The Water Summit – Farmer Perspectives

August 15, 2019

Rodney Rulon

Farming Since 1869

RULON

ENTERPRISES

Our Cropping System:

PRODUCTIVE & SUSTAINABLE

-4th Generation family farm

-North Central Indiana

-100% No-Till since 1989

-90% CB Rotation, 10% CAC

-15 years cover crops

-Liquid Hog manure 320 a/yr (No-Till)

-1 acre grid management w/ full VRT

-Conservation is the best economic model

-We are accountable for what leaves our farm

We are a Legacy Farm

Farming Since 1869

RULON ENTERPRISES

CONSERVATION LEGACY *awards*

NATIONAL WINNER 2012
Presented by USDA, ASA, NCGA
Sponsored by Corn and Soybean Digest

Recognizing the Conservation Achievements of U.S. Soybean Farmers...

https://www.youtube.com/watch?v=UW_Kz7WFivc

Conservation Legacy Awards

National No-Till Innovator Award in 2010
Ag Rep to Indiana Environmental Rules Board
National "River Friendly Farm" Award Finalist 2014


What is
Sustainability
?
MEET THE *NEEDS* OF
THE *PRESENT*
WITHOUT
DIMINISHING THE
ABILITY TO MEET
FUTURE NEEDS

BALANCE:
ECONOMIC
SOCIAL
ENVIRONMENT

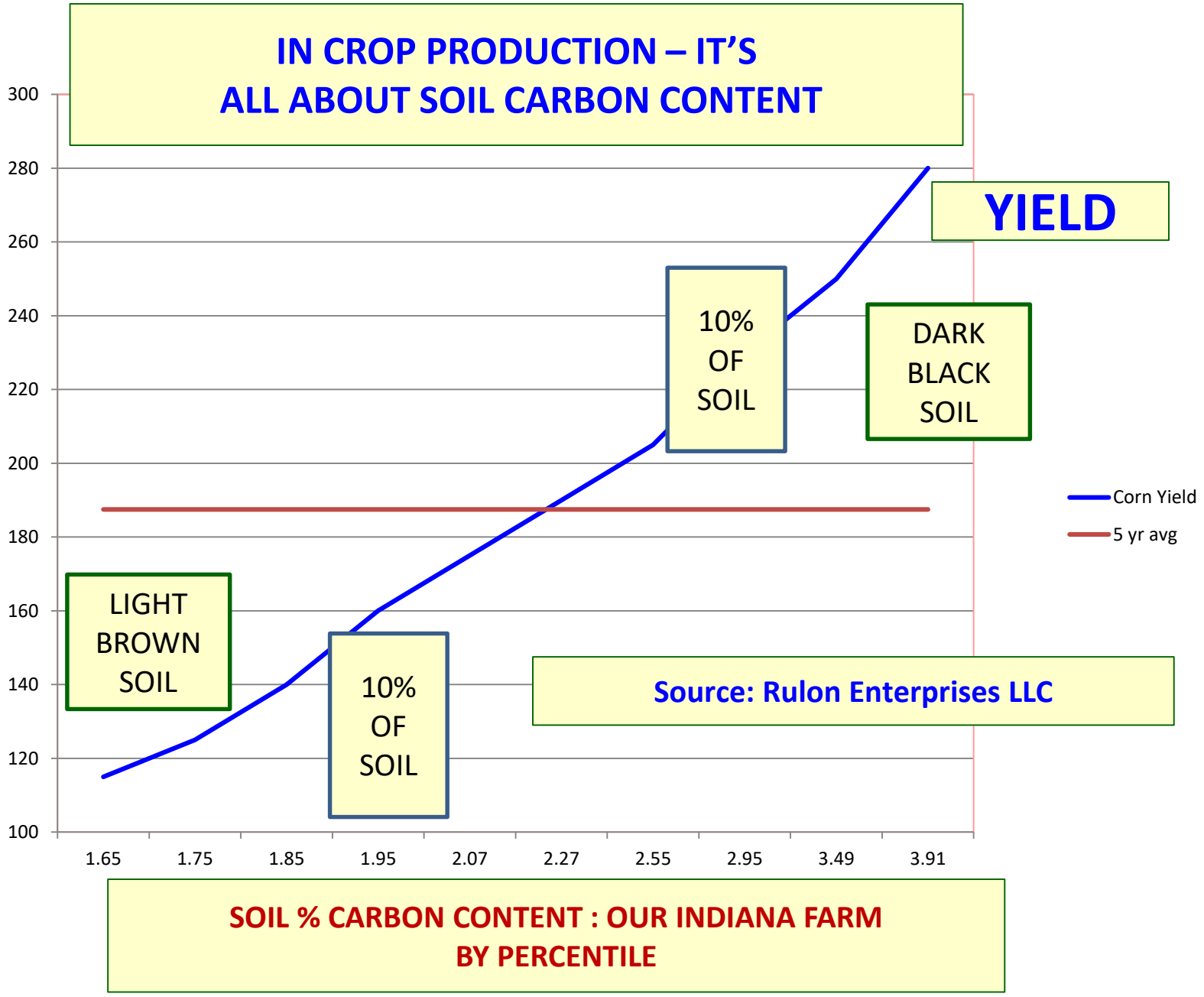
SUSTAINABLE
IS DIFFERENT
FOR EVERY
TOWN
STATE
COUNTRY

WHAT ABOUT
OUR FARM ?

