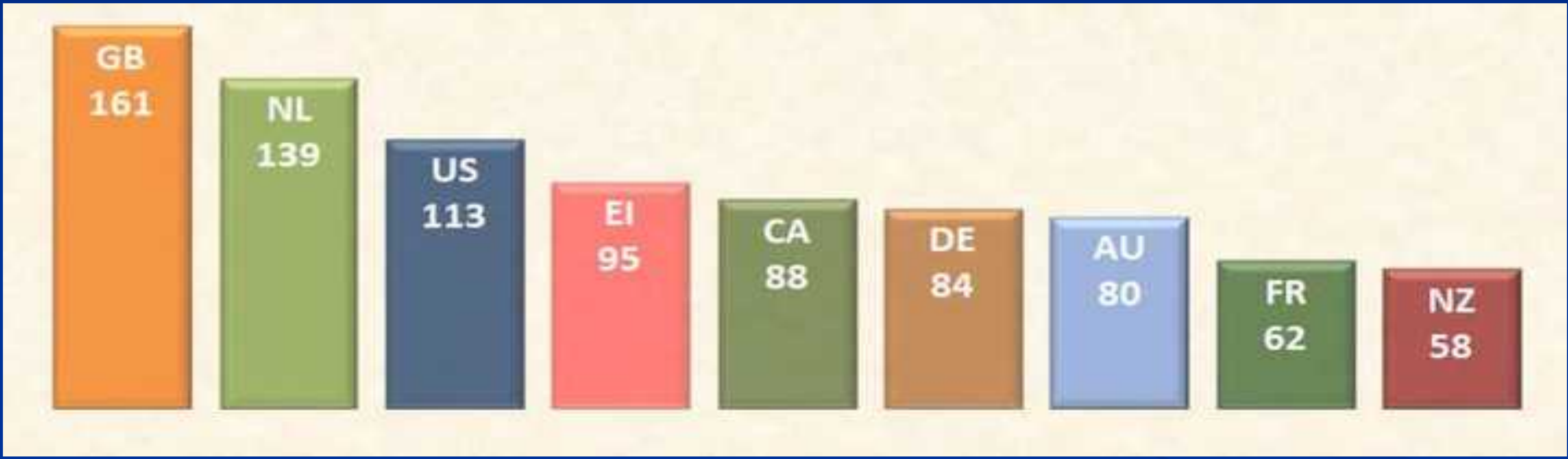
Making No-Till

WORK!!

Peter Johnson
peter.johnson@bell.net
@WheatPete

Number of Tweets/Farmer



Social Farmers, UK

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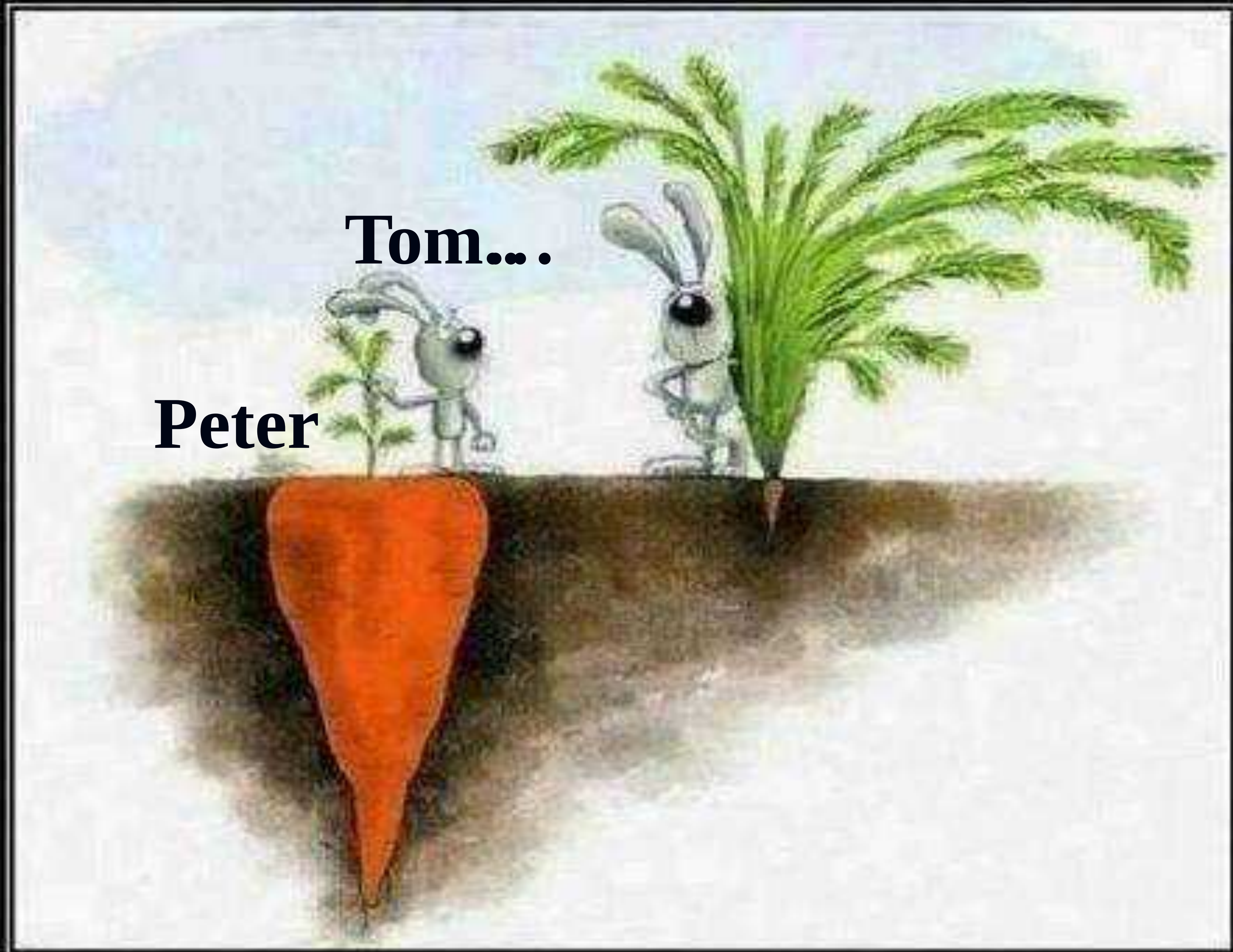
Tom….
Peter

~~No-Till~~

ZERO-TILL!

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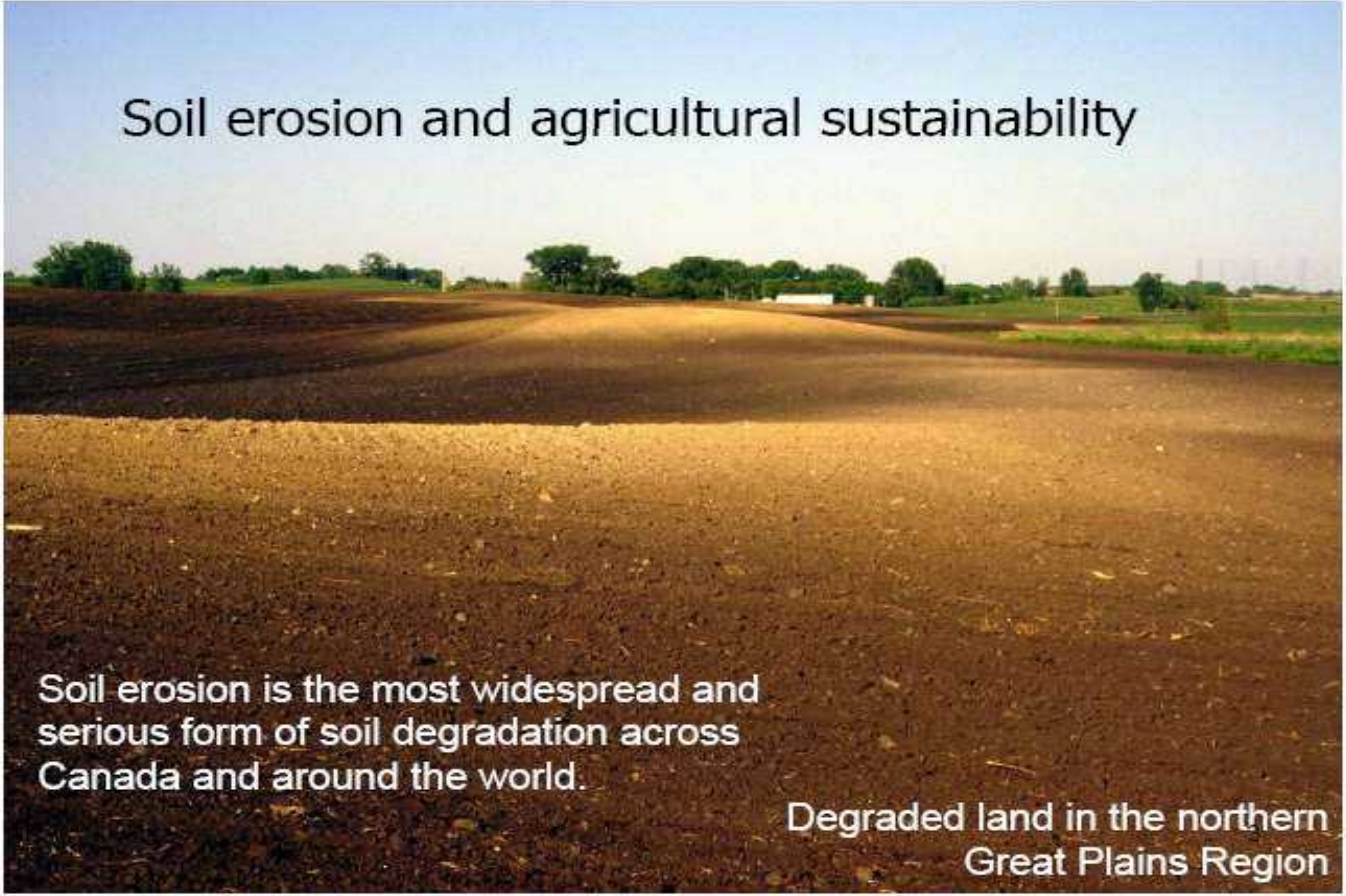
Soil erosion and agricultural sustainability
Soil erosion is the most widespread and serious form of soil degradation across Canada and around the world.
Degraded land in the northern Great Plains Region


#rootsnotiron

"Your level of success will equal slightly less than the average of the 10 people closest to you."

