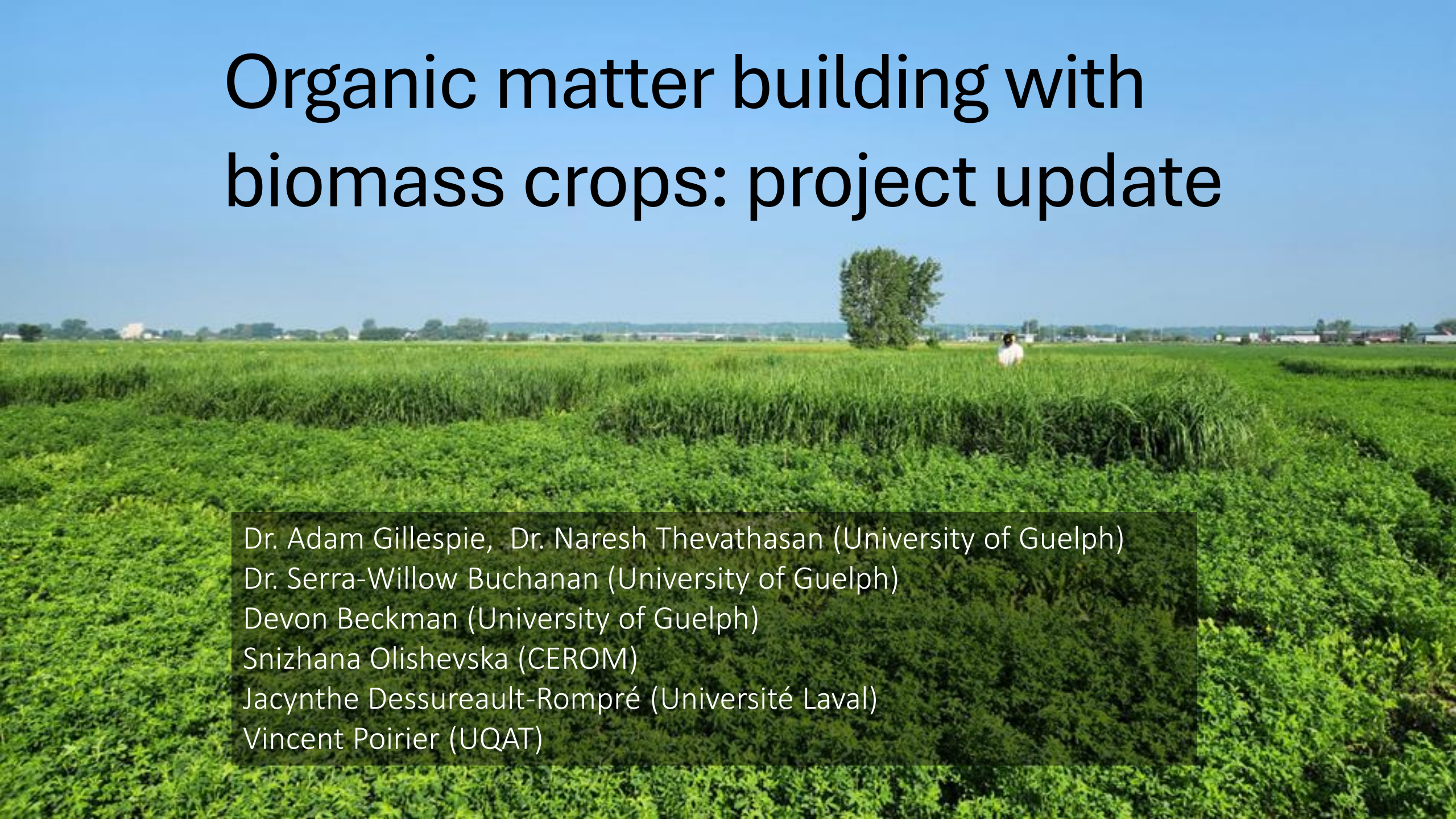


Organic matter building with biomass crops: project update



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Acknowledgements

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 - Stephen Sumary
 - Devon Beckman