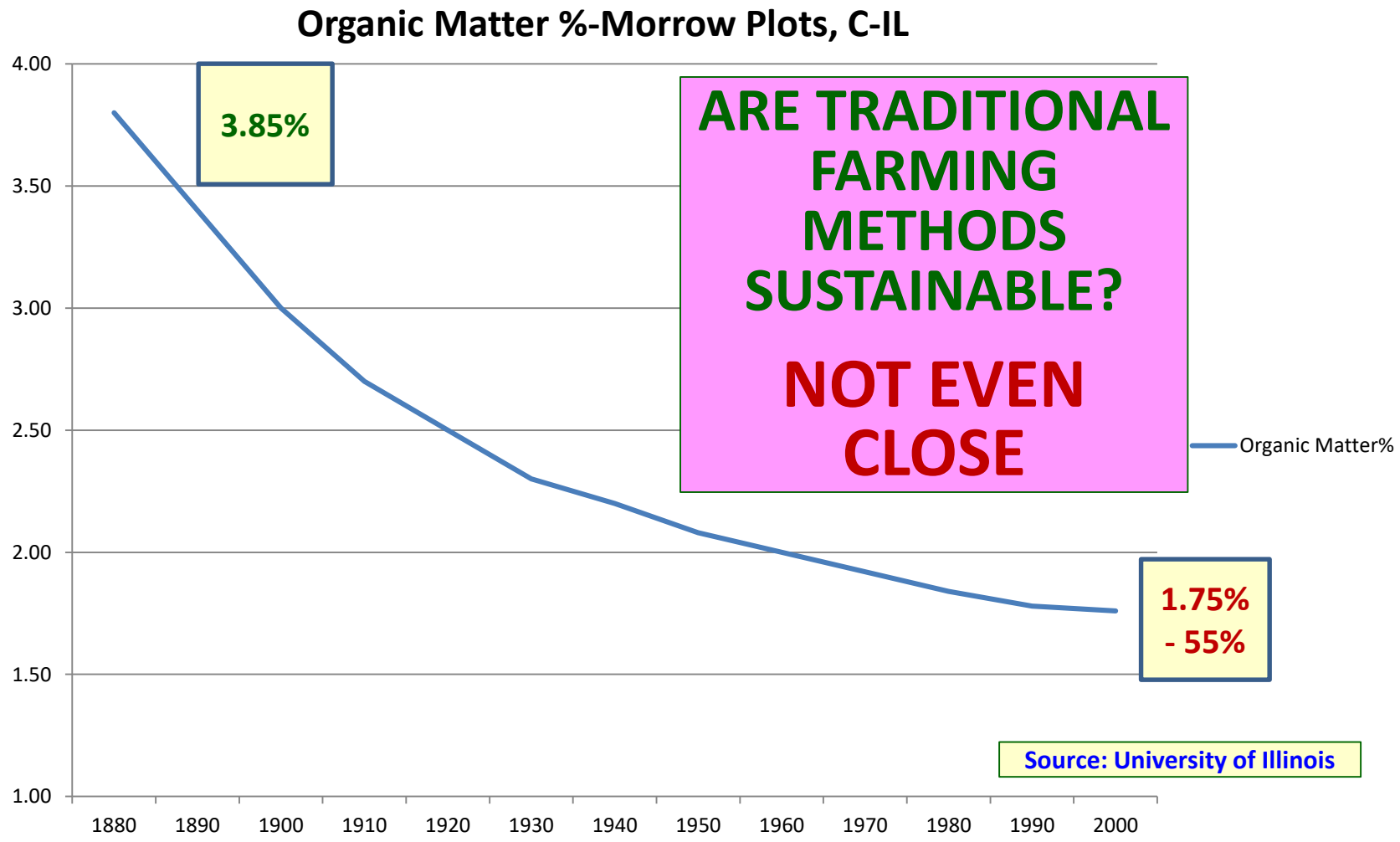
SUSTAINABLE REQUIRES

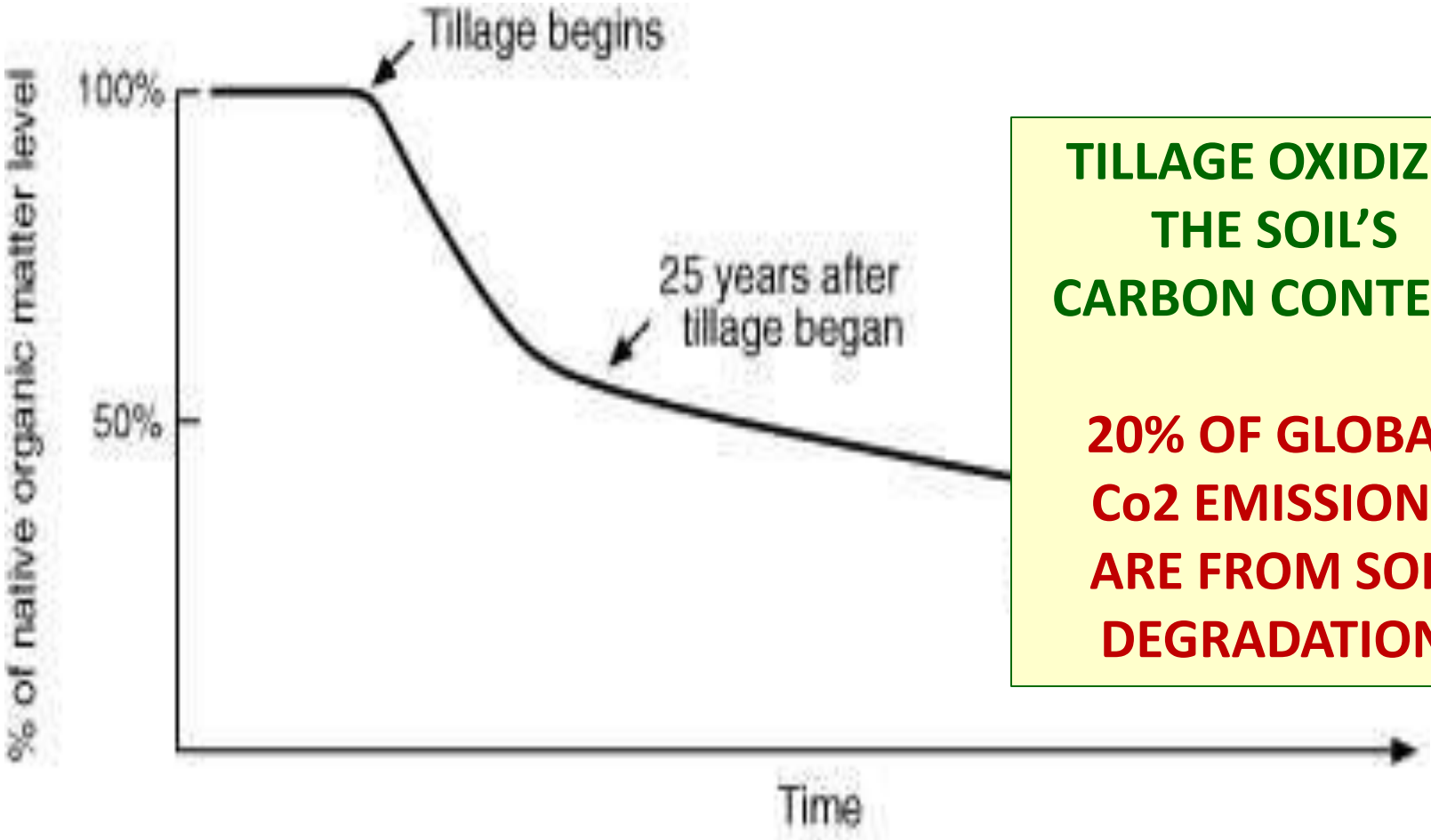
CARBON CAPTURE

TECHNOLOGY


IN CROP PRODUCTION – IT'S
ALL ABOUT SOIL CARBON CONTENT
YIELD
300
280
260
240
220
200
180
160
140
120
100
1.65
1.75
1.85
1.95
2.07
2.27
2.55
2.95
3.49
3.91
10%
OF
SOIL
DARK
BLACK
SOIL
LIGHT
BROWN
SOIL
10%
OF
SOIL
Corn Yield
5 yr avg
Source: Rulon Enterprises LLC
SOIL % CARBON CONTENT : OUR INDIANA FARM
BY PERCENTILE

MUST MAINTAIN % CARBON CONTENT TO BE SUSTAINABLE





TILLAGE OXIDIZES THE SOIL'S CARBON CONTENT

20% OF GLOBAL Co2 EMISSIONS ARE FROM SOIL DEGRADATION

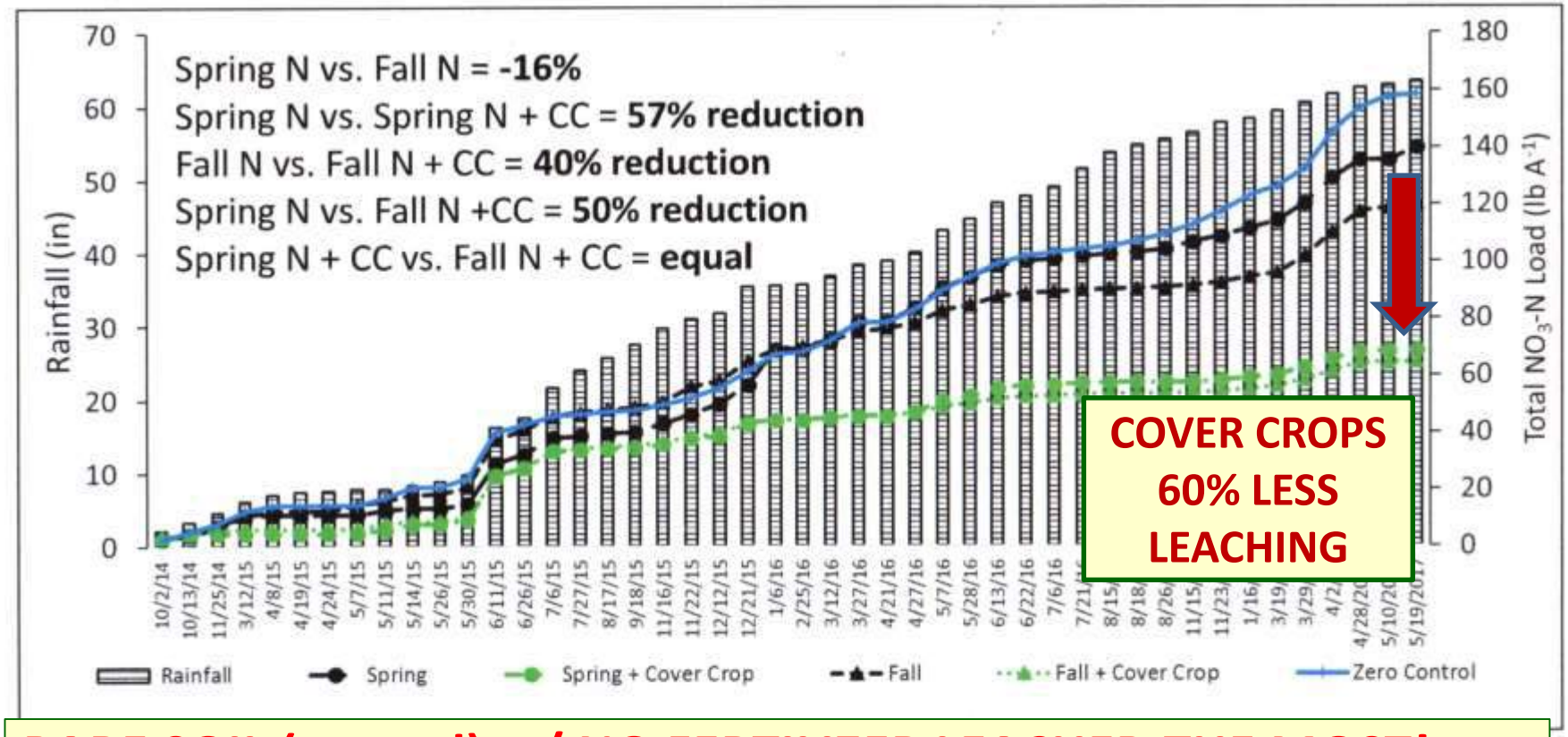
Source: USDA, National Soil Conservation Service
MUTIPLE TESTS OVER 80 YEARS

How to be Sustainable:

- Stop Soil Degredation/Increase Soil Carbon
- Be a low cost producer
- Continuous No-Till – not rotational
  - Eliminate catastrophic tillage events
  - Allow soil to build structure and biology
  - Plant Cover Crops – NO Erosion, NO Bare Soil, STOP leaching of nutrients, Manage Infiltration
  - Utilize New Technology

HOW DO WE STOP NUTRIENT LEACHING?

Cumulative Rainfall and Nitrate Loading



BARE SOIL (control) w/ NO FERTILIZER LEACHED THE MOST!

