Climate-Smart Soils Training and Education

Claudia Wagner-Riddle

@UoGAgMet

Summit on Canadian Soil Health
Soil Conservation Council
November 17, 2021

University of Guelph

Ontario Agricultural College

School of Environmental Sciences

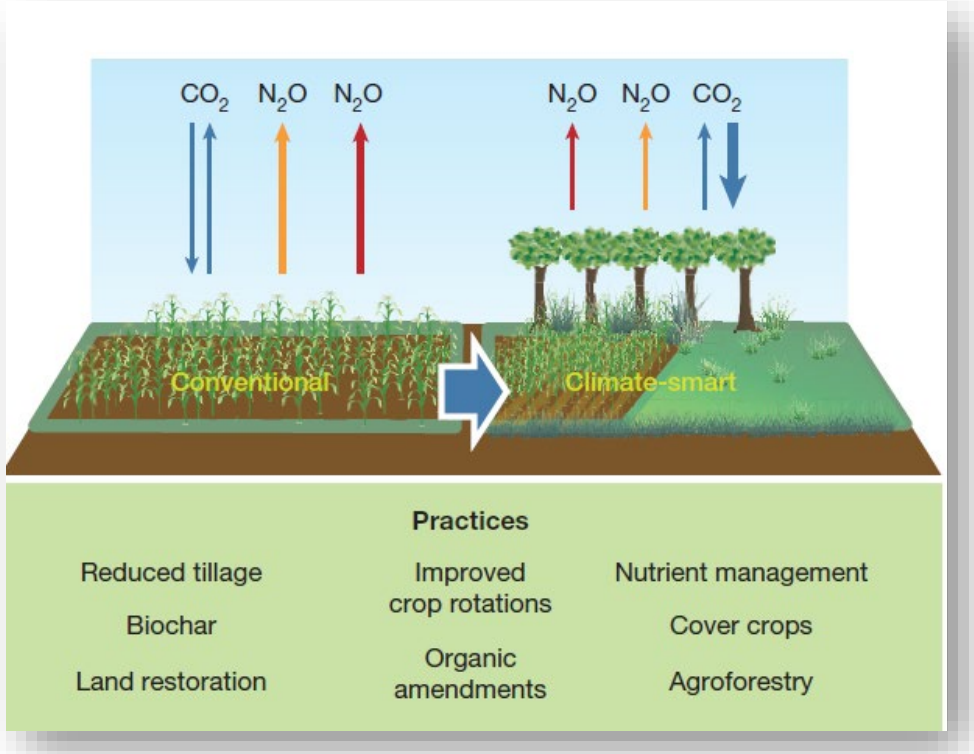
The case for Soil Health

- 95% of the global food supply derived from soils
- Soil degradation is estimated to cause losses in crop productivity of $3 billion/year in Canada
- This estimate does not consider impact on other services such as water security, biodiversity and climate change mitigation
- Globally 24 bill tons of fertile soil are lost every year and soil degradation is estimated to reduce GDP in developing countries by up to 8%
- Soils could play a pivotal role in limiting global temperature increase to less than 2°C

Three Objectives of Climate-Smart Agriculture….

