

# Practical and Profitable Approaches to Soil Health

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There's been a lot of "buzz" around soil health lately



# Soil Health – What is it?

## AAFC

“Soil health, also called soil quality, is defined in agricultural terms as the soil's fitness to support crop growth without becoming degraded or otherwise harming the environment.”

## USDA (NRCS)

“Soil health, also called soil quality, is defined as the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.”

# Soil quality

Texture

Depth of A horizon

Subsoil

**What you are  
starting with**



# Soil health

**How you manage  
the soil**



# What are we expected to provide

- Yield
- Nutrient cycling
- Resist erosion
- Regulate water
- And much more!

exp... to provide

MAINTENANCE SCHEDULE										
FILL IN DATES AS YOU COMPLETE REGULAR SERVICE										
		MAINTENANCE						SERVICE DATES		
		BEFORE EACH USE								
		EVERY 8 HOURS								
		EVERY 25 HOURS								
		EVERY 50 HOURS								
		EVERY 100 HOURS								
		EVERY SEASON								
		BEFORE STORAGE								
TRACTOR	Check Brake Operation	✓	✓							
	Check Tire Pressure	✓	✓							
	Check Operator Presence and Interlock Systems	✓	✓							
	Check for Loose Fasteners	✓	✓							
	Sharpen/Replace Mower Blades	✓	✓							
	Lubrication Chart									
	Check Battery Level									
	Clean Battery and Terminals			✓ <sub>3</sub>		✓ <sub>5</sub>			✓	
	Check Transaxle Cooling			✓					✓	
	Check V-Belts			✓					✓	
ENGINE	Check Engine Oil Level			✓					✓	
	Change Engine Oil (with oil filter)	✓	✓			✓				
	Change Engine Oil (without oil filter)									
	Clean Air Filter					✓ <sub>1,2</sub>				
	Clean Air Screen			✓ <sub>1,2</sub>					✓	
	Inspect Muffler/Spark Arrester			✓ <sub>2</sub>					✓	
	Replace Oil Filter (if equipped)			✓ <sub>2</sub>					✓	
	Clean Engine Cooling Fins					✓				
	Replace Spark Plug							✓ <sub>1,2</sub>		
	Replace Air Filter Paper Cartridge					✓ <sub>2</sub>			✓	
Replace Fuel Filter					✓ <sub>2</sub>			✓		

# Challenging Weather



Ontario O



CHATHAM DAILY NEWS



## Heavy rainfall results in flood watches in Chatham-Kent

*The Lower Thames Valley and St. Clair Region conservation authorities issued flood watches Saturday after heavy overnight rainfall.*

Daily News staff

Jun 26, 2021 • June 28, 2021 • 1 minute read • [Join the conversation](#)

## Abnormally dry conditions affecting farmers' crops in southwestern Ontario

By Tyler Griffin • The Canadian Press

Posted July 19, 2022 5:12 am • Updated July 19, 2022 6:15 pm



6 50 - 100 MM / 2 - 4" LOCALLY 100+ MM



*"We don't have a runoff problem, we have an infiltration problem"*

Ray Archuleta



# Managing for better soil and profit



- Crop rotation
- Reduce tillage
- Add Cover crops
- Add manure or Organic Amendments
- Avoid compaction

