

YES!  
We can!

Make SOIL  
Great Again



# Soil Characteristics

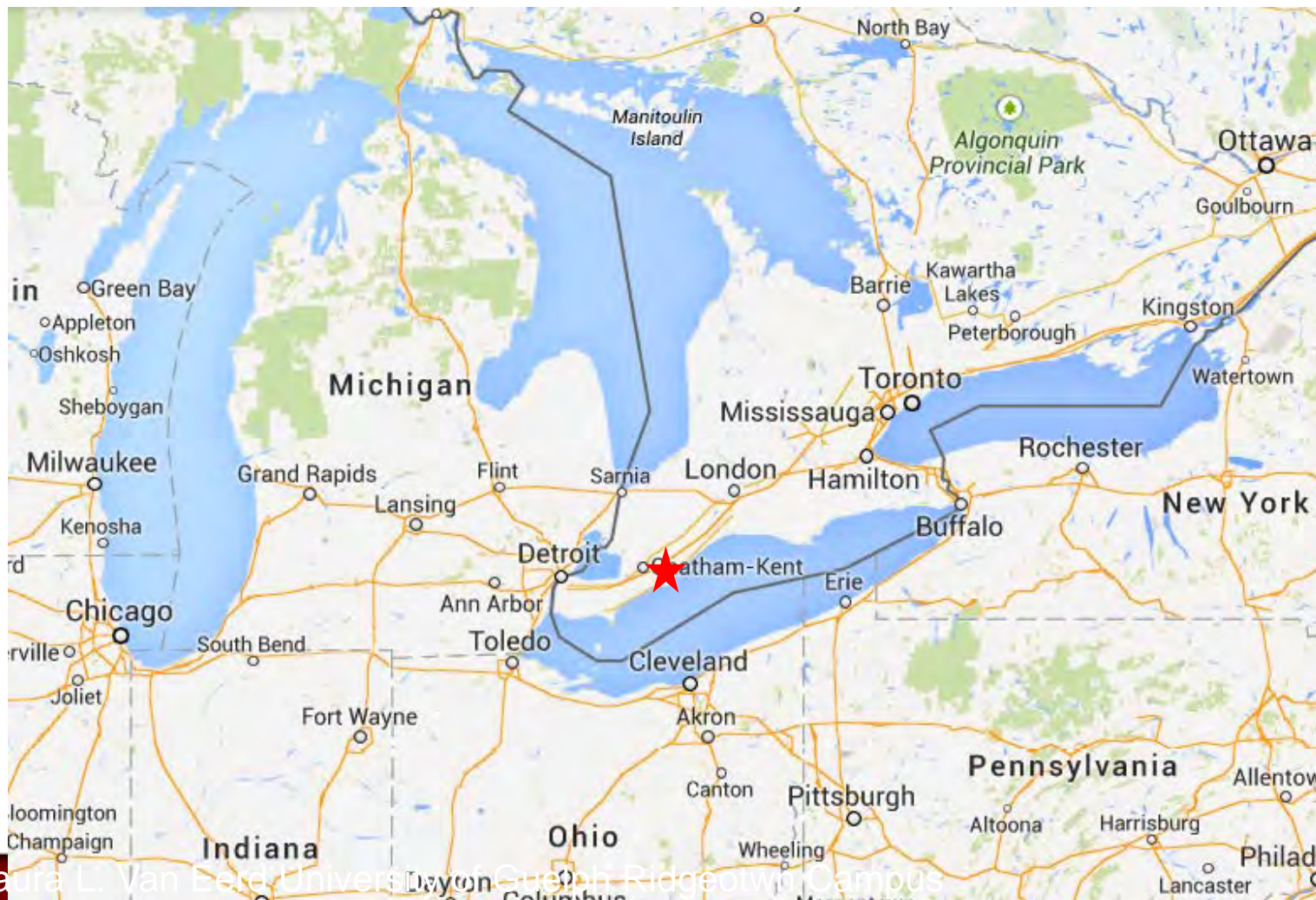
pH	6.3
Soil texture	75:18:7 Sandy loam
% OM	3.5
CEC (cmol kg <sup>-1</sup> )	9.4
P (ppm)	52
K (ppm)	248
Ca (ppm)	927
Mg (ppm)	79