Source: Purdue University
Dr. Shalamar Alexander

Healthy Soil is a System

- No-Till (infiltration/OM/cover/biology)
- Cover Crops (rooting/temp/OM/feed biology)
- Soil Carbon/Soil Health
- Drainage (Managing Air/Water)
- Soil Balance (Proper Chemistry-Structure)
- VRT N, P, K , Seed etc.
- VRT Lime/Gypsum/amendments/Manure
- Variety Selection (Plant health and Yield)
- Integrated Pest Management (IPM)
- On Farm Testing - Economic Tracking

What healthy soil returns to us:

- Increased Yield
- Increased Biology (Big and Small)
- Nutrient Efficiency and Cycling
- Drought Tolerance/decreased soil temp/evaporation
- Increased water infiltration/water holding
- Improved Plant Health (reduced disease and insects)
- Improved Structure=Improved Trafficability (Timing)
- Improved Economics/Agronomics

What we do to manage soil Quality:

- Cover Crops
- Manage for long term soil health-FAST




Cover Crops on Our Farm

- Remove compaction without tillage (Soil repair)
- Transition from tillage to no-till
- Rotational Advantage
- Take no-till and soil quality/Biology to the next level
- Trap nitrogen from manure/carryover/soybeans
- Erosion Control
- Break disease cycle in CAC
- Cycle expensive nutrients
- Build Organic Matter/Structure
- Economics/Agronomics
- Grandpa used cover crops and he was pretty smart

CAN WE INCREASE SOIL CARBON?

4 WEEKS LATER

OATS/RADISHES/RAPESEED/CLOVER COVER CROP

CAN WE INCREASE SOIL CARBON?

PLANTING CORN
INTO GREEN RAPESEED

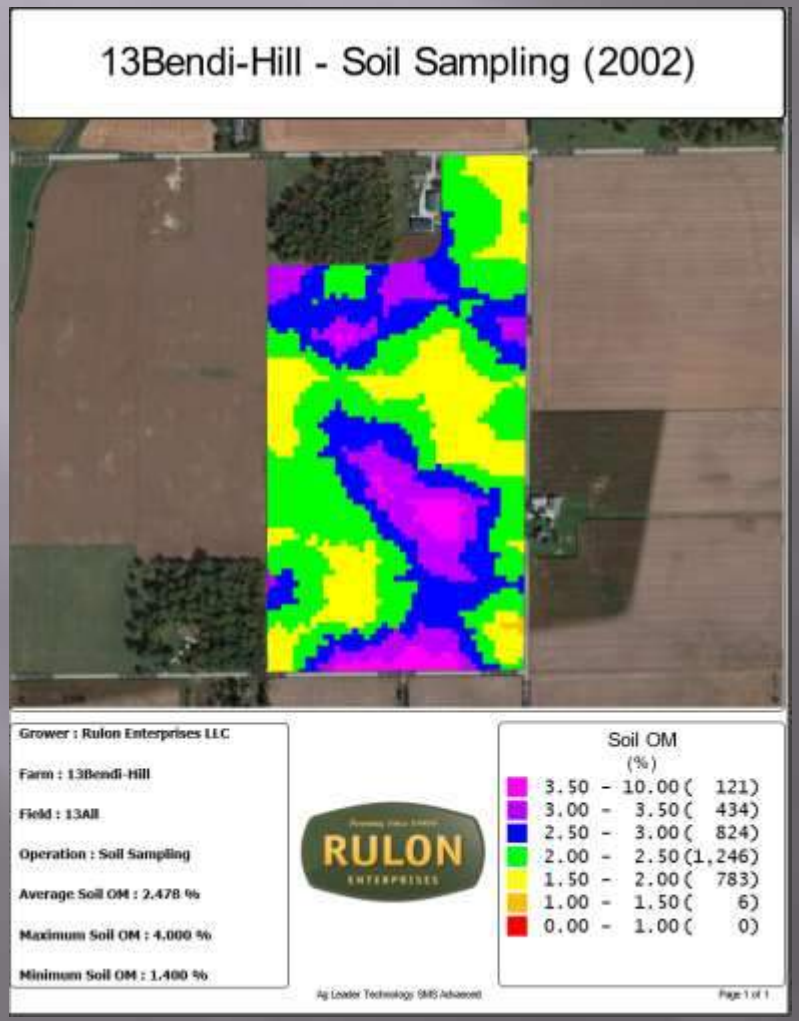
PLANTING SOYBEANS
INTO GREEN RYEGRASS

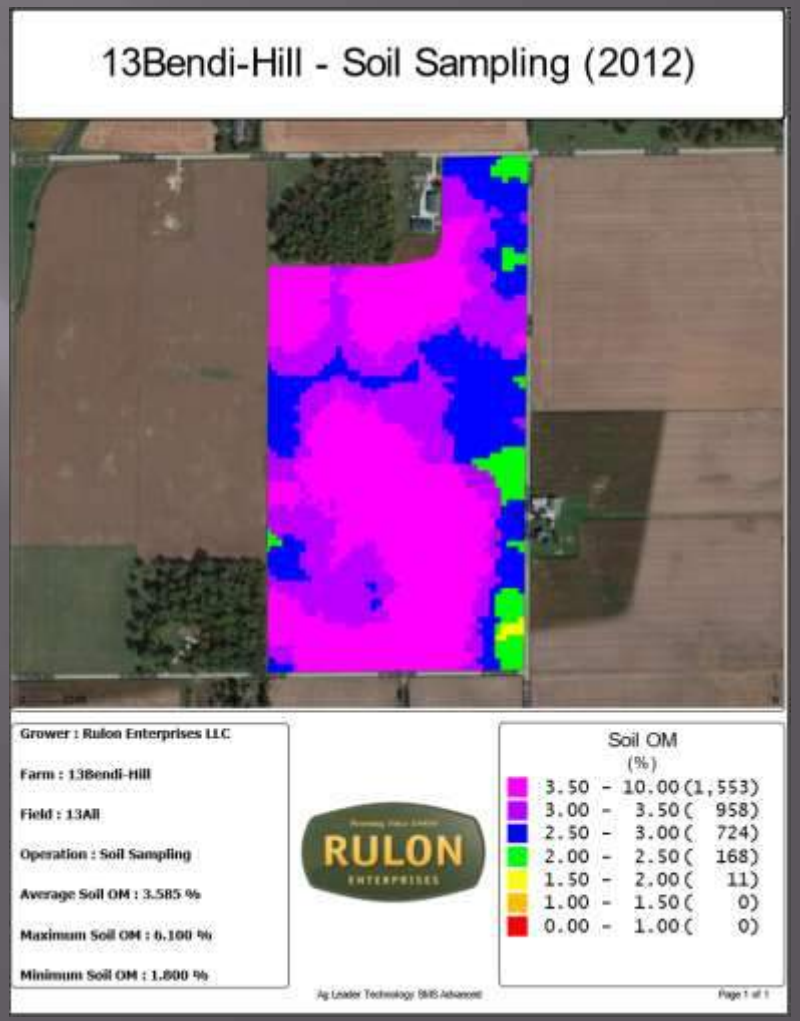
INCREASE SOIL CARBON CONTENT : AVG = .5%

Organic Matter 2002 vs. 2012 = + 1.1%

2.47 (1.4 to 4.0)

3.58 (1.8 to 6.1)