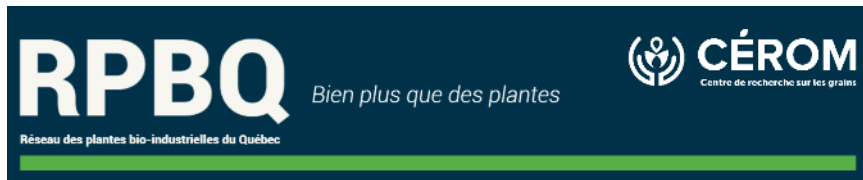


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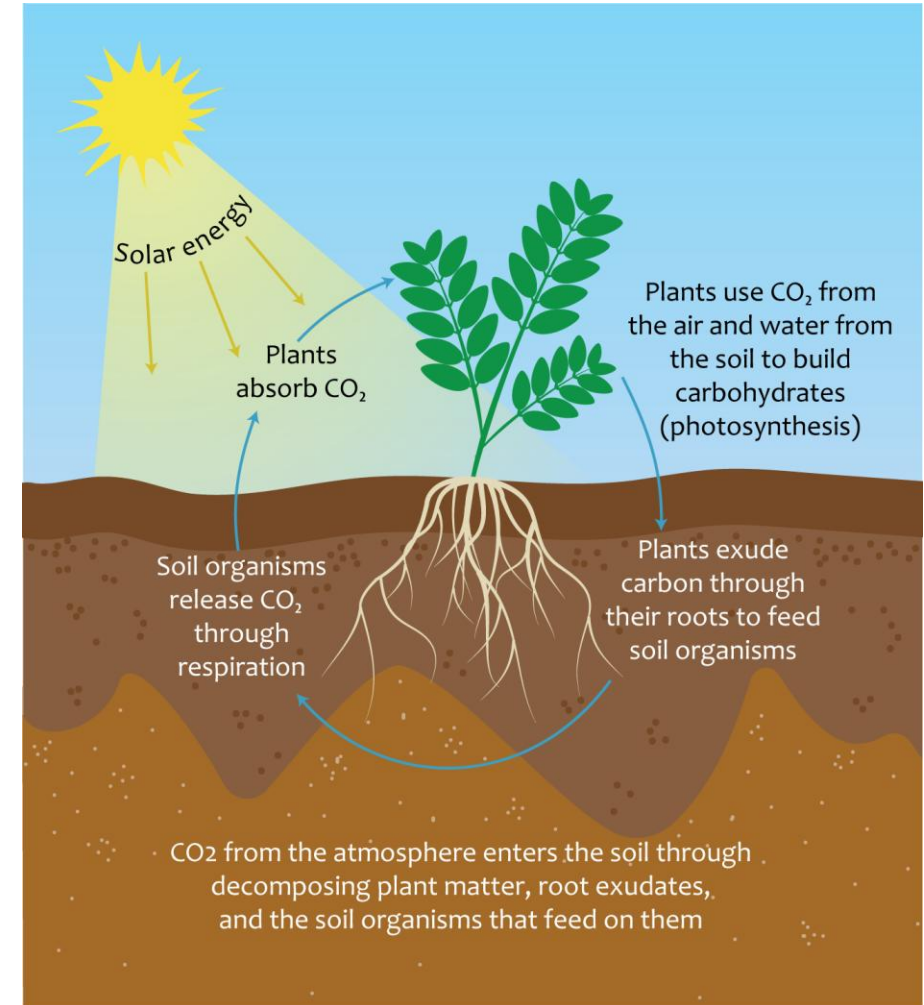
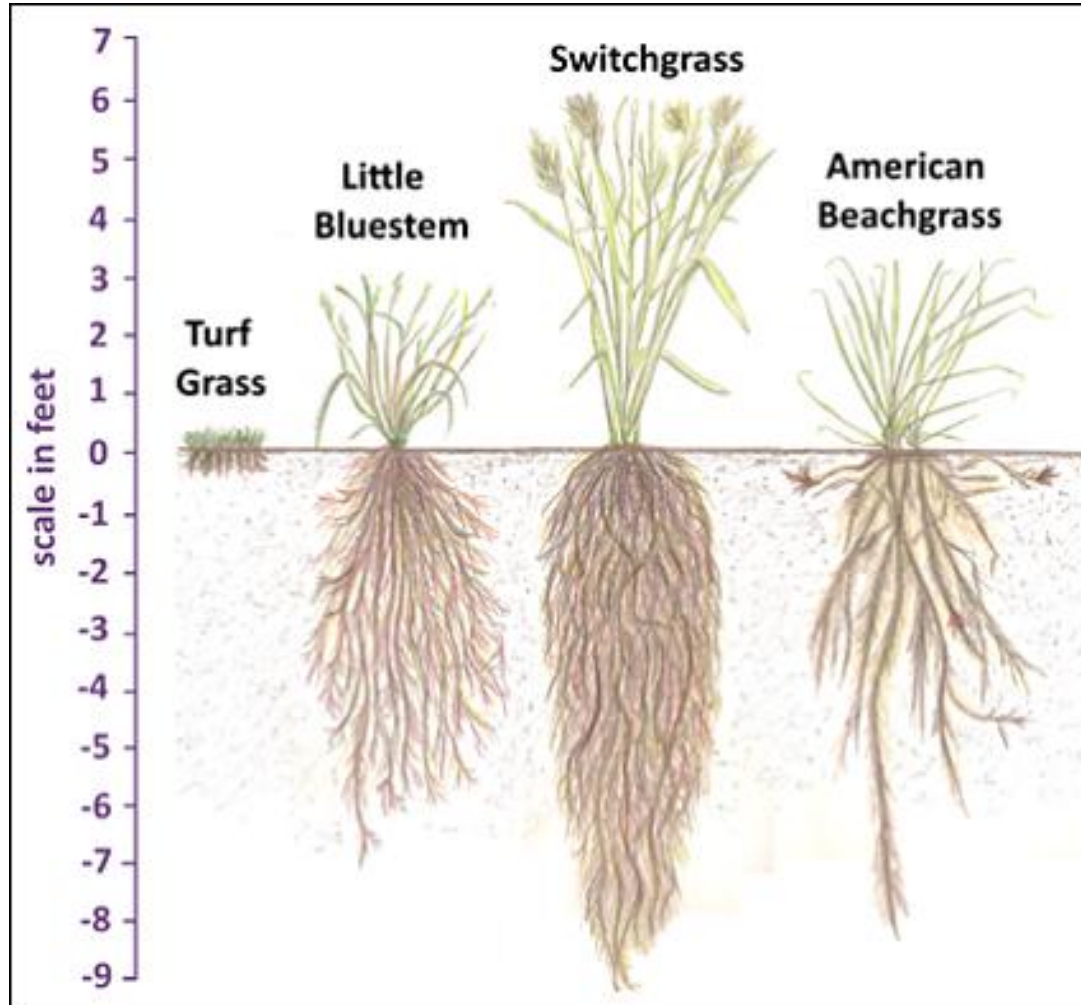