Al Schultz

@WheatPete

Ontario
Canada

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Arctic Ocean
North America
North Atlantic Ocean
Europe
Asia
Middle East
North Pacific Ocean
Caribbean
Central America
Africa
South America
Indian Ocean
Oceania
South Pacific Ocean
South Atlantic Ocean
Australia
Southern Ocean
Antarctica
EQUATOR
PRIME MERIDIAN
45°N
45°N
0°
0°
0°
0°
90°W
90°E
45°S
45°S
worldatlas

@WheatPete

Superior
Ontario
Quebec
Minnesota
Wisconsin
Huron
Ontario
Michigan
New York
Michigan
Erie
Pennsylvania
Illinois
Indiana
Ohio
Image © GLIN

Rain

- Ontario 825-1000 mm
- South Australia 225-550 mm

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99.9% OF CANADIANS SAY “OH SHIT” BEFORE GOING IN THE DITCH ON A SLIPPERY ROAD.
THE OTHER 0.1% ARE @WheatPete FOLLOWERS AND SAY, “HOLD MY BEER I'M GONNA TRY SOMETHING”.

Past technological yield gains
- Increased water requirements?-

There is an obligatory link between CO_2 assimilation rate and transpiration rate.

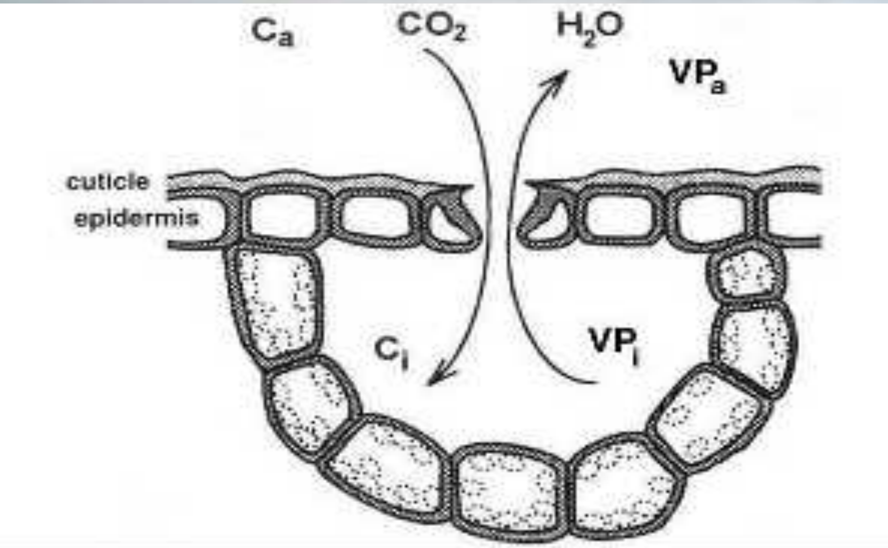
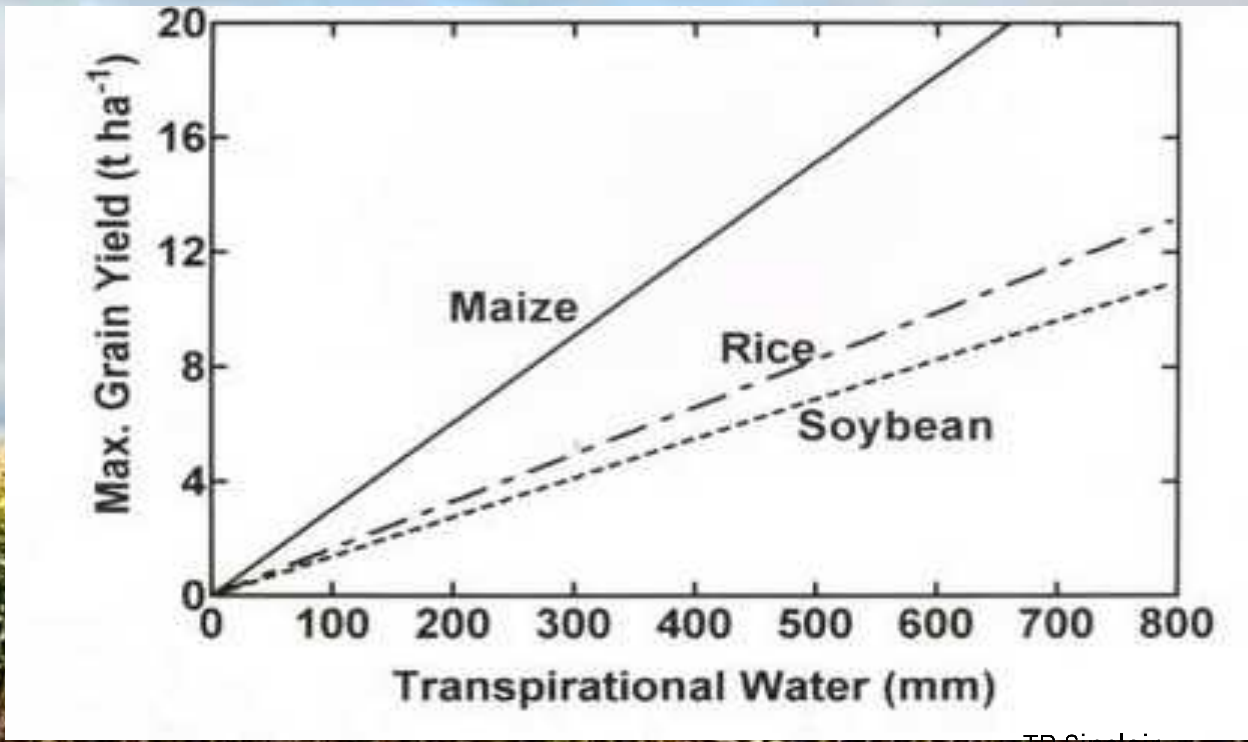


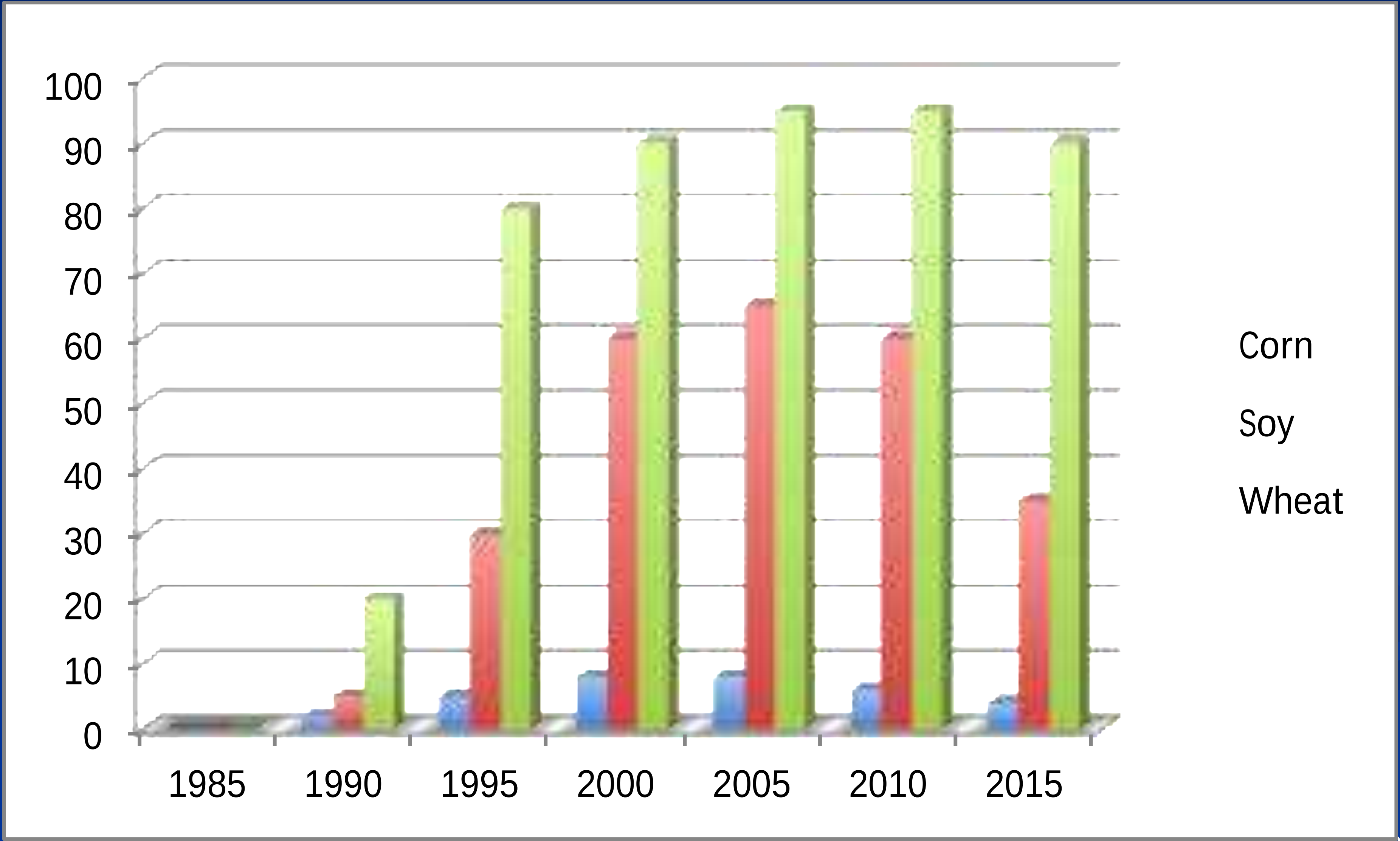
Figure 1: The diffusion pathway for CO_2 from the surrounding air through the stomata and into a leaf and for water vapor from inside the leaf to the outside air



TR Sinclair

Peter No-Till

No-Till?