# Ridgetown, ON

Ave. monthly precipitation = 80 mm

3200 CHU



# Two Long-term Cover Crop Trials

## #1 Cover crop planting date

Started in 2008

**Early** (August) vs.

**Late** (September)

- 1) No cover crop
- 2) Oats 72 lb/ac
- 3) Cereal rye 60
- 4) Oilseed radish 12
- 5) Forage peas 150
- 6) Hairy vetch 25



# 1: Planting Date Expt.

late vs. early peas Oct. 30



late vs. early radish Oct. 30



late vs. early oats Oct. 30



## **Trial started 2008**

Photo Oct 30<sup>th</sup>

Early planted - 1<sup>st</sup>-2<sup>nd</sup> week in August

Late planted - 1<sup>st</sup>-2<sup>nd</sup> week in September

late vs. early vetch Oct. 30



# Cover Crop Planting Date

Vegetable crop yield was not impacted by when the cover crop was planted.

**Choose cover crop for your system!**

## **Possible Implications:**

- A growing plant more important than how much it grows
- Shows importance of roots



# Cover crop growth



August



October



December



May



# Main Crop

**Snap beans**

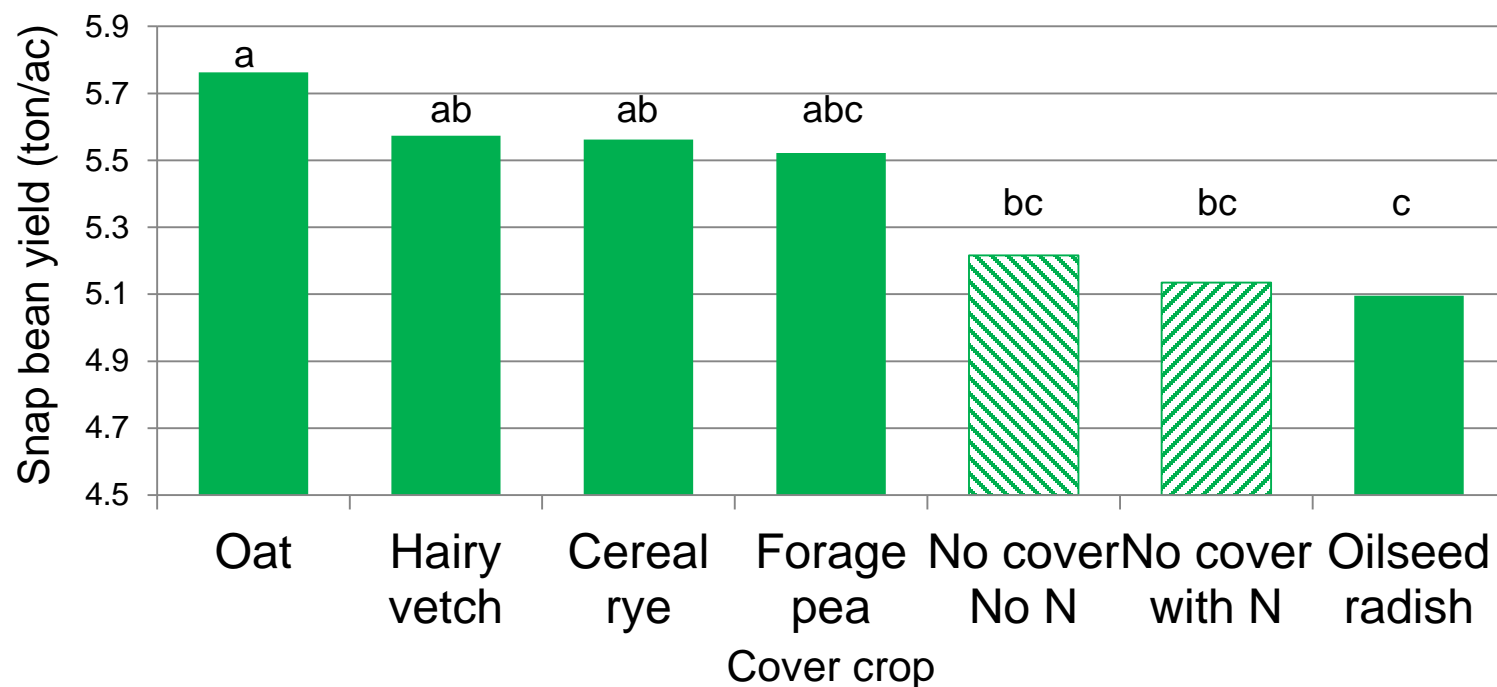
**Sweet corn**





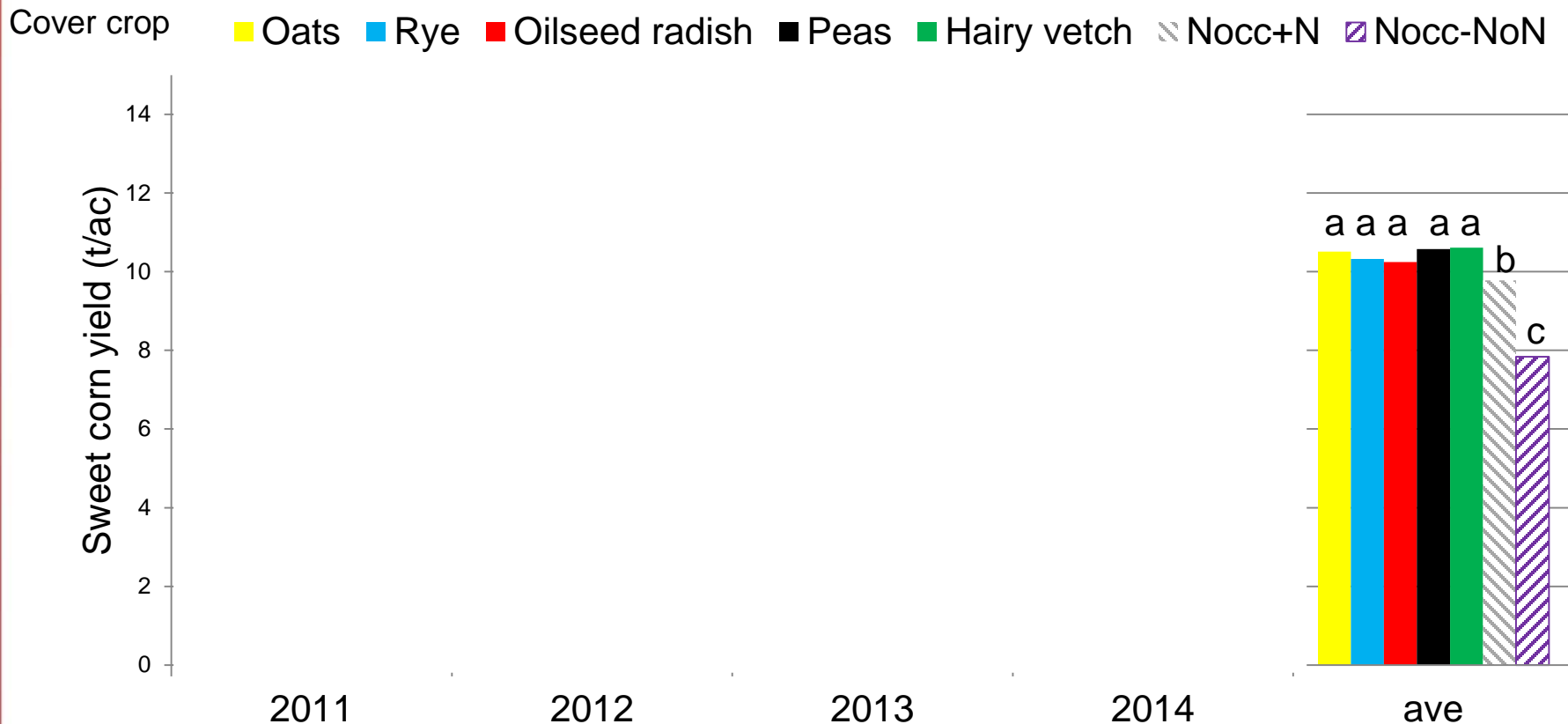
# Snap bean yield

Trial established 2008 – same cover crop on same plot  
Processing green bean grown in 2011-2014



# Sweet corn yield

Trial established 2008 – same cover crop on same plot  
Processing sweet corn grown in 2011-2014





# Profit Margins

- Revenue from crop yield over costs of cover crop
- Revenue
  - Corn \$90 per ton
  - Snaps \$189 per ton
- Only takes into account costs that vary among treatments
  - Cover crop seed and planting (\$34.25 to \$50 per ac)
  - Herbicide and application (rye only) (\$21.70 per ac)

Economic Analysis by Dr. Richard J. Vyn

# Profit Margins

## Compared to no cover crop control

### Snaps (4 yr ave)

Cover crop	\$/ac
Oats	85.01
Hairy vetch	42.63
Fall rye	37.12
Forage peas	32.82
Radish	<b>-57.65</b>

