

The Latest...

No Till Cover Crop Revelations

Steve Groff
Holtwood, PA



Remember this?



Keys to Success

The reason why one farmer can make cover crops work and his neighbors can't is complex. Attention to details and timing!

Management!

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The Big Picture

We need to focus more on
Biological solutions
than
Chemical, Fertilizer, and Iron solutions

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Cover Crop Influences: Yield - input costs = Profit



Species / Blend Planted in Separate Plots



Crimson Clover

Hairy Vetch

Control (No cover crop)

Hairy Vetch, Austrian Winter Pea, Crimson Clover

Subterranean Clover, Hairy Vetch

Austrian Winter Pea

Yellow Blossom Sweet Clover, Hairy Vetch





100 degrees
No cover

88 degrees
Crimson Clover



3 days later!





Dr. Ray Weil July 6th

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Measuring yields



**Penn State
University**

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Results: Corn Planted Behind Cover Crops

Study 1

Cover Crops and Blends Tested

Corn, Bushels Per Acre (b/a) Yield

90 100 110 120 130 140 150 160

Zero N Added 5-31-11

Crimson Clover, Austrian Winter Peas, Hairy Vetch

151.55

Subterranean Clover/Hairy Vetch

144.56

Control (only plot with N added, 75 lb/a)

99.08

Austrian Winter Pea

144.92

Yellow Blossom Sweet Clover/Hairy Vetch

142.85

Crimson Clover

124.18

Hairy Vetch

152.36

Average Corn Yield
From Cover Crop Plots

143.40

44.32 b/a
Increase Over Control

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Corn Planted Behind Cover Crops, 120 lb/a N Added at Sidedress

Study 1

Cover Crops and Blends Tested

Corn, Bushels Per Acre (b/a) Yield

90 100 110 120 130 140 150 160

120 lb/a N Added 5-31-11

Crimson Clover, Austrian Winter Peas, Hairy Vetch

163.61

Subterranean Clover/Hairy Vetch

145.87

Control (*only plot with N added, 75 lb/a*)

128.66

Austrian Winter Pea

147.94

Yellow Blossom Sweet Clover/Hairy Vetch

158.68

Crimson Clover

136.22

Hairy Vetch

158.78

Average Corn Yield
From Cover Crop Plots

151.85

23.19 b/a
Increase Over Control

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Another Slice of the Data

Study 1

Average Yield

All Cover Crop Plots	143.20 b/a
All Control Plots	110.28 b/a
Increase	32.92 b/a

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Cover Crop Economics

Study 1

Gross value
-seed costs
@ \$7.00/bu

Average Yield, All Plots

By Species Regardless of N Rate Addition

		Seed Prices Retail / lb, Incl Inoculant	Seeding Rate (lb/a)	Seed Cost Per Acre	
Crimson Clover	128.39	\$1.45	12	\$17.40	\$881.33
Hairy Vetch	151.43	\$2.70	15	\$40.50	\$1019.51
Control, no cover crop grown	110.28	—	—	—	\$771.96
Hairy Vetch, Austrian Winter Pea, Crimson Clover	151.31	\$2.70 / \$0.90 / \$1.45	5 / 12 / 14	\$30.10	\$1029.07
Subterranean Clover, Hairy Vetch	138.70	\$3.19 / \$2.70	8 / 8	\$47.12	\$923.78
Austrian Winter Pea	138.67	\$0.90	40	\$36.00	\$934.69
Yellow Blossom Sweet Clover, Hairy Vetch	150.73	\$2.16 / \$2.70	4 / 10	\$35.64	\$1019.47

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Cover Crop Research

Research on Timing of Tillage Radish Planting and Effect on Corn Yield

Objective:

Attempt to determine the latest practical planting date for Tillage Radish (TR) to have a positive effect on yield for corn planting following Tillage Radish grown as a cover crop.

Tillage Radish Planted	Corn Yield b/a	Difference b/a
Control (no TR)	136.75	—
September 20, 2010	149.21	+ 12.46
October 9, 2010	145.11	+ 8.36

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Cover Crop Mixes

- Guards against failure of one species
- Provide opportunity for maximum benefits of any given species
- A smorgasbord of food for the critters
- Crop rotation on steroids!
- Can cut seeding rates due to synergistic effects
- Higher cash crop yields!

