

The Effects of Soil Health and How to Get Started

While increasing profits

Cody T. Nelson



What is Soil Health?

Soil health is a state of a soil meeting its range of ecosystem functions as appropriate to its environment. Soil health testing is an assessment of this status. Soil health depends on soil biodiversity, and it can be improved via soil conditioning. [Wikipedia](#)



What does Healthy Soil Look Like?

- Always Covered
- Never Tilled
- Managed properly to Maintain Cover
- Nutrients Applied Accordingly to New Test



Who is Getting on Board With Regenerative and Sustainable Brands?

- General Mills
- Land O' Lakes
- Campbell's Soup
- Tyson Foods
- Pepsi
- Wrangler
- Phillip Morris
- McDonalds
- Nestle/Purina
- Turkey Hill
- Whole Foods
- Blue Apron
- Sweet green
- Cargill
- Walmart
- Coca-Cola
- ADM
- Bonduel
- Unilever
- Patagonia



INSIDE: WHY IT'S CRITICAL THAT FARMERS SHOULD INVEST IN SOIL HEALTH. P.40

Successful Farming



MEET YOUR NEW BOSS

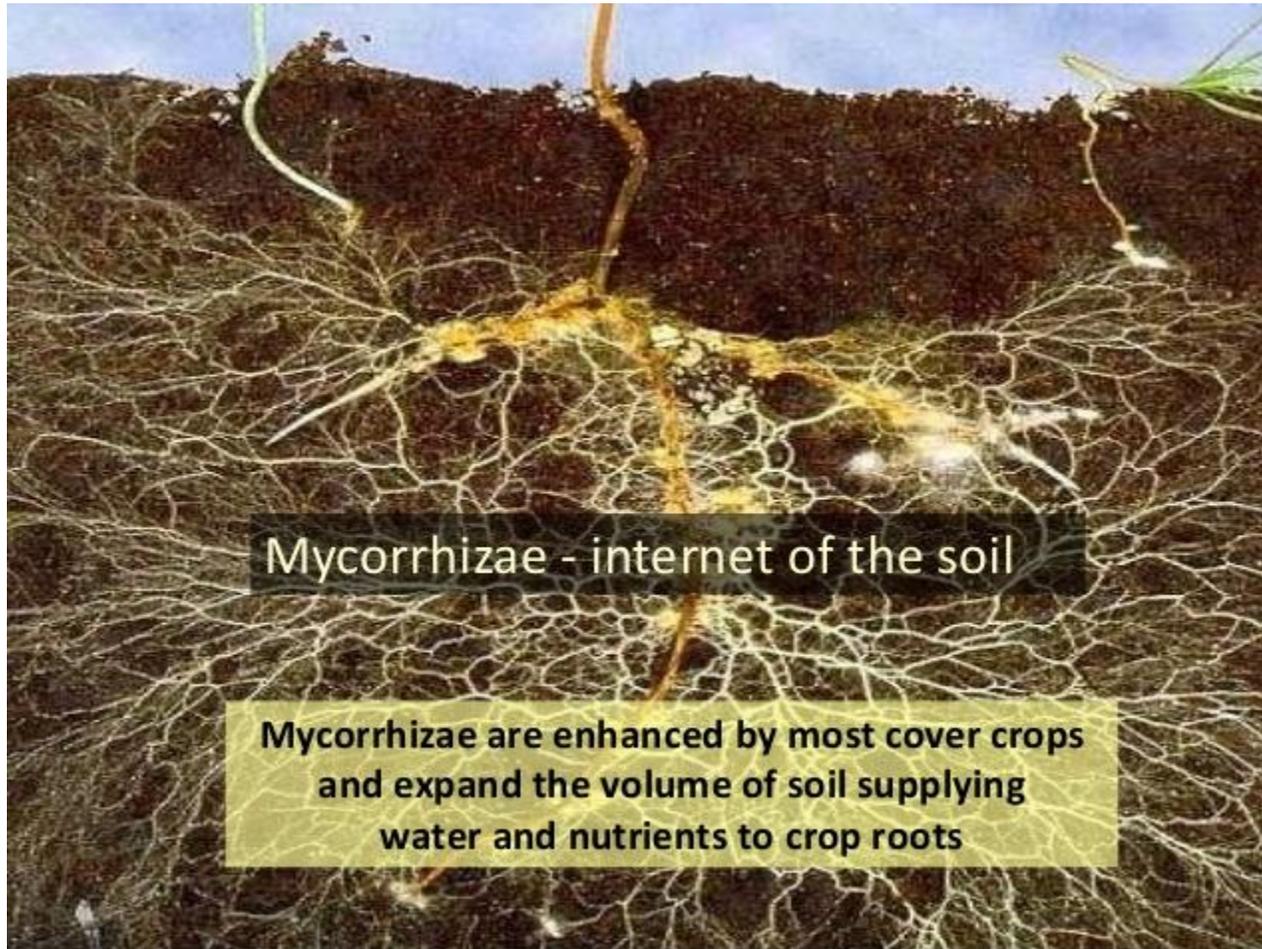
MOMS, BLOGGERS, AND FOODIES - THESE MILLENNIALS ARE DRIVING THE NEW FOOD AND AG ECONOMY. P.26