### Sweet Corn (4 yr ave)

Cover crop	\$/ac
Hairy vetch	39.88
Forage peas	35.81
Oats	35.78
Fall rye	No diff
Radish	No diff



## Long-term cover crop trials (2007 to 2016)

- 122 cover crops planted in 20 trials
- **121 times** crop yields were as good as or better with a cover crop than without

Cover crops we tested:

Oats, Cereal rye, Radish, Radish+Rye, Forage peas, Hairy vetch

# Long-term Cover Crop Trial Summary

Cover crop Recommendation	Veg. crop	# of Trials	Significance Difference
Any	Sweet Corn	6	5 of 6 yrs

Cover crops we tested:

Oats, Cereal rye, Radish, Radish+Rye, Forage peas, Hairy vetch



# http://mccc.msu.edu/covercroptool/

CHANGING LIVES  
IMPROVING LIFE

## MCCC - Vegetable Cover Crop Decision Tool Michigan: Grand Traverse County Seeding Dates

Location Information

Cash Crop Information

Soil Information

Attribute Information

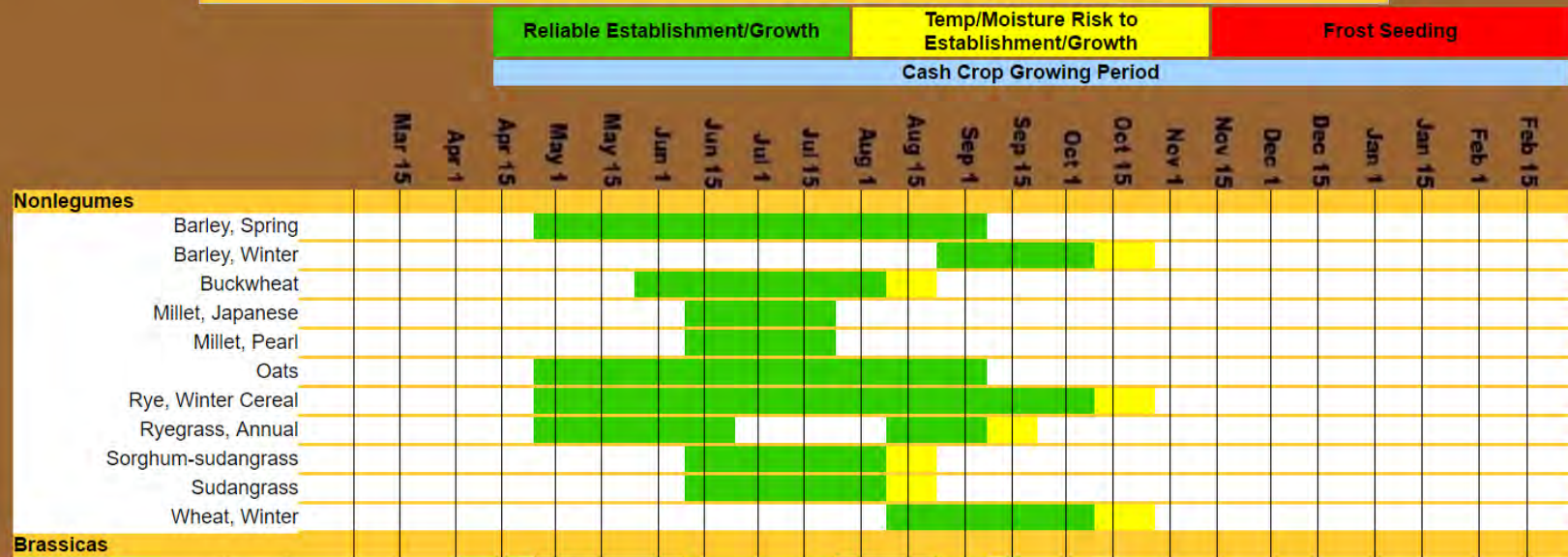
Location Information

Cash Crop  Plant Date:  Harvest Date:

Drainage Information  Flooding

Goal #1  Goal #2  Goal #3

Click on cover crop for further information

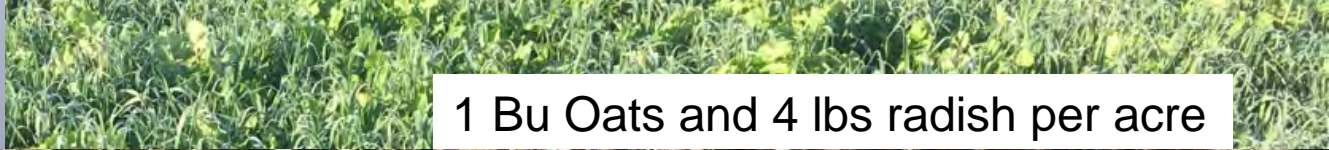




Ku







1 Bu Oats and 4 lbs radish per acre

















# Soil Health BMPs

**Grass Land**

**Permanent  
cover**

**Organic  
Amendments**

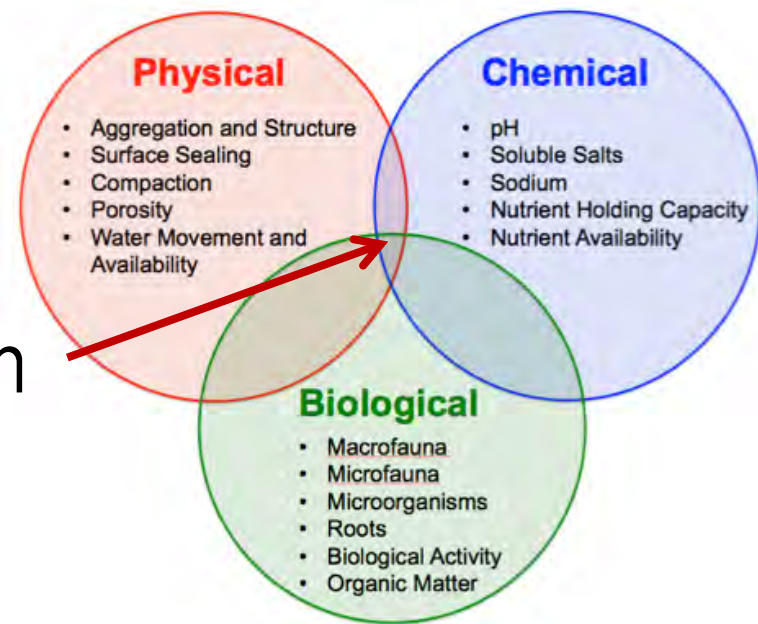
**Cover Crops**

**Crop Diversity**

**Reduced Tillage**

# Soil Health

Soil health



“Measured by how good a crop you can grow with no inputs at all”

Frederic Thomas



# Soil Health

## Increased soil organic matter

- Pulling larger machinery with same horse power
- Less ponding/standing water
- 1000 ac of beans in a drought year yielded in mid-60s



2500 ac of no-till and cover crops  
corn, soybeans, sugarbeets, winter wheat



# Organic Matter vs Organic Carbon

- Soil organic matter
- Soil organic carbon

# Soil test report

To: Mr. J. H. H. H. H. H.  
2700 ALTAIR ROAD  
LONDON, ON N5V 3P5

For

Report Date: 12/11/99

## SOIL TEST REPORT

Page 1

[illegible]