https://www.fao.org/climate-smart-agriculture/en/

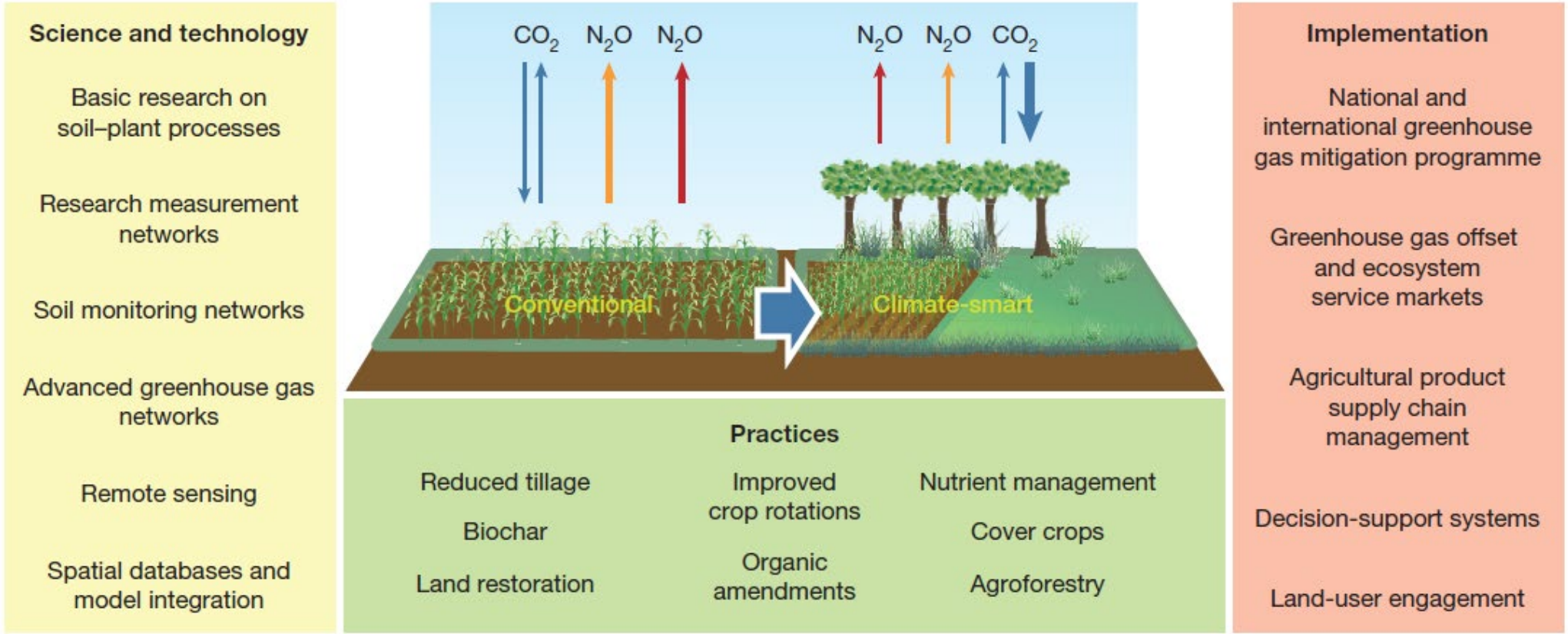
…and Climate-Smart Soils



Adapted from Paustian et al. (2016)

Co-benefits:
↑ soil health, ↓ soil erosion, ↑ food security
↑ water quality, ↑ biodiversity

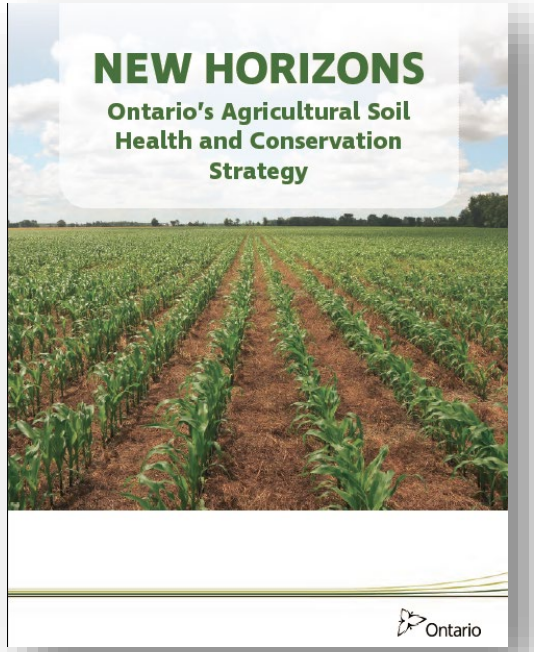
To get there: Need to Integrate Research and Implementation



Paustian et al. (2016)

"… there needs to be a greater level of engagement with the land users themselves, who will be the ones implementing practices that abate GHG emissions and sequester C."

Soil Health Strategies: Need for Training and Education



Second Session, Forty-third Parliament,
69-70 Elizabeth II, 2020-2021

HOUSE OF COMMONS OF CANADA

BILL C-290

An Act respecting soil conservation and soil health

FIRST READING, APRIL 26, 2021

(d) support and encourage farmers and other land users in the use of best management practices that allow soil systems to be managed in ways that promote soil health and sustainability, including by

(i) supporting research programs that provide evidence to guide the development and implementation of regenerative soil management,

(ii) providing education and training in soil health and conservation for producers and agricultural professionals,

(iii) enhancing knowledge transfer and the availability of technical assistance to producers and soil managers who work in soil health, and

(iv) promoting Indigenous stewardship and conservation practices and the sharing of Indigenous knowledge of the soil;

- **Diversify learning approaches** available to farmers
- Build understanding of farmers' **learning styles and motivation**
- Build capacity for **peer-to-peer** learning and innovation
- Build soil knowledge among **service providers**
- Build provision of key soil-related skills in **post-secondary education**
- **Elementary and secondary education** provides sound basic soils knowledge
- Build **general understanding** of soil health

