

Organic matter building with biomass crops: launching a new project across Ontario and Quebec.

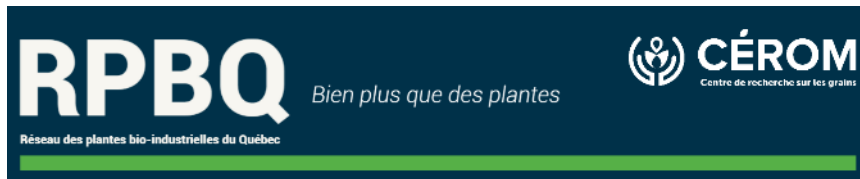
- Adam Gillespie, Naresh Thevathasan (University of Guelph)
- Snizhana Olishevskaya (CEROM)
- Jacynthe Dessureault-Rompré (Université Laval)
- Vincent Poirier (UQAT)

Acknowledgements



ONTARIO
AGRICULTURAL COLLEGE
SCHOOL OF ENVIRONMENTAL SCIENCES

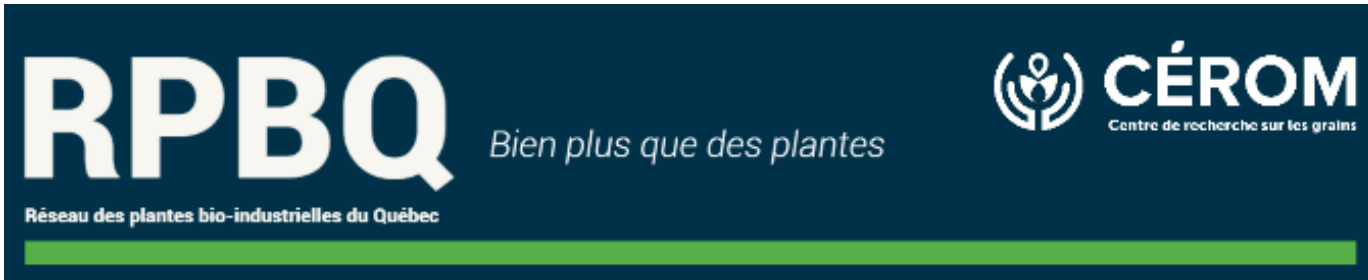
- Summer students:
 - Stephen Sumary
 - Devon Beckman