For families who make their money from ranching & their business @ 1/17-2/16/2016 | Vol. 134 No. 3 | Agriculture.com



Why Soil Health?... Nutrient Density



5 Principles of Soil Health

- Keep the Soil Covered
- Reducing Soil Disturbance
- Increase Plant Diversity
- Keeping a living root in the ground
- Incorporating Livestock



What are we Doing?



Just a Few more Reminders...











Let's start to keep the Soil and the Nutrients in the field!

It's Yours!

You Paid For It.

Why Not Keep It?

... On Your Farm!!!

**5.2 tons per acre per
year loss**

Soil Sample Results...

N-163

P-36ppm

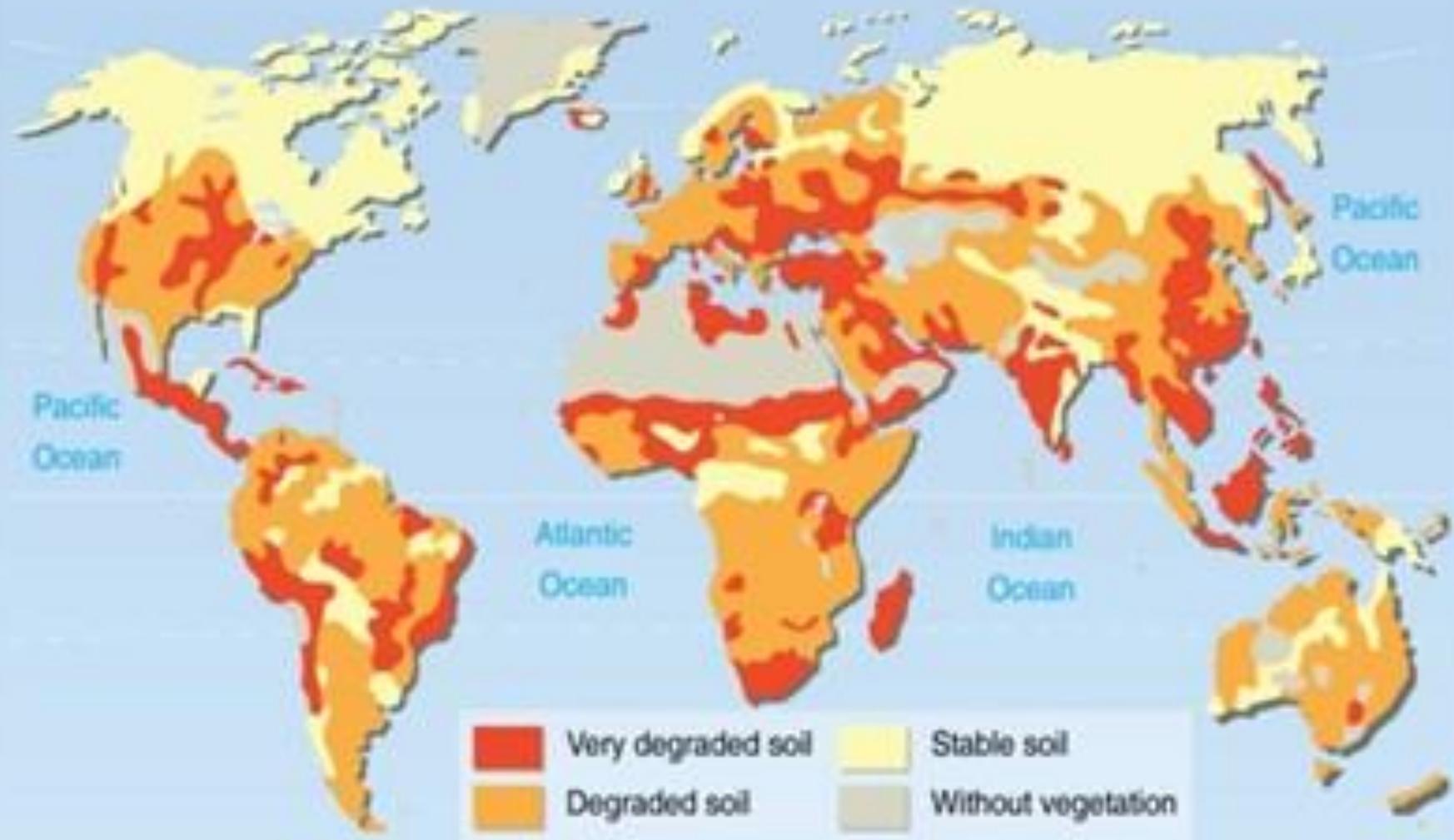
