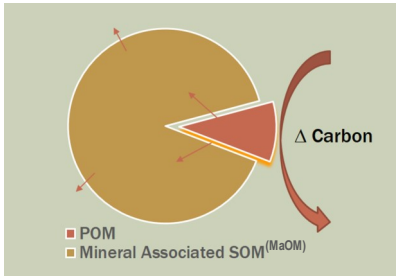


Fig. 1. The significance of soil organic matter (SOM, 2 mm)



ΔPOM - an early indicator of soil organic matter pool

Fig. 2. Particulate organic matter (POM, 0.053 – 2.0 mm) is biologically and chemically active and is part of the labile (easily decomposable) pool of soil organic matter.

What Does This Mean for Agriculture in Ontario?

- Understanding short- and long-term changes of soil organic carbon and nitrogen in agriculture systems
- Modeling long-term crop yield and soil carbon and nitrogen response to projected cropping management

Parameters Measured and Modeled

- Soil mineral nitrogen, organic carbon and total nitrogen
- Particulate organic matter carbon and nitrogen
- Running the DSSAT/Century model

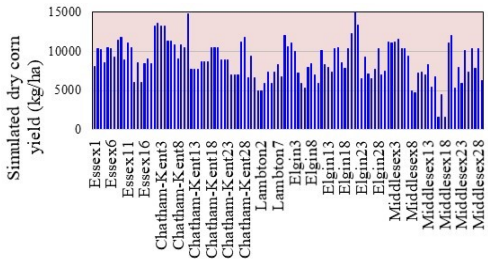
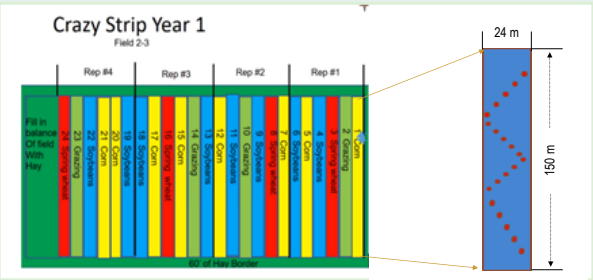


Fig. 3. Simulated corn grain yield in some counties of southern ON.

Sites Sampled

Baseline soil samples taken from all sites

Mike Groot

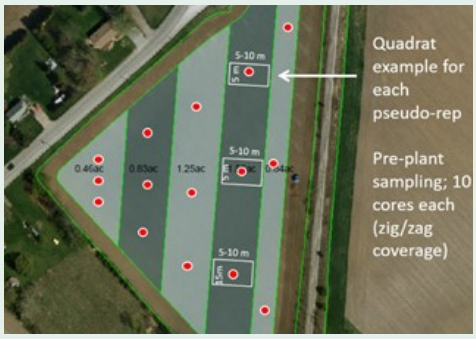


Samples from control and grazed crazy strip treatments

Ken Laing

- Rapid regeneration trials
- Cover crop screening trials

Woody Van Arkel



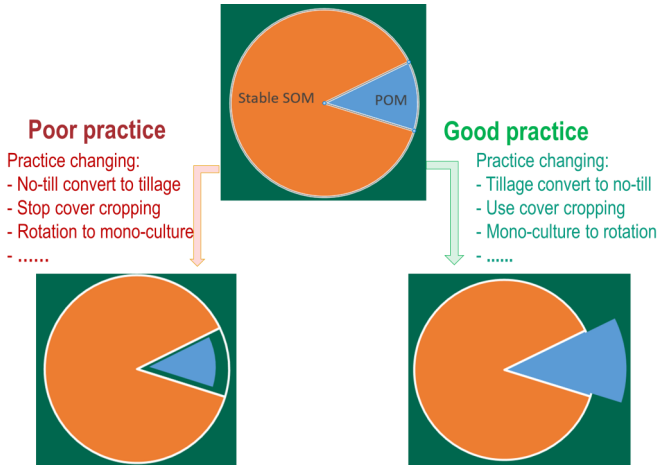
- In row and between row sampling from strips with and without perennial covers

Key Terms

Crazy Strips: replicated trial of 80-foot strips of different rotations: corn-soybeans, corn-soybeans-wheat, and corn-soybeans-wheat with perennial forages that is rotationally grazed with cattle

Early Results

- Soil organic matter gradually reaches an equilibrium over a long time and under a given farming practice



- Under poor practices POM is likely to show an obvious decline over a short period, while stable SOM remains
- Under good practices stable SOM would have no remarkable increase but POM could show a significant increase over a short period

- Results from one season of Ken Laing's rapid regeneration trials are shown in the figure below
- Deep compost mulch led to 3.75-fold increase in POM pool but <1.5-fold increase in SOC stocks in mineral soil layer (0-15 cm).
- Wood chip mulching also resulted in a larger POM increment (0.75-fold increase) than SOM (0.15-fold only).
- This shows that DCM is more helpful to increase SOC than wood chips
- Cover crop treatment-1 showed a small positive effect on POM pool, however, cover crop treatment-2 reveal a small negative effect on both POM and SOM perhaps as these were the only tilled plots. One more year results would make the effects clearer.