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LAVAL

Faculté des sciences de l'agriculture
et de l'alimentation

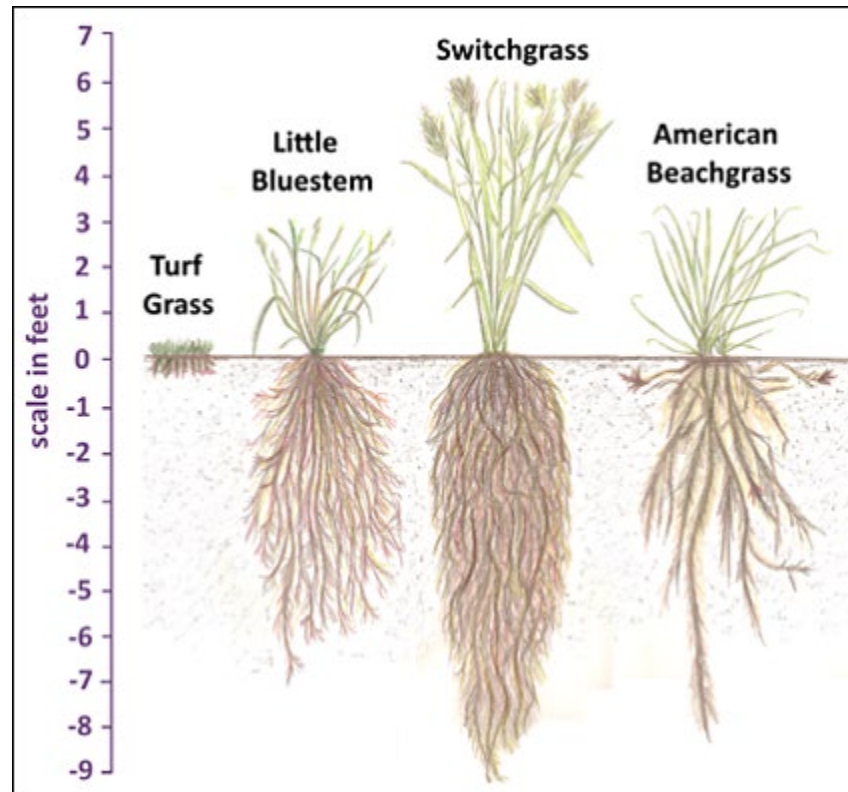




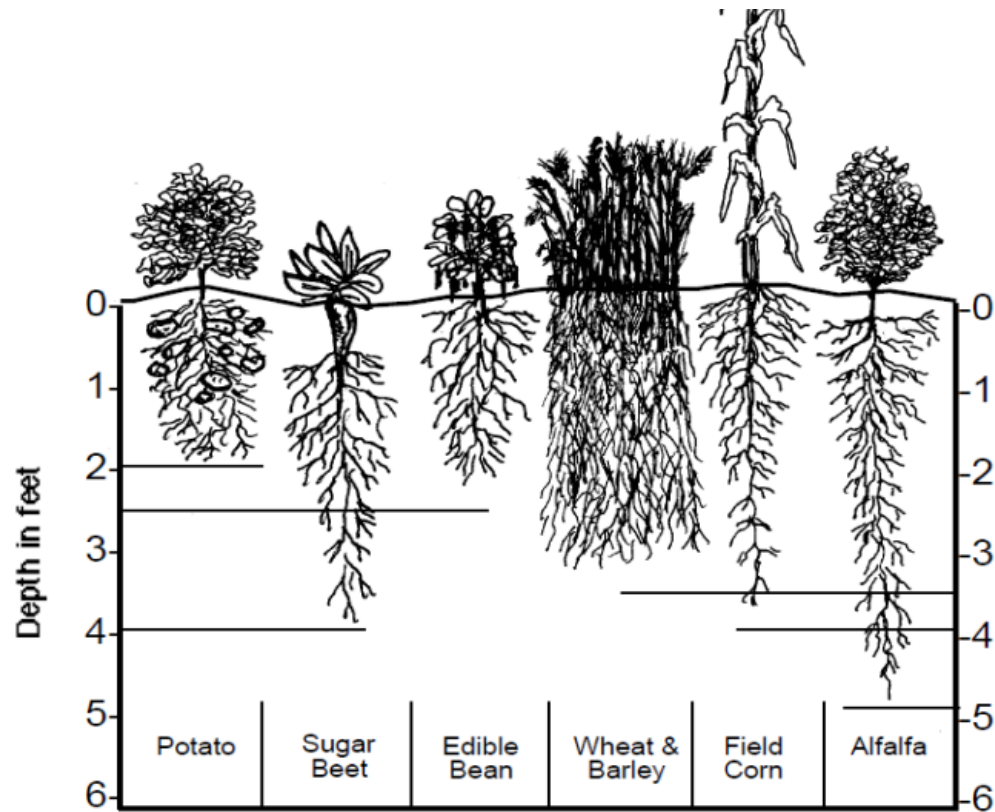
The sampling was done on plots of various cultivars of switchgrass and miscanthus established in 2010 as part of the Quebec Bioindustrial Plants Network funded by the Quebec Ministry of Agriculture, Fisheries and Food.

L'échantillonnage a été réalisé sur des parcelles de différents cultivars de panic érigé et le miscanthus géant, plantés en 2010 et faisant partie du réseau des plantes bio-industrielles du Québec financé par le ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec.