K-498ppm

OM-7.2%

PH-7.2



Soil degradation



Source: UNEP, International Soil Reference and Information Centre (ISRIC), World Atlas of Desertification, 1997.

Philippe Rekacewicz, UNEP/GRID-Arendal



Sankrist Text - 1500BC

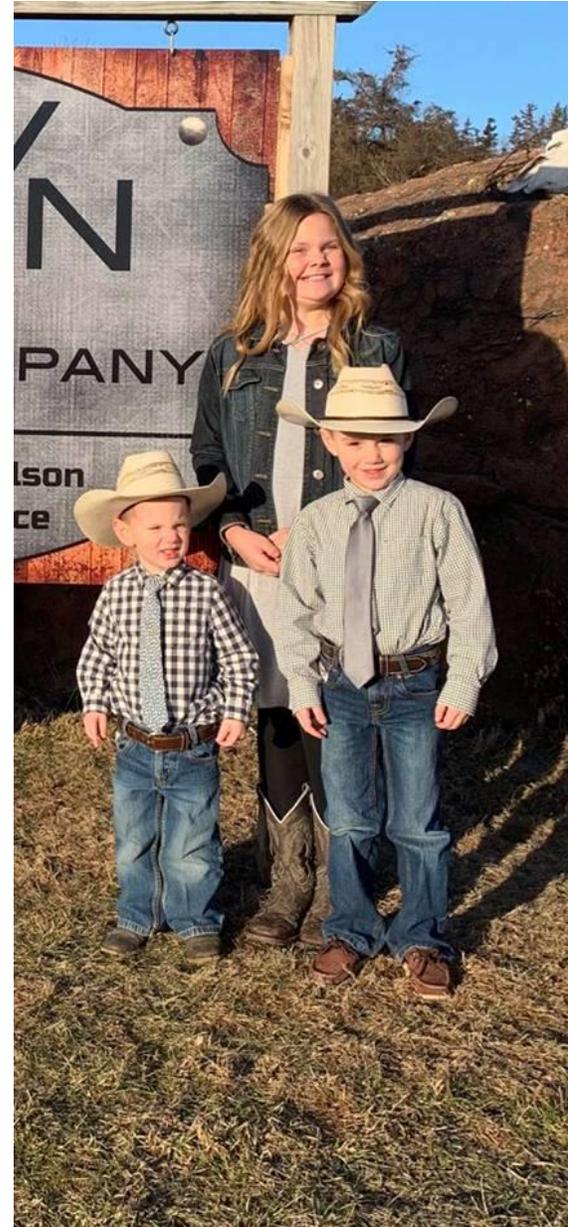
“Upon this handful of Soil our survival depends. Husband it and it will grow our food, our fuel, our shelter, and it will surround us with Beauty. Abuse it and the soil will collapse and Die.”



Future Generations...

Jeremiah 2:7

“I brought you into fertile land to eat its fruit and rich produce but you came and defiled my land and made my inheritance detestable.”

