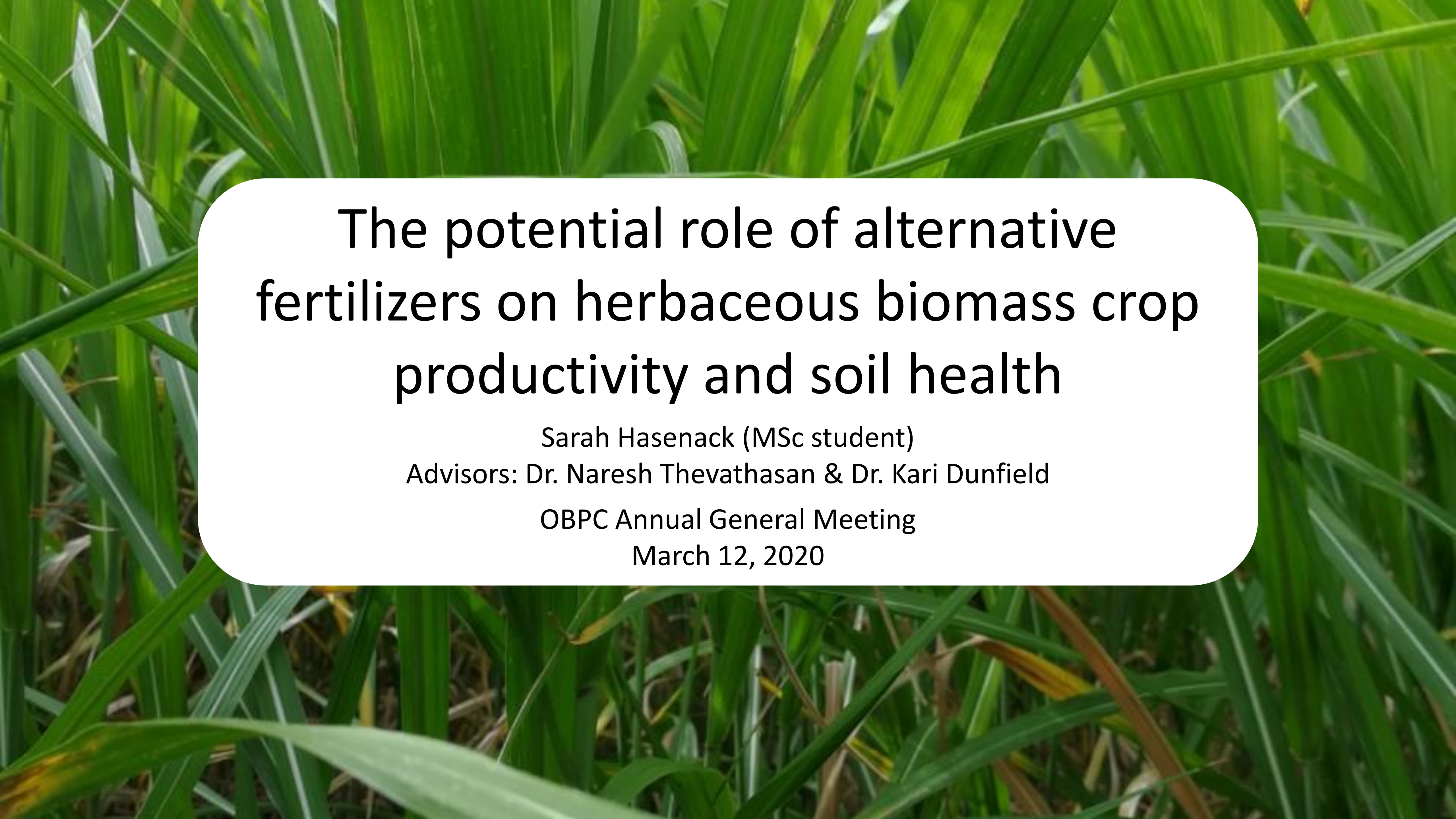


The potential role of alternative fertilizers on herbaceous biomass crop productivity and soil health

Sarah Hasenack (MSc student)
Advisors: Dr. Naresh Thevathasan & Dr. Kari Dunfield

OBPC Annual General Meeting
March 12, 2020

Introduction

Discovered my interest in sustainable agriculture in a course taught by Dr. Naresh Thevathasan

- Later decided I would like to complete a Master's thesis in Environmental Sciences related to sustainable agricultural practices

My work is an expansion on research started by Sean Simpson (MSc)

- Sean's Research: (1) soil organic carbon accumulation, (2) optimizing non-commercial inoculants, (3) greenhouse experiments, (4) early field trial with JumpStart
- I am focussing more on the effects of different fertilizer options on (1) crop growth and yield, (2) soil health, and (3) greenhouse gas emissions under field conditions

Field work is to be conducted in 2019 and 2020 (1 year done, 1 more to go!)