Biomass Crops Root Deeply

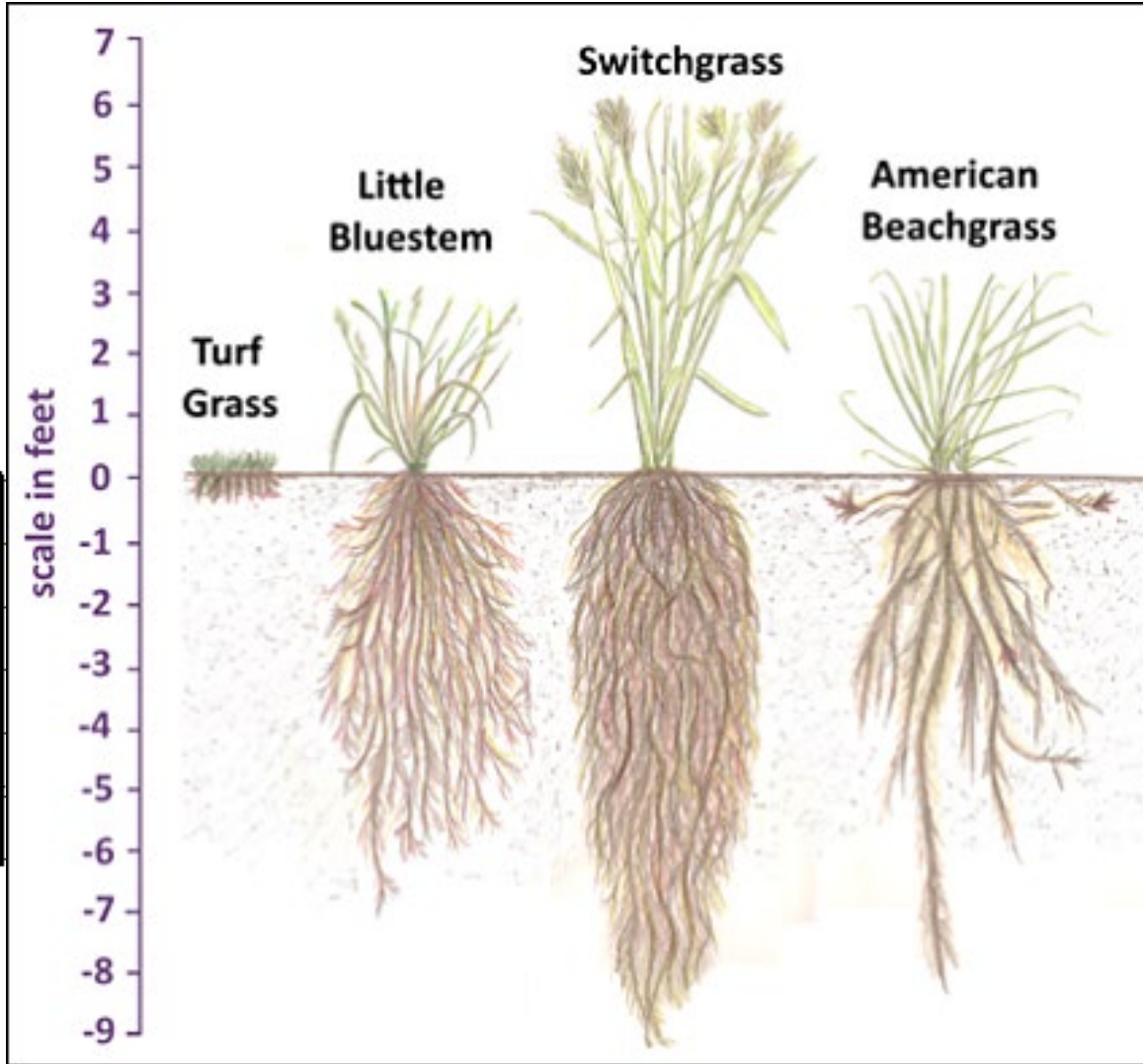
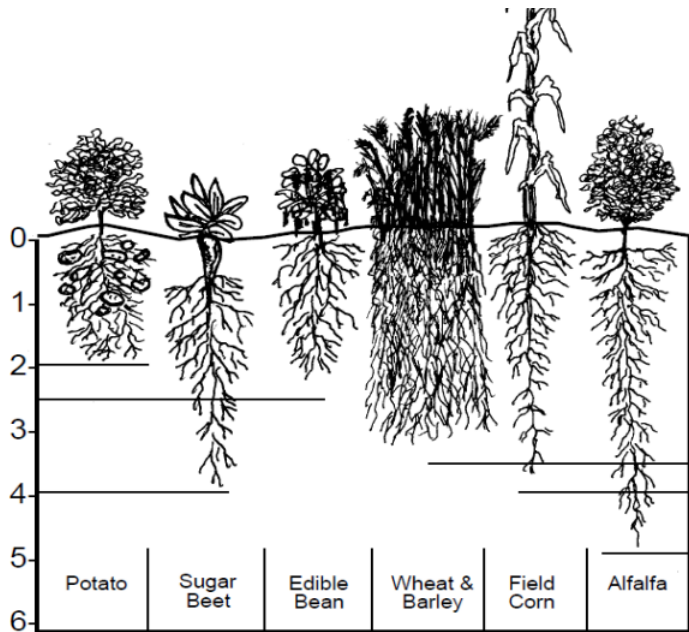