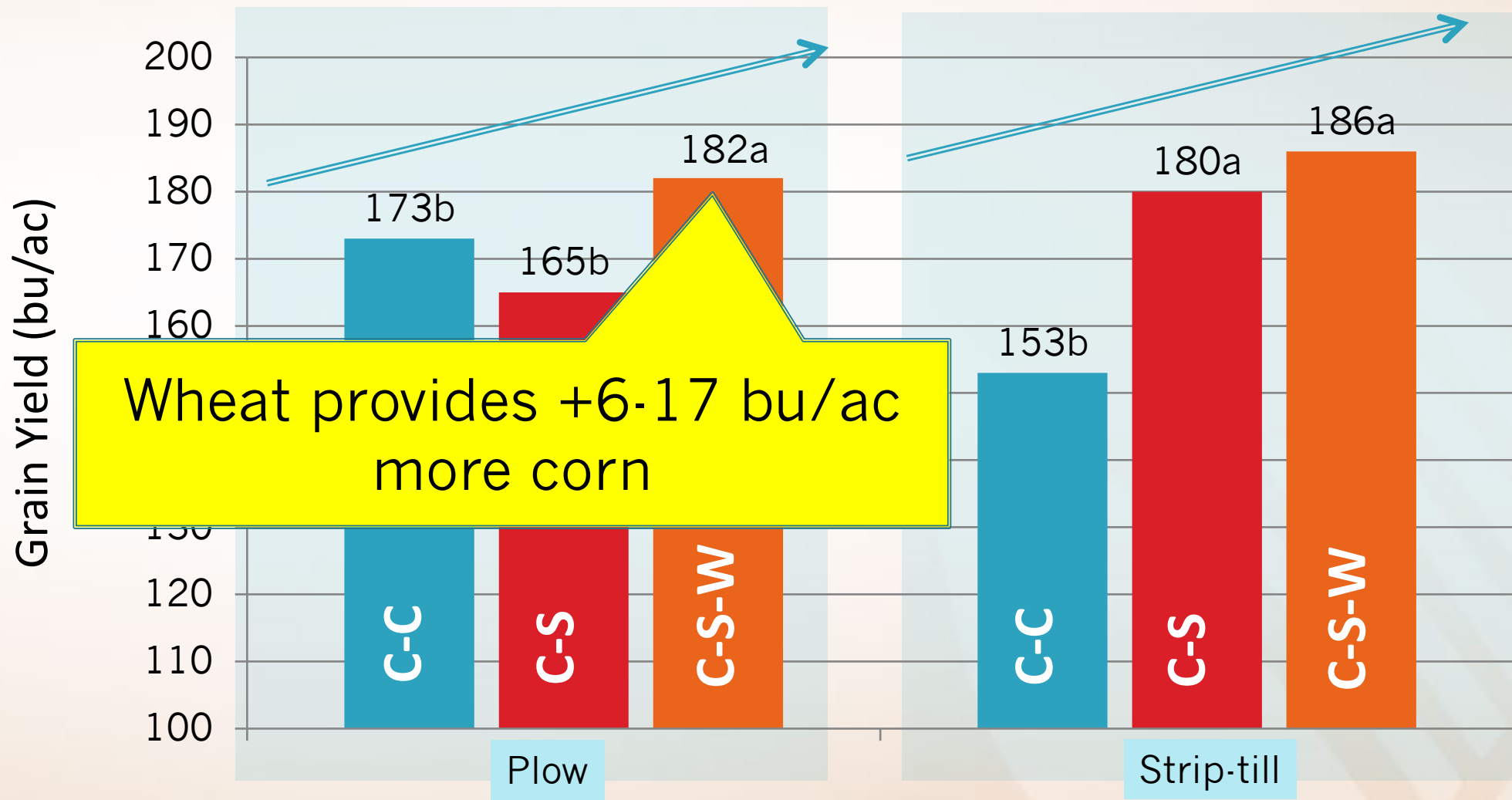


# Long-term Crop Rotation Experiments Elora and Ridgetown since 1980 and 1995



# Tillage x Crop Rotation and red clover on corn yields

Ridgetown 2009-19 using 120-160 lbs fertilizer N/ac



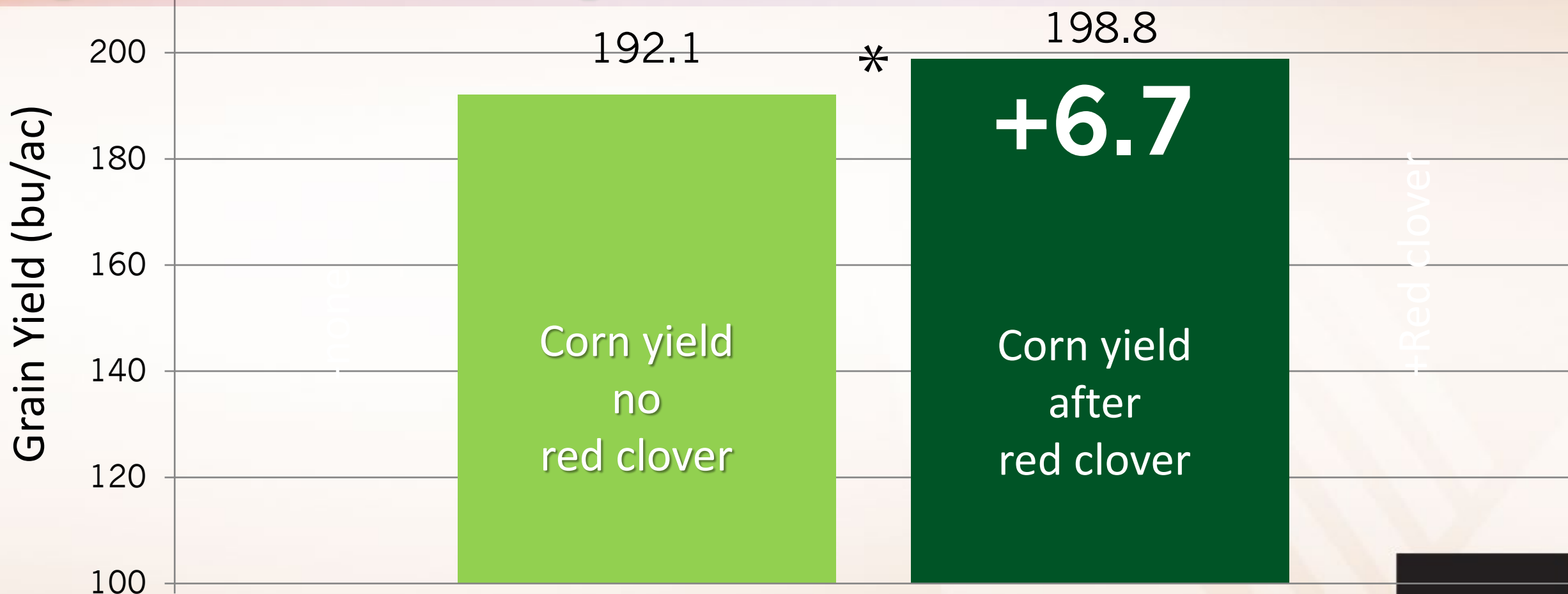
Note: Mean separation within tillage system (p=0.05)