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Cost Analysis of Cover Crop Use Compared to Nitrogen Input for Corn

Study 3



Our Cover Crop 'Cocktail' – Species Selected for Known Benefits and Synergies

Tillage Radish®

Sunflower

Sweet Blue Lupin

Austrian Winter Pea

Phacelia

Fava Bean

Early Cover Hairy Vetch

Common Vetch

Sunn Hemp

Fenugreek

Calendula

Oats

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All Plots Harvested October 18, 2011

Study 3

190 bu/ac corn grown with no synthetic N!

Cover Crop Economics

All Data is Per Acre Except Where Noted

Nitrogen input:
60/40 blend of Super U
and Ammonium Sulfate,
at \$0.795 / lb



190.8 bu/ac
Zero Units / N



205.6 bu/ac
60 Units / N



198.1 bu/ac
90 Units / N



196.9 bu/ac
120 Units / N

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All Plots Harvested October 18, 2011

Study 3

	N Cost	N Cost	N Cost	N Cost
Cover Crop (No fertilizer; Seed +\$17.60 drill cost)	\$46.80	–	–	–
Urea (Cost +\$12.00 application cost)	–	\$59.70	\$83.55	\$107.40
Gross Profit / Acre @ \$7.00 / bu Corn	\$1,288.80	\$1,379.50	\$1,303.15	\$1,270.90

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Tillage Radish[®]/Tillage RootMax[®] annual ryegrass



Tillage Radish[®]/Crimson Clover



Tillage Radish[®]/RootMax[®] Annual Ryegrass/ Crimson Clover



Annual Ryegrass and Crimson Clover



Tillage RootMax®

Deeper roots

Certified seed

Later maturity in spring

More tillers-easier to kill

High grazing/forage potential

New Annual Ryegrass

But what about planting into green covers?





**Patience
and
Wisdom!**



Planting into cereal rye

Add N at planting!

Cover Crops that Pay

- **Precision Planted** cover crops
 - Can cut seeding rates in half!
 - Save Cover Crop \$\$\$
 - Larger equipment=faster planting
 - Better seed placement
 - Custom cover crop planting service?