Annual crops not so much



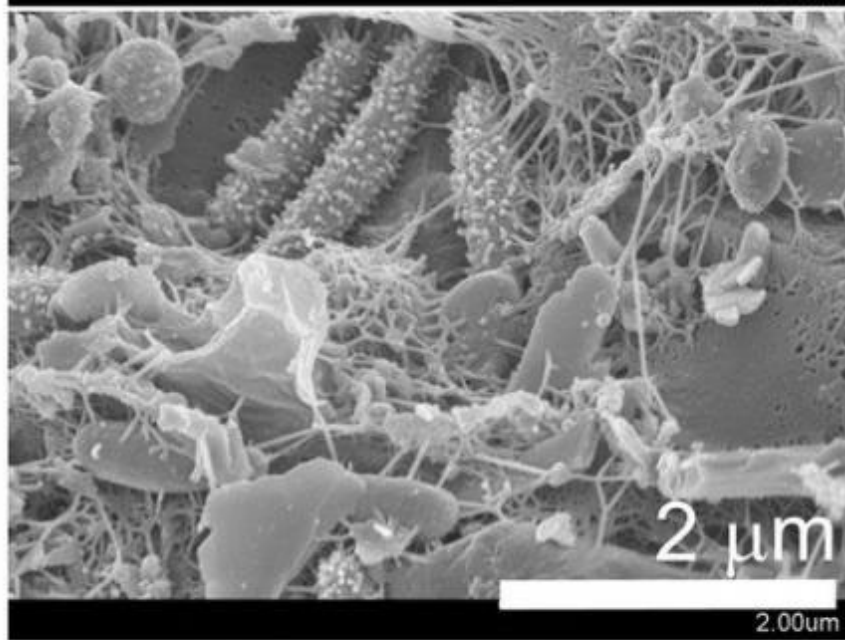
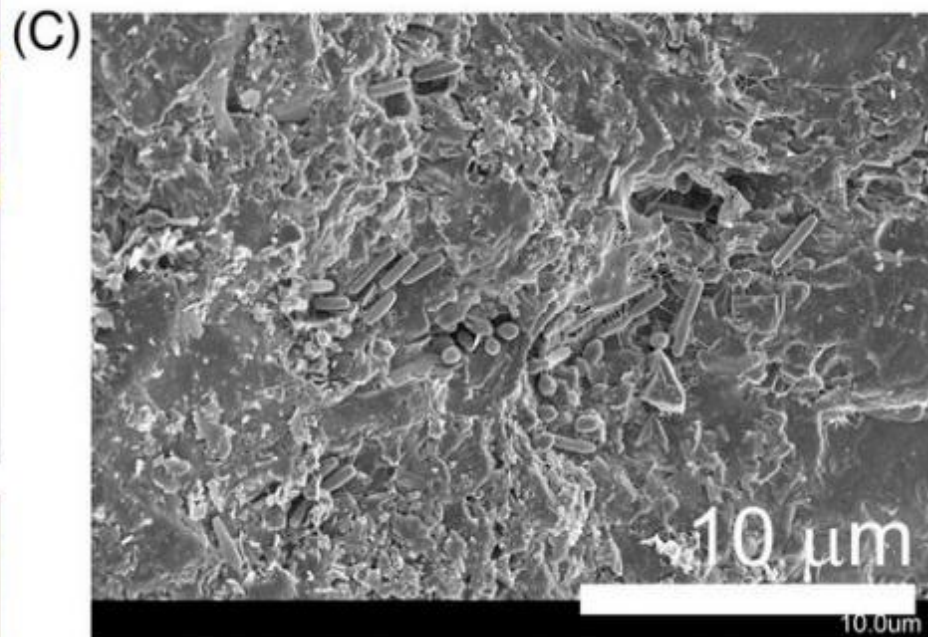