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SOMETIMES I LIE AWAKE AT NIGHT, AND I ASK "WHERE HAVE I GONE WRONG?" THEN A VOICE SAYS TO ME, "THIS IS GOING TO TAKE MORE THAN ONE NIGHT."

heatPete

Don Lobb, 1982

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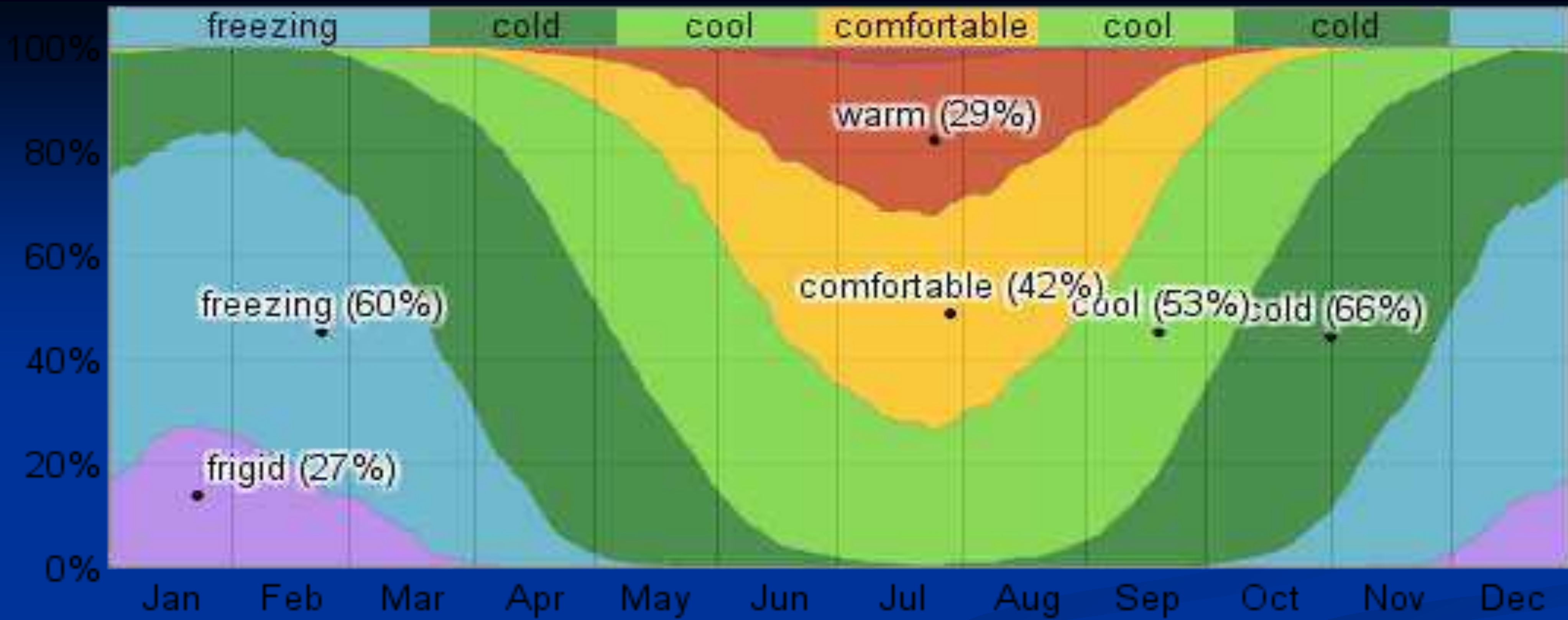
System!

Crop Sequence	13%
Equipment Set-up	23%
Nitrogen Mngmt	18%
Cover Crop Mngmt	14%
Variety	14%



The average fraction of time spent in various temperature bands: frigid (below -9°C), freezing (-9°C to 0°C), cold (0°C to 10°C), cool (10°C to 18°C), comfortable (18°C to 24°C), warm (24°C to 29°C), hot (29°C to 38°C) and sweltering (above 38°C).

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Grain fill conditions critical

Need bright but cool days

	NZ	ON
Grain fill: 660 day^{0}C (days)	40	34
Latitude	43S	43N
Radiation (mj/day)	20.9	22.2
Potential grain fill/day (t/ha)	0.27	0.29
Potential grain fill (t/ha)	10.8	9.9
Whole crop model (t/ha)	14.2	11.9
Av. yield for 2010-14 (t/ha)	8.18	5.5
% of potential	58%	44%

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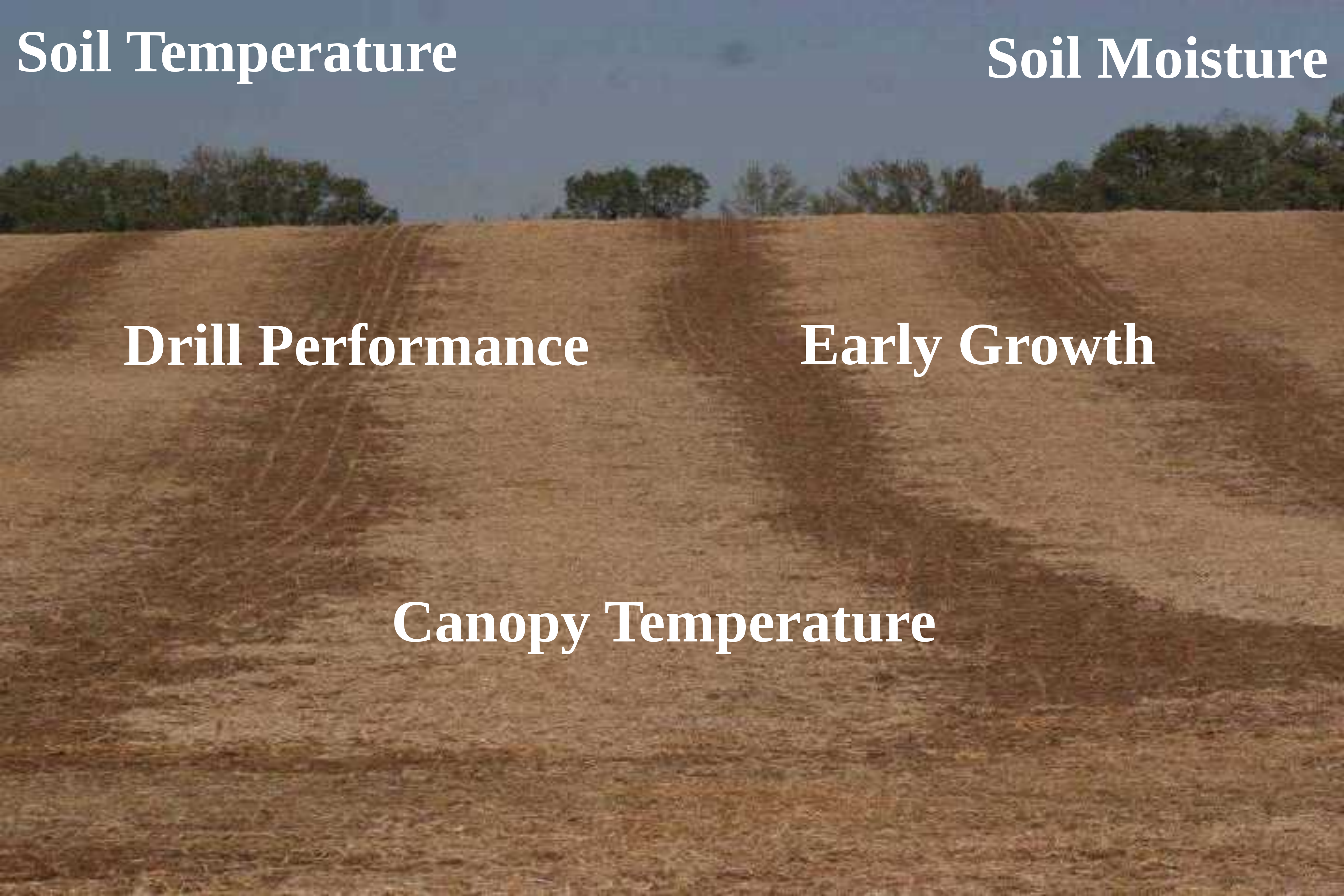
Soil Temperature
Soil Moisture
Drill Performance
Early Growth
Canopy Temperature


DEERE
750

Wheat Chaff Effect

Corn rows planted in wheat chaff	9.07 t/ha,	53,340 p/ha
Corn rows **Not** planted in wheat chaff	10.27 t/ha,	65,455 p/ha

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Crop Uniformity!!

Uniform Germination For Consistent Stand Establishment

"Every plant in the field should be up within 8 hours after the first plants emerge."

- Steve Albrecht, NCGA Winner
- 341 bu/acre

"Even seed depth is a must. All seeds need to emerge the same day within several hours of each other."

- Dave Hula, NCGA Winner
- 429 bu/acre

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INSANITY…

Keep doing the same thing year after year

And EXPECT A DIFFERENT RESULT!!!!

Hoe Drill?

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Keaton Seed Firmers
Checking Planting Depth Consistency

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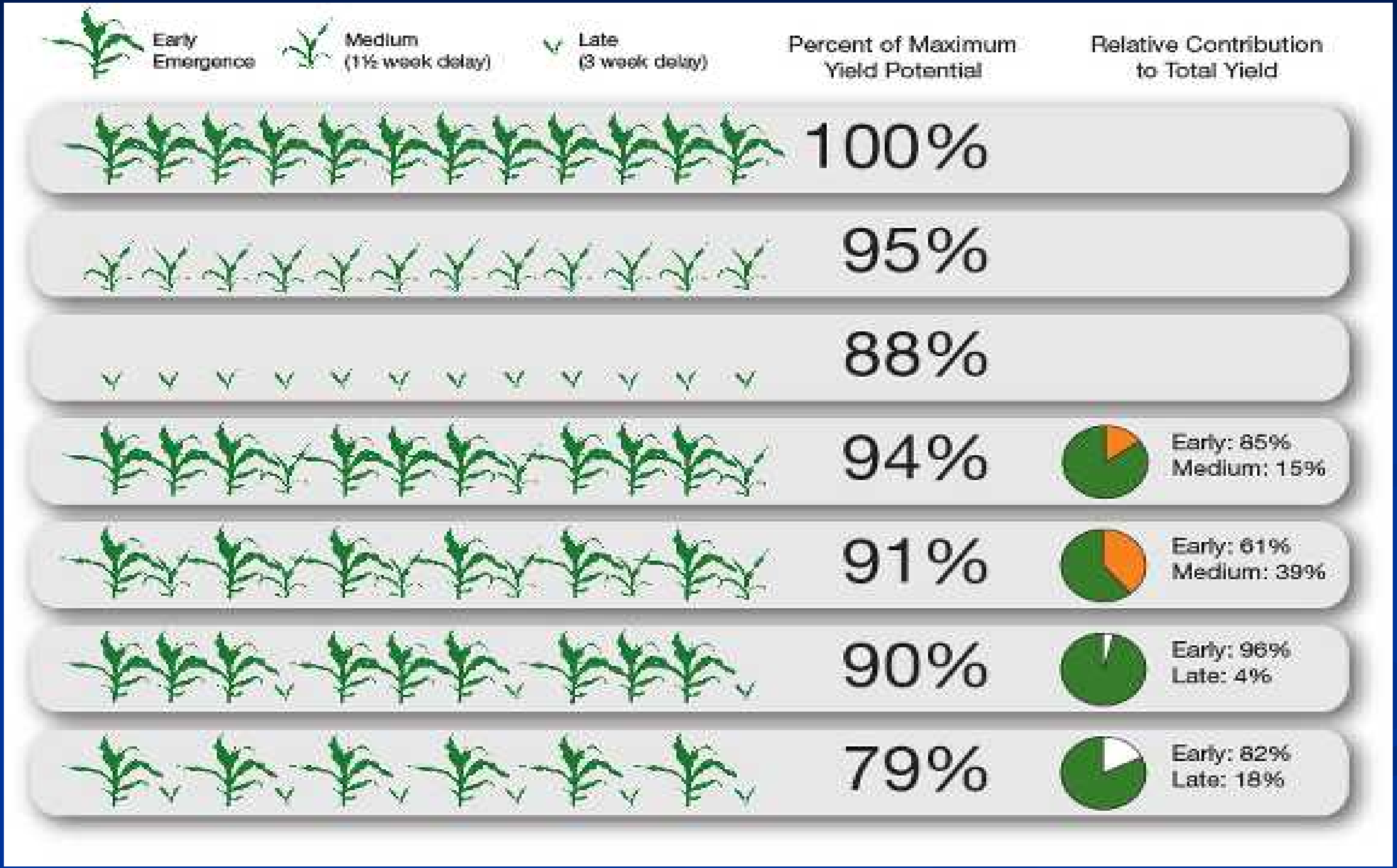
Uneven emergence COSTS!