@cropdoc2

# Corn Yields after Wheat +/- Red Clover

Long-term rotation trial Ridgetown 2010-19



**Fertilizer N applied to all plots @ 180-240 lbs N/ac (N sufficient)**

\* = difference significant at P=0.05

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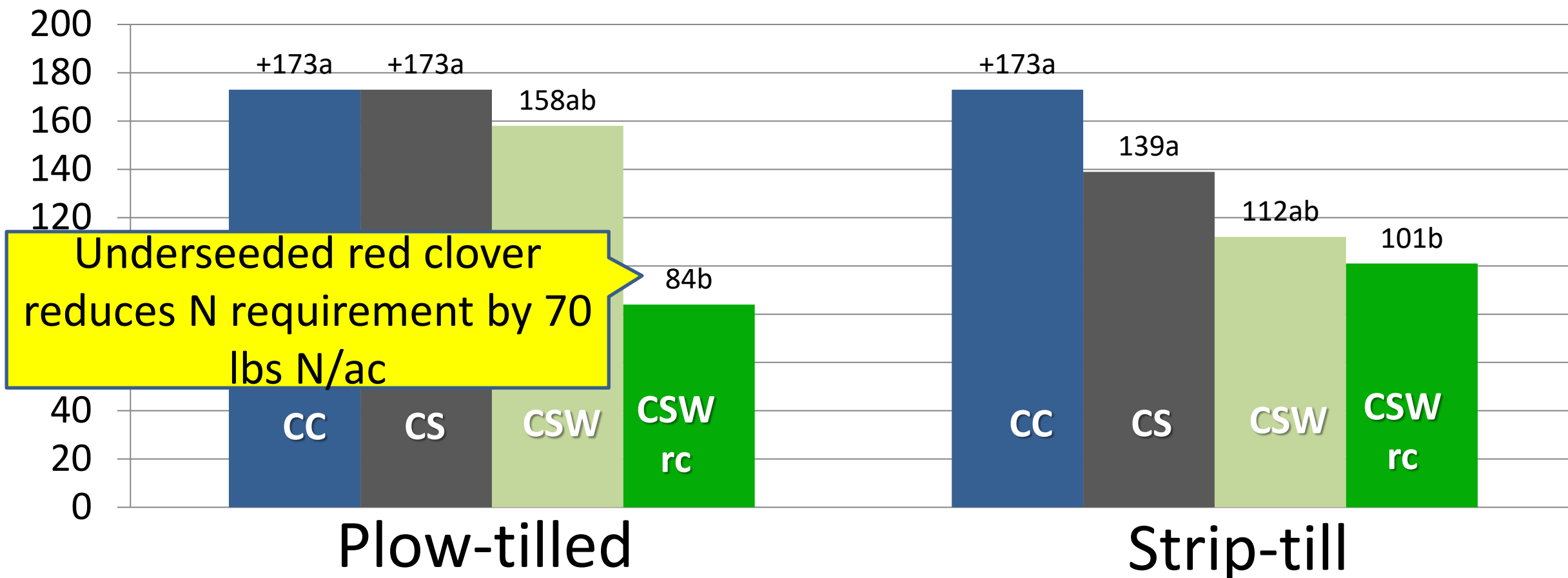
Hooker (UG Ridgetown)

# No-till + crop rotation reduces N fertilizer requirement

## Ridgetown 2010-2019

Maximum Economic Rates of N in corn

(lbs N/ac)



$n=40$  observations per mean (4 reps x 10 years)

MERN >173 lbs N/ac in "+173" values

Mean separation within tillage Fisher's Protected LSD (0.05)



@cropdoc2

Hooker (UG)