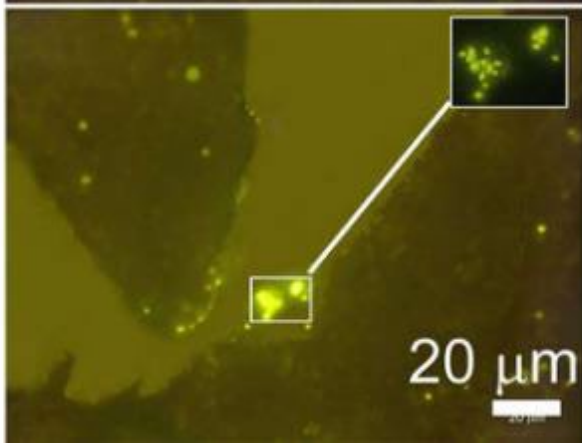
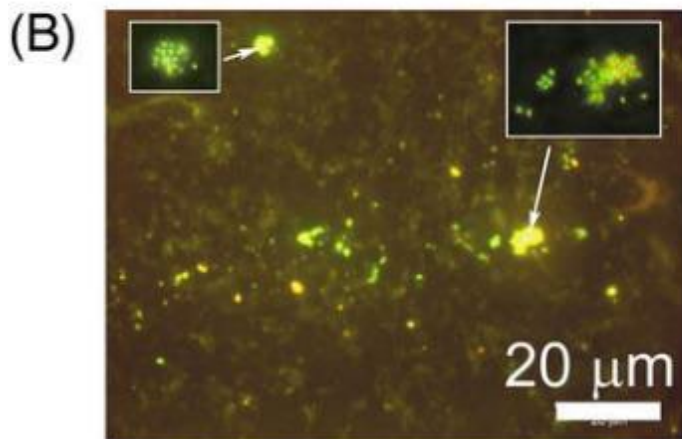
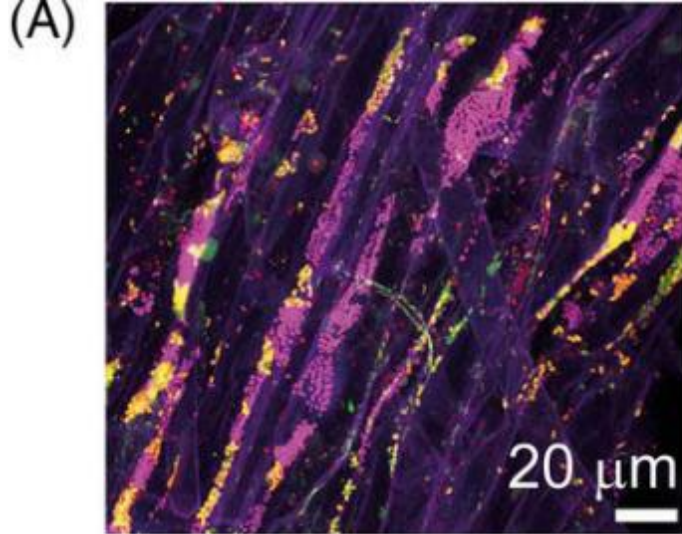
Lundstrom, 1988

