

Making Fertilizer Decisions Based on Proper Soil Testing Techniques

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Precision Ag Summit

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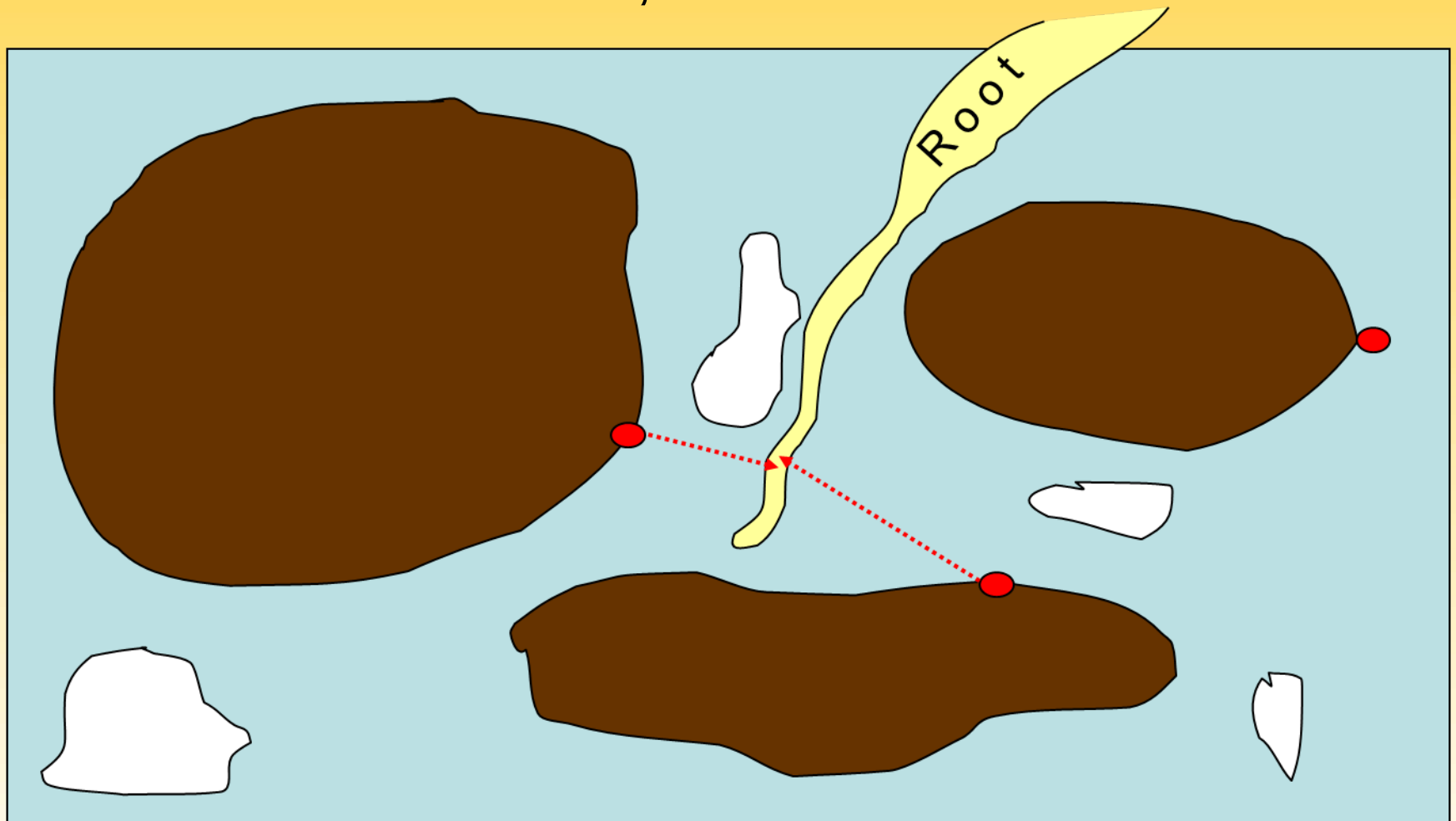
Nutrient Placement Research