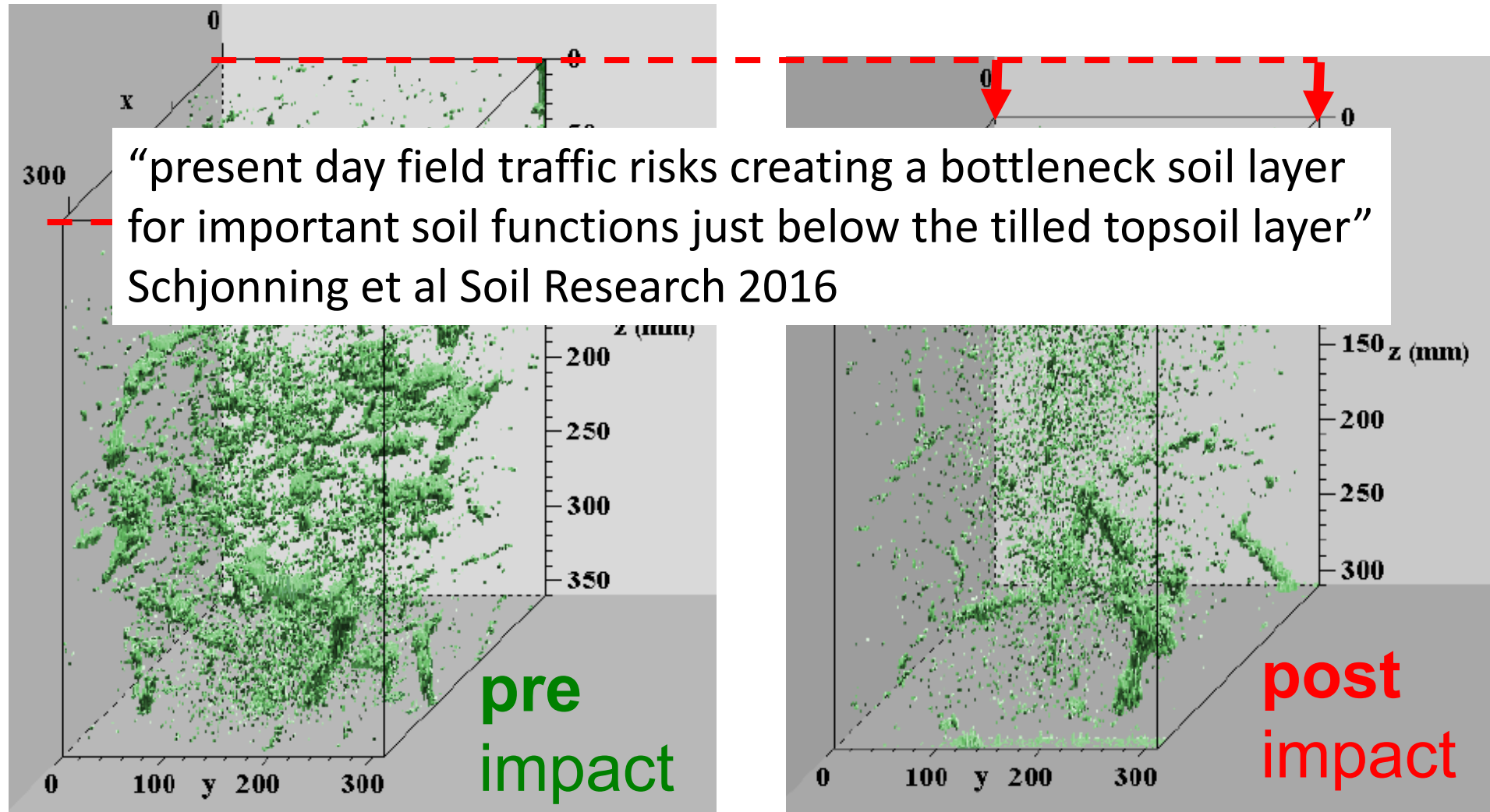


- # Ridgetown Tillage-Rotation-N trial
- Wheat adds +6-17 bu/ac corn, +5 bu/ac soybean
  - Underseeded red clover +6.7 bu/ac to corn, and 70 lbs N/ac credit