Data from Carter, P.R., E.D. Nafziger, and J.G. Lauer. Uneven emergence in corn. North Central Regional Extension Publication No. 344

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Crop Sequence

Crop Sequence Effect
No-Till vs. Conventional Tillage

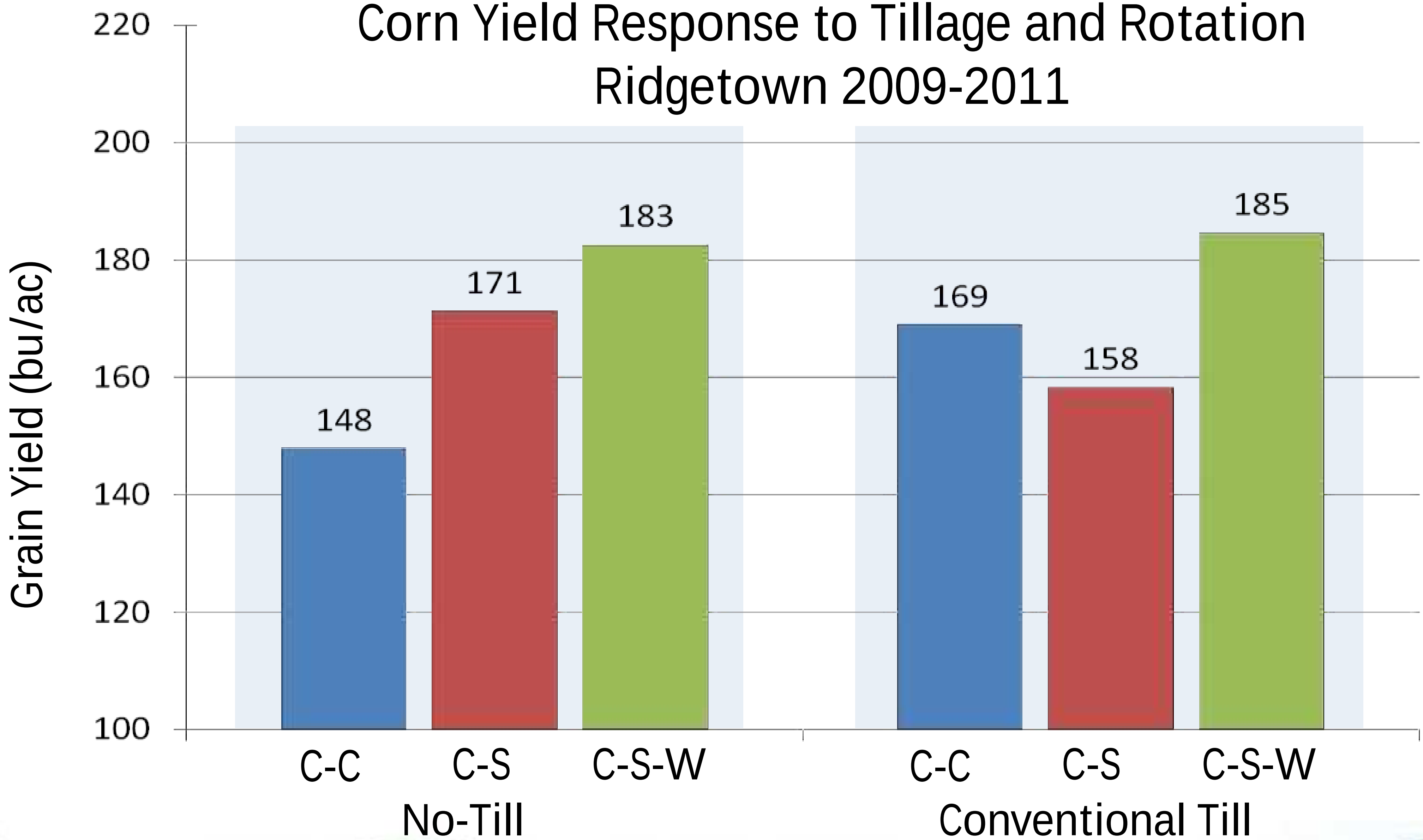
Soys follow Wheat

Sandy Loam	N-T CvT	2.33 2.77	-15% (N-T)
Silty Clay Loam	N-T CvT	1.96 2.38	-17% (N-T)

Soys follow Corn

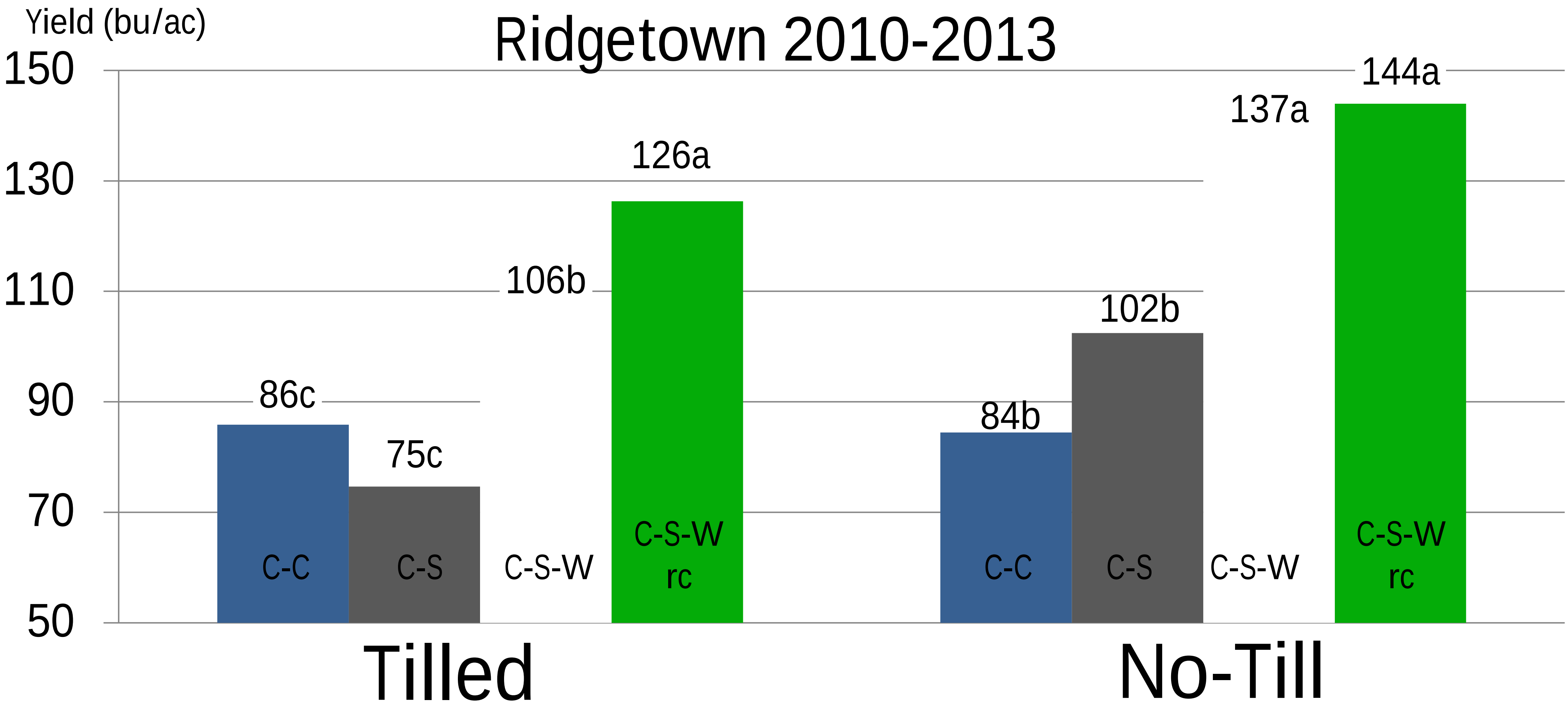
Silty Clay Loam	N-T CvT	3.03 2.7	+11% (N-T)

Corn Yield Response to Tillage and Rotation Ridgetown 2009-2011



Hooker et al. (UGRC, 2012)

Corn yield response to soil N capacity
-- zero fertilizer N –
Ridgetown 2010-2013