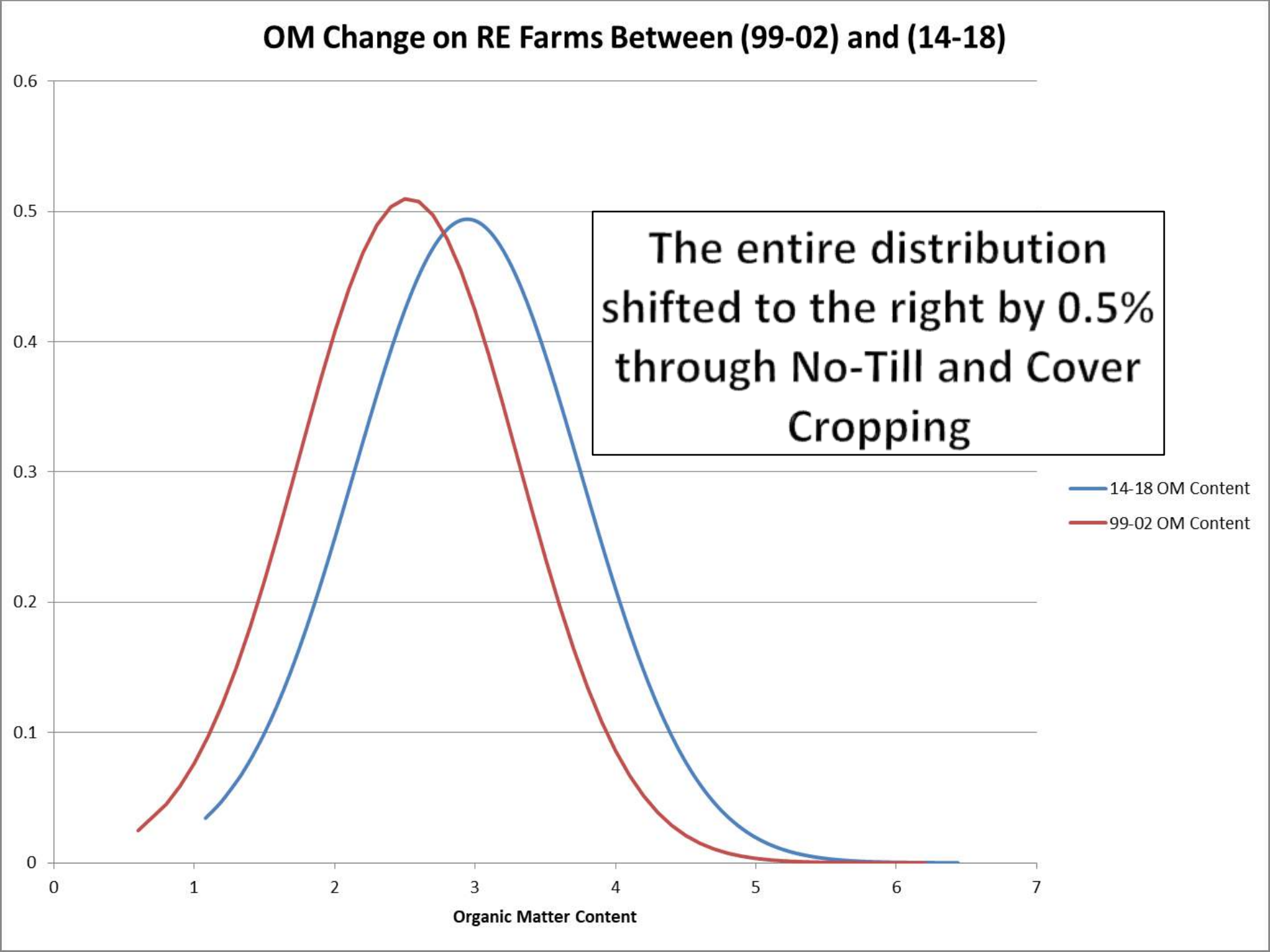



Weasel Creek
Rulon Enterprises
Dock Doctor
Rulon Rd

Soil Sample Percentile Breakdown
6000 Samples 2015-2018

%	TEC	pH	OM	N lb/ac	S ppm	Easy P P2O5	P1 ppm	Easy P ppm	k ppm	ca %	mg %	K %	na %	Other %	H %
5%	10.24	5.6	1.89	58	7	46	4	10	78	54.16	7.62	1.33	0.33	4.1	0
10%	11.12	5.8	2.04	61	8	55	6	12	87	59.46	8.4	1.5	0.39	4.3	0
15%	11.83	5.9	2.14	63	8	64	7	14	95	62.38	9	1.61	0.42	4.4	0
20%	12.47	6	2.23	65	9	73	8	16	102	64.32	9.52	1.71	0.46	4.5	1.5
25%	12.99	6.1	2.31	66	10	78	10	17	109	65.9	10.02	1.8	0.49	4.6	3
30%	13.6	6.2	2.4	68	10	87	11	19	114	67.02	10.51	1.89	0.52	4.7	4.5
35%	14.18	6.3	2.49	70	11	96	13	21	120	68.02	10.96	1.97	0.55	4.7	4.5
40%	14.73	6.3	2.59	72	11	105	14	23	127	68.97	11.43	2.05	0.57	4.8	6
45%	15.27	6.4	2.7	74	12	115	16	25	133	69.92	11.89	2.13	0.6	4.9	7.5
50%	15.88	6.5	2.81	76	13	128	18	28	140	70.77	12.39	2.23	0.62	4.9	7.5
55%	16.45	6.5	2.93	79	13	137	21	30	147	71.65	12.83	2.32	0.65	5	9
60%	17.21	6.6	3.04	80	14	156	24	34	154	72.47	13.31	2.41	0.68	5.1	10.5
65%	17.93	6.7	3.17	82	16	174	27	38	162	73.35	13.89	2.52	0.72	5.1	10.5
70%	18.7	6.7	3.3	83	19	192	31	42	171	74.18	14.44	2.62	0.76	5.2	12
75%	19.68	6.8	3.46	85	30	220	38	48	180	75.07	15.05	2.76	0.8	5.2	13.5
80%	20.73	6.9	3.62	86	74	252	46	55	192	75.97	15.75	2.9	0.85	5.4	15
85%	21.96	7	3.83	88	114	293	57	64	206	77.09	16.72	3.07	0.91	5.6	18
90%	23.72	7.1	4.09	91	168	357	75	78	224	78.49	17.88	3.34	0.99	5.8	21
95%	26.56	7.3	4.48	95	246	467	178	102	252	80.42	20.08	3.77	1.1	6.2	27
100%	74.7	8.1	16.36	128	5978	3412	0	745	482	90.15	30.18	7.42	6.45	7.8	49

This chart shows the nutrient values over all of our farms ranked in 5% intervals. We use this chart to help in writing our formulas for seeding rate, N rate, etc.


OM Change on RE Farms Between (99-02) and (14-18)
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
4
5
6
7
Organic Matter Content
The entire distribution shifted to the right by 0.5% through No-Till and Cover Cropping
14-18 OM Content
99-02 OM Content

Rulon Enterprises LLC - Cover Crop Cost Analysis Fall 2017					
SEED COSTS		**Cost/Acre**	**Acres**	**Seed Cost**	
Mix #1- Early After Soybeans		$20.79	1,300	$27,027	
Mix #2- Late After Soybeans (Oct 10th)		$15.12	1,300	$19,656	
Mix #3- Early After Corn		$14.85	1,300	$19,305	
Mix #4- Late After Corn (Oct 15th)		$7.25	1,300	$9,425	
	5,200		**Seed Cost =**	**$75,413**	
				Seed Cost/Acre =	**$14.50**
Planting Costs for Season		**Quantity**	**Rate**	**Total Cost**	
Tractor Hours		338	$59.00	$19,942	
Labor (40 acres/hr@70%=28 acres/hr)		185.7	$17.50	$3,250	
Fuel		1267.5	$3.05	$3,866	
Planter Repairs/Wear		5,200	$3.00	$15,600	
Total Other Costs	**Acres =**	**5,200**		**$42,658**	
				Planting Cost/Acre =	**$8.20**
			Total Cover Crop Cost =	**$118,071**	
		Total Cost/Acre Planted = $22.71			

Rulon Enterprises LLC Cover Crop Benefits Fall 2017

	Per acre	Acres	Total Benefit
Fertilizer Saved-P&K (20#P@$.38 + 30#K@$.225)	$14.35	5,200	$74,620
Fertilizer Saved-N (35#/Acre: 200 versus 165)	$7.35	2,600	$19,110
Corn Yield (4yearsx64strips:Plot Data: 7.1bu@$4)	$28.40	2,600	$73,840
Soybean Yield Increase (1.95bu@$10)	$19.50	2,600	$50,700
TOTAL ANNUAL BENEFIT=	**$41.98**		**$218,270**
Drought Tolerence (2004-17: 30 bu every 5th=6 Bu@$4)	$24.00	2,600	$62,400
Carbon Content (5.35bu/.1 of OM x 50% = 2.7bu@$4)	$10.80	5,200	$56,160
Erosion Reduction (2 ton/acre @ $4)	$8.00	5,200	$41,600
CSP Program Payment ($40,000)	$7.69	5,200	$40,000
TOTAL LONG-TERM BENEFIT=	**$50.49**		**$200,160**

Total Cover Crop Benefit = $418,430

Net Economic Return = $300,359

ROI = 254%

Net Profit/Acre Planted = $57.76

2018 CCSI Cover Crop/N Rate

Cover Crop vs N Rate Study - Bean Average Yields

Year	Cover	Rep1	Rep2	Avg	Rank	Advantage	Field Average
2012	Annual Rye	-	63.4	63.4	1	5.3	60.20
	Cereal Rye	-	59.8	59.8	2	1.7	
	Oats/Radish	-	59.5	59.5	3	1.4	
	No Cover	-	58.1	58.1	4		
2014	Oats/Radish	76.3	72.7	74.5	1	2.95	73.43
	Cereal Rye	72.8	75.4	74.1	2	2.55	
	Annual Rye	72.3	74.8	73.55	3	2	
	No Cover	73.5	69.6	71.55	4		
2016	Oats/Radish	68.4	67.8	68.1	1	8.0	63.93
	Cereal Rye	66	62.9	64.5	2	4.3	
	Annual Rye	64.7	61.3	63.0	3	2.9	
	No Cover	64.3	56	60.2	4		
2018	Oats/Radish	67.6	72.5	70.1	1	3.7	68.65
	Cereal Rye	66	72.4	69.2	2	2.9	
	Annual Rye	67.9	70.2	69.1	3	2.7	
	No Cover	67.4	65.22	66.3	4		
					Average	3.36	

*Rep #1 in 2012 was harvested by 2 different combines and data was too inaccurate to summarize.

Cover Crop Yield +3.36 bu/ac
Oats/Radish +4.01 bu/ac

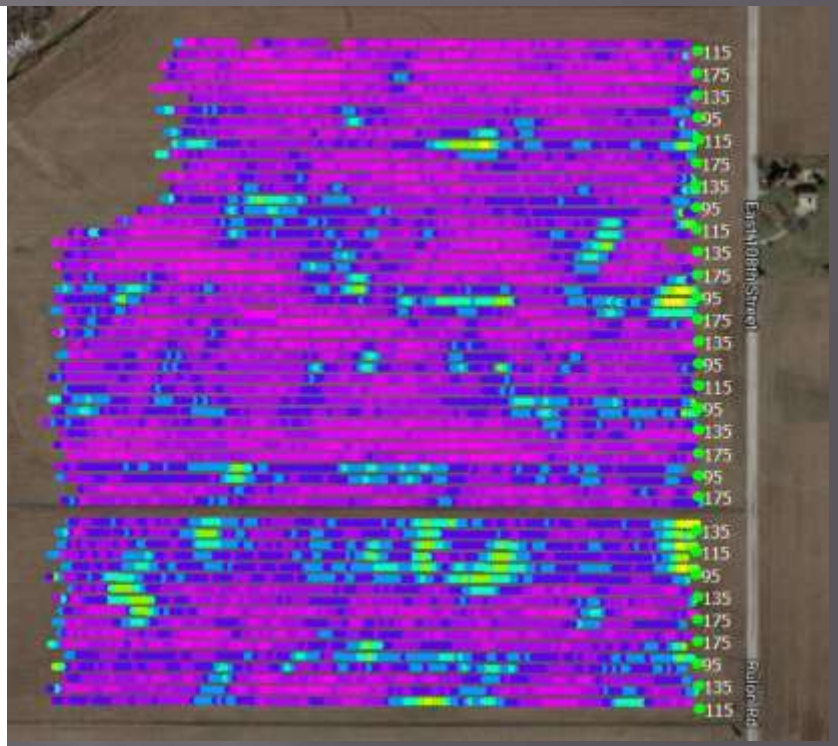
Overall Yield Advantage:
Oats/Radish = 4.01 bu/ac
Cereal Rye = 2.86 bu/ac
Annual Rye = 3.23 bu/ac