IS = VERY LOW      I = LOW      M = MEDIUM      H = HIGH      VII = VERY HIGH

## SOIL FERTILITY RECOMMENDATIONS (lb/acre)

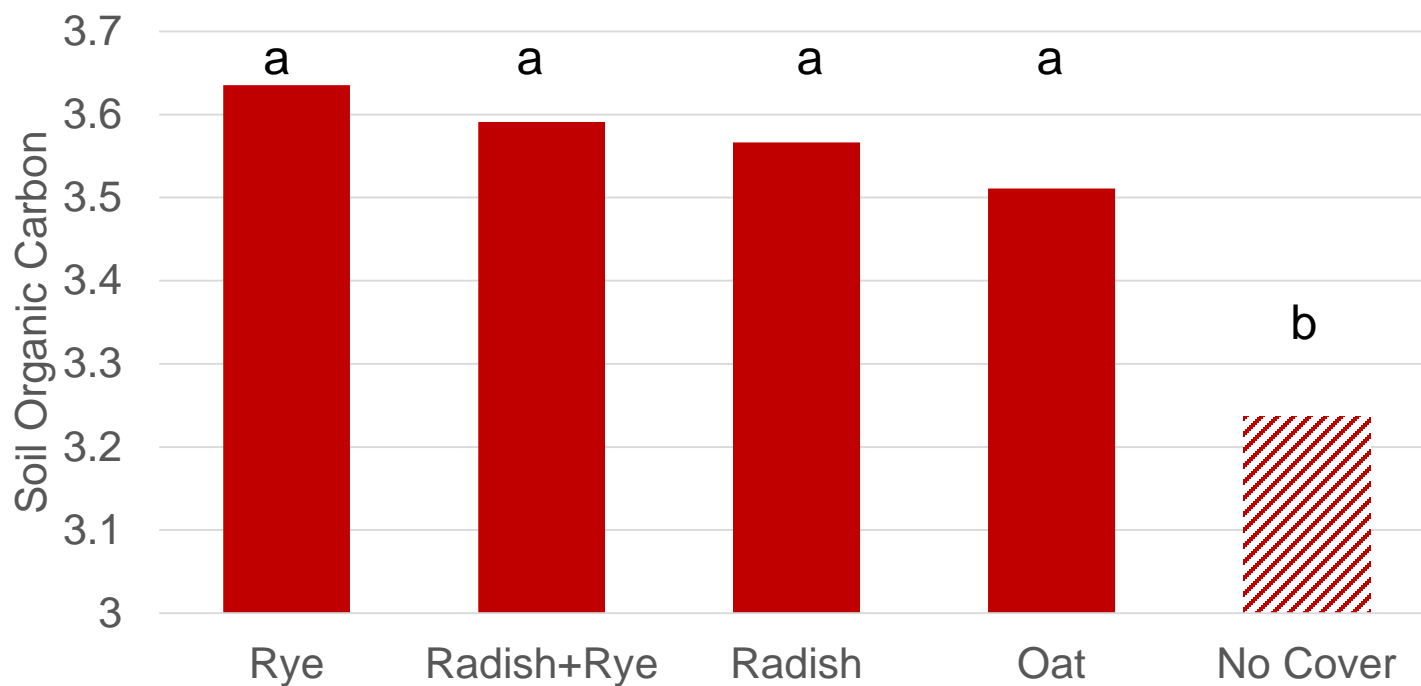
[illegible]

Only paid to be covered by insurance of factors of production in the future. No question of negatively affecting their performance at work (p. 83)