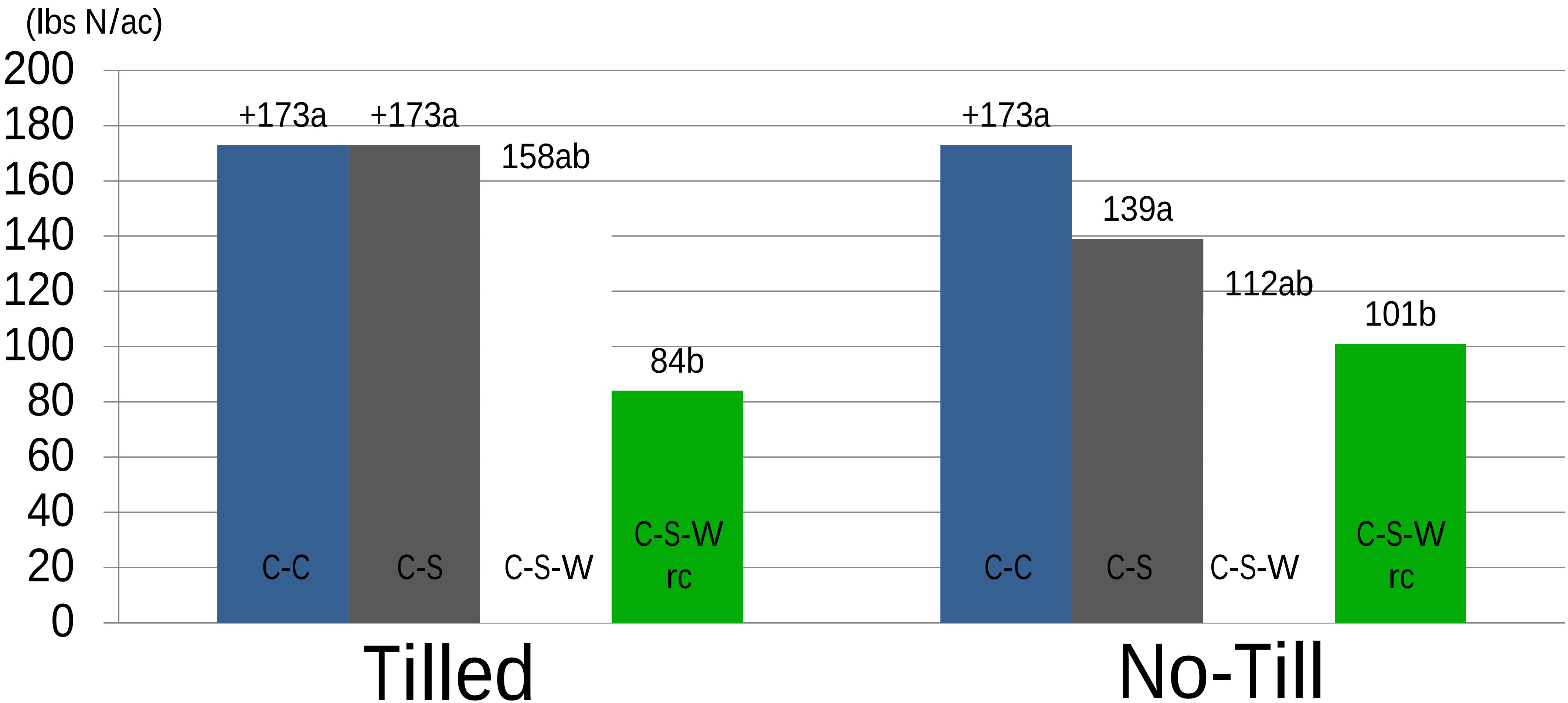


n=16 observations per mean (4 reps x 4 years)

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

Hooker (UG)

No-till + crop rotation reduces N fertilizer requirement
Ridgetown 2010-2013



n=16 observations per mean (4 reps x 4 years)

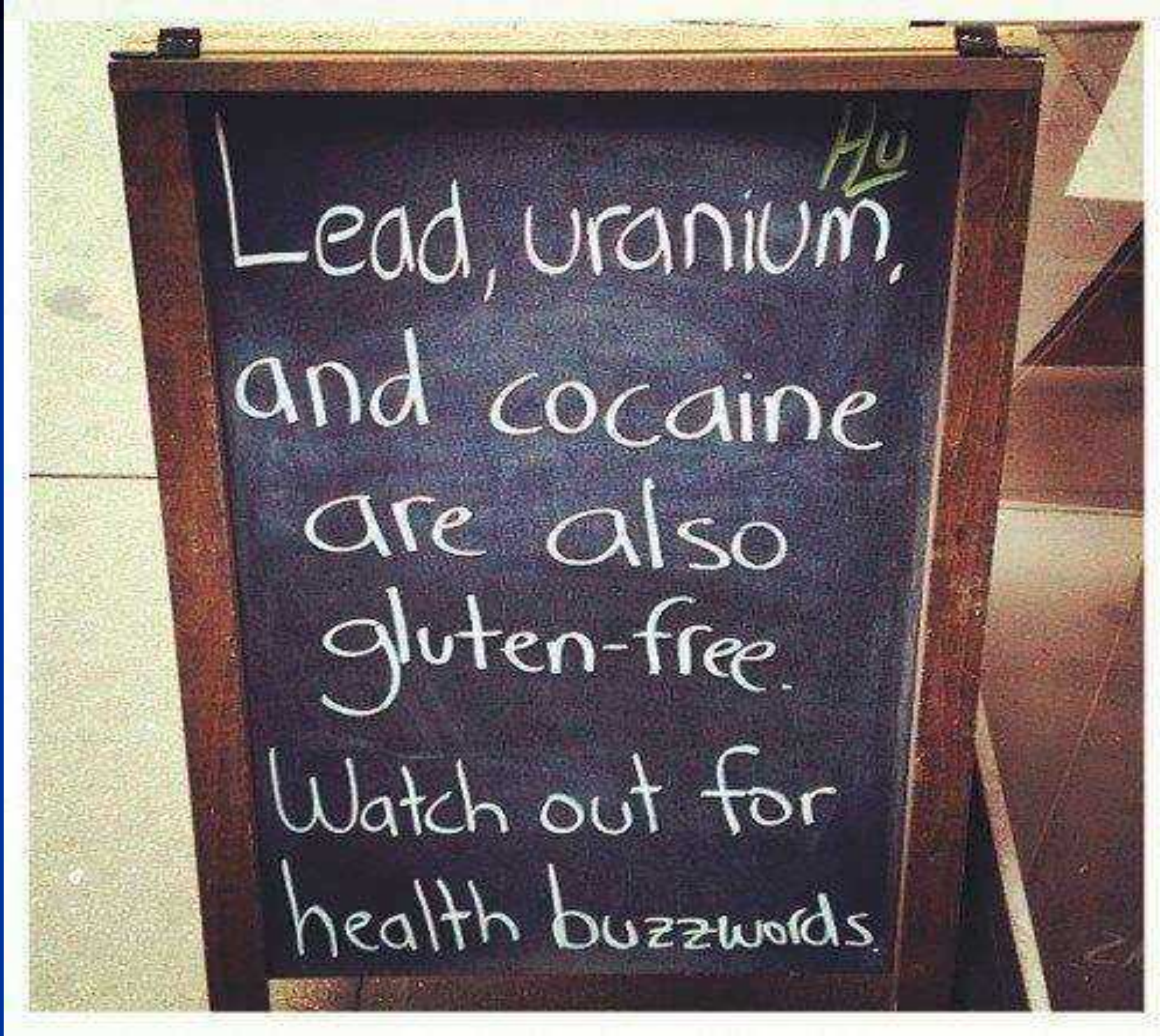
MERN >173 lbs N/ac in “+173” values

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

Hooker (UG)

Sequence

- Beans after corn
- Wheat after canola
- No corn after canola


HU
Lead, uranium,
and cocaine
are also
gluten-free.
Watch out for
health buzzwords.

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Zero-till WORK!

- Residue
- Planting depth
- Sequence
- Seed treatment

Seed Treatments…

Treatment	Emergence %
Untreated	75.9 (b)
Dividend	80.7 (a)
Vitaflo 280	80.8 (a)


Untreated vs Treated
Clothianidin
Rodney, Ontario
June 22/02

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Starter Fertilizer??

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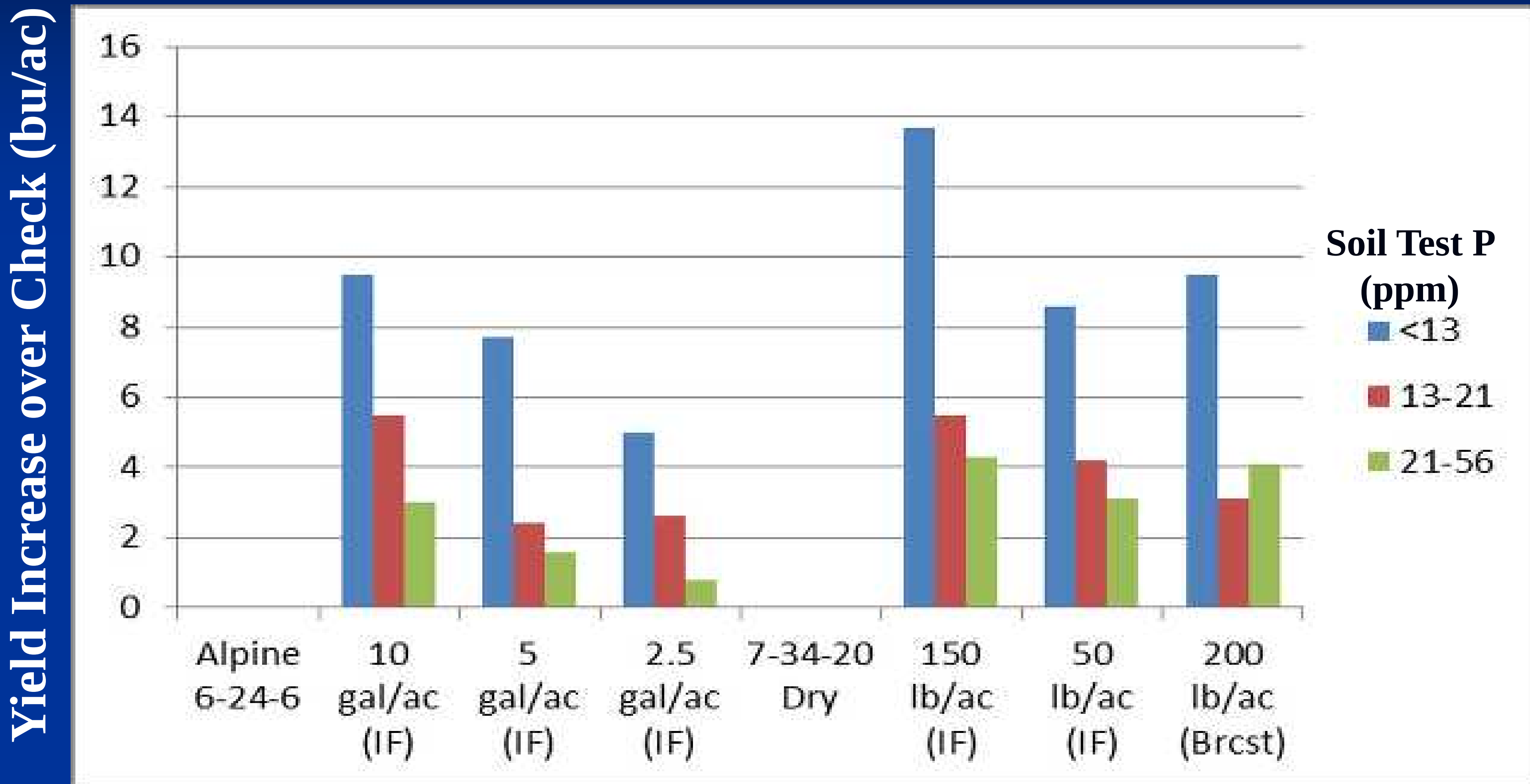
Phosphorus!