From Dr. Dave Hooker

# Soil compaction happens - right?



# Macropores and Rebar



# Soil Health Cover crops = living roots & building organic matter

New understanding of OM - 50% or more through microbes

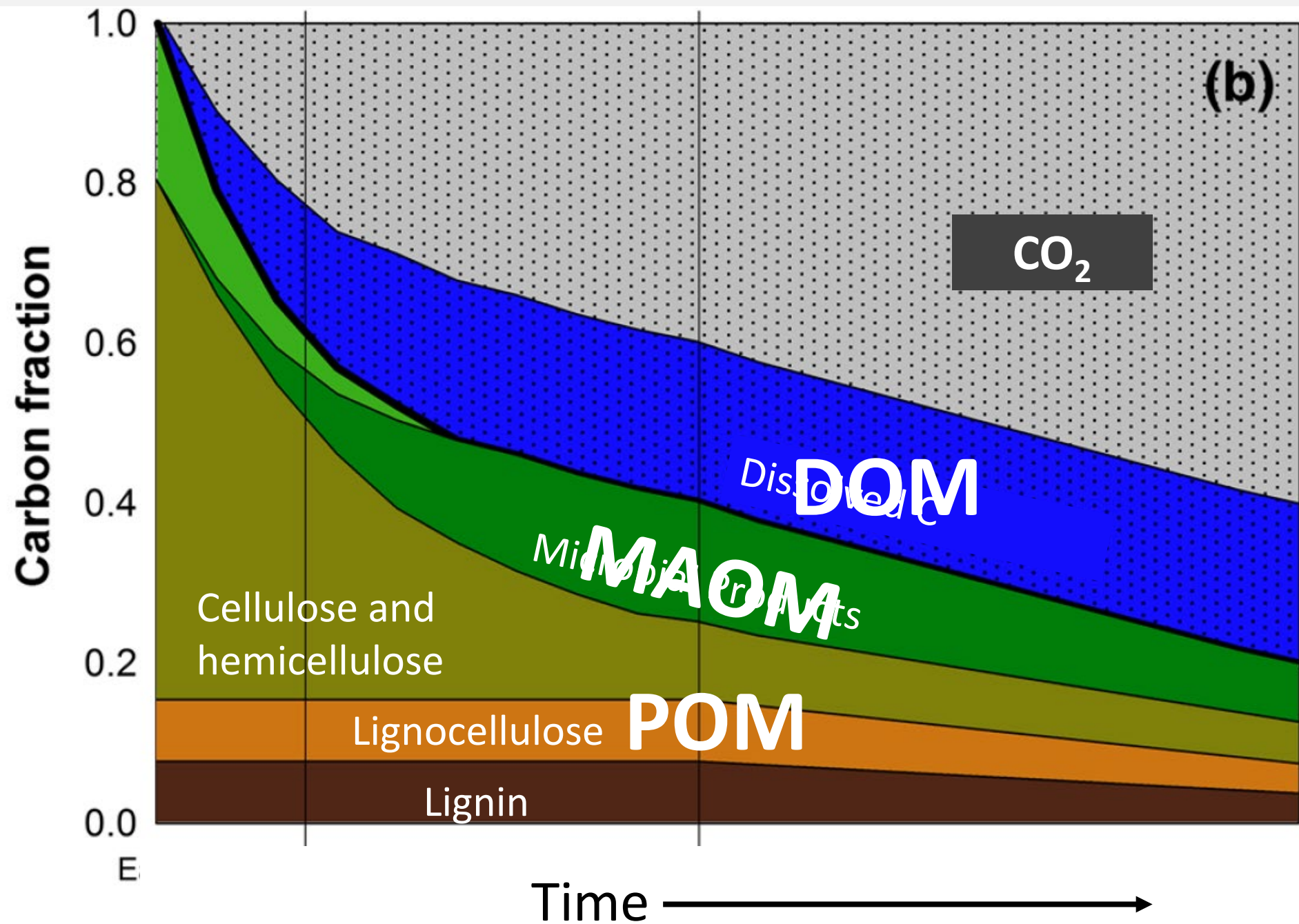
- 20-50% of C fixed by photosynthesis – released to the soil through rhizodeposition
- And what feeds the microbes?
  - Root exudates are 5x (?) more likely to become SOM compared to aboveground residue