Training the next generation of scientists

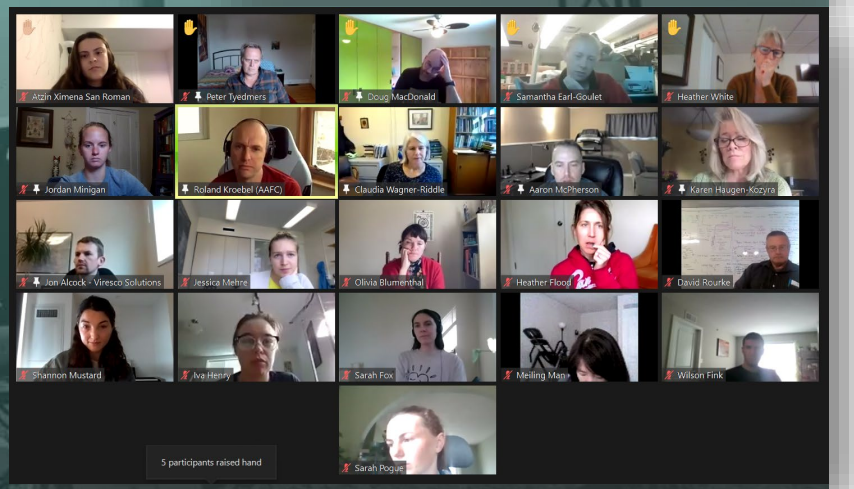
CREATE
Climate-Smart Soils

HOME PROGRAM TEAM FAQ NEWS CONTACT APPLY

Addressing climate change through soil science training

The CREATE in **Climate-Smart Soils** (CREATE-CSS) is the first **multi-institutional soil-centered program** to address the need for highly qualified personnel training to sustainably lead Canada's agri-food sector.

FIND OUT MORE



https://smartsoils.ca/

Climate-Smart Soils Training Program

- Funding: NSERC Collaborative Research and Training Experience Program
- 6-year value-added training program started in 2019
- $1.65 mill total: 80% for stipends, 20% for training activities
- 6 Universities (Dalhousie, McGill, Toronto, Guelph, MB, SK)
- 21 original and 9 new collaborators: industry and farming org., NGOs, private sector, federal and provincial dept.

CREATE Climate-Smart Soils

UNIVERSITY of GUELPH

NSERC CRSNG

Who is involved?