Periodic Table of the Elements																																																																																	
1 IA 1A												18 VIIIA 8A																																																																					
2 IIA 2A												17 VIIA 7A																																																																					
3 IIIB 3B		4 IVB 4B		5 VB 5B		6 VIB 6B		7 VIIB 7B		8 VIII 8		9 VIII 9		10 VIII 10																																																																			
11 IB 1B		12 IIB 2B		13 IIIA 3A		14 IVA 4A		15 VA 5A		16 VIA 6A		17 VIIA 7A		18 VIIIA 8A																																																																			
1 <b>H</b> Hydrogen 1.008																	2 <b>He</b> Helium 4.003																																																																
3 <b>Li</b> Lithium 6.941	4 <b>Be</b> Beryllium 9.012									5 <b>B</b> Boron 10.811	6 <b>C</b> Carbon 12.011	7 <b>N</b> Nitrogen 14.007	8 <b>O</b> Oxygen 15.999	9 <b>F</b> Fluorine 18.998	10 <b>Ne</b> Neon 20.180																																																																		
11 <b>Na</b> Sodium 22.990	12 <b>Mg</b> Magnesium 24.305	13 <b>Al</b> Aluminum 26.982	14 <b>Si</b> Silicon 28.086	15 <b>P</b> Phosphorus 30.974	16 <b>S</b> Sulfur 32.06	17 <b>Cl</b> Chlorine 35.453	18 <b>Ar</b> Argon 39.948	19 <b>K</b> Potassium 39.098	20 <b>Ca</b> Calcium 40.078	21 <b>Sc</b> Scandium 44.956	22 <b>Ti</b> Titanium 47.867	23 <b>V</b> Vanadium 50.942	24 <b>Cr</b> Chromium 51.996	25 <b>Mn</b> Manganese 54.938	26 <b>Fe</b> Iron 55.845	27 <b>Co</b> Cobalt 58.933	28 <b>Ni</b> Nickel 58.693	29 <b>Cu</b> Copper 63.546	30 <b>Zn</b> Zinc 65.38	31 <b>Ga</b> Gallium 69.723	32 <b>Ge</b> Germanium 72.631	33 <b>As</b> Arsenic 74.922	34 <b>Se</b> Selenium 78.971	35 <b>Br</b> Bromine 79.904	36 <b>Kr</b> Krypton 84.796																																																								
37 <b>Rb</b> Rubidium 85.468	38 <b>Sr</b> Strontium 87.62	39 <b>Y</b> Yttrium 88.906	40 <b>Zr</b> Zirconium 91.224	41 <b>Nb</b> Niobium 92.906	42 <b>Mo</b> Molybdenum 95.94	43 <b>Tc</b> Technetium 98.907	44 <b>Ru</b> Ruthenium 91.224	45 <b>Rh</b> Rhodium 101.07	46 <b>Pd</b> Palladium 106.42	47 <b>Ag</b> Silver 107.868	48 <b>Cd</b> Cadmium 112.411	49 <b>In</b> Indium 114.818	50 <b>Sn</b> Tin 118.710	51 <b>Sb</b> Antimony 121.757	52 <b>Te</b> Tellurium 127.6	53 <b>I</b> Iodine 126.905	54 <b>Xe</b> Xenon 131.29	55 <b>Cs</b> Cesium 132.905	56 <b>Ba</b> Barium 137.327	57-71 <b>Lanthanide Series</b>		72 <b>Hf</b> Hafnium 178.49	73 <b>Ta</b> Tantalum 180.948	74 <b>W</b> Tungsten 183.84	75 <b>Re</b> Rhenium 186.207	76 <b>Os</b> Osmium 190.23	77 <b>Ir</b> Iridium 192.22	78 <b>Pt</b> Platinum 195.085	79 <b>Au</b> Gold 196.967	80 <b>Hg</b> Mercury 200.592	81 <b>Tl</b> Thallium 204.38	82 <b>Pb</b> Lead 207.2	83 <b>Bi</b> Bismuth 208.980	84 <b>Po</b> Polonium [209]	85 <b>At</b> Astatine [210]	86 <b>Rn</b> Radon 222.018																																													