agement



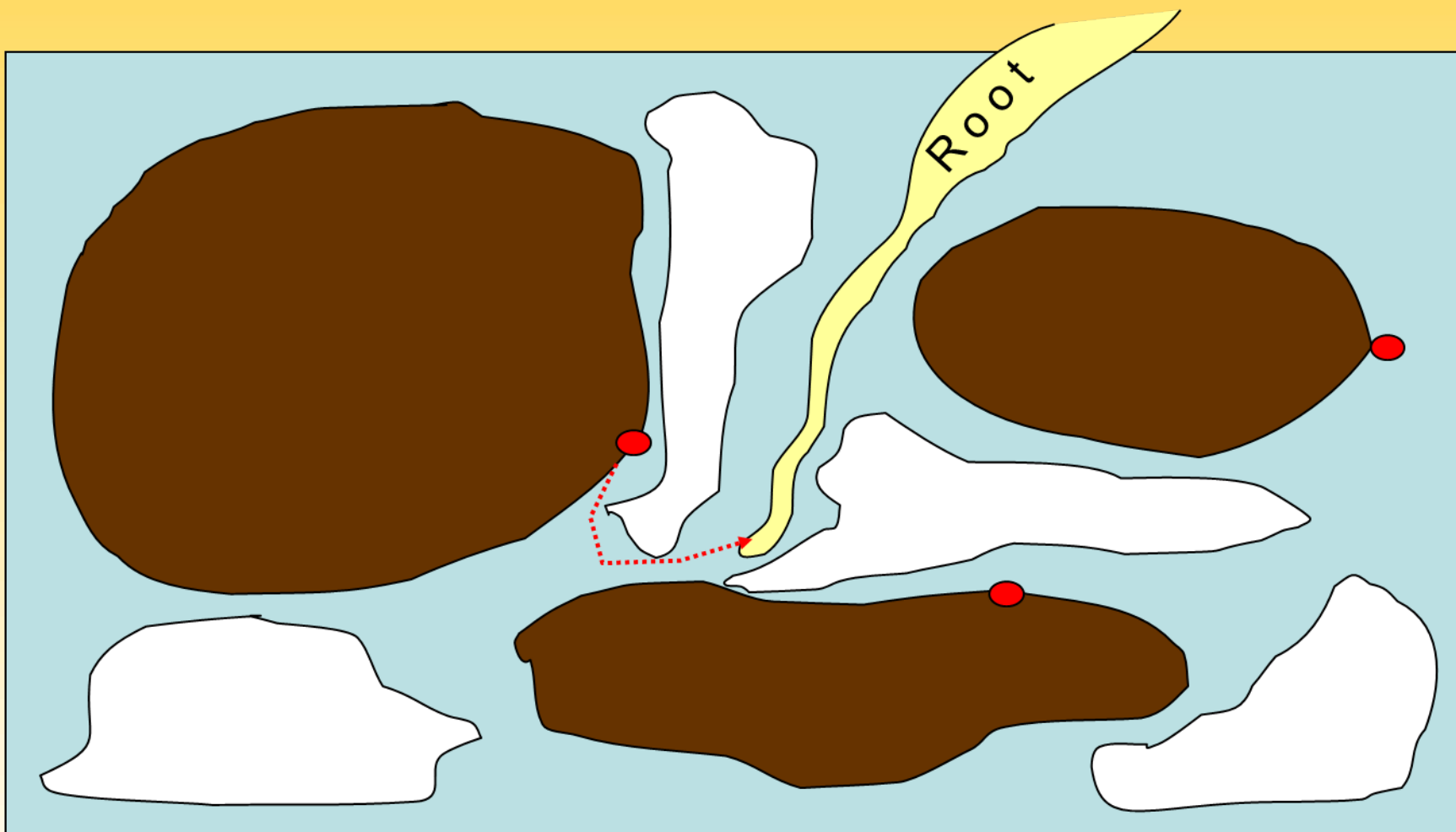
*Diffusion distances during the growing season are short: P = 0.2 mm; K = 2 mm