Johnson, Janovicek and McClure @WheatPete


ZERO N
35 N

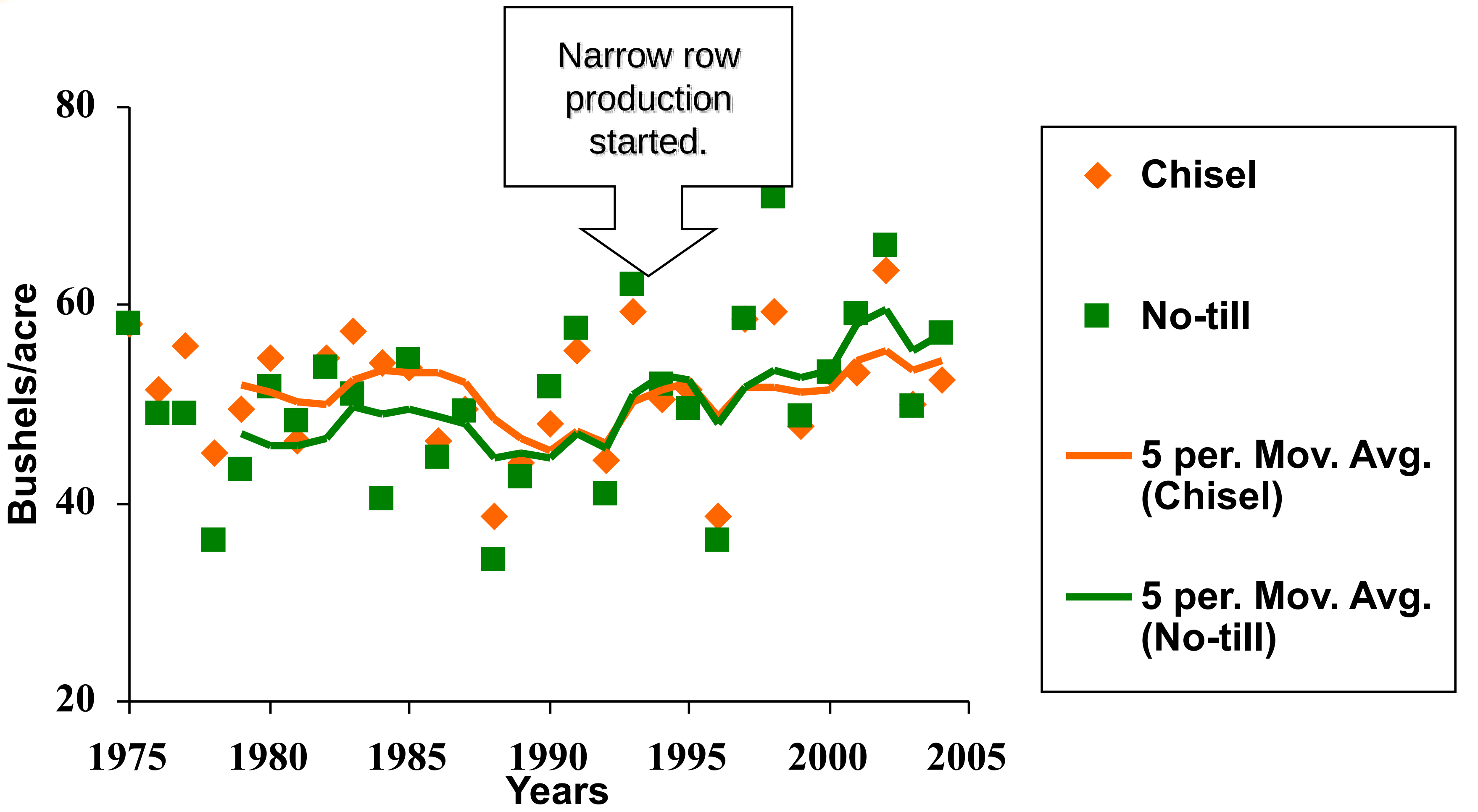
Potash: No Response

Fertilizer	Soil Test K (ppm) < 100 Yield (bu/ac)	Soil Test K (ppm) > 100 Yield (bu/ac)
None	82	84
150 lb/ac 7-34-20 IF	89	94
100 lb/ac MAP IF	89	94
100 lb/ac MESZ IF	89	93
200 lb/ac 7-34-20 Brdcst	87	91
Sites	11	10
Soil test K Range	50 - 98	104 - 165

Johnson, Janovicek and McClure @WheatPete

Row Width

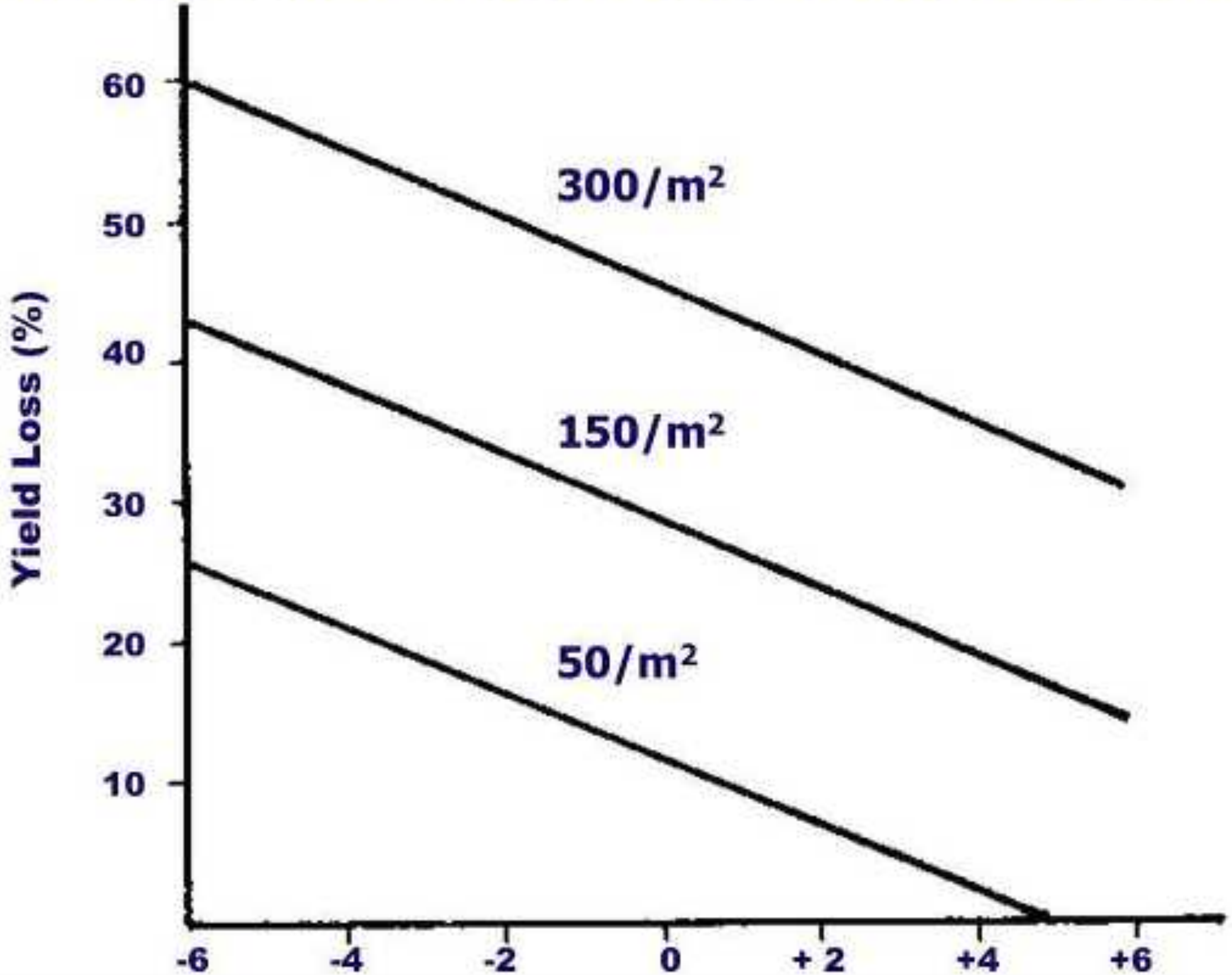
Yield, 5 Yr Moving Average, Chisel Vs. No-till, Soybeans Following Corn, West Lafayette, 1975-2004.



NARROW!

- From 38 cm to 19 cm= 8% yield
- From 19 cm to 10 cm= 0 to 4% yield
- 1% per 2.5 cm???
- **WEED** CONTROL!!!