2017 CCSI Cover Crop/N Rate Harvest Data

Cover Crop vs N Rate Study 2017

Nitrogen Rate	Cover	Rep1	Rep2	Avg	Rank	AVG For N Rate
95	Oats/Radish	195.53	208.96	202.24	1	195.45
	No Cover	191.24	207.30	199.27	2	
	Cereal Rye	189.94	198.40	194.17	3	
	Annual Rye	181.90	190.32	186.11	4	
115	Oats/Radish	210.14	222.88	216.51	1	206.72
	Annual Rye		207.25	207.25	2	
	No Cover	197.74	214.99	206.37	3	
	Cereal Rye	183.37	210.64	197.01	4	
135	Oats/Radish	221.98	228.78	225.38	1	217.24
	No Cover	215.27	221.97	218.62	2	
	Annual Rye	206.62	218.51	212.56	3	
	Cereal Rye	194.82	218.82	206.82	4	
175	Oats/Radish	229.86	233.66	231.76	1	220.45
	Cereal Rye	217.53	216.67	217.10	2	
	Annual Rye	213.92	219.38	216.65	3	
	No Cover	212.73	215.99	214.36	4	

Other N Credits	Total N Applied
30# from planter	95 + 30= 125#
	115 + 30= 145#
	135 + 30= 165#
	175 + 30= 205#



Cover Crop Yield +0.5 bu/ac
Oats/Radish +10.26 bu/ac

Final Yield Average:

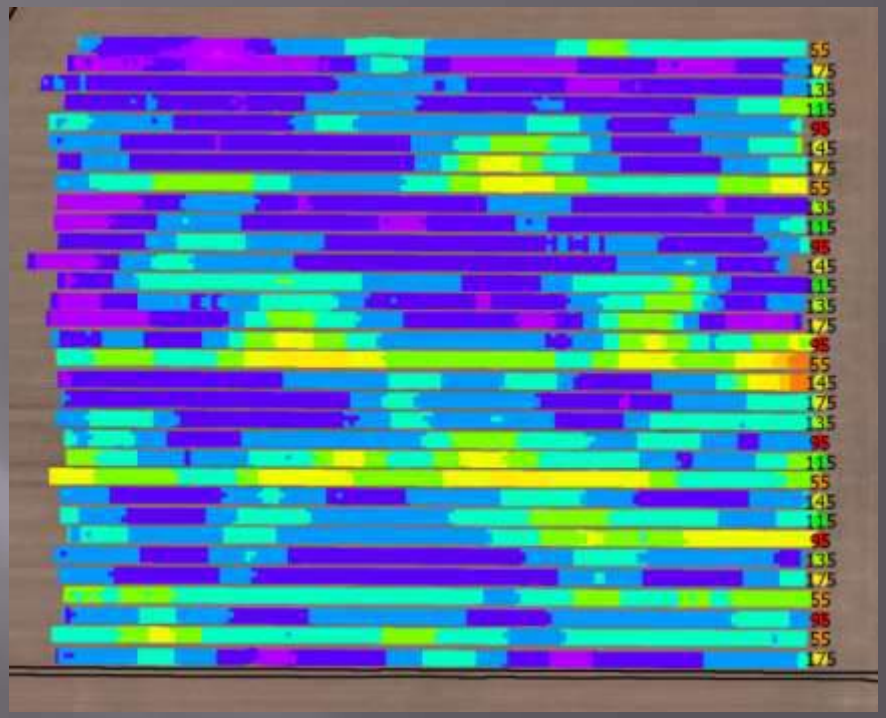
Oats/Radish = 219.32 bu/ac
Cereal Rye = 205.03 bu/ac
Annual Rye = 204.25 bu/ac
No Cover = 209.06 bu/ac

2015 CCSI Plot Harvest Data

Cover Crop vs N Rate Study 2015

Nitrogen Rate	Cover	Rep1	Rep2	Avg	Rank	AVG For N Rate
55	Oats/Radish	150.66	169.4	160.03	1	142.27
	Cereal Rye	155.65	146.48	151.07	2	
	Annual Rye	137.05	125.82	131.44	3	
	No Cover		126.55	126.55	4	
95	Cereal Rye	164.89	187.1	176.00	1	165.42
	Oats/Radish	154.48	180.07	167.28	2	
	Annual Rye		162.26	162.26	3	
	No Cover	143.78	168.5	156.14	4	
115	Cereal Rye	171.9	195.26	183.58	1	172.06
	Oats/Radish	163.82	185.32	174.57	2	
	Annual Rye	174.9	171.35	173.13	3	
	No Cover	159.83	154.12	156.98	4	
135	Cereal Rye	184.35	196.58	190.47	1	184.08
	Oats/Radish	184.37	192.86	188.62	2	
	No Cover	182.17	175.5	178.84	3	
	Annual Rye	173.53	183.25	178.39	4	
175	Oats/Radish	187.12	203.39	195.26	1	187.35
	Annual Rye	186.29	187.65	186.97	2	
	No Cover	184.7	183.69	184.20	3	
	Cereal Rye	184.94	181	182.97	4	

Other N Credits	Total N Applied
30# from planter	55 + 80 = 135#
50# Soybeans	95 + 80 = 175#
	115 + 80 = 195#
	135 + 80 = 215#
	175 + 80 = 255#



Cover Crop Yield + 12.8 bu/ac

Final Yield Average:

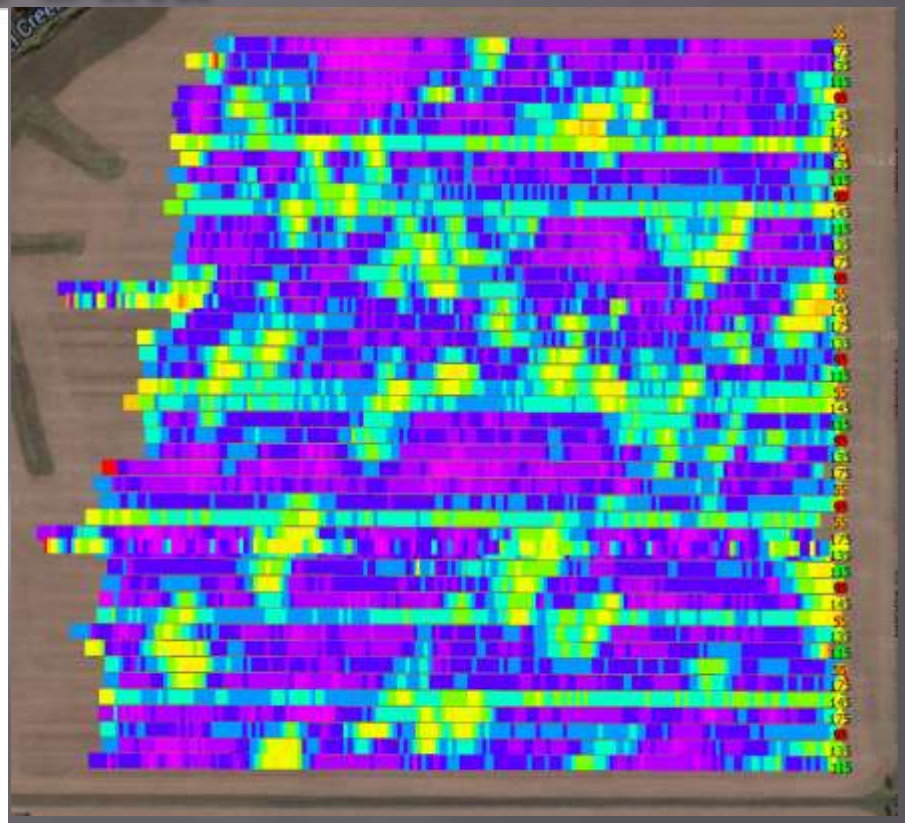
Oats/Radish = 177.1 bu/ac
Cereal Rye = 176.8 bu/ac
Annual Rye = 166.9 bu/ac
No Cover = 164.3 bu/ac

2013 CCSI Cover Crop/N Rate Harvest Data

Cover Crop vs N Rate Study 2013

Nitrogen Rate	Cover	Rep1	Rep2	Avg	Rank	AVG For N Rate
55	Oats/Radish		153	153	1	149.56
	Annual Rye	148.9	155.6	152.3	2	
	No Cover	148.8	150.4	149.6	3	
	Cereal Rye	139	147.8	143.4	4	
95	Oats/Radish		203.7	203.7	1	183.40
	Annual Rye	180.8	178.8	179.8	2	
	Cereal Rye	172.6	180.6	176.6	3	
	No Cover	173.3	173.7	173.5	4	
115	Oats/Radish	193.7	187.2	190.5	1	184.05
	Cereal Rye	192.5	175.7	184.1	2	
	Annual Rye	181.7	183.2	182.5	3	
	No Cover	168.5	189.9	179.2	4	
135	Oats/Radish	204.8	193.1	199.0	1	189.81
	Cereal Rye	194.6	189.1	191.9	2	
	Annual Rye	181.6	191.7	186.7	3	
	No Cover	178.1	185.5	181.8	4	
175	Oats/Radish	208.4	194.4	201.4	1	190.90
	Annual Rye	190.3	190.5	190.4	2	
	Cereal Rye	182.8	193.1	188.0	3	
	No Cover	173.3	194.4	183.9	4	