SK

Kate Congreves
Soil Biogeochemistry

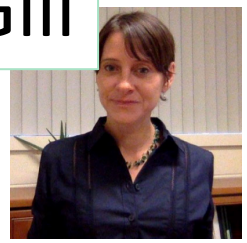
Melissa Arcand
Soil Biogeochemistry

MB

Mario Tenuta
Soil Ecology

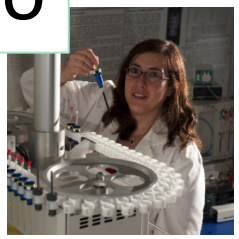
Martin Entz
Agronomy

McGill



Cynthia Kallenbach
Soil Ecology

Toronto



Myrna Simpson
Environmental Chemistry

Guelph

Claudia Wagner-Riddle
PI, Agrometeorology

Kari Dunfield
Env. microbiology

Alfons Weersink
Agric. & Resource Economics

Helen Hambly
Capacity Dev. & Extension

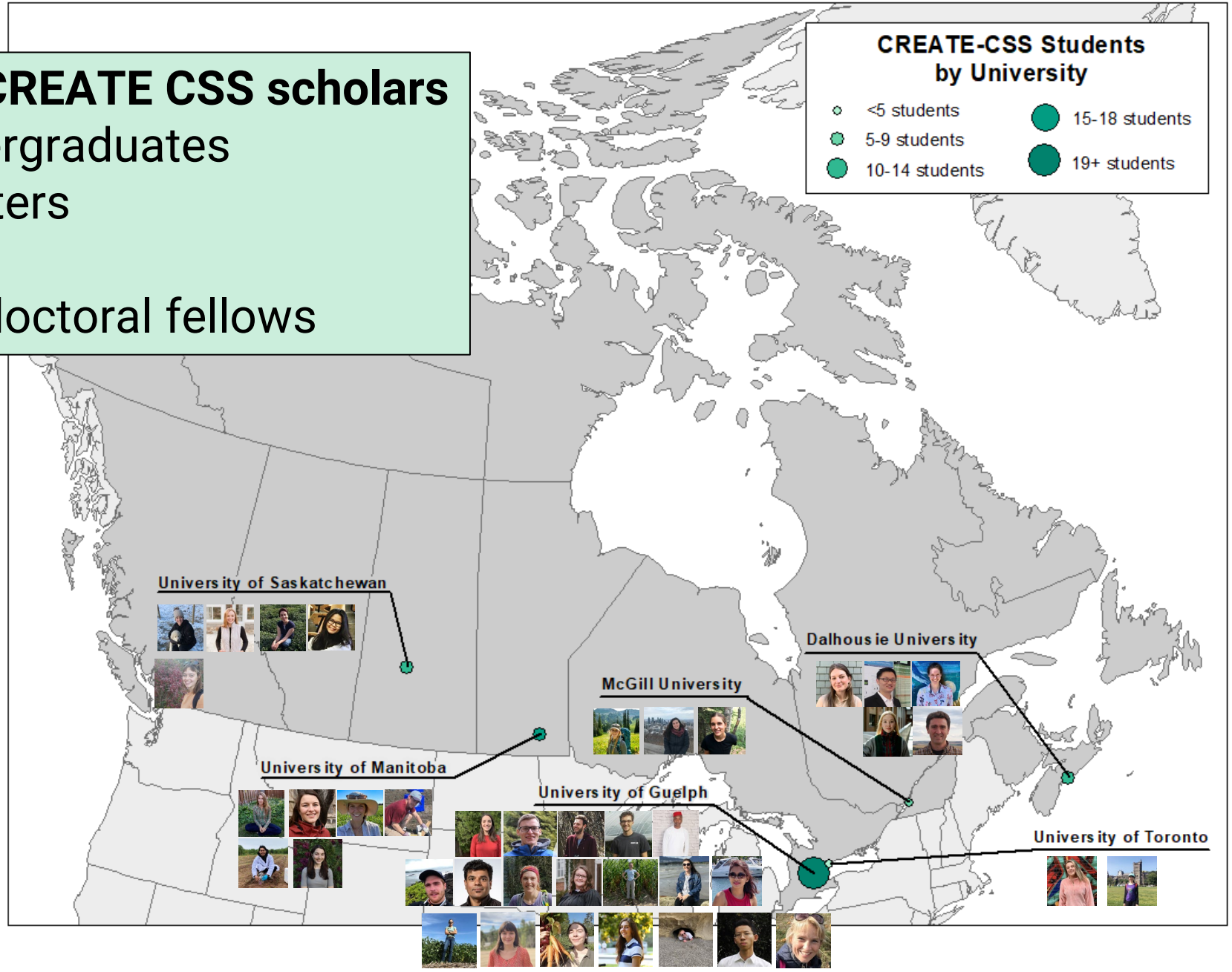
Dal

David Burton
Soil Science

Peter Tyedmers
Food Systems Sustainability

Goal: 62 CREATE CSS scholars

- 21 undergraduates
- 30 Masters
- 8 PhD
- 3 post-doctoral fellows



Program Objectives

- train HQP to have a deep **understanding** of soil GHG emissions and C sequestration mechanisms by using novel techniques, and to establish Canada as a leader in CSS science;
- provide **systems-based** training for HQP to conceptualize and create more durable and resilient future solutions for CSS nationally and globally;
- equip HQP with **knowledge** in C protocol development, GHG inventory analysis, implementation metrics and policy development for climate change reduction target achievements;
- provide training in the use of CSS knowledge from **gender and diversity perspectives**;
- equip HQP with effective **professional skills** to enable implementation of CSS practices in the agri-food sector.

Program Components

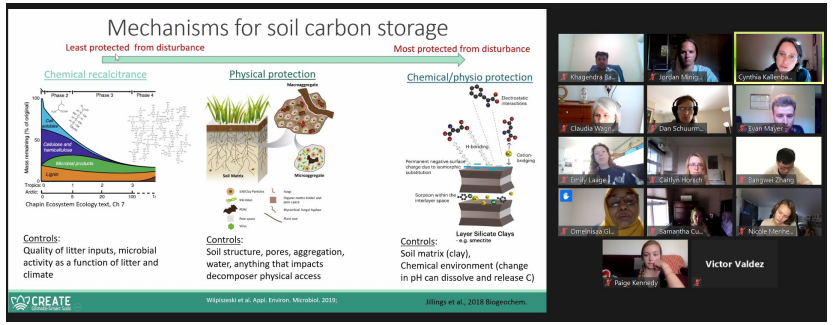
- Research projects (all)
- **Core course***: “Principles and Assessment of Climate-Smart Soils” (graduate students and post-doc)
- **Internships*** (graduate students)
- Professional skills:
  - Individual Development Plan/**Mentorship*** (graduate students)
  - Adaptive Project Management & Leadership Short Course (graduate students)
  - Workshop on Gender & Diversity Leadership, **Science Communication*** (all)

*collaborator involvement

Core Course: Principles & Assessment of Climate-Smart Soils

Principles

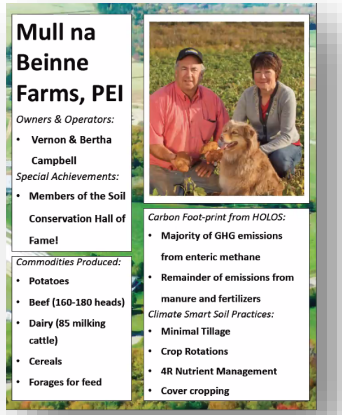
- Soil Ecosystems Overview
- Climate-Smart Soils and Agriculture
- Socio-economics of Climate-Smart Soils
- Social Dimensions of Climate-Smart Soils
- Stakeholder's Perspective: Regenerative Agriculture at General Mills
- Communicating with Farmers and Ontario Soil Health Strategy