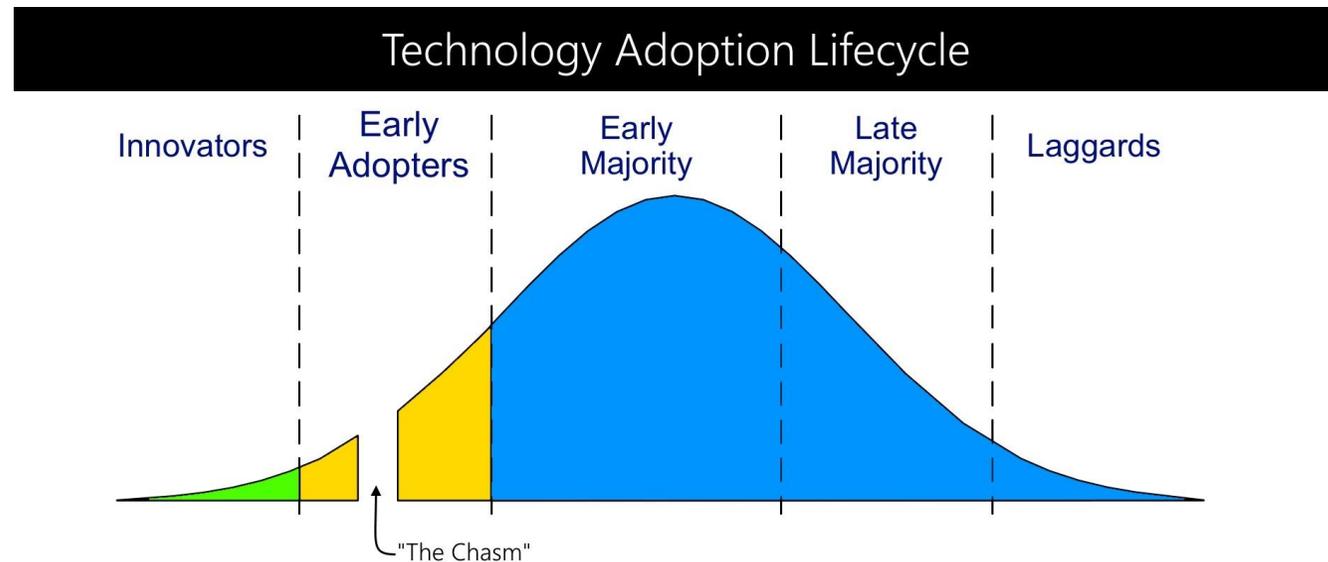


But We Can Help!



The Factors in Deciding to Try Cover Crops

- Values/ Emotions
- Social Support
- Change Aversion
- Access to Information
- Return on Investment (ROI)



Cover Crop Benefits 101

- Managing Soil Moisture
- Improving Soil Tilth & Water Infiltration
- Preventing Leaching of Nutrients
- Reducing Fertilizer Costs / Nutrient Recycling
- Reducing Compaction
- Increasing Organic Matter
- Breaking Weed Life Cycle – Mulch
- Reducing Diseases and Nematodes
- Increasing Yields
- Reducing Erosion
- **Increasing Profit!!!**



Increasing Organic Matter?

USDA-NRCS SOIL HEALTH INFOGRAPHIC SERIES #002

Unleash the
SECRETS
of SOIL

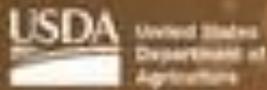
what's underneath

healthy soil has amazing water-retention capacity.



Every **1%** increase in organic matter results in as much as **25,000** gal of available soil water per acre.

Source: Kansas State Extension Agronomy e-Update, Number 257, July 6, 2012



Want more soil secrets?
Check out www.nrcs.usda.gov

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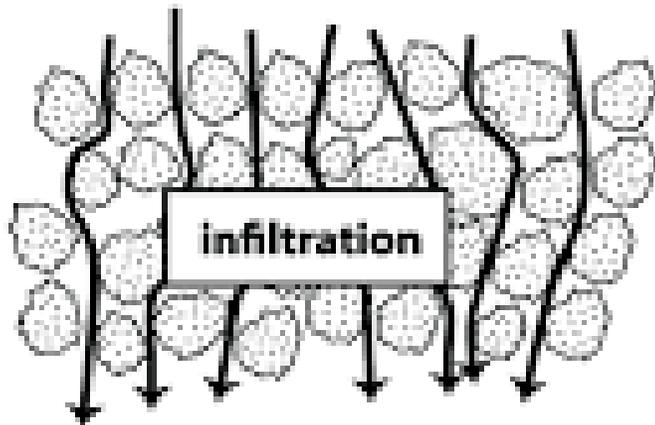