Actual N Applied	Total N Applied
30# N on planter	55 + 30= 85#
	95 + 30= 125#
	115 + 30= 145#
Total N Rate	135 + 30= 165#
	175 + 30= 205#



Cover Crop Yield + 7.1 bu/ac

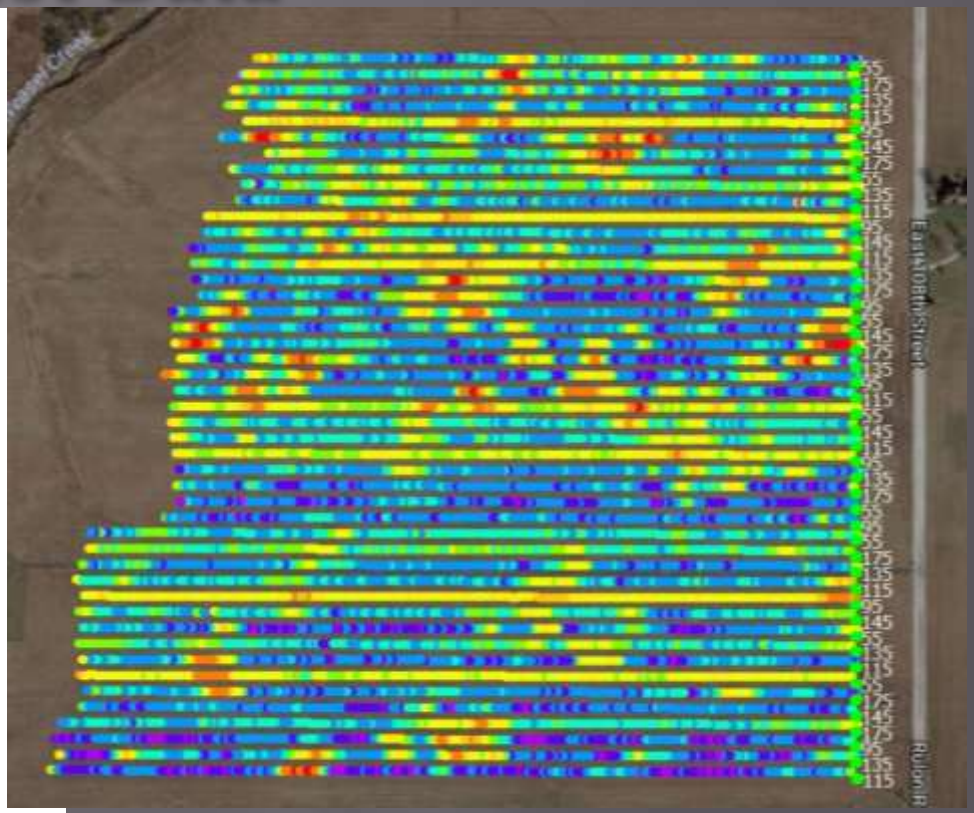
Final Yield Corn/Oats+Radish = 190.5
Final Yield Corn/Rye = 187.6
Final Yield Corn/No Cover = 183.4

2011 CCSI Cover Crop/N Rate Harvest Data

Cover Crop vs N Rate Study 2011

Nitrogen Rate	Cover	Rep1	Rep2	Avg	Rank	AVG For N Rate
0	Annual Rye	110.5	109.5	109.98	1	105.00
	No Cover	108.4		108.43	2	
	Oats/Radish	101.6	114.2	107.89	3	
	Cereal Rye	94.0	93.4	93.69	4	
65	No Cover	148.3	150.4	149.33	1	143.56
	Annual Rye	140.1	148.4	144.25	2	
	Oats/Radish	136.8	148.4	142.6	3	
	Cereal Rye	135.9	140.2	138.05	4	
112	Annual Rye	149.8	162.4	156.11	1	154.49
	Cereal Rye	154.5	157.5	155.97	2	
	Oats/Radish	151.9	159.4	155.63	3	
	No Cover	141.5	159.0	150.27	4	
150	Annual Rye	149.9	173.9	161.91	1	153.03
	Oats/Radish	141.9	172.9	157.42	2	
	Cereal Rye	141.9	153.4	147.61	3	
	No Cover	145.2		145.19	4	
160	No Cover	156.1	176.3	166.17	1	162.06
	Oats/Radish	158.9	169.3	164.12	2	
	Annual Rye	156.0	164.2	160.1	3	
	Cereal Rye	160.9	154.9	157.87	4	
206	Oats/Radish	160.5	180.2	170.34	1	162.54
	Annual Rye	155.5	169.6	162.56	2	
	No Cover	145.4	173.2	159.29	3	
	Cereal Rye	148.3	166.0	157.18	4	

Actual N Applied	Total N Applied
30# N on planter	0 + 30= 30#
	65 + 30= 95#
	112 + 30= 142#
	150 + 30= 180#
	160 + 30= 190#
	206 + 30= 236#

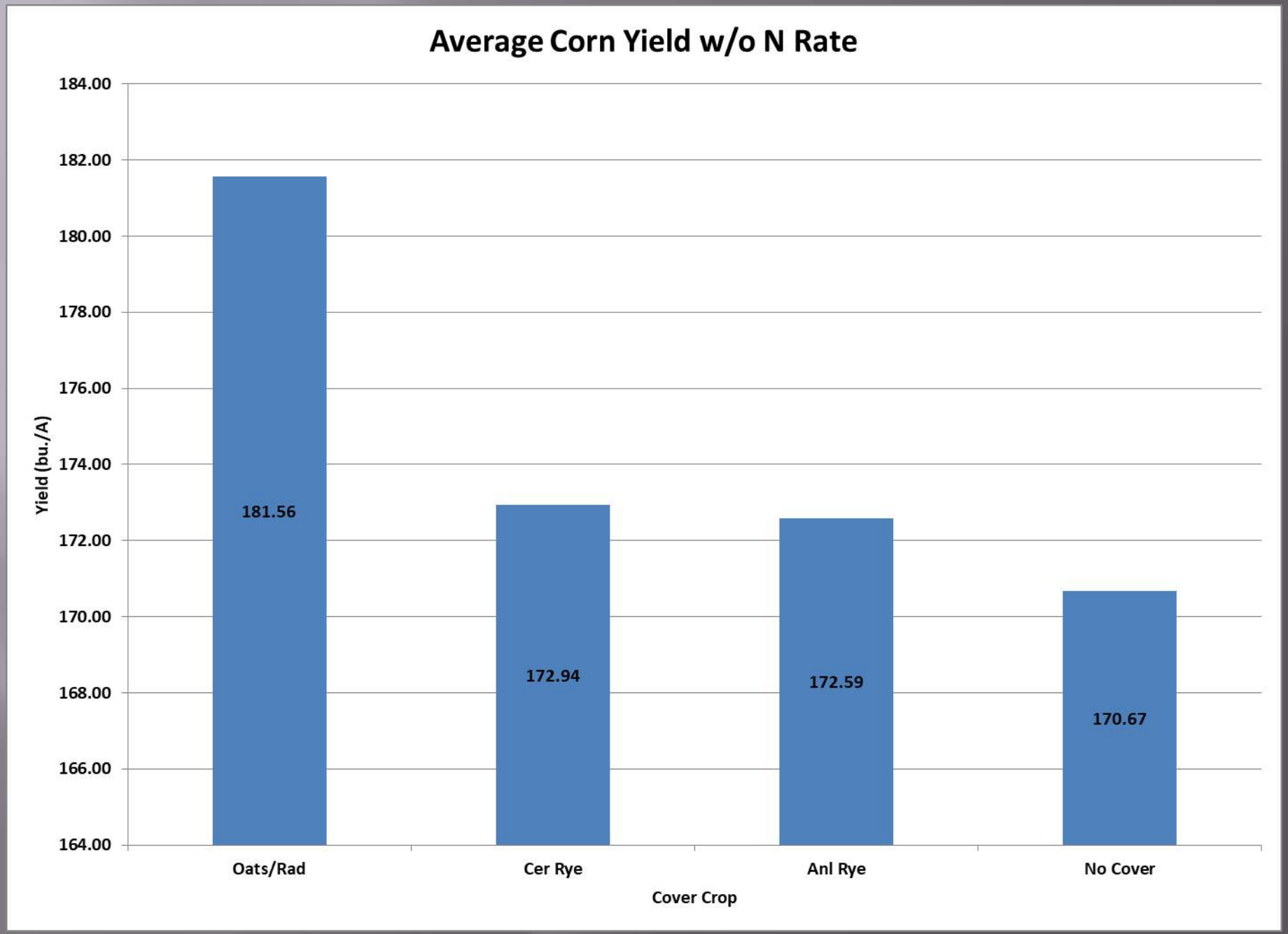


Cover Crop Yield WITH 0 & 60# Rates: -5.9 bu/ac

Cover Crop Yield EXCLUDING 0 & 60# Rates: +2.5 bu/ac

Final Yield Average:

Oats/Radish = 147.95 bu/ac
Cereal Rye = 140.55 bu/ac
Annual Rye = 146.33 bu/ac
No Cover = 150.87 bu/ac