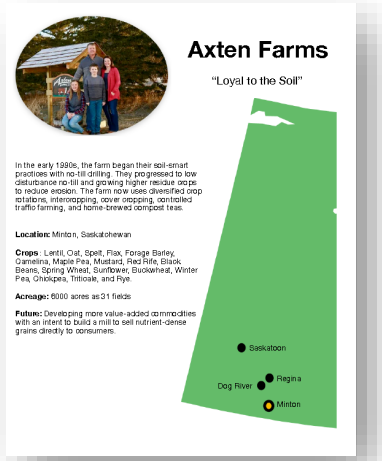


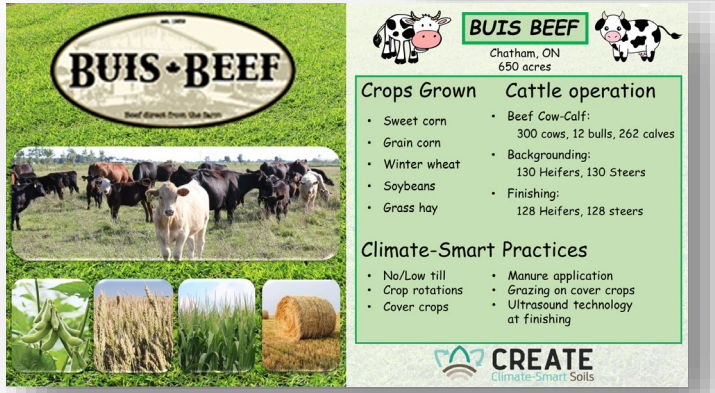
Core Course: Principles & Assessment of Climate-Smart Soils

Assessment

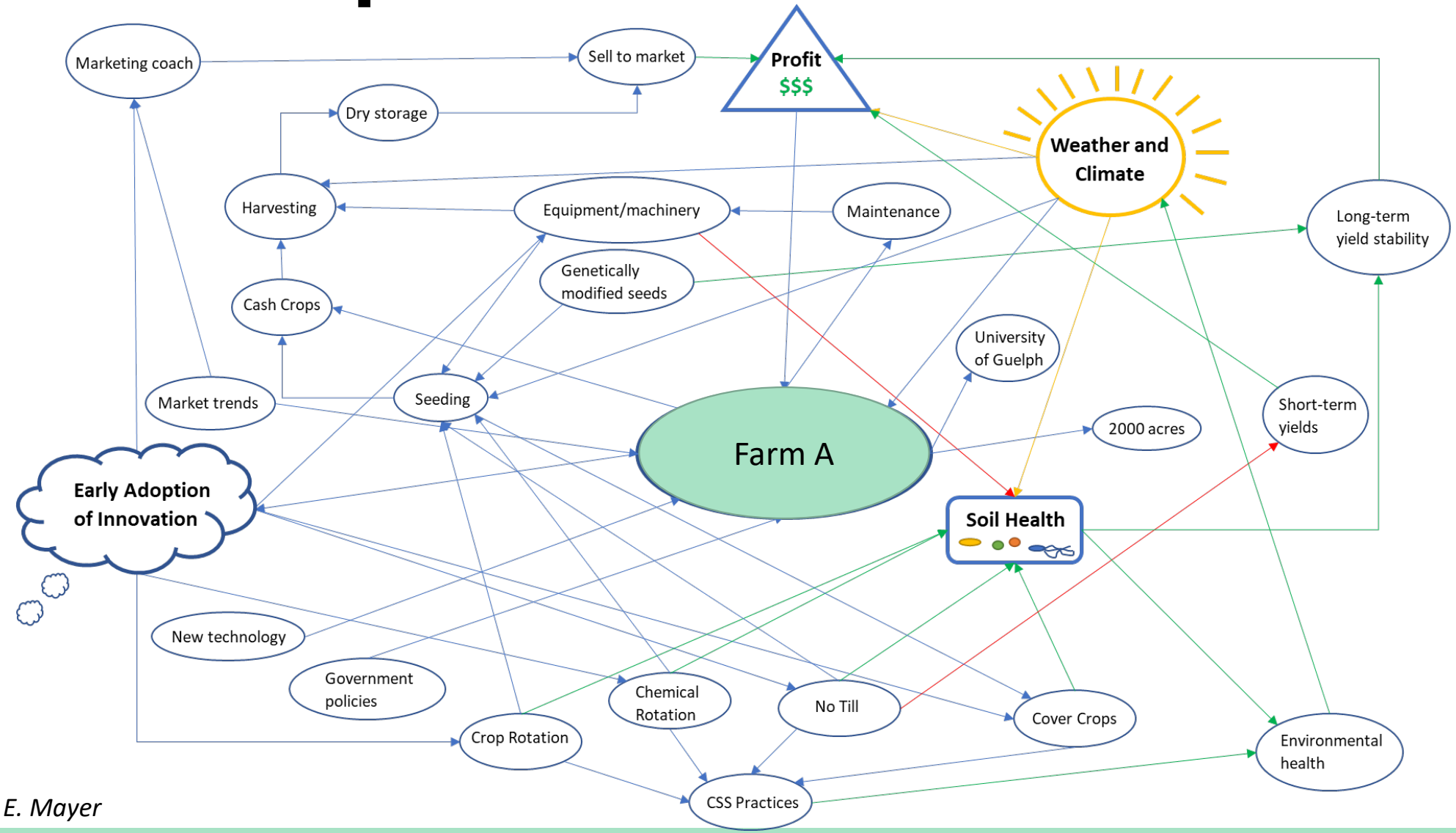
- Canada's National GHG Inventory
- Holos GHG Calculator
- Life Cycle Assessment
- Quantifying & Monetizing GHG Emissions
- Environmental Farm Plan
- Group assignment: apply Holos to 3 farms (SK, ON, PEI)
- Farm visits and panel discussion between farmers and students