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Profiles of Success

David Brandt, Ohio





Precision Planting

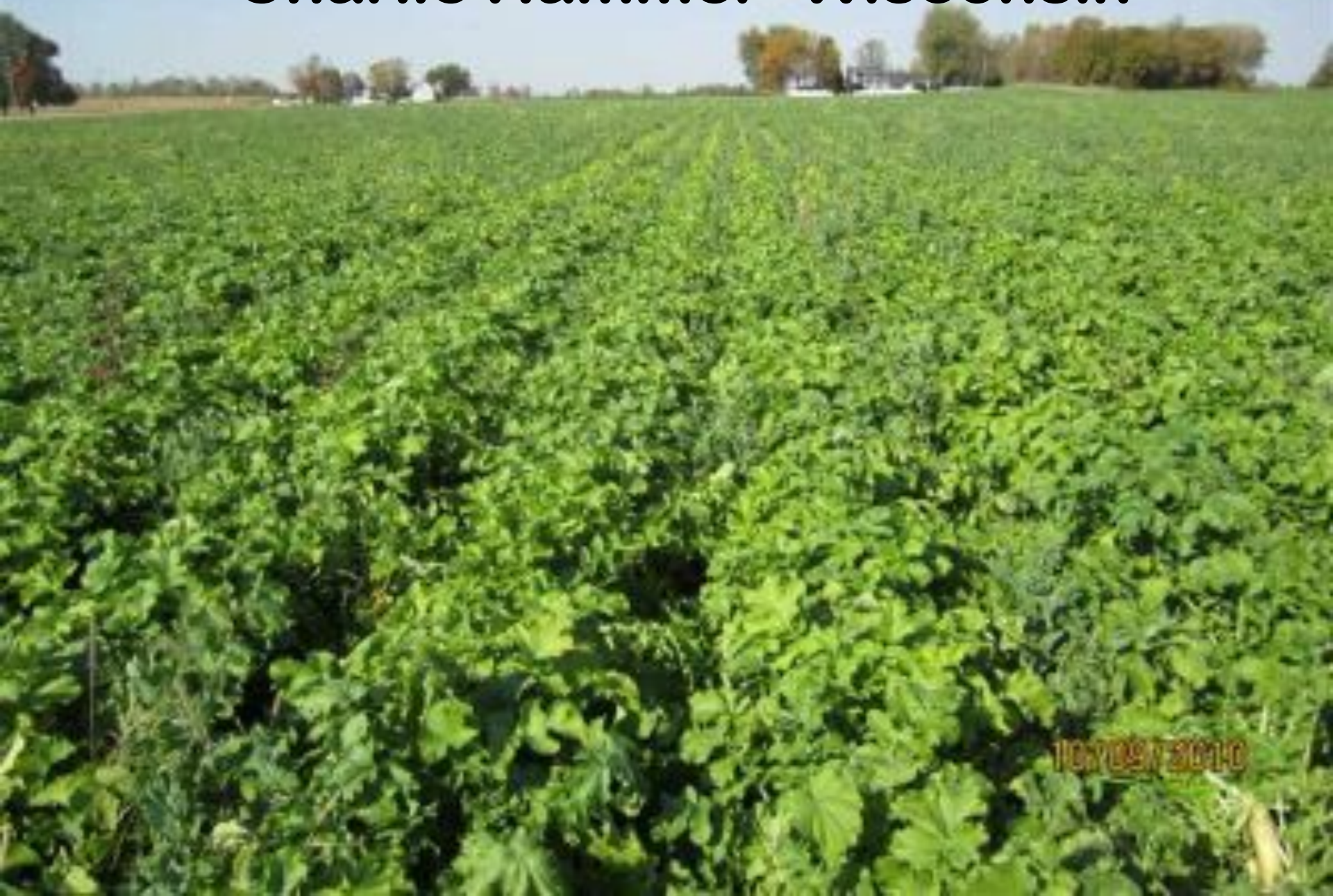


**Precision
Planting**
•2lbs/A in
15" rows
•15lbs/A
With Peas
**Less than
\$20/A!**

B Y



Charlie Hammer- Wisconsin



11/07/09 2010

Controlled spillage...



...in slow motion!



Bio Strip till



Enhanced Residue decomposition







Over 200 bu **bt corn the past 2 seasons**

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Nice decomposition!

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My Vertical tillage tool



- **Plant shorter season hybrids/varieties on a portion of your acres**
 - **Modern short season varieties have improved yield potential**
 - **Possibly can plant covers 2 weeks earlier**
 - **Spreads out harvest**

Shorter Season Corn -103 day-harvested Sept 20th



**Planted Tillage Radish®, Crimson Clover, Tillage RootMax® Annual Ryegrass
September 20th**



Harvesting long Season-111 day- Oct 18th



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Using Shorter Season Varieties

Study 4

103-day hybrid

194 bu/ac (dry)

111-day hybrid

163 bu/ac (dry)

31 bu difference this year!



Results based on 2011 weather conditions

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- **Aerial/broadcast seeding**
 - **Earlier planting window**
 - **Plant in standing crop**
 - **Faster/less cost?**
 - **With proper management has been effective on many acres**

High Clearance Seeders



Don Birkey, Illinois

High Clearance Seeders

Matt Van Tillburg, Ohio



High Clearance Seeders



High Clearance Seeders



Aerial Seeding





Penn State University's



Cover Crop
Interseeder







Cover Crop Herbicide Research



**Penn State
University
-2nd year**

B Y



Early “in crop” establishment









Sunn Hemp and Tillage Radish



Sunn Hemp and Tillage Radish



Sweet Blue Lupin





Sweet Blue Lupin=N production



Phacelia



Phacelia=soil conditioning





Look at them roots!

