



Productive and sustainable agriculture

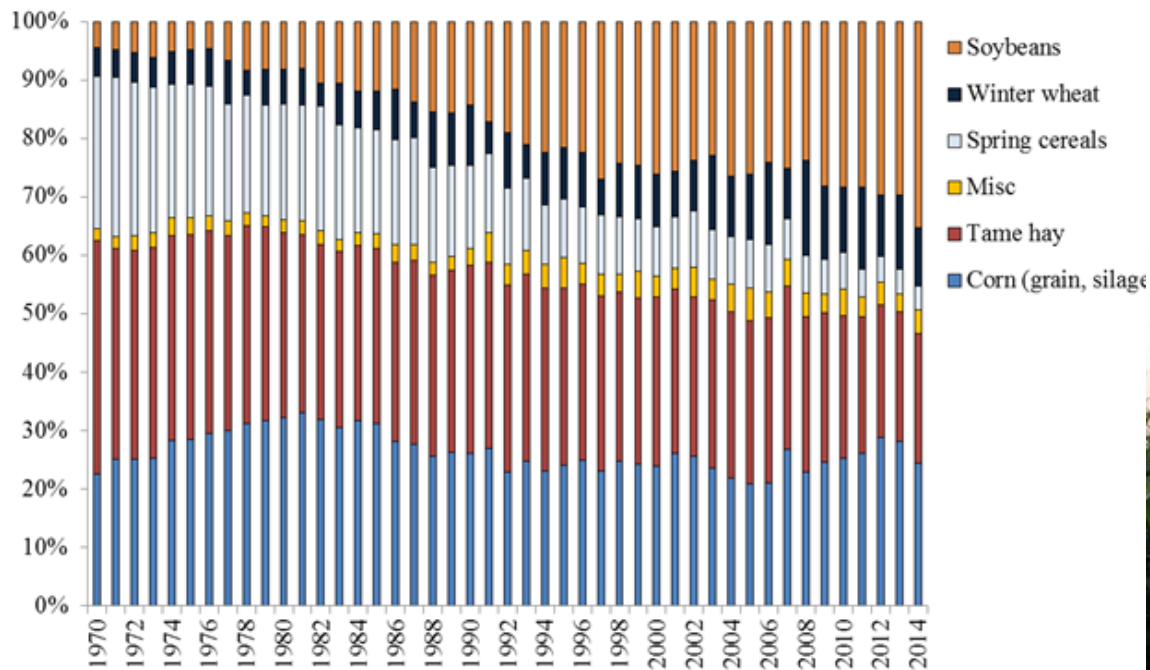
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Research Overview: What is this research about?

Harvested areas (hectares) of major field crops shown as % of total harvested area from 1970 to 2014 for Ontario. (Source: Statistics Canada, 2016.) (Reproduced from Deen et al., 2016)



July 2014, somewhere near London, ON



Research Methods

Long-Term Rotation Exp.



- Initiated in 1980
- Rotations – CCCC, AAAA, CCAA, CCSS, CCSW, CCSW(rc), CCOB, CCO(rc)B(rc)
- Conventional tillage and no-till



Cover Crop Exp.