WILD OAT IMPACT ON SPRING CEREAL YIELD – WESTERN CANADA



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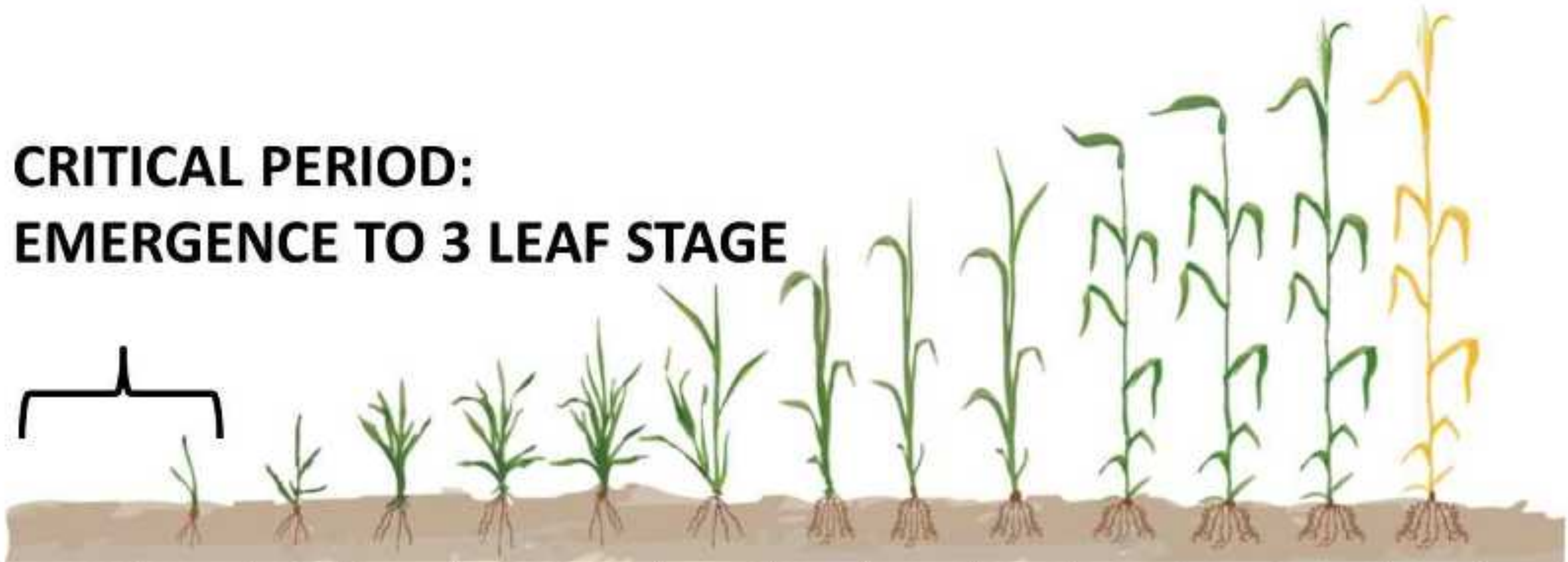
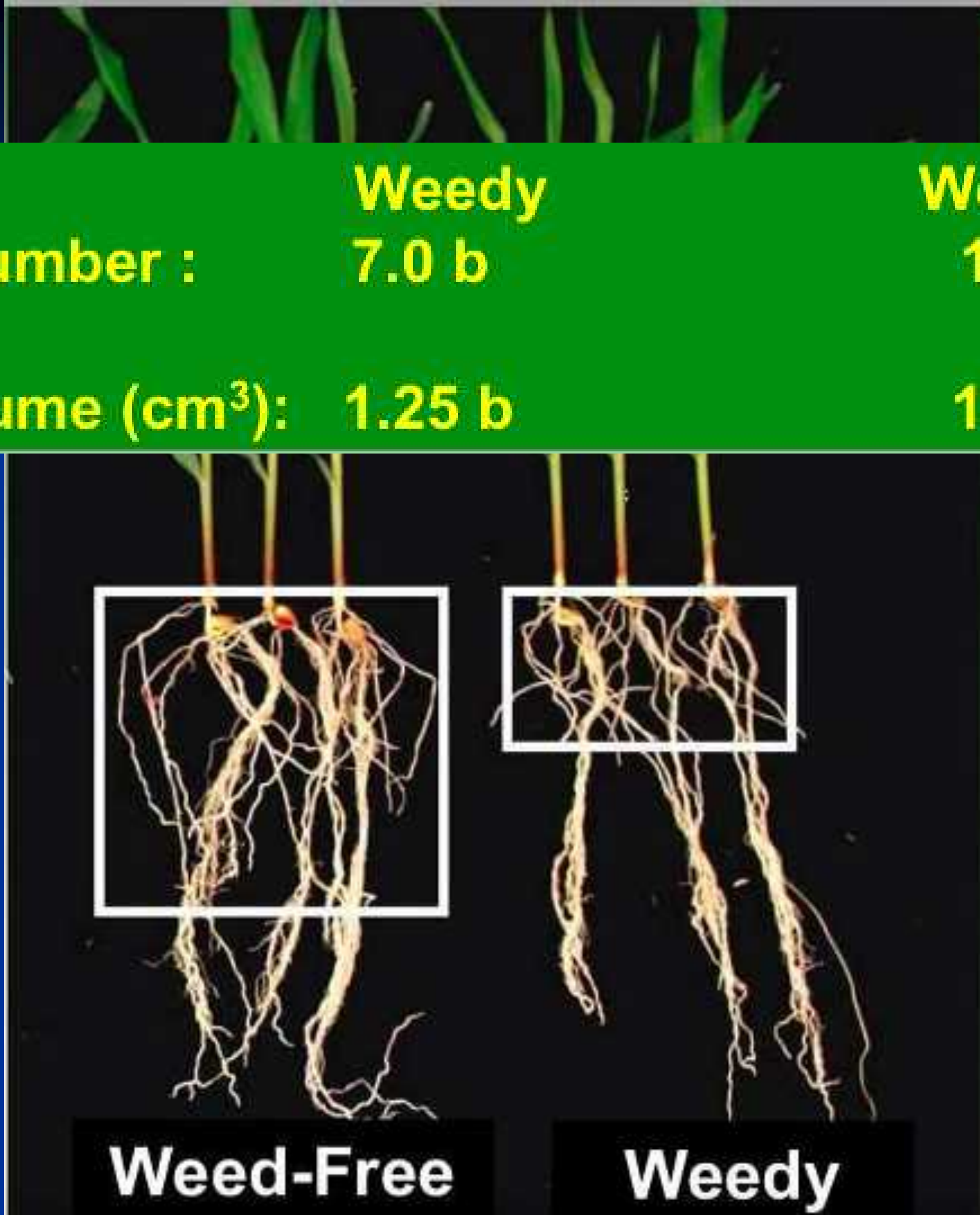
CRITICAL PERIOD:
EMERGENCE TO 3 LEAF STAGE



Feekes	1	2	3	4	5	6	7	8	9	10	10.1	10.5	11
Zadoks	10	21	26	30	30	31	32	37	39	45	50	60	90

	Weedy	Weed-free
Crown root number :	7.0 b	11.6 a
Total root volume (cm^3):	1.25 b	1.58 a



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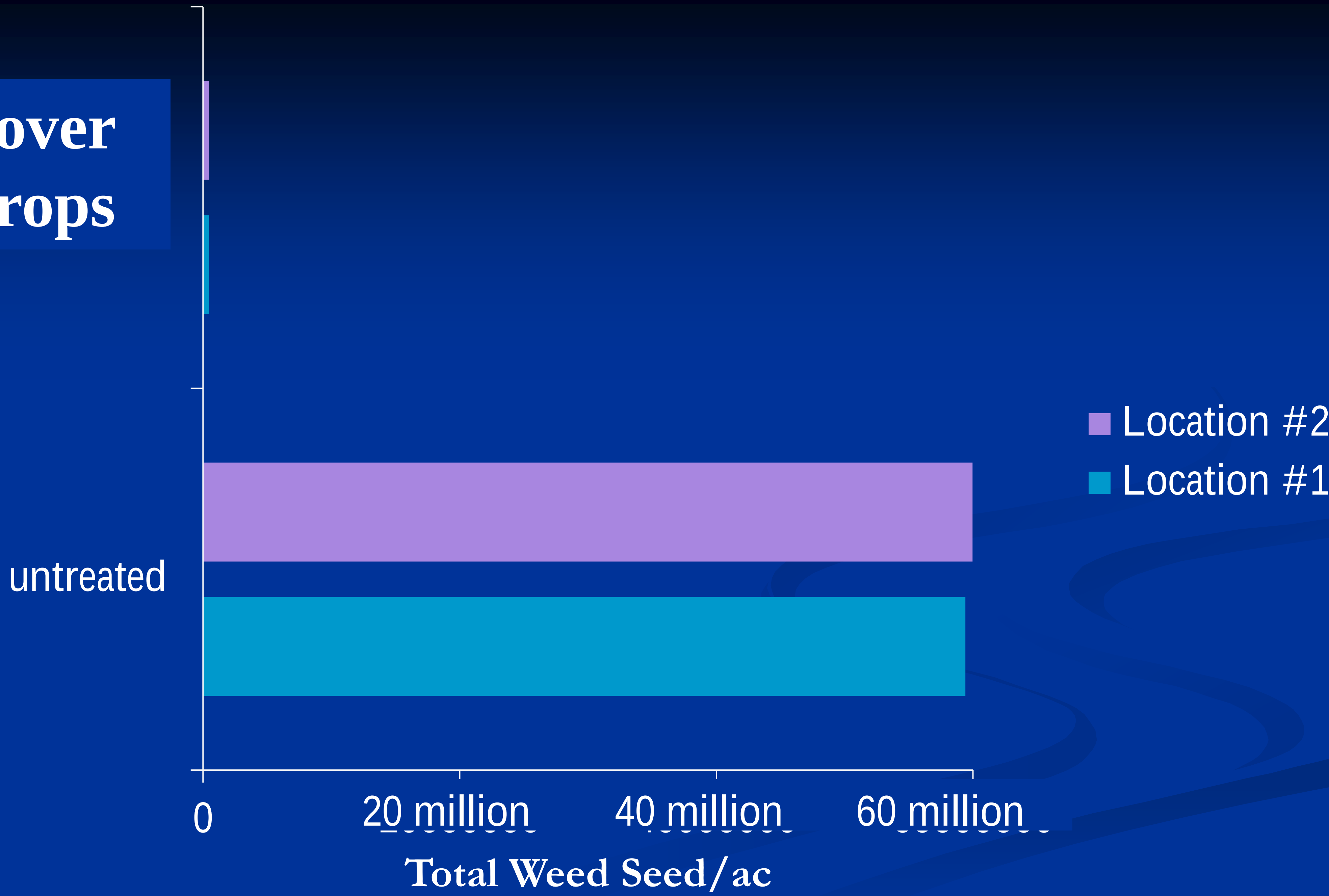
PRE-EMERGE
WEED CONTROL
(ERAGON)
NO
WEED CONTROL