87 <b>Fr</b> Francium 223.020	88 <b>Ra</b> Radium 226.025	89-103 <b>Actinide Series</b>		104 <b>Rf</b> Rutherfordium [261]	105 <b>Db</b> Dubnium [262]	106 <b>Sg</b> Seaborgium [266]	107 <b>Bh</b> Bohrium [264]	108 <b>Hs</b> Hassium [265]	109 <b>Mt</b> Meitnerium [268]	110 <b>Ds</b> Darmstadtium [271]	111 <b>Rg</b> Roentgenium [272]	112 <b>Cn</b> Copernicium [277]	113 <b>Uut</b> Ununtrium [285]	114 <b>Fu</b> Flerovium [289]	115 <b>Uup</b> Ununpentium [291]	116 <b>Lv</b> Livermorium [293]	117 <b>Uus</b> Ununseptium [294]	118 <b>Uuo</b> Ununoctium [294]																																																															
<table><tr><th>Lanthanide Series</th><th>La</th><th>Ce</th><th>Pr</th><th>Nd</th><th>Pm</th><th>Sm</th><th>Eu</th><th>Gd</th><th>Tb</th><th>Dy</th><th>Ho</th><th>Er</th><th>Tm</th><th>Yb</th><th>Lu</th></tr><tr><td></td><td>Lanthanum 138.905</td><td>Cerium 140.12</td><td>Praseodymium 140.908</td><td>Niodymium 144.24</td><td>Promethium 144.913</td><td>Samarium 150.36</td><td>Europium 151.964</td><td>Gadolinium 157.25</td><td>Terbium 158.925</td><td>Dysprosium 162.50</td><td>Holmium 164.930</td><td>Erbium 167.259</td><td>Thulium 168.934</td><td>Ytterbium 173.054</td><td>Lutetium 174.967</td></tr><tr><th>Actinide Series</th><th>Ac</th><th>Th</th><th>Pa</th><th>U</th><th>Np</th><th>Pu</th><th>Am</th><th>Cm</th><th>Bk</th><th>Cf</th><th>Es</th><th>Fm</th><th>Md</th><th>No</th><th>Lr</th></tr><tr><td></td><td>Actinium 227.028</td><td>Thorium 232.038</td><td>Protactinium 231.036</td><td>Uranium 238.029</td><td>Neptunium 237.048</td><td>Plutonium 244.064</td><td>Americium 243.061</td><td>Curium 247.070</td><td>Berkelium 247.070</td><td>Californium 251.080</td><td>Einsteinium 254</td><td>Fermium 257.105</td><td>Mendelevium 258.1</td><td>Nobelium 259.10</td><td>Livermorium [262]</td></tr></table>																		Lanthanide Series	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		Lanthanum 138.905	Cerium 140.12	Praseodymium 140.908	Niodymium 144.24	Promethium 144.913	Samarium 150.36	Europium 151.964	Gadolinium 157.25	Terbium 158.925	Dysprosium 162.50	Holmium 164.930	Erbium 167.259	Thulium 168.934	Ytterbium 173.054	Lutetium 174.967	Actinide Series	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		Actinium 227.028	Thorium 232.038	Protactinium 231.036	Uranium 238.029	Neptunium 237.048	Plutonium 244.064	Americium 243.061	Curium 247.070	Berkelium 247.070	Californium 251.080	Einsteinium 254	Fermium 257.105	Mendelevium 258.1	Nobelium 259.10	Livermorium [262]
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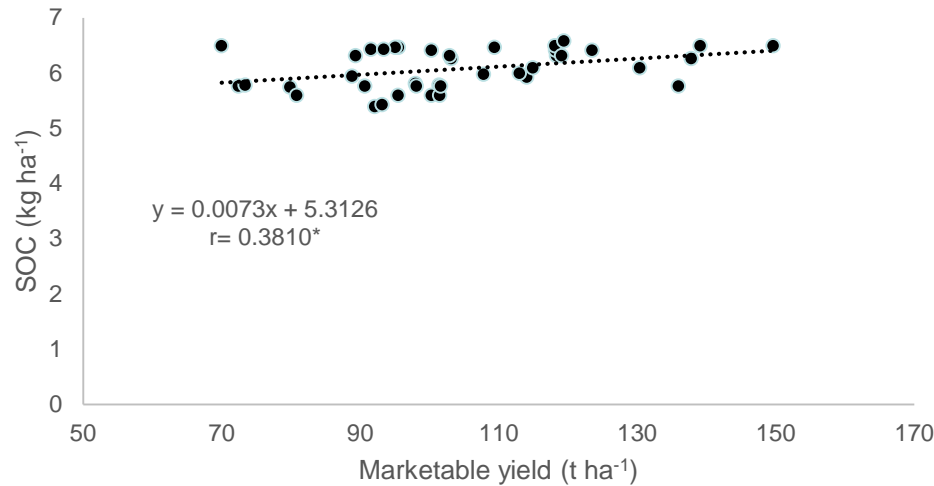
# Soil organic carbon