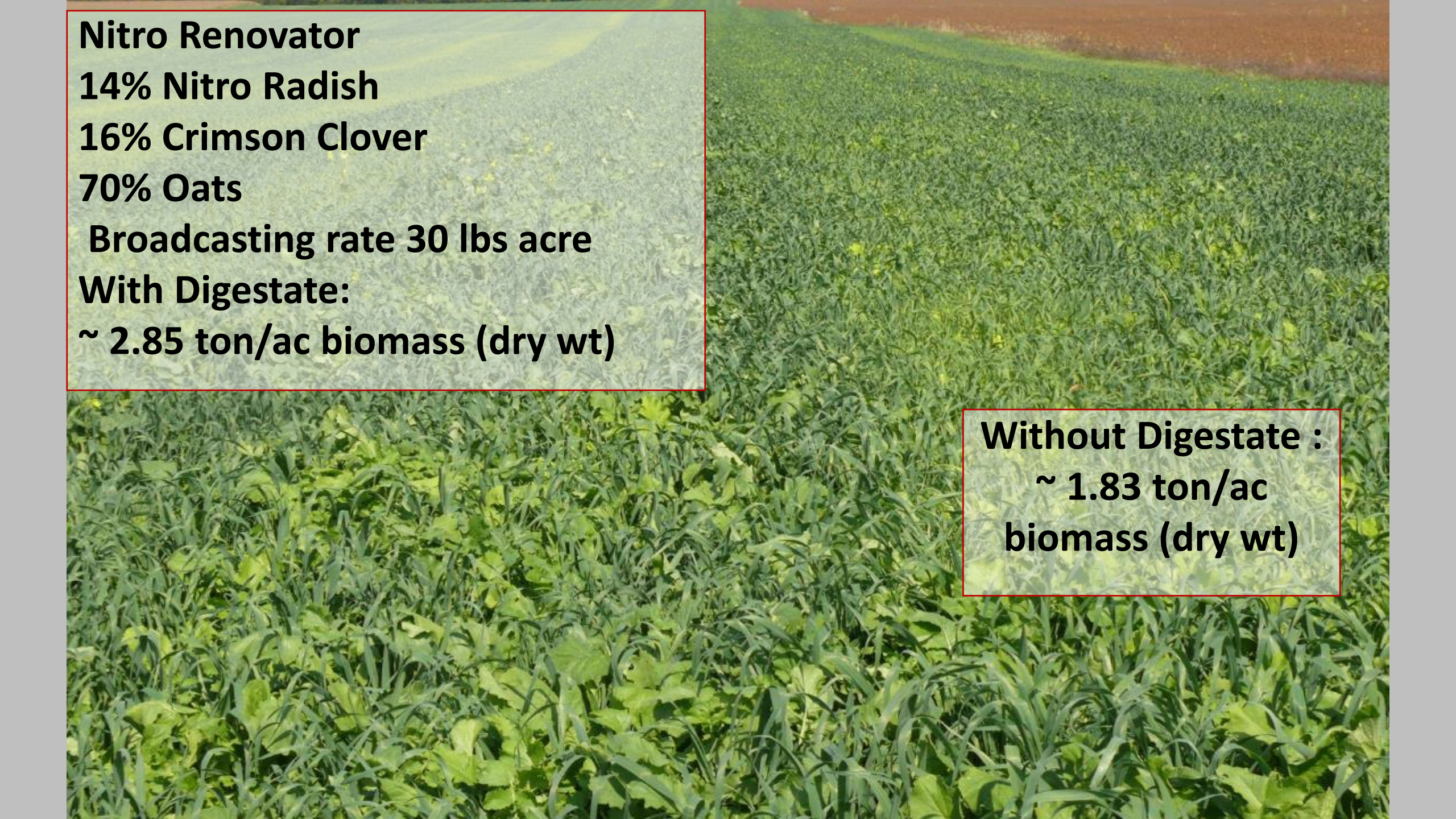


# We used to talk about the living, the dead and the very dead

NOW - Location!

- Dissolved (DOM)
- Particulate (POM)
  - Plant bits
- Mineral Associated (MAOM)
  - Microbial excrement and...necromass