Tillage Radish research



Tillage Radish[®] effect on Yields

University of Maryland:

12 bushel corn yield increase and
8 bushel soybean yield increase
after planting Tillage Radish[®]
the previous fall. Never had a
yield decrease. 5 years- over 70
comparisons

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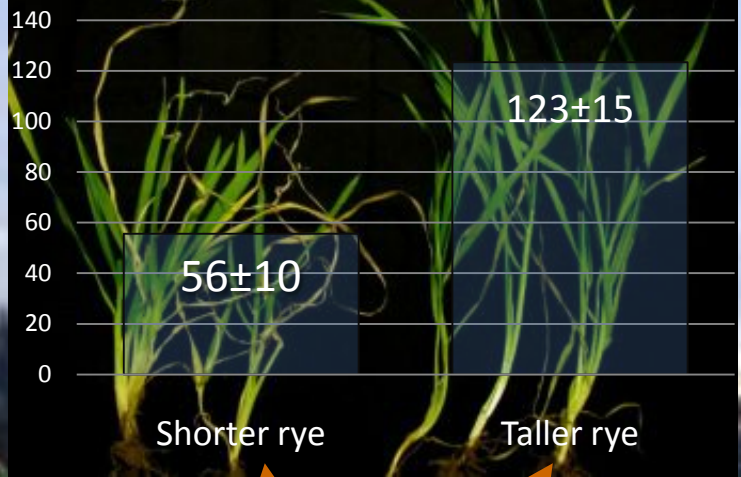
Tillage Radish[®]

- **Break up compaction**
- **Control winter annuals**
- **Capture N in the Fall- release in the spring**
- **Increase yields!**

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NO₃-N in sap, ppm



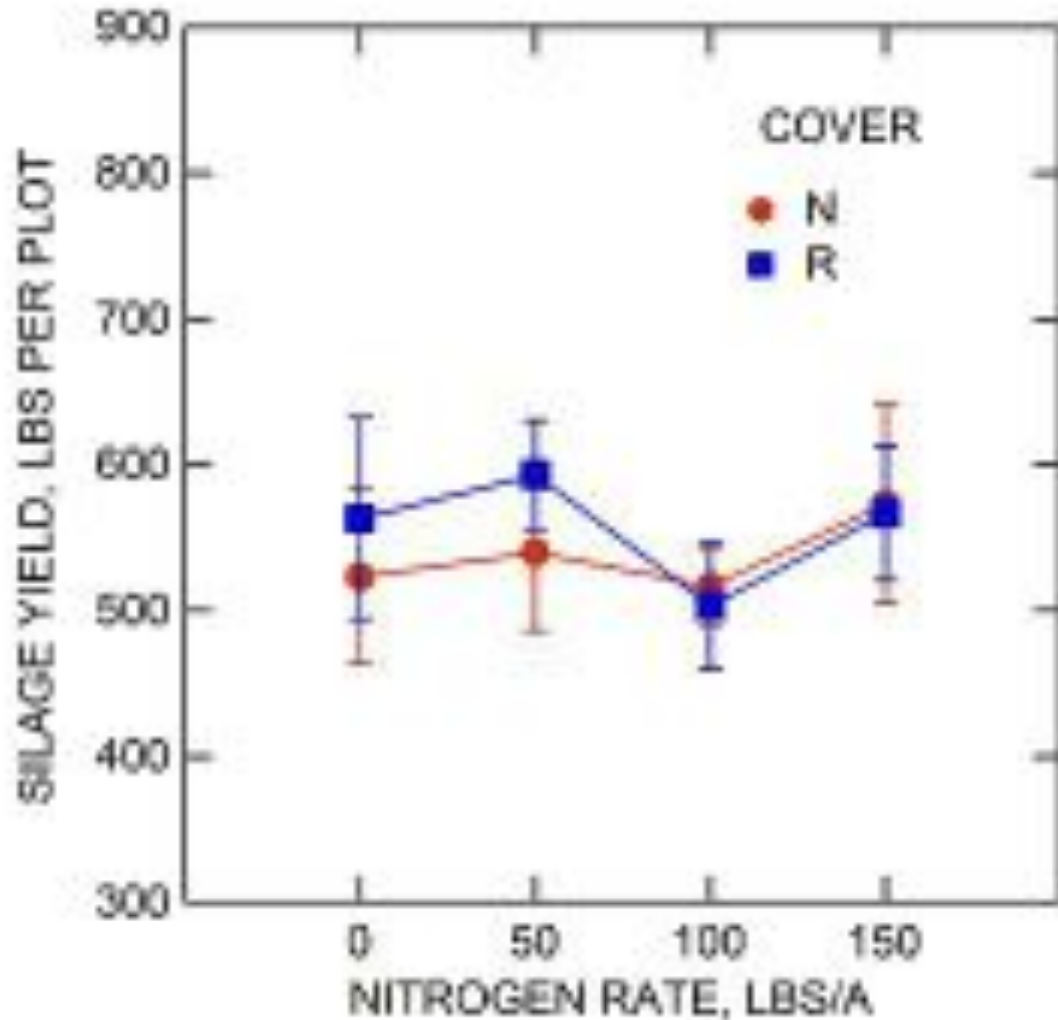
Rye cover crop in December 2011 responds (strips of darker, taller plants) to June 2011 UAN-N side-dressing in 60 cm wide rows where Tillage Radish was grown in fall 2010 but *not* in the strips where no cover crop was grown in fall 2010.