2015+2016 all sample dates –LVE lab

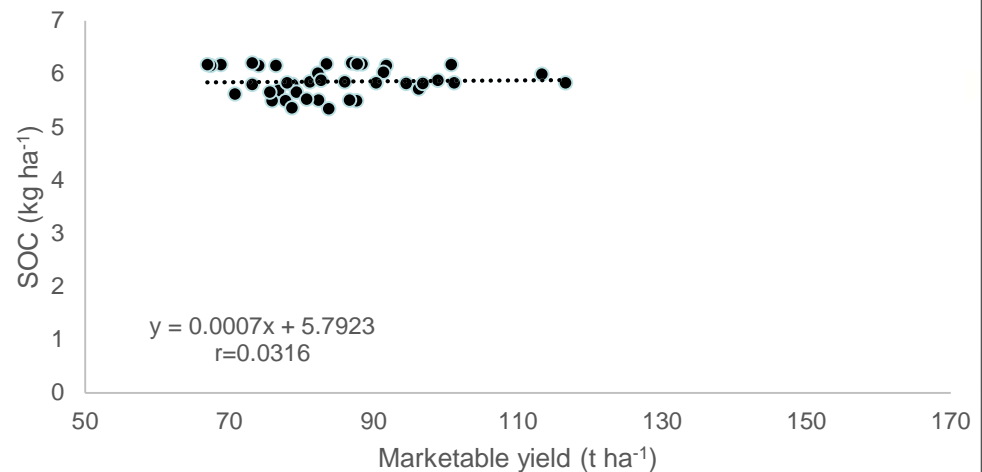
# Soil organic carbon and yield

2016



Hot and dry year  
–benefits of soil health show up  
–better yields with better soil

2015





[illegible]



# Clive's Farming principles

- Always want something growing – would you ever turn off a solar panel ?
- No bare soil – reduce water loss
- Maximize diversity – a varied diet is a healthy diet
- Minimize disturbance, allow biology to thrive and build strong networks
- Feed soil biology buy building SOM
- Improve water infiltration with #rootsnotiron

@TWBfarms