Mind map from one of the Farm-Visits



Source: E. Mayer

Mentorships

Agriculture and Agri-Food Canada

Agriculture et Agroalimentaire Canada

Smart Prosperity Institute

Ministry of Agriculture, Food & Rural Affairs

Agriculture, Pêcheries et Alimentation Québec

Environment and Climate Change Canada

Environnement et Changement climatique Canada

Plant Nutrition Canada

UNIVERSITY OF ALBERTA

Internships

Manitoba

Study of long-term climate trends across the Canadian Prairies

OSCIA

Creation of Health Training modules on the role of soil microbes in soil health

Ministry of Agriculture, Food & Rural Affairs

Creation and delivery of materials for the 2020 Midwest Cover Crop Council Conference

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Quantifying manure carbon addition to soils in the National GHG Inventory Report

Scotiabank

Ag-related emissions in financial portfolio through a life cycle assessment

Midwest Cover Crops Council

Developing communication materials on cover crop research

SOIL CONSERVATION COUNCIL OF CANADA
CONSEIL CANADIEN DE CONSERVATION DES SOLS

Research on carbon sequestration in Canada's managed soils

FERTILIZER CANADA
FERTILISANTS CANADA

Development of 4R Nutrient Stewardship BMP guidance documents

FARMERS FOR CLIMATE SOLUTIONS

Research on Canada's Business Risk Management programs and the role of crop insurance on adoption of cover crops

iresco Solutions
End-to-end sustainability

Grassland carbon offset pilot project

Les Fermes Cavendish Farms

Advising producers in on soil health and nutrient management

IAPO
First Nations Farm & Business Financing

Developing a soil health program for client education

Canadian Foodgrains Bank
A Christian Response to Hunger

Scaling Up Conservation Agriculture program in Kenya

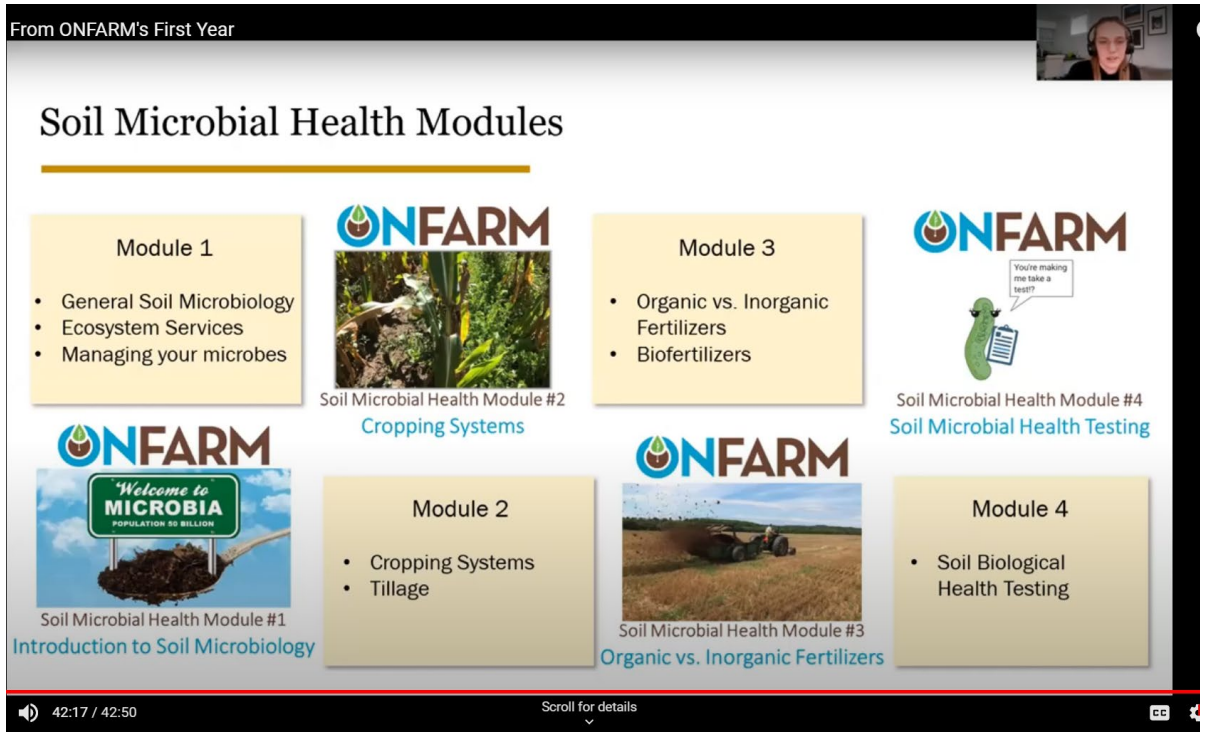
Science Communication and Outreach

CREATE Climate-Smart Soils @SmartSoils · Apr 23, 2020

Remembering a time when we could learn & share in person...