The sampling was done on plots of various cultivars of switchgrass and miscanthus established in 2010 as part of the Quebec Bioindustrial Plants Network funded by the Quebec Ministry of Agriculture, Fisheries and Food.

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.



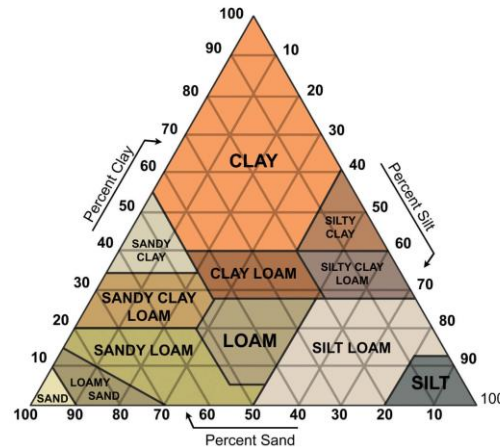
Biomass crops root deeply = Opportunity for C storage



Gaps in our knowledge

How will C storage potential change between:

- Switchgrass varieties
 - Cave-in-Rock
 - Sundance
 - Big Rock
- Soil texture
- Geographic regions
 - Ontario + Quebec



Objectives

- Quantify the carbon being sequestered by switchgrass stands in Ontario and Quebec
 - Particulate OM vs Mineral Adsorbed OM
 - Biomass crop contribution to soil C (C_3 - C_4)
 - 'Stability' of C using pyrolysis
- Demonstrate the value of planting this crop for soil remediation and environmental benefit

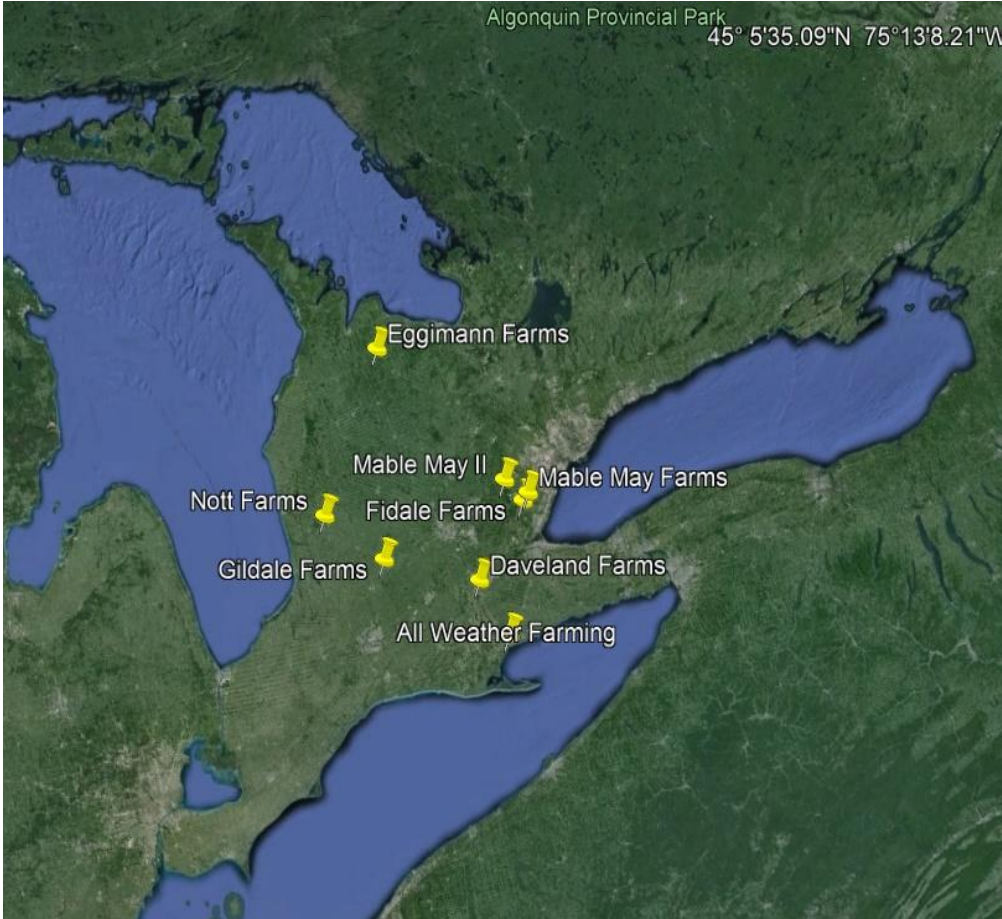


Expectations

- Biomass crops will sequester more carbon than annual crops.
- Soil carbon accumulation will extend to deeper layers over time.
- Carbon derived from biomass crops, particularly from roots, will be more stable