Compare



Particulate OM vs Mineral Adsorbed OM

- POM
 - Sand-sized ($>53\mu\text{m}$)
 - Partly decomposed residues of...
 - In aggregates, on their own
- MAOM
 - Clay + silt sized ($<53\mu\text{m}$)
 - Microbial excrement and necromass



Maybe it's about the **roots**?

- Direct contact with soil surfaces
- Drives the microbial population
- Underground = slower decomposition
- 5x (?) more likely to become SOM vs. aboveground residue



Washed switchgrass root mass



<https://www.delmarvanow.com/story/news/local/maryland/2020/10/25/switchgrass-new-cash-crop-farmers-chesapeake-bay/3711696001/>

The project

- Deep cores (1m)
- Total carbon
- Biomass crop contribution (C_3 - C_4)
- Carbon 'stability'
 - Analytical pyrolysis
- Root architecture



Comparison

- Geographic regions
- Cropping systems
 - Includes commercial and research
- Switchgrass varieties
 - Cave-in-Rock
 - Bluejacket
 - Sundance
 - Big Rock
- Miscanthus
 - Nagara



Quebec

Laurentides Wildlife Reserve

La Pocatière

Laval

Centre de recherche sur les grains (CÉROM)

Madaléo

McGill

Norac

Sherrington, Québec

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus

Ontario

Eggimann Farms

Mable May II

Mable May Farms

Nott Farms

Fidale Farms

Gildale Farms

Daveland Farms

All Weather Farming



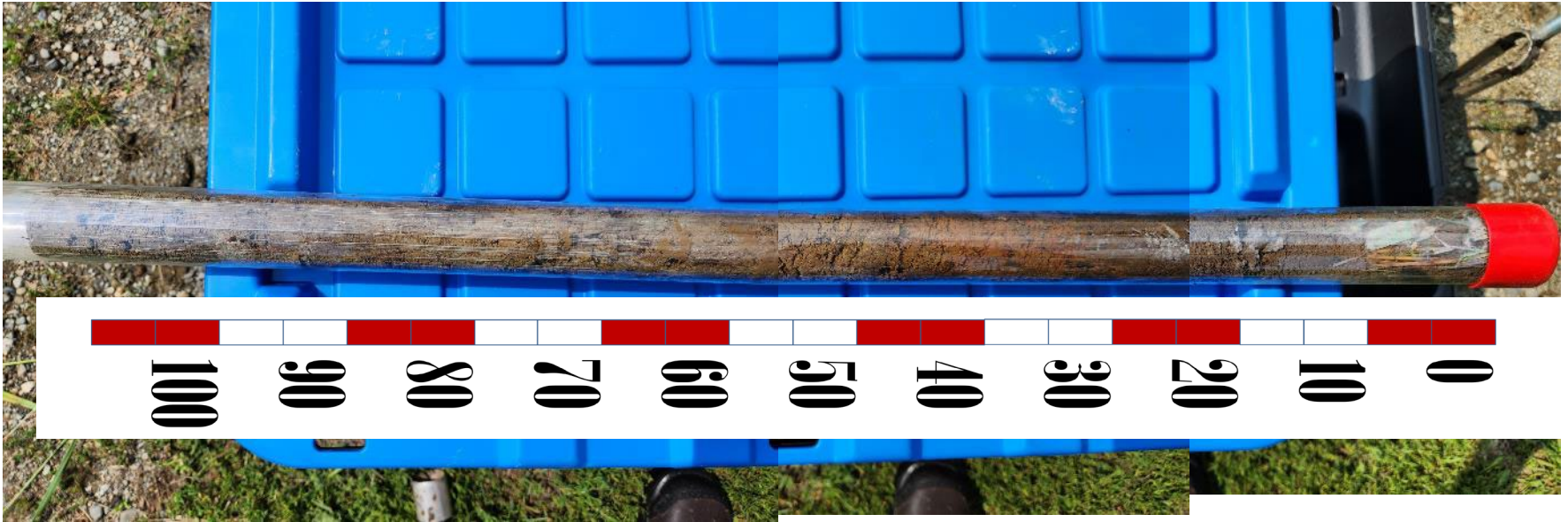
CEROM (near Beloeil)