The water infiltration matters - Same Hybrid, different management

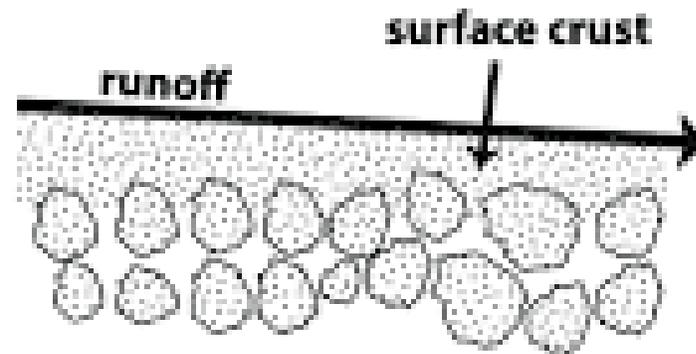


It's All about the Water

Changes in water flow due to soil crusting/compaction.



a) aggregated soil



b) soil crusts over after aggregates break down



Water Infiltration



Building Soil Aggregates



Black Cottage Cheese Look



Flooding



Soil Testing

- The Top Meter of soil contains thousands of tons of minerals/acre
- Specific Microbial Function groups have access to this mineral fraction, provided they receive liquid carbon produced from plants
- High Potassium and Phosphorus fertilizers inhibit formation of the plant- microbe bridge (MF)
- Classic models for soil carbon dynamics are based on conventionally managed fields and pastures, where the plant microbe bridge is dysfunctional.



Soil Facts

- 30,000 Tons of Nitrogen per acre in Atmosphere
- Soil showing greater than 15ppm Phosphorus will inhibit the Mycorrhiza to function- This limits nutrient cycling-
- Mycorrhiza can weather proof soils
- Plants use Carbon #1 and N # 2
- **Corn & Soybean alternation is less than 50% efficient collecting solar energy**
- Liquid Carbon is Root exudates which is 5 times more likely to end up as OM as crop residue that's tilled in.
- 1% Organic Matter can hold up to 25,000 Gallons of water per acre -Roughly an inch



Nutrient Calibration

- Many growers estimate yields fairly well. Few have enough experience with cover crops to walk through their fields and estimate their nutrient uptake.
- This photo shows a range of sizes you might encounter with tillage radish. All tubers were grown in a late summer and/or fall growing window.



Nutrient Calibration: Plant Uptake

Keys to assess:

- Number of plants
- Amount of growth
- Nutrient content

Average Tuber Length	Radishes per ft ²	Dry Biomass (lbs/a)	Leachable Nutrients		Non-Leachable Nutrients				Leachable Nutrient Value
			Nitrogen Uptake (lbs/a)	Sulfur Uptake (lbs/a)	Phos. Uptake (lbs/a)	Potash Uptake (lbs/a)	Mag. Uptake (lbs/a)	Calcium Uptake (lbs/a)	
2"	1	93	1	1	1	6	0	1	\$ 1.29
	2	186	3	2	1	11	1	3	\$ 2.58
	3	279	4	2	2	17	1	4	\$ 3.87
	4	372	6	3	3	22	1	6	\$ 5.16
	5	465	7	4	3	28	2	7	\$ 6.45
	6	558	9	5	4	33	2	8	\$ 7.74
4"	1	436	8	3	3	23	2	8	\$ 6.36
	2	872	15	7	5	46	3	17	\$ 12.71
	3	1308	23	10	8	70	5	25	\$ 19.07
	4	1744	30	13	11	93	6	33	\$ 25.42
	5	2180	38	17	14	116	8	42	\$ 31.78
	6	2617	45	20	16	139	9	50	\$ 38.13
6"	1	1077	20	8	6	53	4	24	\$ 16.20
	2	2153	40	16	12	107	7	47	\$ 32.41
	3	3230	60	24	18	160	11	71	\$ 48.61
	4	4307	79	32	25	214	15	94	\$ 64.81
	5	5383	99	40	31	267	18	118	\$ 81.02
	6	6460	119	48	37	320	22	141	\$ 97.22
8"	1	2044	39	15	11	96	7	49	\$ 31.52
	2	4089	79	29	22	193	13	98	\$ 63.03
	3	6133	118	44	33	289	20	147	\$ 94.55
	4	8178	157	59	44	386	27	197	\$ 126.07
10"	1	3362	67	24	17	152	11	87	\$ 52.84
	2	6724	134	47	35	305	21	174	\$ 105.68
	3	10086	201	71	52	457	32	261	\$ 158.51
12"	1	5048	103	35	25	222	16	139	\$ 80.63
	2	10095	207	70	50	444	31	278	\$ 161.26
14"	1	7117	149	49	34	304	22	206	\$ 115.29
	2	14234	299	97	68	609	43	412	\$ 230.58