Our Sites



Ontario



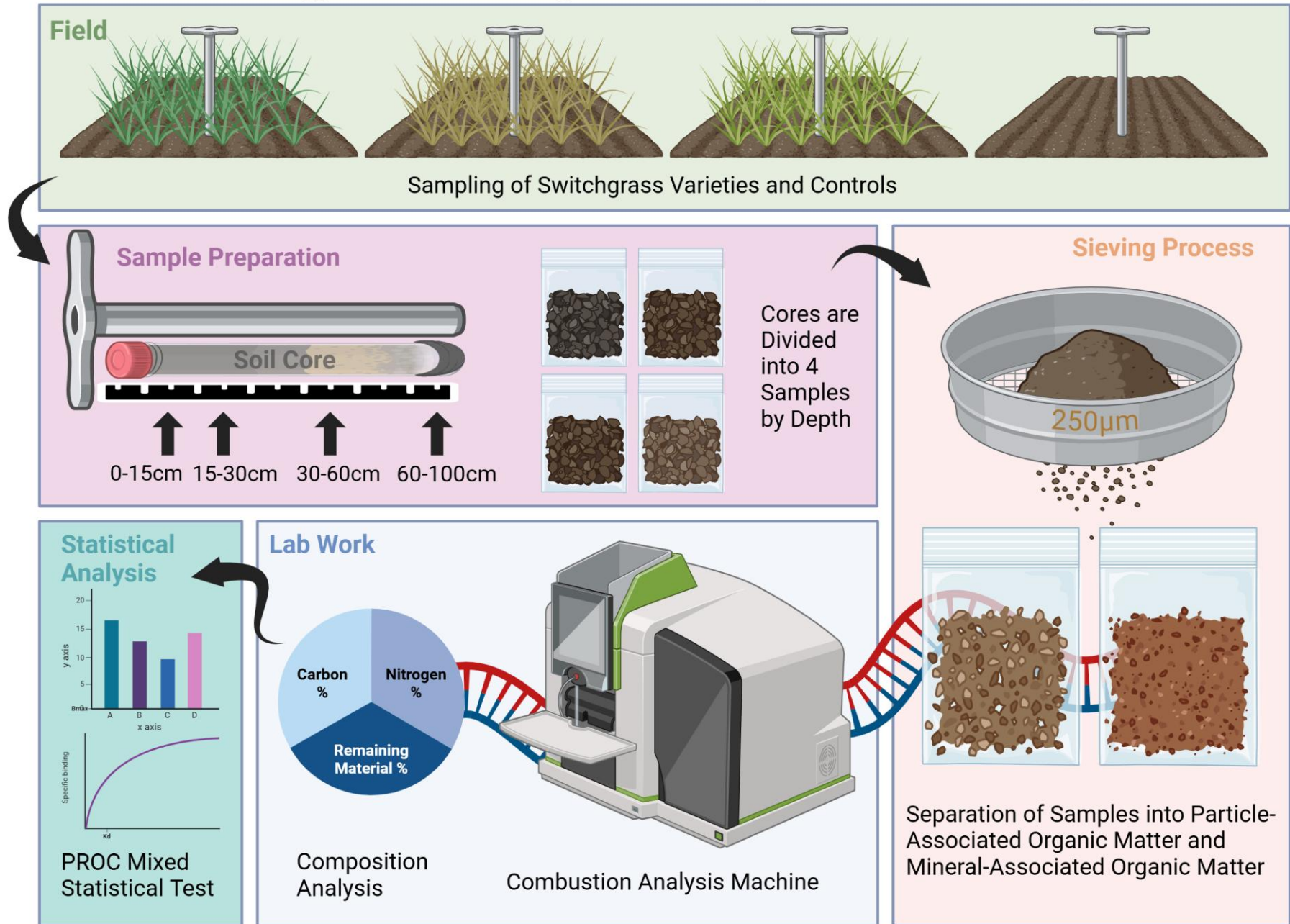
Quebec

Sampling Procedure

- 1m deep soil cores
- 3x per plot
- Modified post pounder
- Captures soil profile