Milton-Switchgrass

Milton-Miscanthus

Guelph-Switchgrass

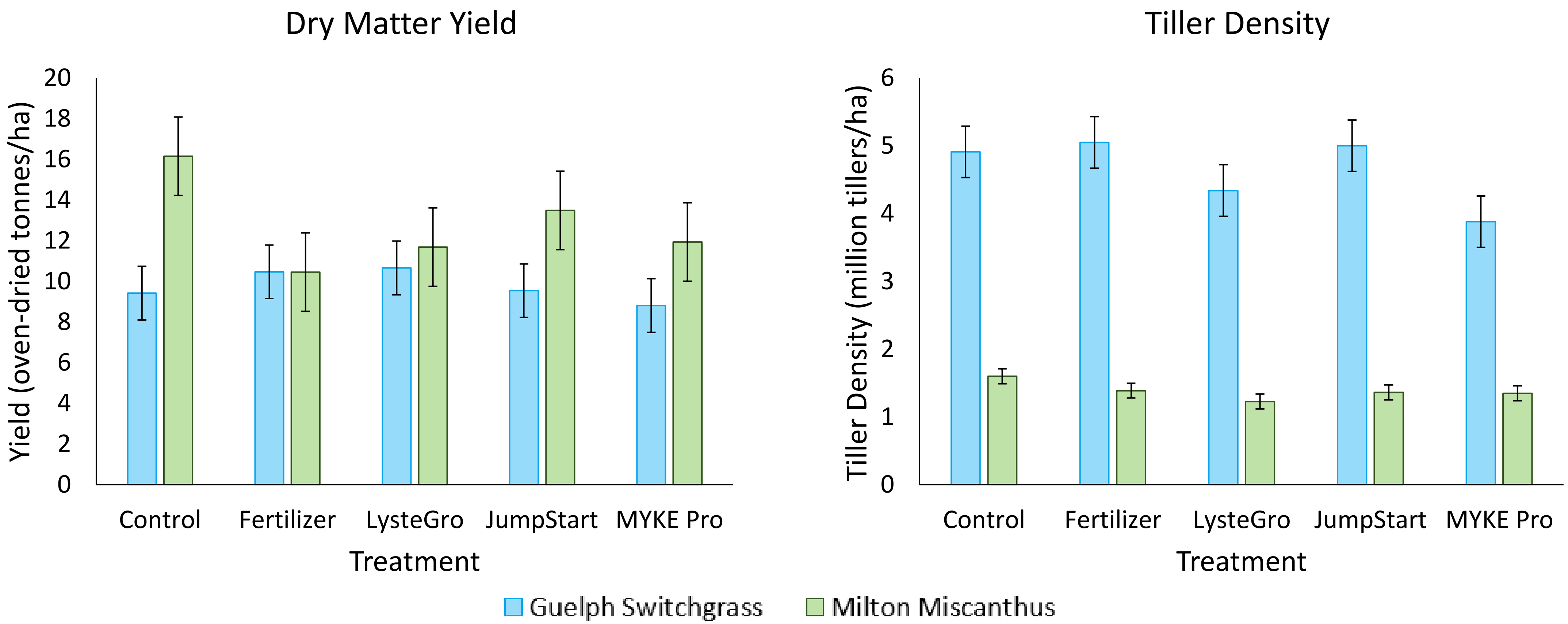
Experimental Design

Two Crops: (1) switchgrass (*Panicum virgatum* var. Cave-in-Rock) and (2) miscanthus (*Miscanthus* x *giganteus*)