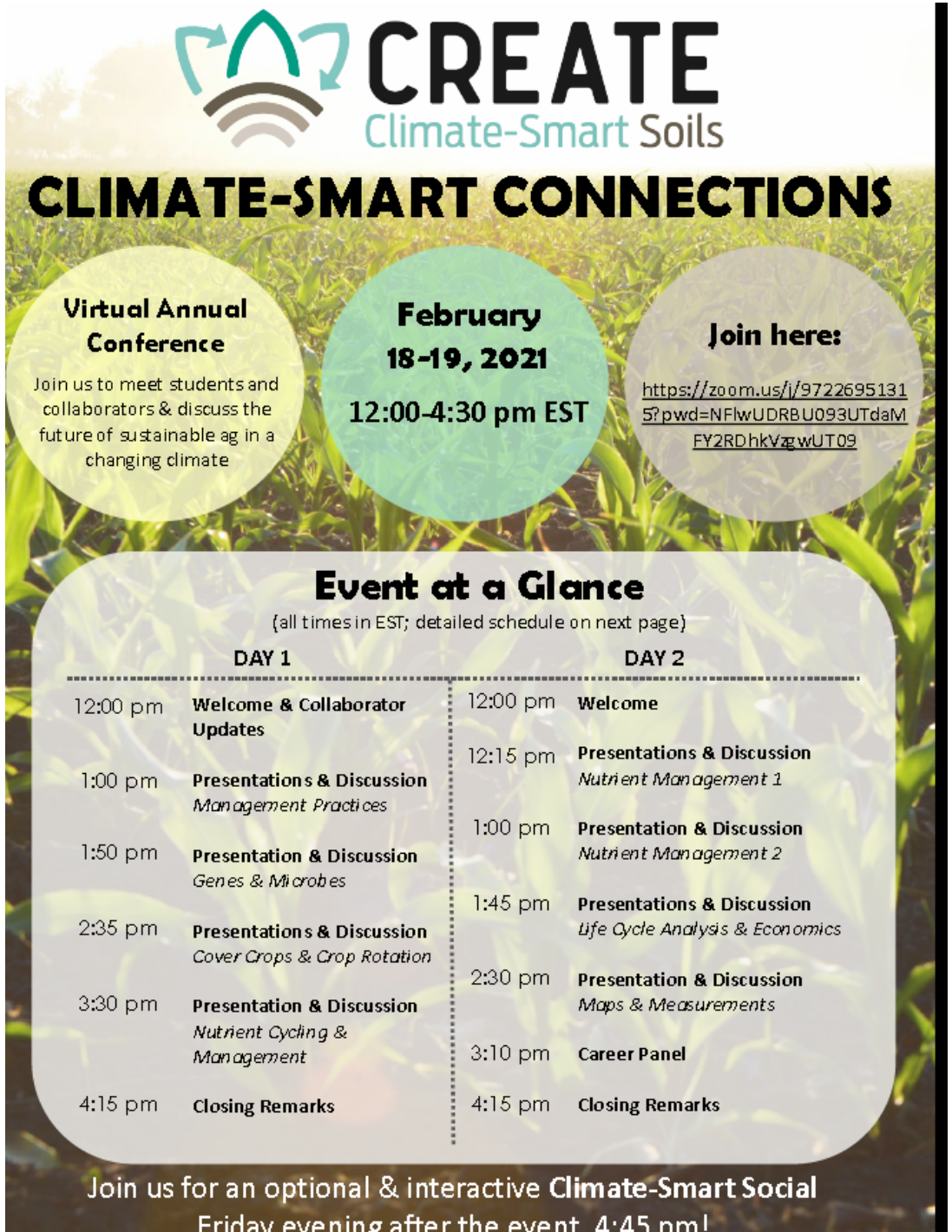
Jess had a very successful display at the Prairie Organics Conference in March, talking about amendments to nutrient cycling w/ farmers. #Scicomm is so important when sharing research w/ those who can use the results!