N-rate plots,
Tillage Radish
in 2010

N-rate plots,
no cover
in 2010

N-rate plots,
Tillage Radish
in 2010

Silage Yields



**2 ton
Increase**

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8 days after planting



8 days after planting

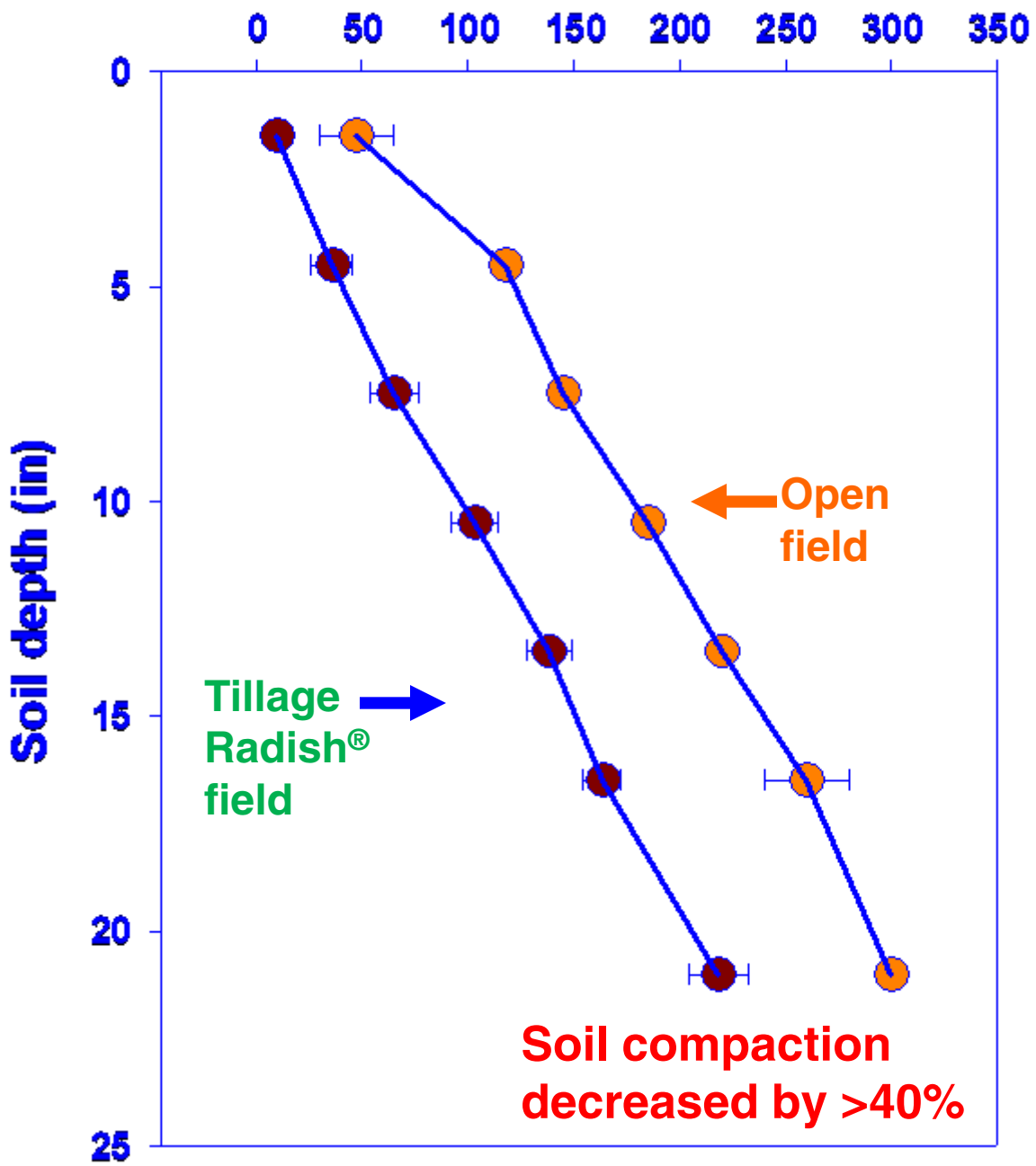
Look at that
root already!