**Nitro Renovator**

**14% Nitro Radish**

**16% Crimson Clover**

**70% Oats**

**Broadcasting rate 30 lbs acre**

**With Digestate:**

**~ 2.85 ton/ac biomass (dry wt)**

**Without Digestate :**

**~ 1.83 ton/ac  
biomass (dry wt)**

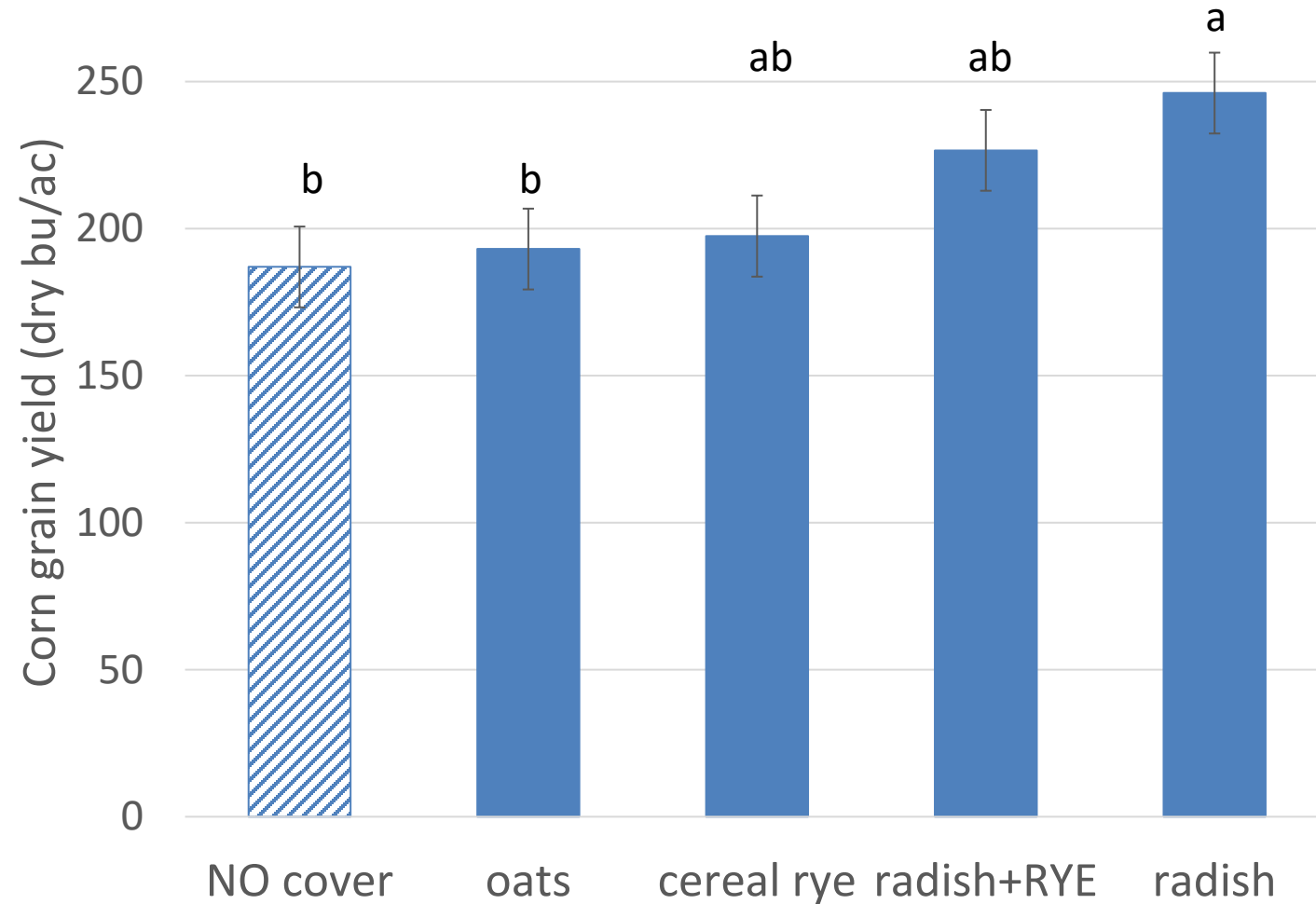
# Organic Amendment Synergy

Cover Crops without manure

Cover Crops with digestate  
- More top growth and root biomass



# PRODUCTIVITY DUE TO LONG-TERM COVER CROP USE (2020)



SOILS AT GUELPH

@LauraVanEerd

2020

Ridgetown Campus

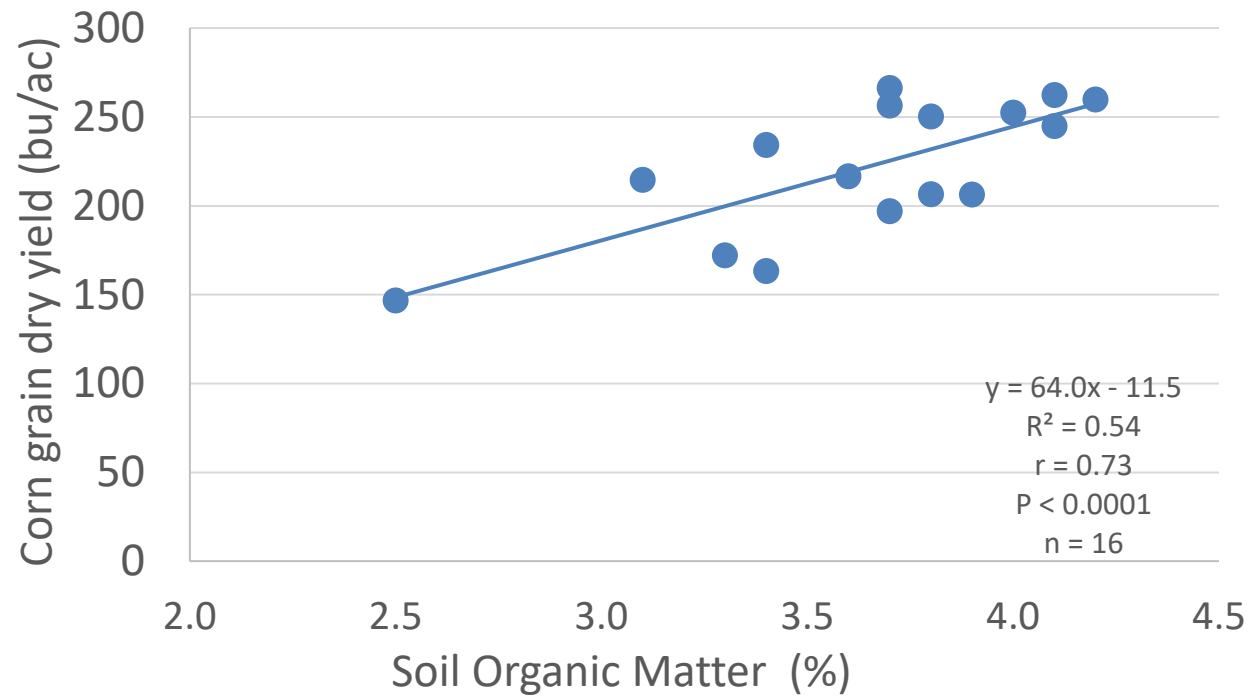
Annual cover crops grown 10 times in 13 yrs. n=16

# BENEFITS of LONG-TERM COVER CROPPING

- 17% increase soil health
- 11% to 22% increase SOC stores
- 4% to 11% increase crop yields
- 5% to 9% increase in partial profit margins