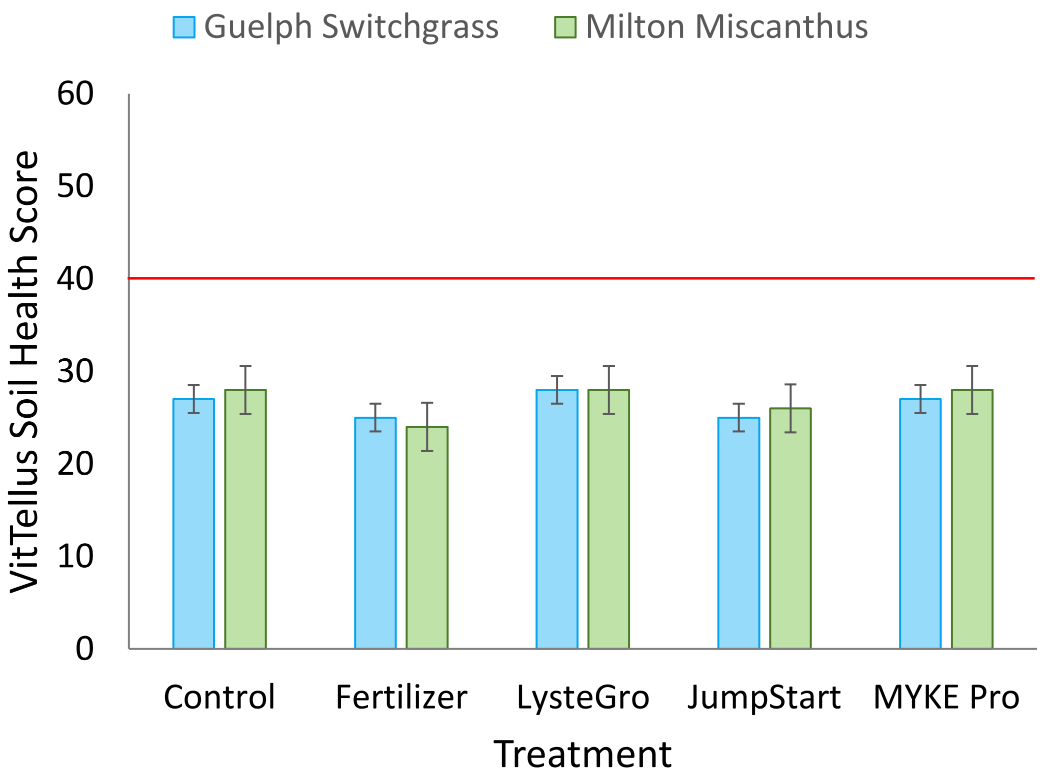
Three Field Sites: (1) Guelph-Switchgrass, (2) Milton-Switchgrass, and (3) Milton-Miscanthus

Five Treatments: (1) control – no inputs, (2) chemical nitrogen fertilizer – urea applied at 55-60 kg N/ha, (3) LysteGro – biosolids organic fertilizer applied at 55-60 kg N/ha, (4) JumpStart® – biofertilizer inoculant of *Penicillium bilaiae* + ½ rate urea, and (5) MYKE® Pro – biofertilizer inoculant of *Glomus intraradices* + ½ rate urea

Results: Yield and Tiller Density



Results: VitTellus Soil Health Index



Rates soil health according to the balance of key physical, chemical, and biological properties.

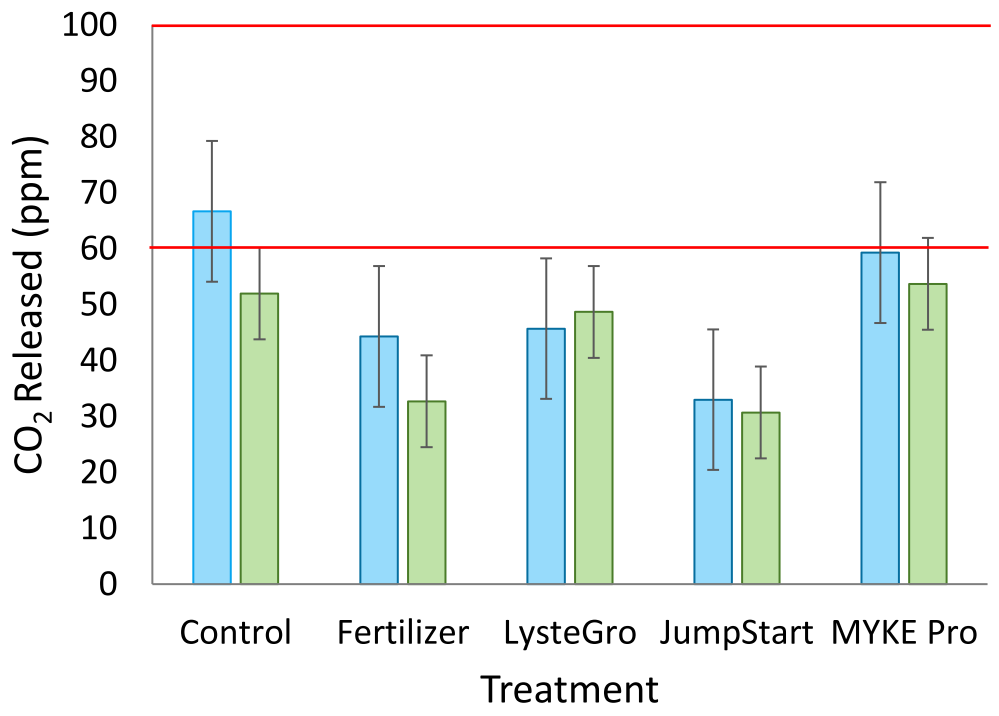
Scale runs from 0-60, with a score of >40 indicating "good" soil health