Mechanized core sampling to 1m

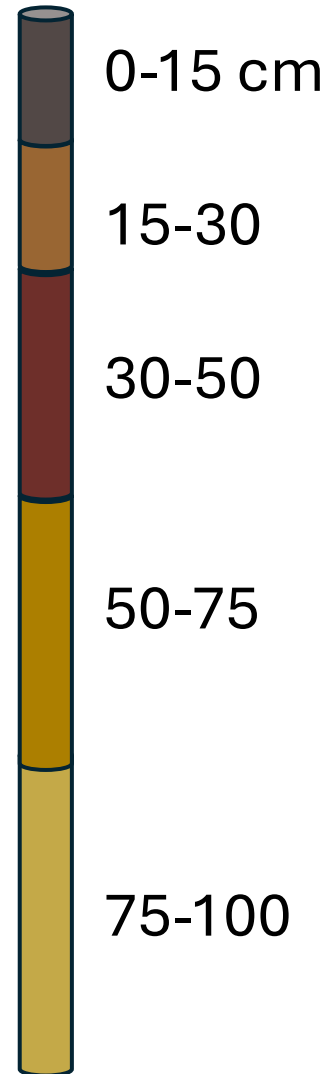


1m core sampling



Sub-sampling

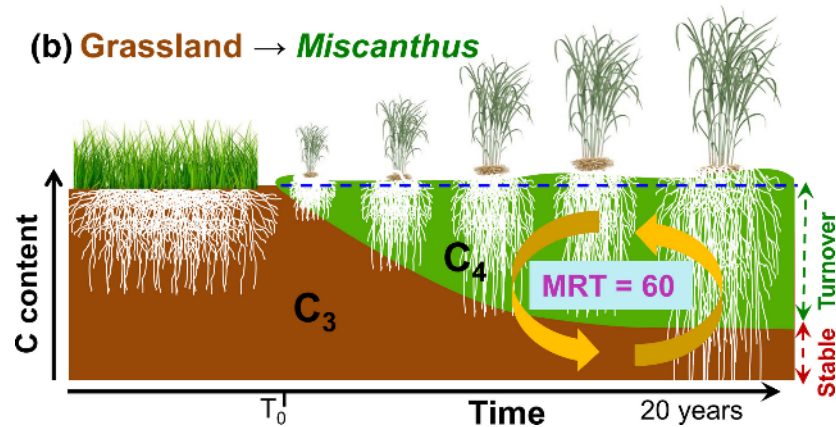
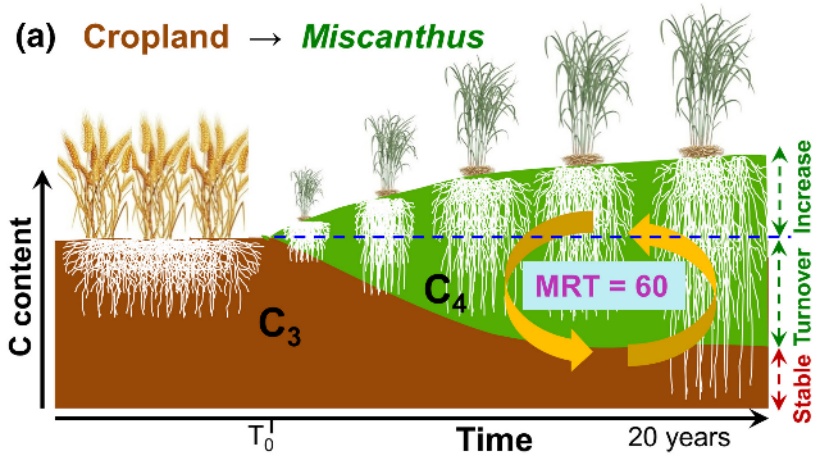
- Segmenting the core
- Tracking carbon through the profile
- Surface and deep C