Display by Jess Nicksy at the Prairie Organics Conference March 2020



Presentation by Linsey Van Koppen at the 2021 ONFARM FORUM organized by Ontario Soil Crop Improvement Association February 2021

Annual Conference Organizing Committee



Concluding Remarks

- Highly qualified personnel with workplace experiences, technical (e.g. carbon reduction verification) and non-technical skills (e.g. communication with non-technical audiences) are needed to implement soil health strategies
- The CREATE-CSS program was designed with these needs in mind and involves collaboration with 6 Universities in 5 provinces and 20+ collaborators from industry, farming organizations, government and NGOs
- The program aims to provide increased understanding of the agricultural industry, access to mentoring and leadership opportunities, career development options, creation of an inclusive environment and building awareness of potential career paths

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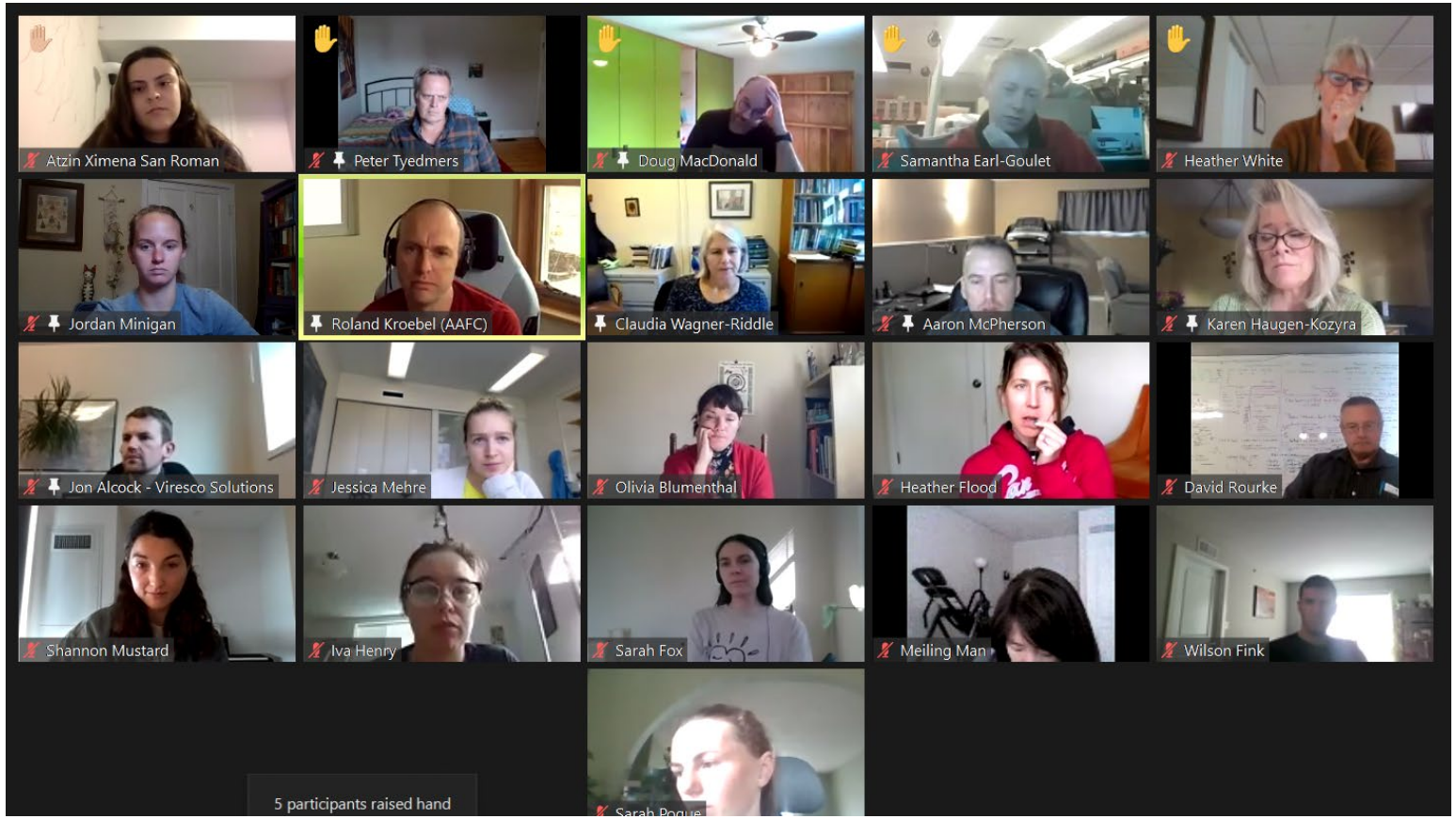
SCHOOL OF ENVIRONMENTAL SCIENCES



Thank you!

Claudia Wagner-Riddle: cwagnerr@uoguelph.ca
Jordan Minigan (program coordinator): info@smartsoils.ca

"Hearing the opinions and getting to talk to experts in the field on a conversation level I felt was eye-opening to our strengths and weaknesses in a field of GHG Assessment. I also felt like it was a great opportunity to utilize professional social skills in a time where we can't meet to discuss in person. Very rewarding experience overall."