Average Corn Yield w/o N Rate
184.00
182.00
180.00
178.00
176.00
174.00
172.00
170.00
168.00
166.00
164.00
Yield (bu./A)
181.56
172.94
172.59
170.67
Oats/Rad
Cer Rye
Anl Rye
No Cover
Cover Crop

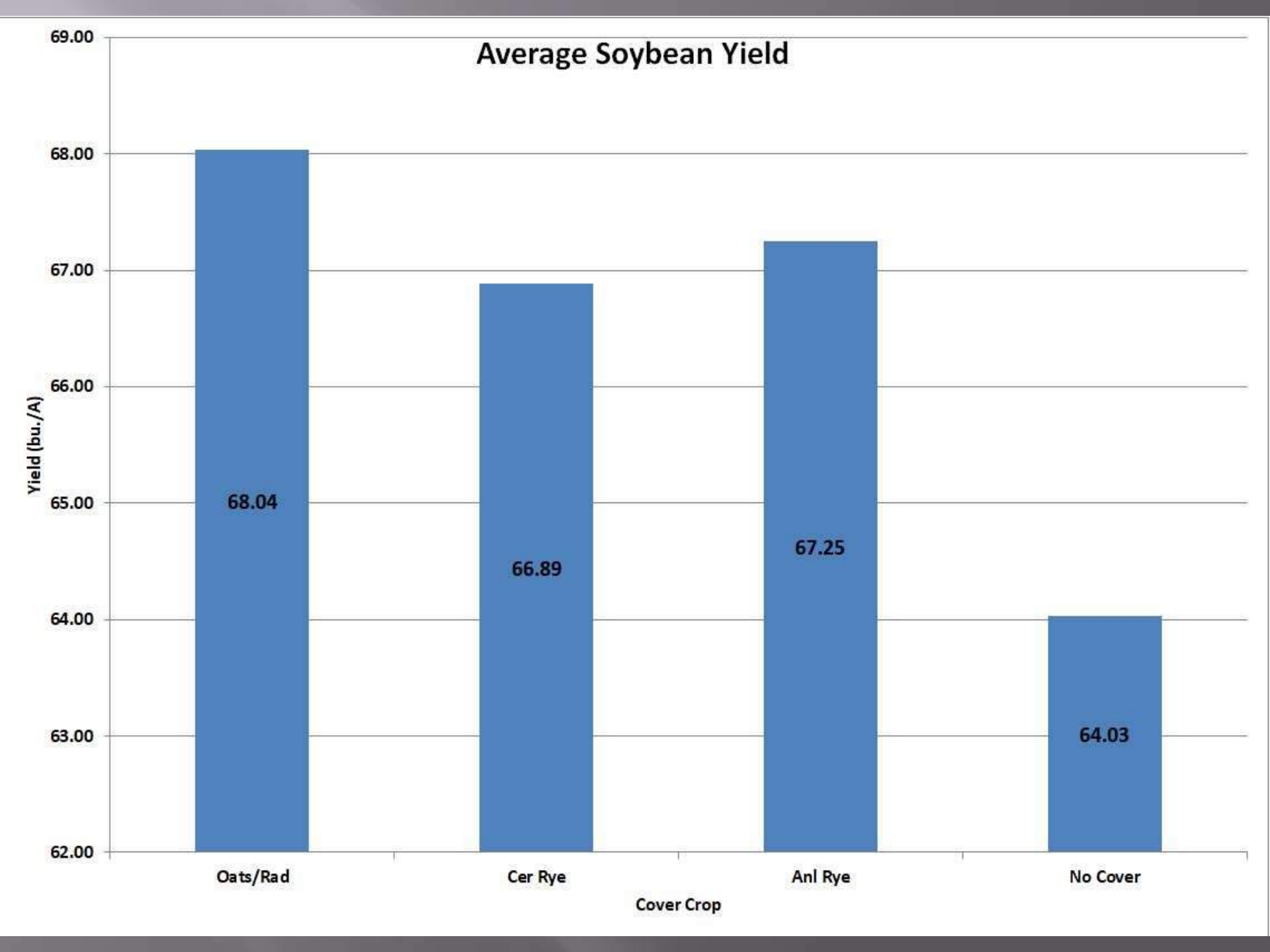
2012, 2014, 2016 CCSI Plot
Soybean Harvest Data Summary

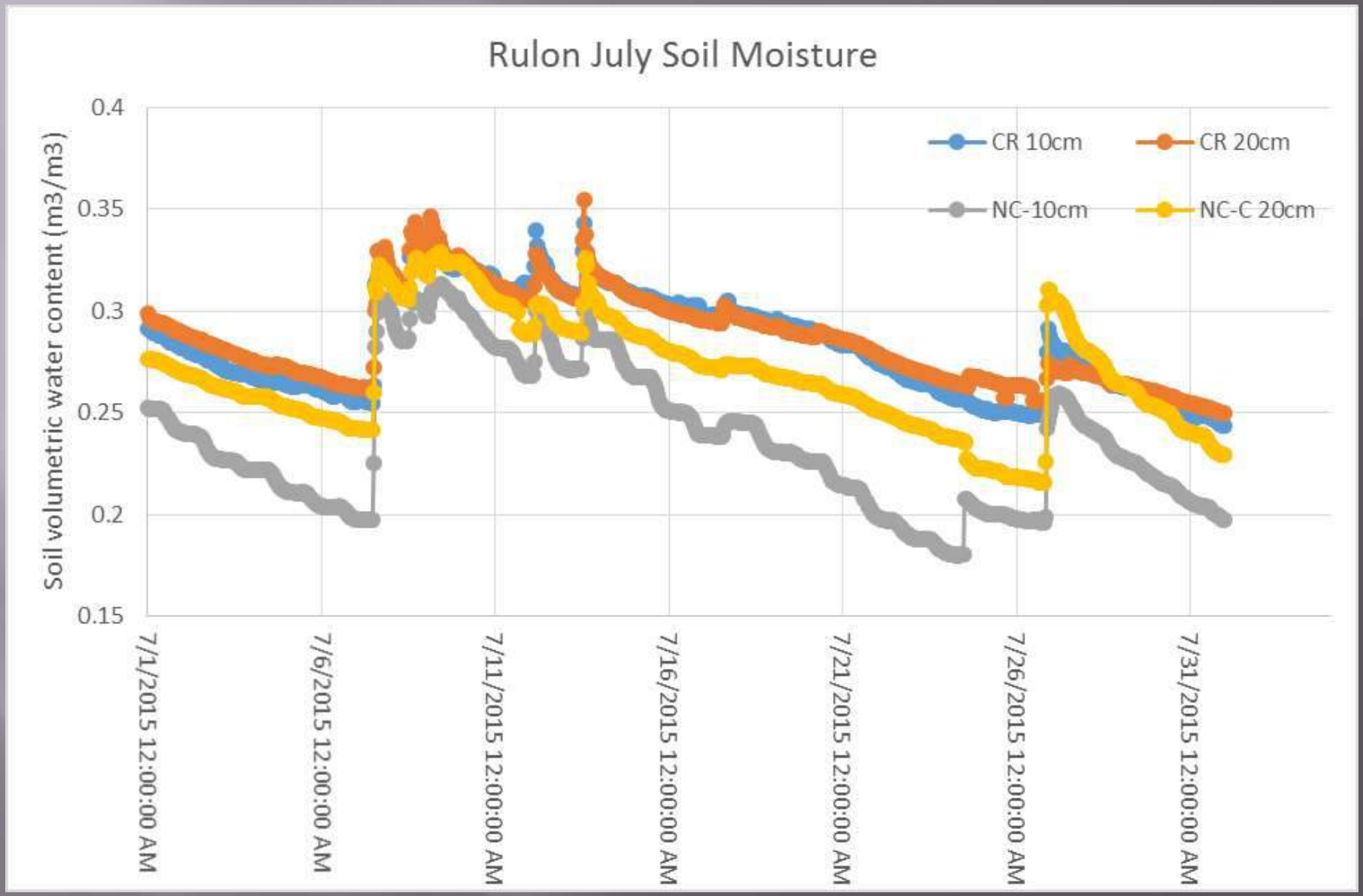
Cover Crop vs N Rate Study - Bean Average Yields						
Year	**Cover**	**Rep1**	**Rep2**	**Avg**	**Rank**	**Field Average**
2012	Annual Rye	-	63.4	**63.4**	1	60.20
	Cereal Rye	-	59.8	59.8	2	
	Oats/Radish	-	59.5	59.5	3	
	No Cover	-	58.1	58.1	4	
2014	Oats/Radish	76.3	72.7	**74.5**	1	73.43
	Cereal Rye	72.8	75.4	74.1	2	
	Annual Rye	72.3	74.8	73.55	3	
	No Cover	73.5	69.6	71.55	4	
2016	Oats/Radish	68.4	67.8	**68.1**	1	63.93
	Cereal Rye	66	62.9	64.5	2	
	Annual Rye	64.7	61.3	63.0	3	
	No Cover	64.3	56	60.2	4	

*Rep #1 in 2012 was harvested by 2 different combines and data was too inaccurate to summarize.