Carbon Additions and Stability

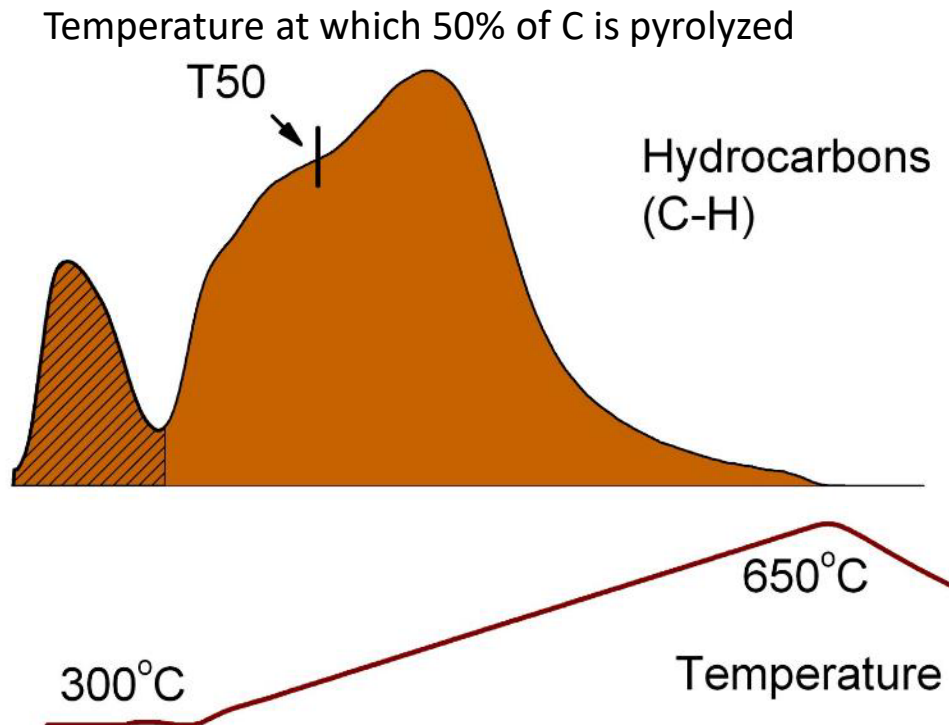


Additions C₃ to C₄

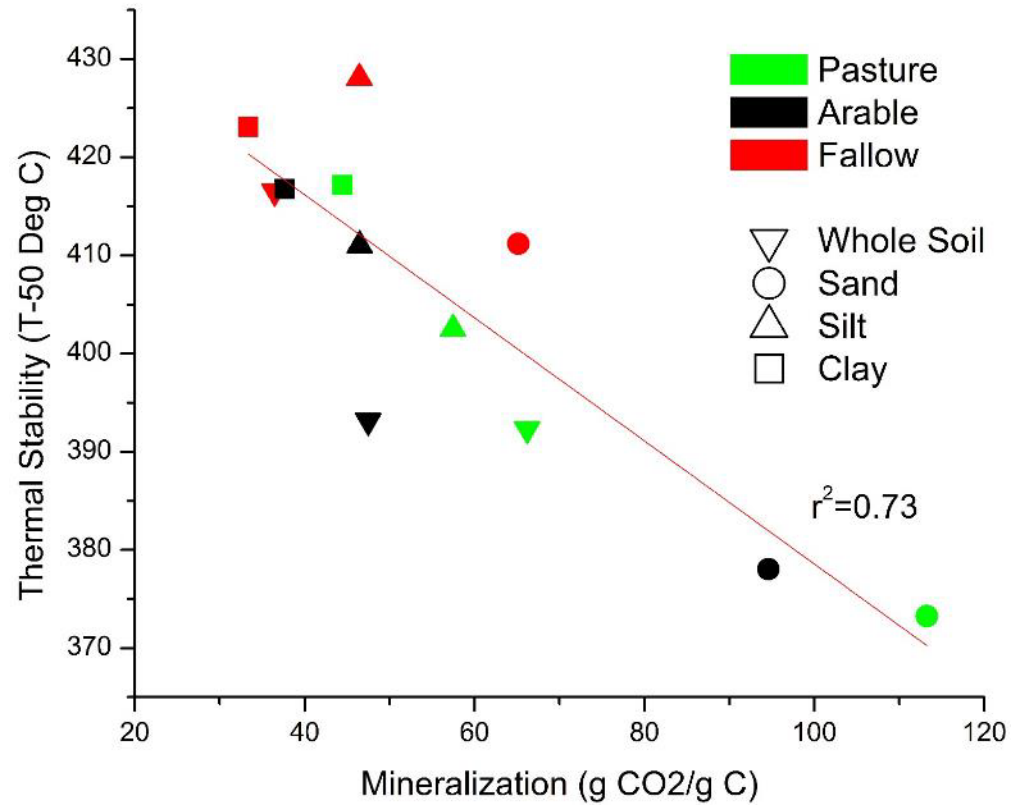


'Stability' is: Resistance to Decomposition

Temperature-controlled pyrolysis



Pyrolysis vs mineralization



Expectation

- Higher amounts of carbon compared to annual crops
- Carbon will build deeper down
- Stability of carbon will be higher where C comes from biomass crop
 - From root contribution
- Stability of C will relate to root biomass

Challenges

- Field without corn history
- Deep cores break equipment
- Graduate student hiring





Discussion

- Does this fit your curiosity for biomass crops?
- What else do you want to know about biomass crops and soil carbon?
- Would you like to be involved?
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