Steve Carruther's farm in Ontario, Canada

Penetration resistance (lbs/in²)



Ohio State University

H S P O N S O R E D B Y





Nitrogen Storage Tanks

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Bulk storage units!



Is bigger always better?



Don't forget about the little things-

The fine roots



Soil Quality Enhancement Activity – SQL05 – Use of Deep Rooted Crops to Break up Soil Compaction



Enhancement Description

This enhancement is for the use of deep rooted crops to break up compacted soils and improve soil quality. Deep rooted crops can be perennial plants like alfalfa or annual plants like forage radish.

Land Use Applicability

Cropland

Benefits

Soils can have naturally occurring compacted layers (hard pans) or those that have been created through tillage or other farming activities. Deep rooted crops with large taproots can alleviate the effects of soil compaction by penetrating the compacted layer, creating pore space that allows air, water and crop roots to penetrate deeper in the soil profile. Eliminating soil compaction through the use of deep rooted crops increases infiltration, reduces surface runoff, improves soil tilth and overall soil quality. It also eliminates the need for sub-soiling with a plow, thus saving fuel, reducing erosion and enhancing water quality.

Criteria for Use of Deep Rooted Crops to Break up Soil Compaction

- The selected crop must be one that has been identified as having the capability of alleviating soil compaction (state specific lists are available in NRCS Field Office Technical Guide).
- If perennial plants are used, once established, they must be maintained annually by proper fertilization and mowing/harvesting.
- Annual crops should be seeded early enough in the fall to allow for adequate growth to occur prior to winter (Follow NRCS 340 standard).
- No deep tillage is allowed to remove compacted layer.

Documentation Requirements for Use of Deep Rooted Crops to Break up Soil Compaction

1. Written documentation for each year of this enhancement describing the following items:
 - Deep rooted crops used and dated planted.
 - Cash crop planted and method used.
2. A map showing fields where the enhancement is applied.
3. Photographs of a representative number of fields showing deep rooted crops.

Tillage Radish[®] With Wheat



+18 bu

+12 bu

+11 bu

+11 bu

+ 5 bu

+2.5bu

+1 bu

0 bu

Tillage Radish[®] With Wheat 2011

- OK- 9 and 11 bu + (very dry)
- OH- 7 bu +
- PA- 6.3 bu +
- PA-3 bu +
- IL-2.5 bu +

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Pushing the envelope...



Other species with wheat



Yep, they can be grazed



What's the ppm of nitrates...



**...coming out
of your
tile lines or
running off
your fields??**

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N is free to leave...



N goes nowhere!



Jan 10th, 2012!



Forerunner Triticale
Tillage RootMax
annual ryegrass
Tillage Radish
Fava Bean
Frostmaster Peas

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Steve's advice...

**TREAT COVER CROPS LIKE
YOUR CASH CROPS!**

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There's still a lot to learn!