# RESILIENCY DUE TO LONG-TERM COVER CROP USE (2020)



Month	Rain (mm)
April	52.3
May	72.5
June	45.2
July	80.1
Aug.	132.1
Sept.	47.7



SOILS AT GUELPH

@LauraVanEerd

2020

Ridgetown Campus

Annual cover crops grown 10 times in 13 yrs



**Long-term  
cover crops**



**No cover crops**



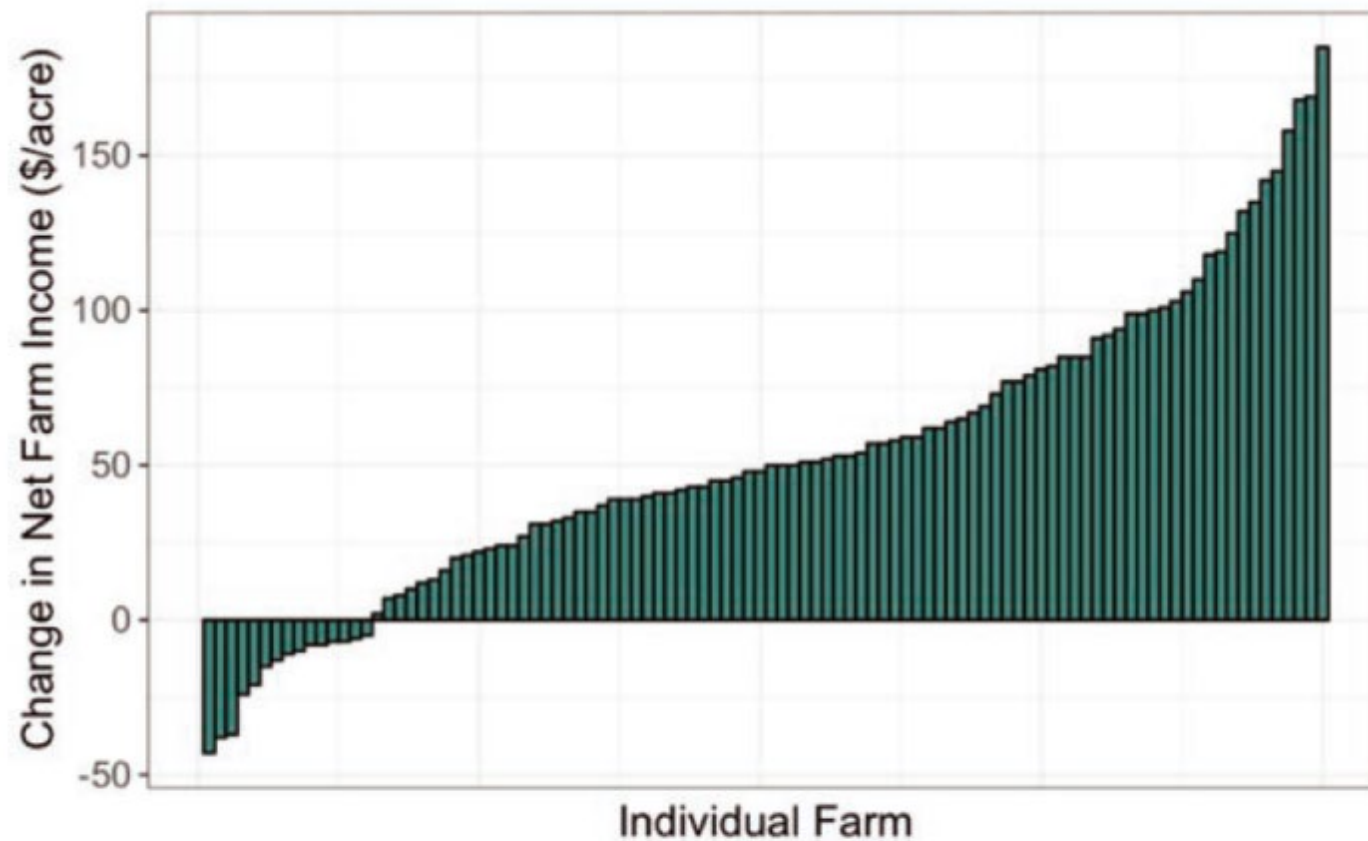
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# The value of soil health

97%

reported increased  
resilience to



**Figure 1.** Change in net farm income for 100 farms that have adopted no-till, reduced till, and/or cover cropping corn. Fifteen farms had a negative change while 85 had a positive change. Aggregated and averaged, the data show a positive net farm increase of \$51.60 per acre.

reported a higher yield than  
their conventional system

by

can

[soilhealthinstitute.org/economics/](https://soilhealthinstitute.org/economics/)



# Emre Farms, Norfolk County

- <https://youtu.be/F8IzY8nYEJg>





# 2010 Management survey

Both Essex and Kent growers

Acreage worked 500 to 3000

Acreage in tomatoes 75 to 350

% of acreage in tomatoes 4% to 32%  
average of 13.2%



## Crop Rotation

- 2 to 8 - **Using cover crops, compost, manure, keeping all the straw**
- Target type
- Where - **Keep sand hills covered with residue or cover crop over winter**

**“ It hurts when I see that sand blowing!”**



- Oats, rye, red clover,

## Tillage:

- No-till
- Soil
- MB
- Pass
- Timi
- fall -
- life

Comments from growers

**“Will take a chance on losing 4 or 5 days rather than being on too early”**

**“Soil has to be fit”**

**“Waiting until its dry is the most important thing... but sometimes hard to do”**

**“Get on it too early – you ruin it for the whole year!”**



# Kurtis Allaer, Serkka Farms, Wallaceburg





OATS 1 bu / ac Spread











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