Case Study- Nutrient Uptake

Iowa Prevented Planting Case Study

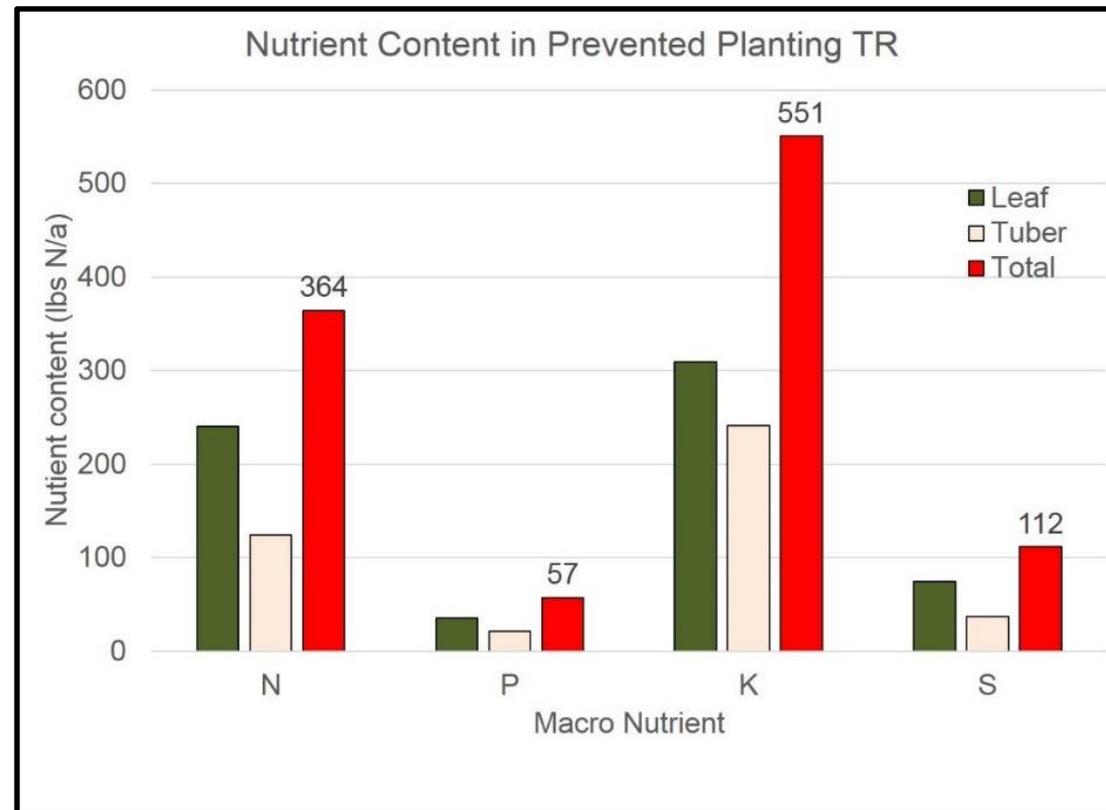
- 60 lbs N/a applied pre-plant.
- No additional N was added.
- Around Aug 1, the field was disked, radish seed was broadcast, and a roller was used to ensure firm seed contact.
- A good stand was established.