- Lower scores: plant matter and nutrient levels don't support optimum microbiological levels
- Higher scores: plant matter and nutrient levels support greater microbiological activity

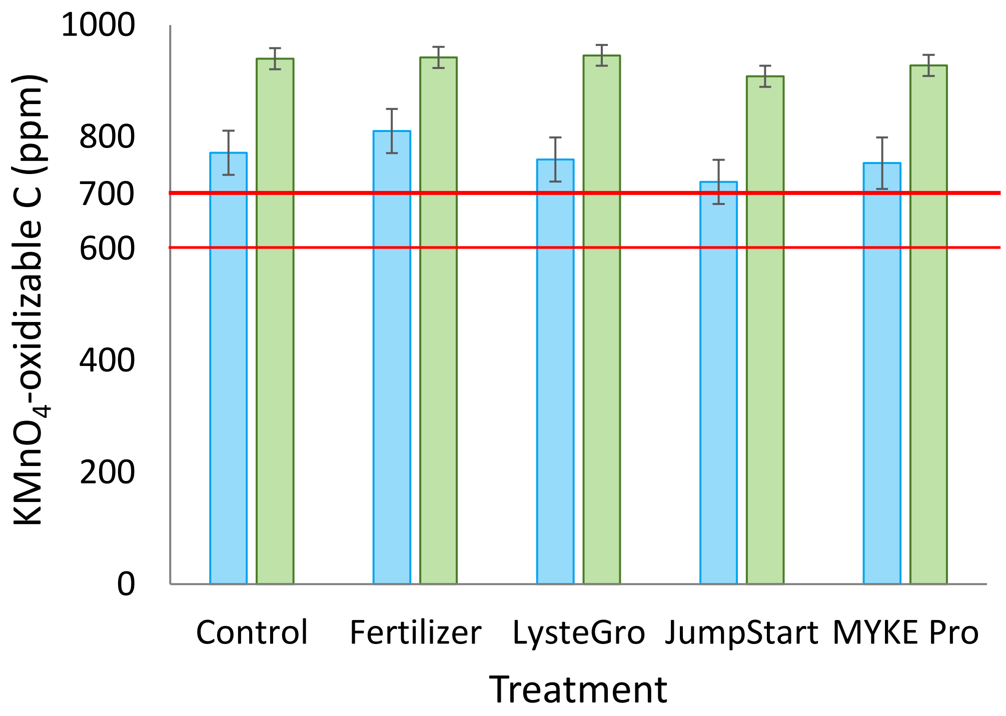
Higher scoring soils are expected to have improved nutrient use efficiency and result in higher yields

Results: Soil Microbial Activity

Solvita CO_2-Burst: microbial respiration



Reactive C Test: carbon substrate availability



Results in Progress

1. Plant Growth Curves
2. Soil Fertility
3. Soil Microbial Communities

Baseline soil microbial sampling at the miscanthus farmer's property in Milton, ON (July, 2019).

Biweekly plant sampling day at the switchgrass farmer's property in Milton, ON (August 2019).

Looking Ahead: Field Season 2020

In 2020 we will repeat the trial, with some adjustments and additions:

Addition: static gas chambers to assess greenhouse gas emissions at the Guelph Switchgrass field site

Addition: earthworm density quantification using mustard solution at all three field sites

Adjustment: remove chemical N from biofertilizer treatments

Adjustment: focus plant and yield sampling methods to minimize random variation

Adjustment: apply fertilizers much earlier in the season to capture their effects throughout the entire growing season

Thank you for listening!

Advisory Committee

- Dr. Naresh Thevathasan
- Dr. Kari Dunfield
- Dr. Paul Voroney

Summer Research Assistants

- Andrew Alphons
- Sean Chapman

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ses school of environmental sciences

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