Interseeder



Annual Rye Grass under-seeded in Corn



Red Clover together with Wheat



Oat after Wheat



3-way mixes after Wheat



10-way mixes after Wheat



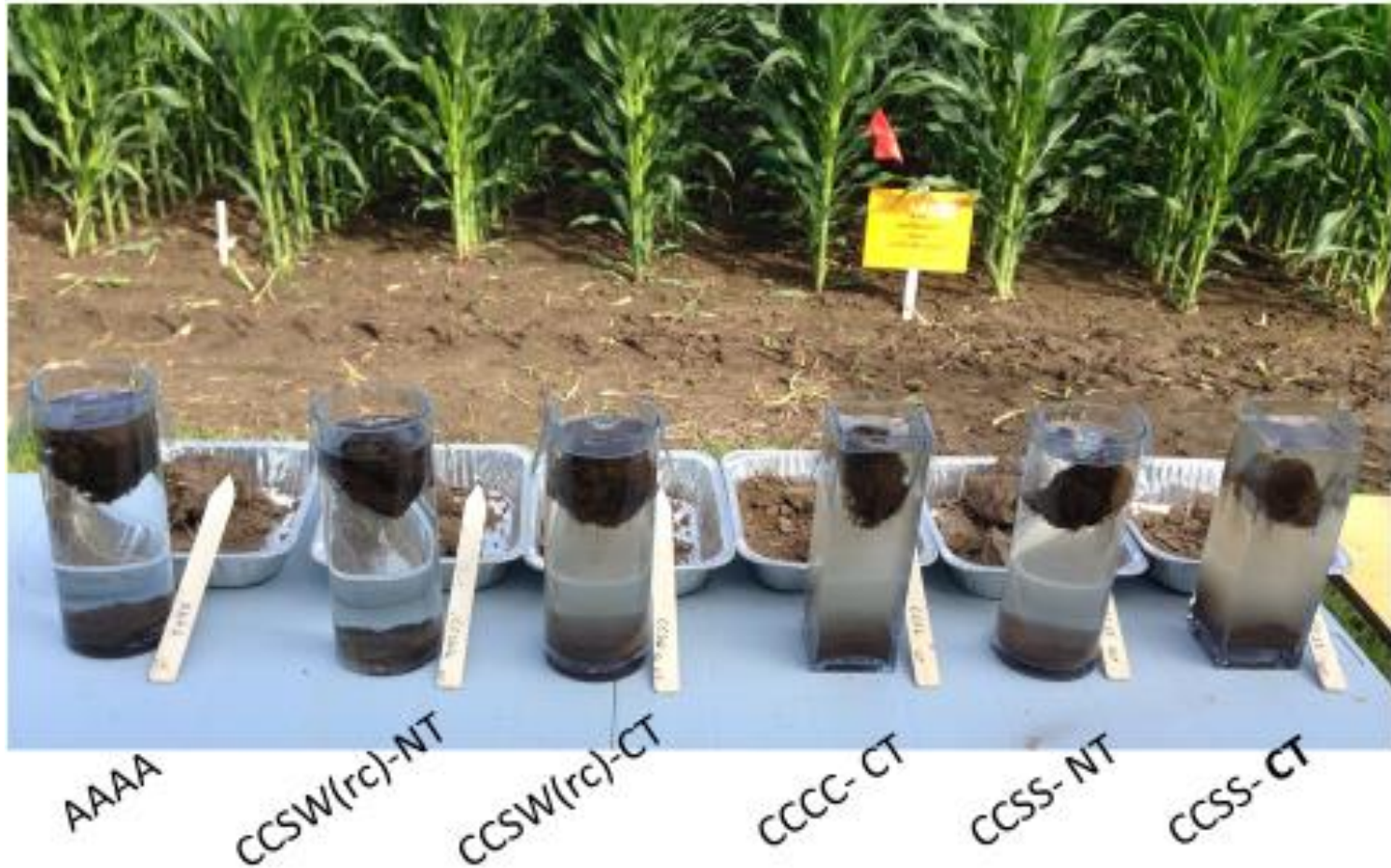
Research Results

Corn/soybean rotation is associated with

- Reduced yield and greater yield instability
- Lowest soil organic matter/poorest soil structure
- Increased nitrogen requirement
- Reduced input use efficiency
- Increased GHG emission
- Reduced success of no-till/reduced till
- Reduced opportunity to incorporate cover crops
- Reduced opportunity for sustainable biomass removal

Meyer-Aurich et al, 2006a; Meyer-Aurich et al 2006b; Sanscartier et al, 2013; Munkholm et al, 2012; Munkholm et al, 2013; Muellera et al, 2009; Gaudin et al, 2013; Gaudin et al. 2014; Gaudin et al. 2015, Kludze et al. 2013.; Van Eerd et al.. 2014

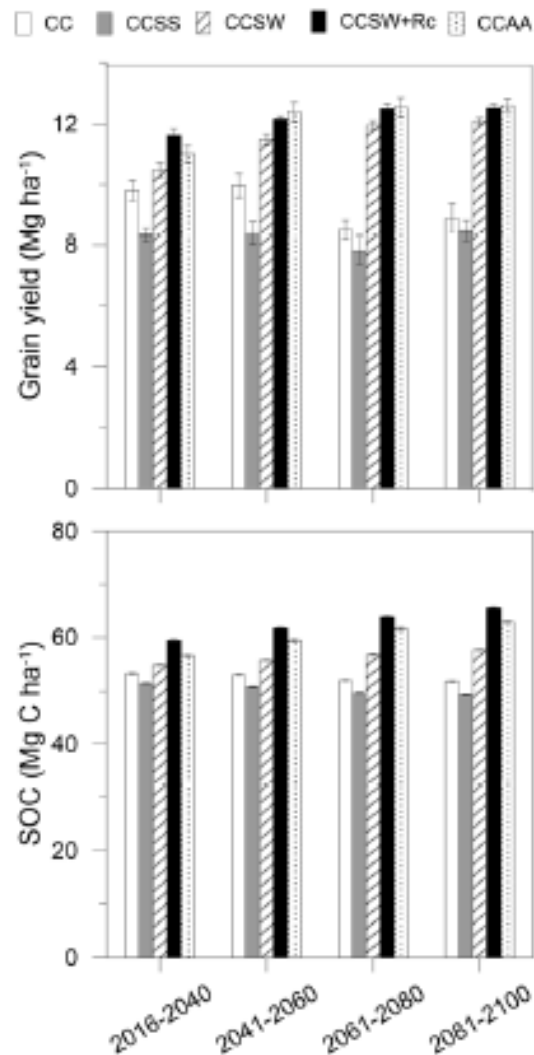
Research Results



Research Results

Predictions of corn yield (top graph) and 0-0.2 m SOC stock (bottom graph) under representative concentration pathway (RCP) scenario RCP 4.5 over 2016 to 2100 at Elora for various cropping systems. Predictions were averaged over selected periods starting in 2016 with error bars representing standard error of means (n=25 for 2016-2040, and n = 20 for other periods). CC = continuous corn; CCSS = corn-corn-soybean soybean, CCSW = corn-corn-soybean-winter wheat, CCSW+Rc = corn-corn-soybean-winter wheat + red clover, CCAA = corn-corn-alfalfa- alfalfa, COAA = corn-oats-alfalfa-alfalfa.

Assessing long-term historical and future trends in corn yields and 1 soil carbon under diversified crop rotations. Marek Jarecki, Brian Grant, Ward Smith, Bill Deen, Craig Drury, Andrew VanderZaag, Budong Qian, Jingyi Yang and Claudia Wagner-Riddle.
Journal of Env. Quality. Submitted



Research Impact

What do people need to know?

- A sustainable crop production system begins with good crop rotation which both mitigates **and** adapts to climate change **and** enables effective use of reduced till/no-till and cover crops, which are also mitigation and adaptation strategies
- Climate change effects on drought occurrence are expected to increase incentives for farmers to adopt good rotation



Summary

How is the research done?

- A combination of long-term and shorter term trials
- Interdisciplinary research



Research Projects

OMAFRA / UofG Partnership – Research / Environmental Sustainability

- Project Proposal - UofG2013-1671 - Evaluation of rotation complexity effects on yield stability under moisture extremes using Elora and Ridgetown long-term trials