Case Study: Nutrient Uptake

Nutrient Analysis

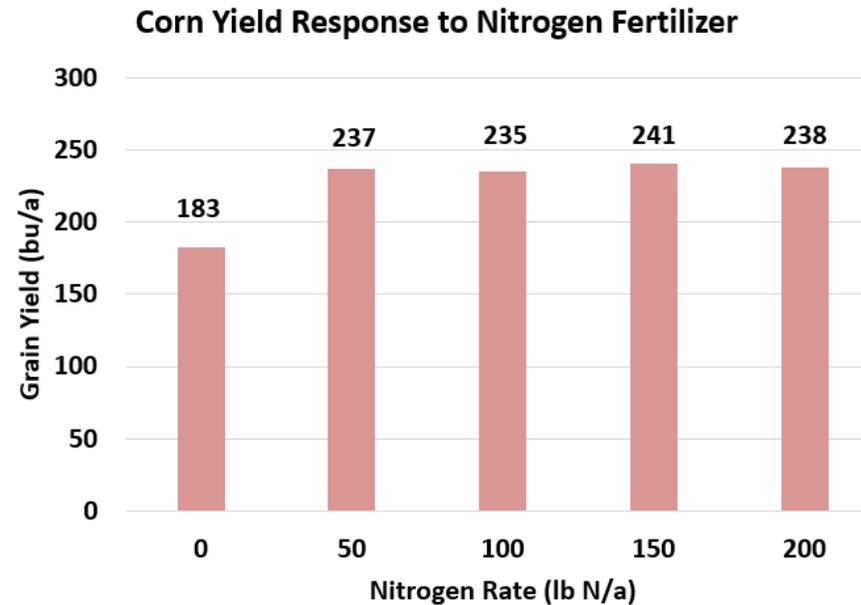
An average of 364 lbs of N were taken up by the radish, plus phosphorus, potassium and sulfur



Case Study- Nutrient Uptake

Nitrogen Needs

- Only 50 lbs N/a was needed to optimize grain yield for 230+ bu/a corn.
- Despite more than 350 lbs N in the TR catch crop, N was still needed, but at a much lower than anticipated amount.
- The lack of full N credit is speculated to be a loss from rain rather than a lack of N release due to a low C:N ratio.



Carbon to Nitrogen Ratio C:N

- Identify your goals when deciding which cover crop to plant.
- How high or low is your biological activity, and how fast will your cover break down?
- What is your next cash crop?
- Start with a low C:N ratio going to corn for increased yield.
- If planting corn into a overwintering cover crop terminate cover early to avoid too much N tie up. This will change as land becomes more biologically driven.



Where Can We Plant Cover Crops?

- Sugar beets
- Edible beans
- Sweet corn
- Peas
- Silage
- Interseeded into standing corn (Early and late)
- After small grains
- Aerial into beans

EVERYWHERE



Future Planting Ideas?