Cover Crop Yield + Up To 7.9 bu/ac Over No Cover in Long term test

2012 Annual Rye = +5.3 bu/ac
2014 Oats/Radish = +2.95 bu/ac
2016 Oats/Radish = +7.9 bu/ac
Three Year Avg = +5.4 bu/ac


Average Soybean Yield
69.00
68.00
67.00
66.00
65.00
64.00
63.00
62.00
Yield (bu./A)
68.04
66.89
67.25
64.03
Oats/Rad
Cer Rye
Anl Rye
No Cover
Cover Crop



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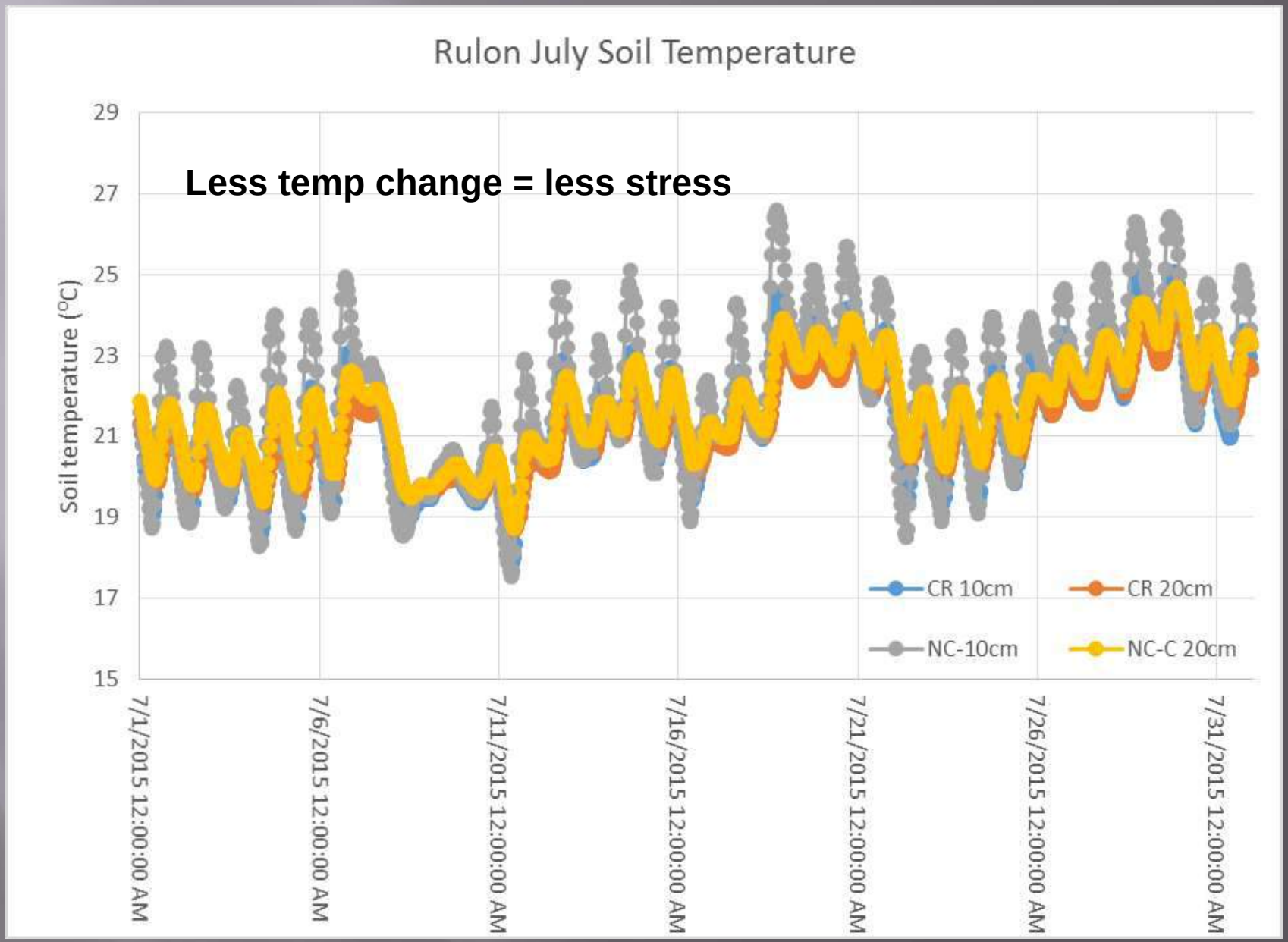

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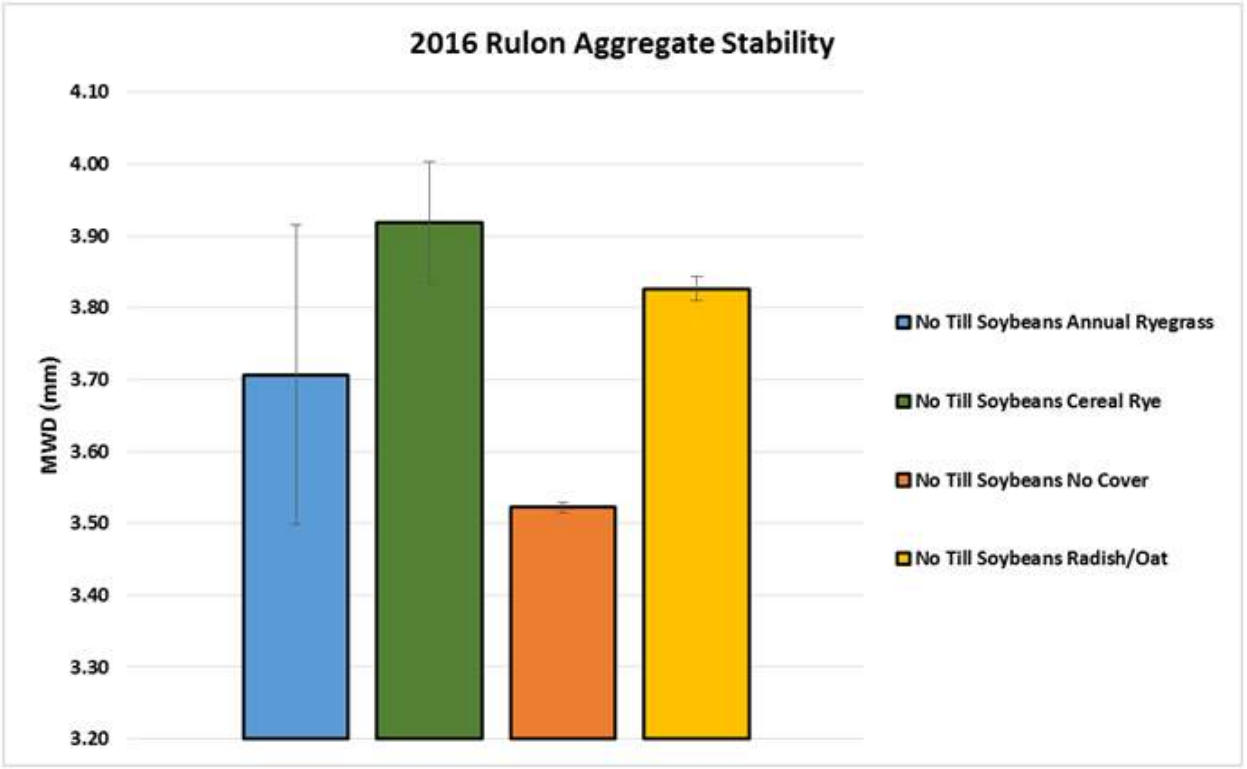

Date	Management	Cash Crop	Cover Crop	Plot#	MWD	Treatment MWD	Standard Deviation	Standard Error
2016	No Till	Soybeans	Annual Ryegrass	RR3	3.50	3.71	0.29	0.21
				RR7	3.91			
2016	No Till	Soybeans	Cereal Rye	RR2	3.83	3.92	0.12	0.08
				RR6	4.00			
2016	No Till	Soybeans	No Cover	RR4	3.52	3.52	0.01	0.01
				RR8	3.53			
2016	No Till	Soybeans	Radish/Oat	RR1	3.81	3.83	0.02	0.02
				RR5	3.84			

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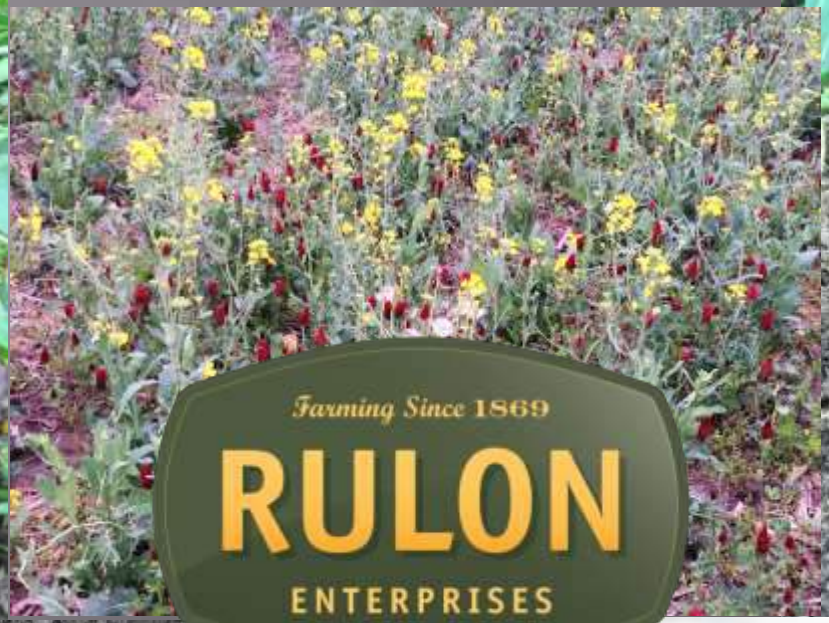
THANK YOU!!



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