Methodology of Determining Carbon Sequestration of Switchgrass



'Allocation' of C from biomass crop to soil

Natural abundance stable C isotopes

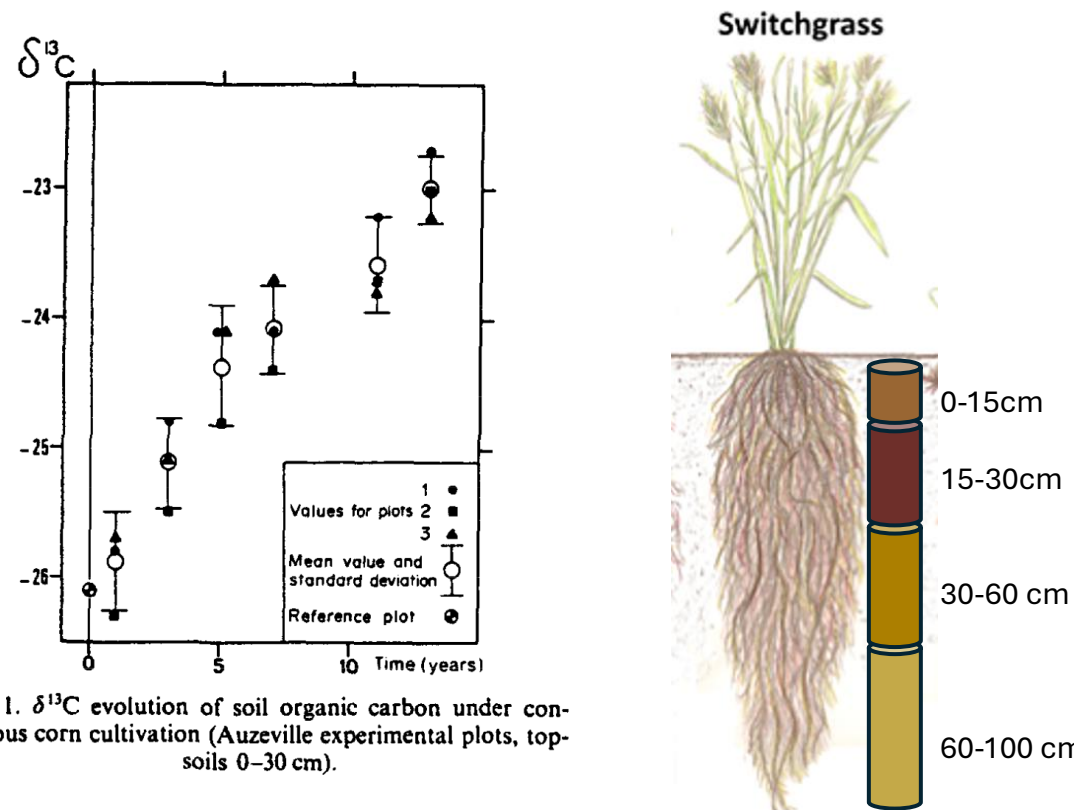


Fig. 1. $\delta^{13}\text{C}$ evolution of soil organic carbon under continuous corn cultivation (Auzeville experimental plots, top-soils 0–30 cm).