Seeding Options... No till vs. tilled



The New Cure for White Mold



Cost Comparison Planting green vs Till

Without Cover Crop / Acre

VT Disking	\$8-17
Disk Ripper	\$18-24
Spring Cultivating	\$12-15
Total	\$38-56

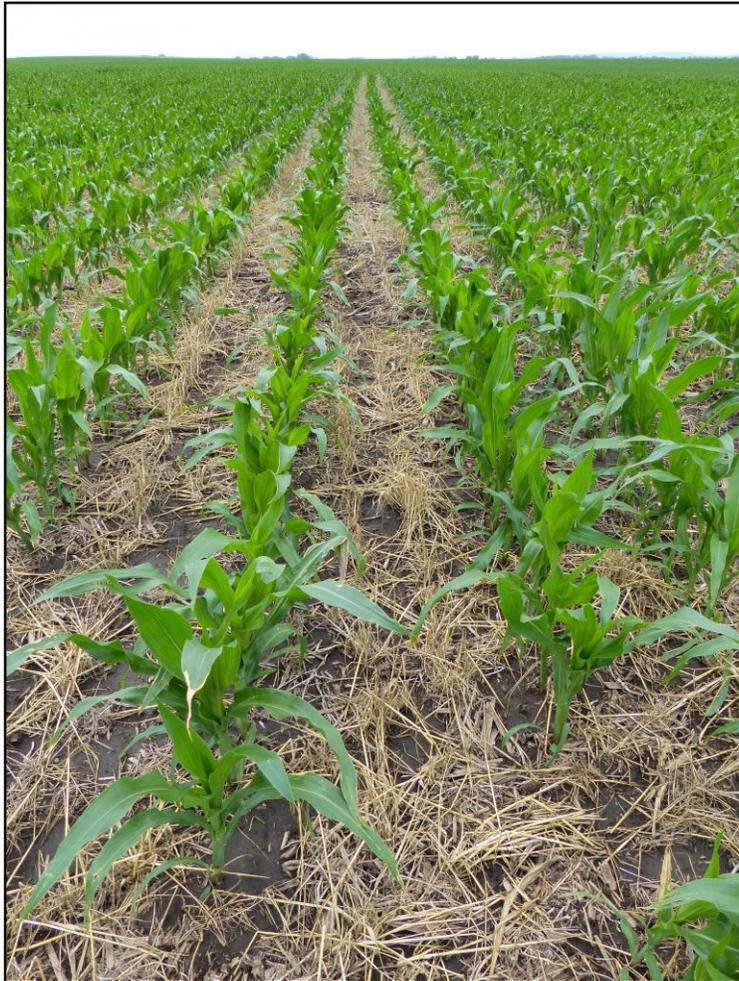
Cover Crop / Acre

Custom Drilling	\$14-16
Winter Rye Seed	\$10-15
Total	\$24-31
<i>Savings</i>	<i>\$14-25</i>

Plus reduced herbicide expense and 3-6 additional Bu of soybeans/acre @ \$8 = \$24-\$48



Planting green



Planting green



Planting green



Increasing Yields!

Field Sample: Central MN

- Following Sugar Beet Harvest seeded Winter Cereal Rye in October 2017 in West Central, MN
- Planted Green in May With Herbicide Termination 7 days following planting
- 73.67 Bushel per Acre Beans
- Finished 23 bushel better than any other field in this farms management of conventional tillage and no covers.

Some things we are seeing

- Increased Water Infiltration
- Earlier maturing beans when planted into Rye
- Early N Tie up allowing later N release during pod fill time?
- Almost Zero White mold
- Much cleaner fields
- Higher top line and lower bottom line = Greater Profit
- Alternative Termination practices?



Showing the drought tolerance between Corn planted direct into covers vs. conventional till



Debunk the Cover crop and No-till myths

- “My Soil Will never warm up!.”
- “My soil will never dry out!”
- “Cover crops lead to increased herbicide use.”
- “Cover crops just don’t work here.”



The Argument...

- We tried no till here 20 years ago and it didn't work then and it wont now-
- 1. Equipment
- 2. Technology
- 3. Cover Crops



Early Harvested Field

- **55 Acres**
- Planted August 15 to Oats, Radish, Turnips, Rapeseed
- Grazed 45 cows for 65 Days and left good cover to protect soil
- Seed cost was below \$15 Per Acre
- Seed was Broadcast and VT'd in
- Harvested 76 bushel Soybeans breaking the farm record by 6.3 bushel



Early Interseeding into Corn



- Interseeding between V-3 & V-7
- Specie Specific
- Watch Herbicide carryover
- The Earlier the better



Early Interseeding into Corn



Early Interseeding into Corn



Early Interseeding into Corn



Early Interseeding into Corn



Early Interseeding into Corn



A step into the Future... 60 Inch corn



Keys to Success

- Maintain Population
- Seed a cover early
- Nutrients in Row
- Straight 60 not skipped row



Get to know your farmers- Find out how you can help?

- Supporting regenerative farming is not just Earth care, it's self-care. If you're not going to do it because it's good for the planet, do it because it's good for YOU. By buying and eating food grown on such farms, you're investing in your own health and vitality, and the benefits can be immediate.



A little About Soil RX INC.

- **Cover Crop and Soil Health Consulting**
- **Land Management** focusing on connecting Landowners with Farmers that are focused on Improving the land.
- Custom Cover Crop Blending Recs.
- Learn More at www.SOILRX.net
- Follow us on Facebook, Twitter, and Instagram
- Subscribe to Cover Crop Kings on YouTube



It's your Turn to Decide What direction will
you go in 2019

*Thank
you!*

Cody T. Nelson
507-720-2998
soilrx1@gmail.com





Disease and Pest Pressure Relief

- White Mold
- Soybean Cyst
- Soybean Aphids
- Sugar beet Aphids
- Goss's Wilt
- Fungus
- Corn Borer
- Root Worm
- Slugs
- ETC.



Soybean Cyst

Nematode Reduction

- ▶ Field studies in IL have shown a meaningful reduction.
- ▶ Data from each site was replicated three times over 2 years.
- ▶ Mechanism not understood, but looks promising.
- ▶ More research is being done.

Site	No-cover	Cereal Rye	An. Ryegrass
1	7533	717	117
2	3650	320	0
3	1559	722	386
4	1202	390	279

Mike Plummer SCN egg counts
University of Illinois