After wheat: Wellington County -Sept, 2013

Estimate: 58 million seeds/ac

Cover Crops



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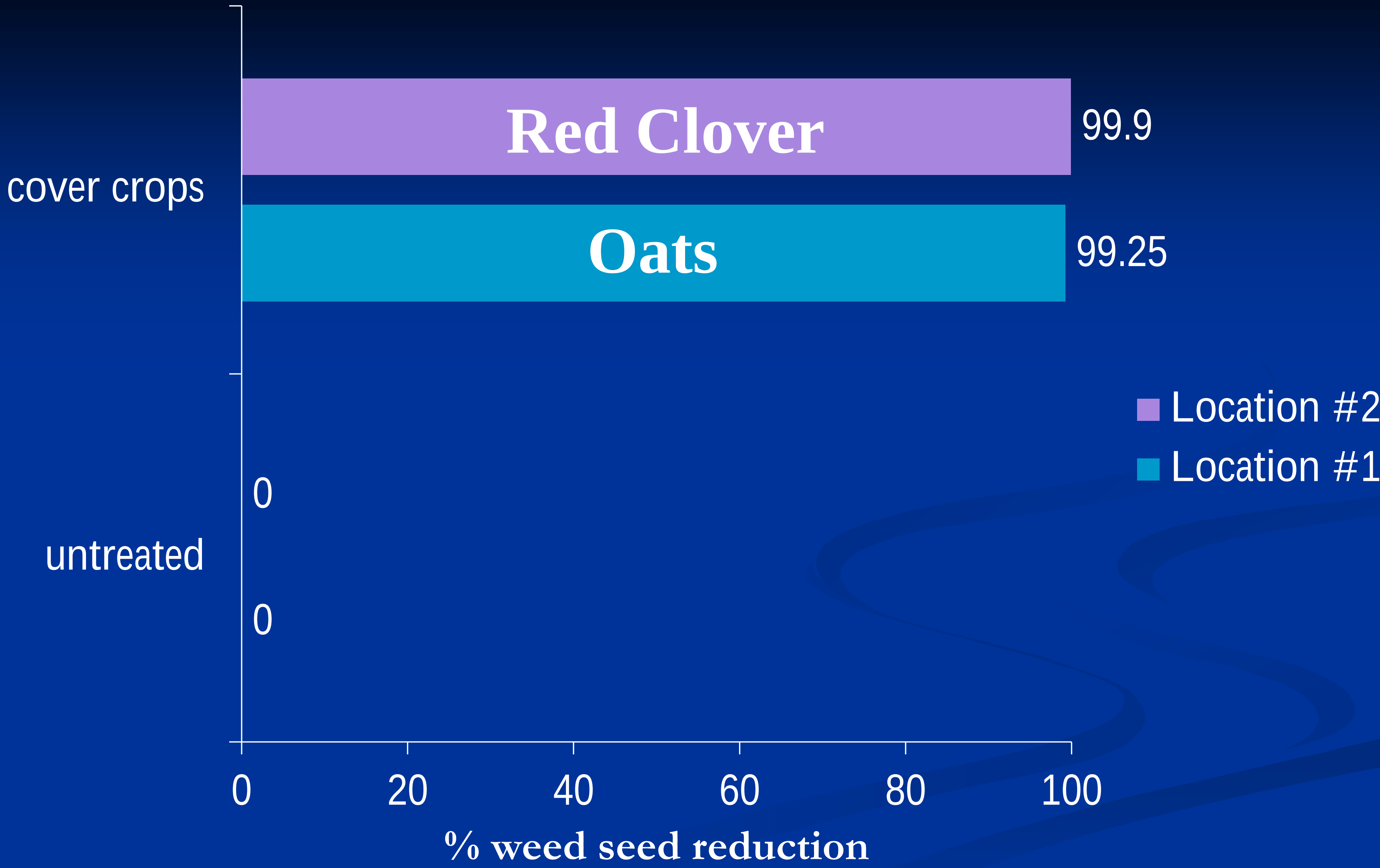

cover crops
untreated
Red Clover
99.9
Oats
99.25
0
0
Location #2
Location #1
0
20
40
60
80
100
% weed seed reduction

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Site 1: Red clover cover crop

Management!

SMART Trials!

Strategic
Management
Adding
Revenue
Today

Acknowledgements

Jonathan Brinkman

Dr. Dave Hooker

Technical
- Scott Jay
- Shane McClure
- Rob Templeman
- Bruce Humphries
- Todd Phibbs
- Cheryl VanHerk
- Eric Vyn

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- Dr. John Lauzon (UofG)
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- Dr. Trevor Kraus (BASF)
- Dr. Harold Wright (Syngenta Crop Protection)
- Grain Farmers of Ontario (GFO)

Summer Students
- 20 over 3 years

Grower Co-operators – many thanks!

Various Seed Companies


430-600
plots/location!!!

S.M.A.R.T. Small Plot Wheat <u>Intensive</u>

Photo Courtesy of Ken Nixon (Ilderton, 2008)

2008-2010 Average

	Yield (bu/ac)		
	90N	120N	150N
No fungicide	93.0	96.7	99.4
+ T3 fungicide	99.9	105.1	108.6
+ T1 +T3 fung	99.7	106.2	111.1

Small plot SMART trials across all varieties

@WheatPete

2008-2010 Average

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@WheatPete

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Small plot SMART trials across all varieties

@WheatPete

2009 25R47

	Yield (bu/ac)		
	90N	120N	150N
No fungicide	**86.3**	101.0	105.5
+ T3 fungicide	99.4	**105.8**	114.8
+ T1 +T3	95.7	111.3	**123.4**

Small plot SMART trials across locations 2009

@WheatPete

2010 Emmit

	Yield (bu/ac)		
	90N	120N	150N
90 N	**99.0**	98.2	106.4
+ T3 fungicide	106.2	**106.9**	109.8
150 N +T1 +T3	106.6	107.3	**113.4**

Small plot SMART trials across locations 2010

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SMART 2008!!

	Yield	Gain
Check	91.3	
Fungicide	98.9	+7.6
+High N	112.6	+21.3

20 sites 2008

SMART 2009!!

	Yield	Gain
Check	86.0	
Fungicide	92.4	+6.4
+High N	107.2	+21.2

16 sites 2009 @WheatPete

SMART 2010!!

	Yield	Gain
Check	91.3	
Fungicide	99.2	+7.9
+High N	109.7	+18.4

16 sites 2010

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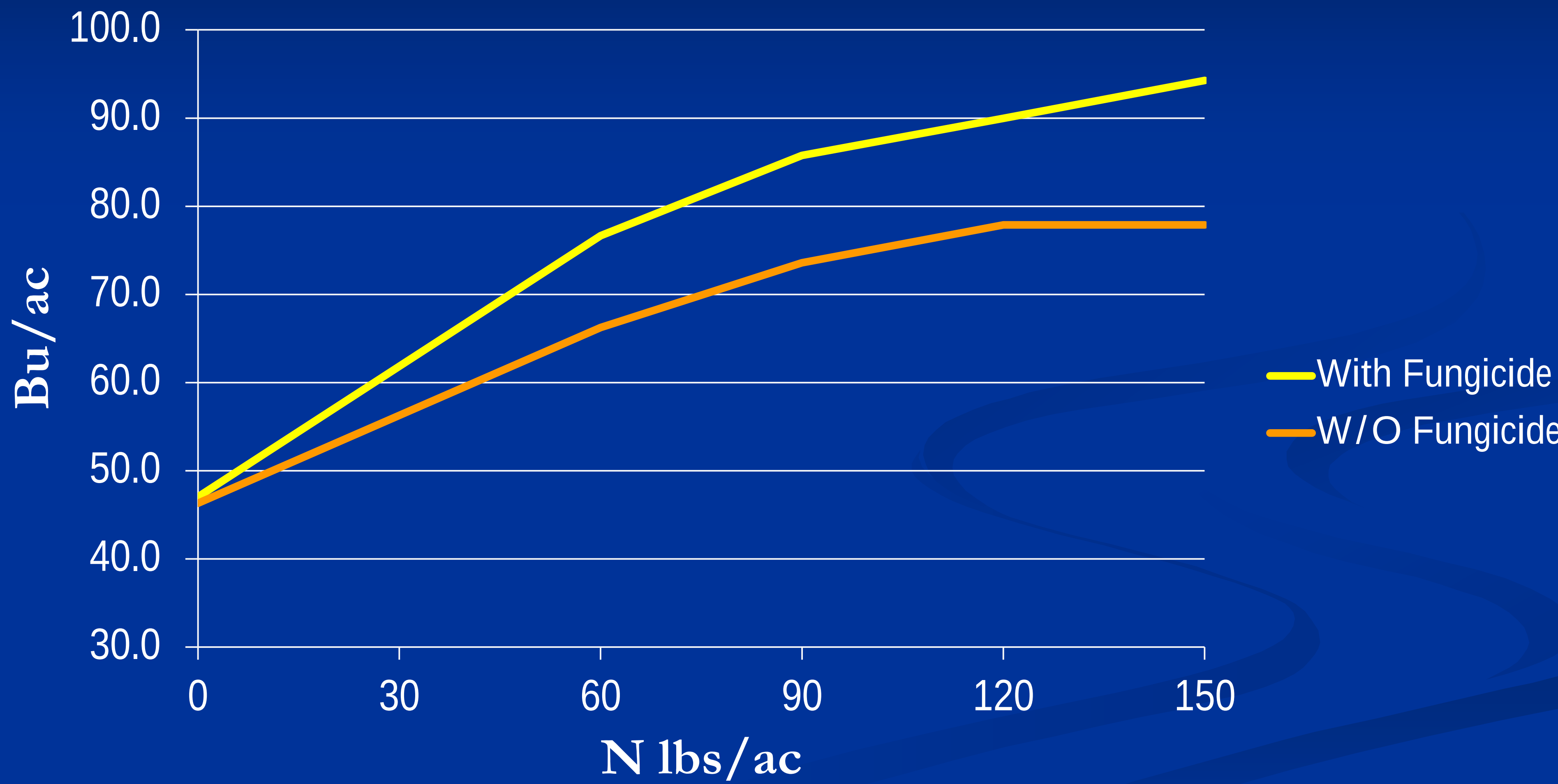
Nitrogen and Fungicide



Johnson, McClure 2013 @WheatPete

Fungicide Timing

Fungicide Timing Response

Number of applications	Application timing	Yield response (increase in yield in bu/ac)
1 application	T1	1.6
	T2	6.9
	T3	8.0
2 applications	T1 + T2	8.0
	T1 + T3	8.9
	T2 + T3	10.8
3 applications	T1 + T2 + T3	12.9

T1 Herbicide timing
T2 Flag leaf timing
T3 Heading timing

= 1 bushel

source: Brinkman J. and Hooker D., University of Guelph, SMART data. 2008 - 2010.

Management Input	Protein Increase (%)
35 kg/ha additional N	0.5
70 kg/ha additional N	1.0
Split N (GS 30 + 32)	0.5
Post Anthesis N (GS 30 + 69)	0.75
Split N (GS 30 + 32 +69)	1.0
Agrotain Plus	0.2
ESN 50%	0.5
ESN 100%	0.75

Johnson and McClure 2008-2013

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[redacted]