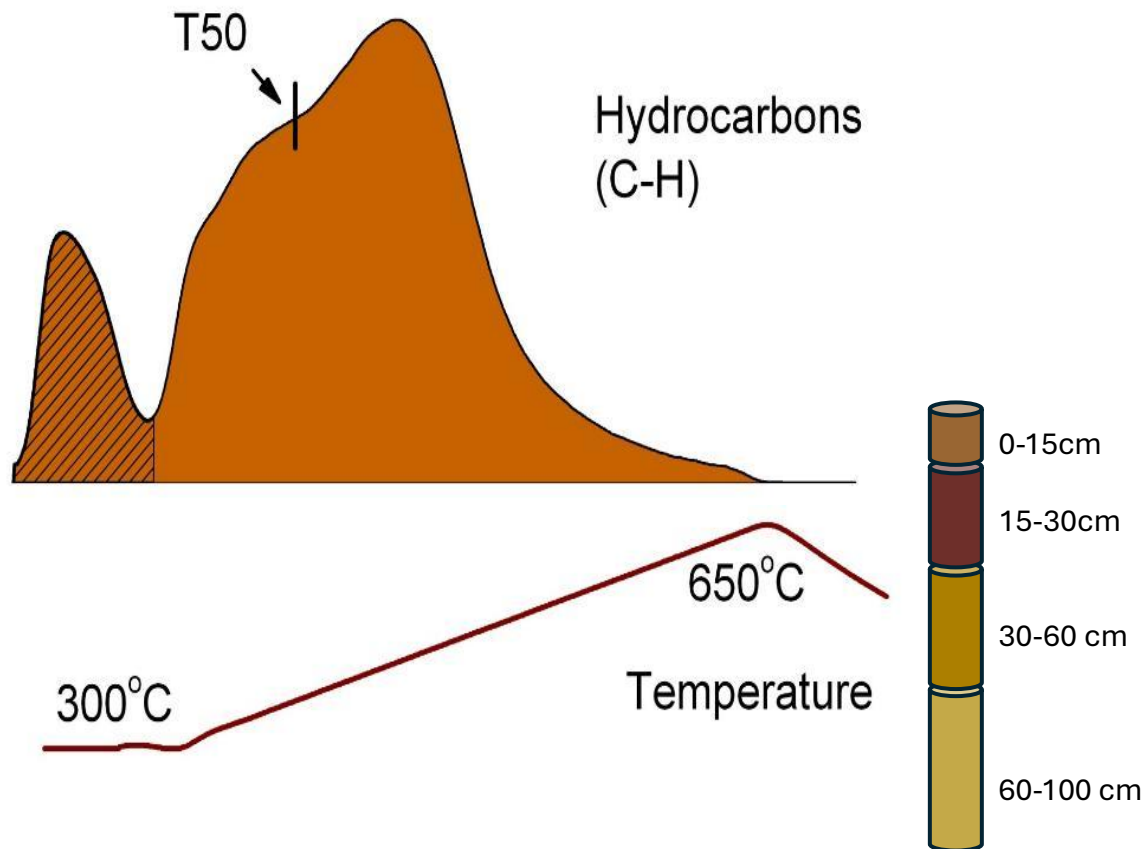
C4 plants (switchgrass) exhibit a distinct carbon isotopic signature ($\delta^{13}\text{C}$) ranging from -16‰ to -10‰

This differs from C3 plants which have values between -33‰ and -24‰

Contributions of biomass crop C can be quantified by comparing the isotopic signature ($\delta^{13}\text{C}$) of a control plot soil to those under switchgrass cultivation

'Stability' of C

Temperature-controlled pyrolysis



The term "stability of C" refers to **how resistant carbon compounds are to decomposition.**

More stable forms of carbon contribute to **long-term carbon storage** in soil, which is crucial for soil health and climate change mitigation.

Programmed pyrolysis: Heating soil under a programmed temperature ramp can teach us about the **thermal stability of soil organic matter.**

Task	Status / Completion Date
Sample collection	Completed (Summer 2023 + 2024)
Subsampling/air drying of cores	Completed (Dec 2024)
Soil grinding	Completed (Feb 2025)
POM + MAOM C content	Ongoing - Anticipated completion July 2025
Total C and N	Ongoing - Anticipated completion April 2025
Stable C isotopes (Sent to U Sask)	Ongoing - Anticipated completion May 2025
Pyrolysis (Samples prepared)	Ongoing - Awaiting contract
Soil textural analysis	Ongoing - Anticipated completion July 2025
Statistical analysis of data	TBD





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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