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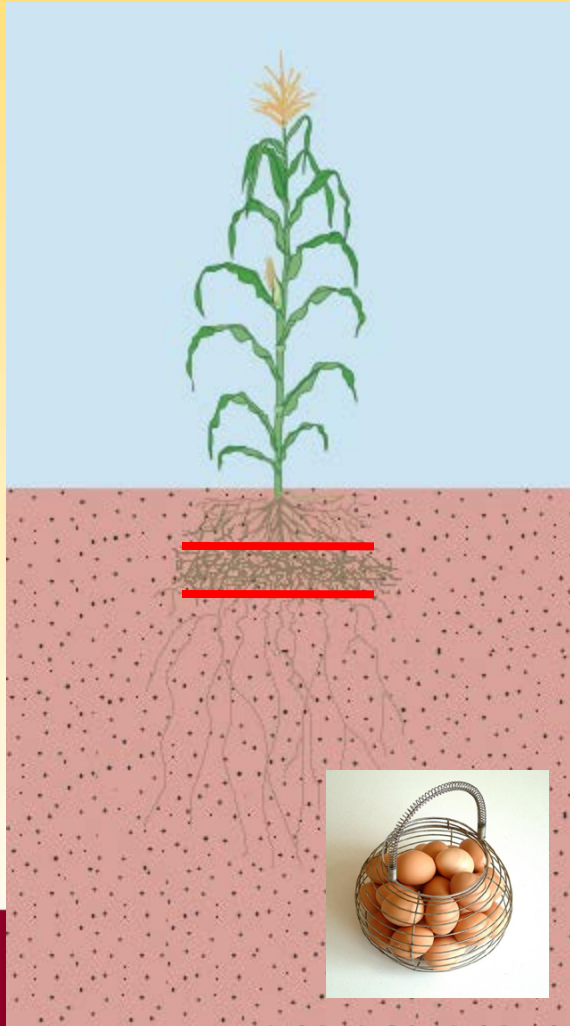


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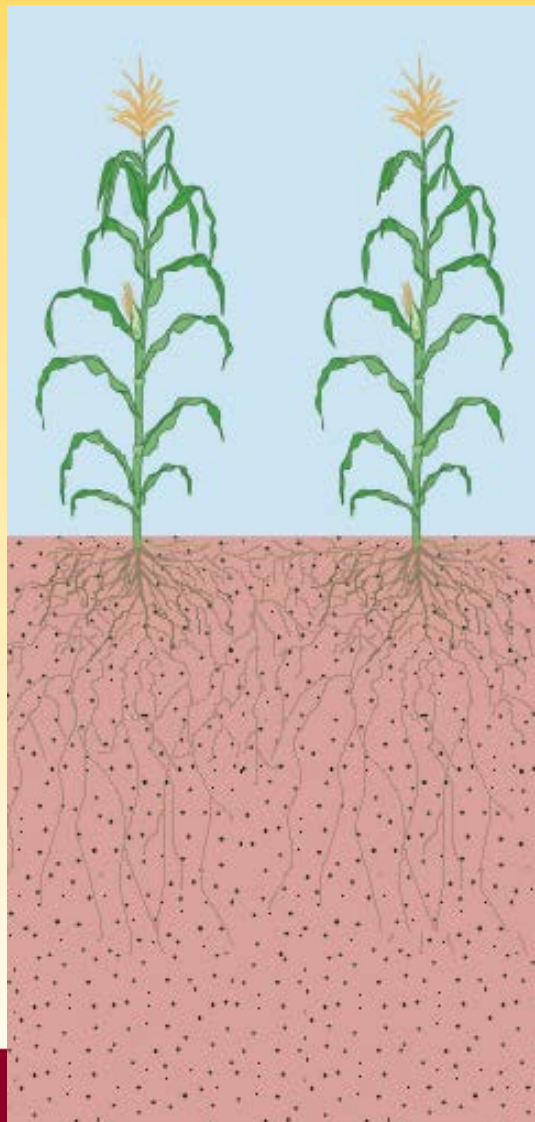
What Happens if the Soil Surface Dries Out?



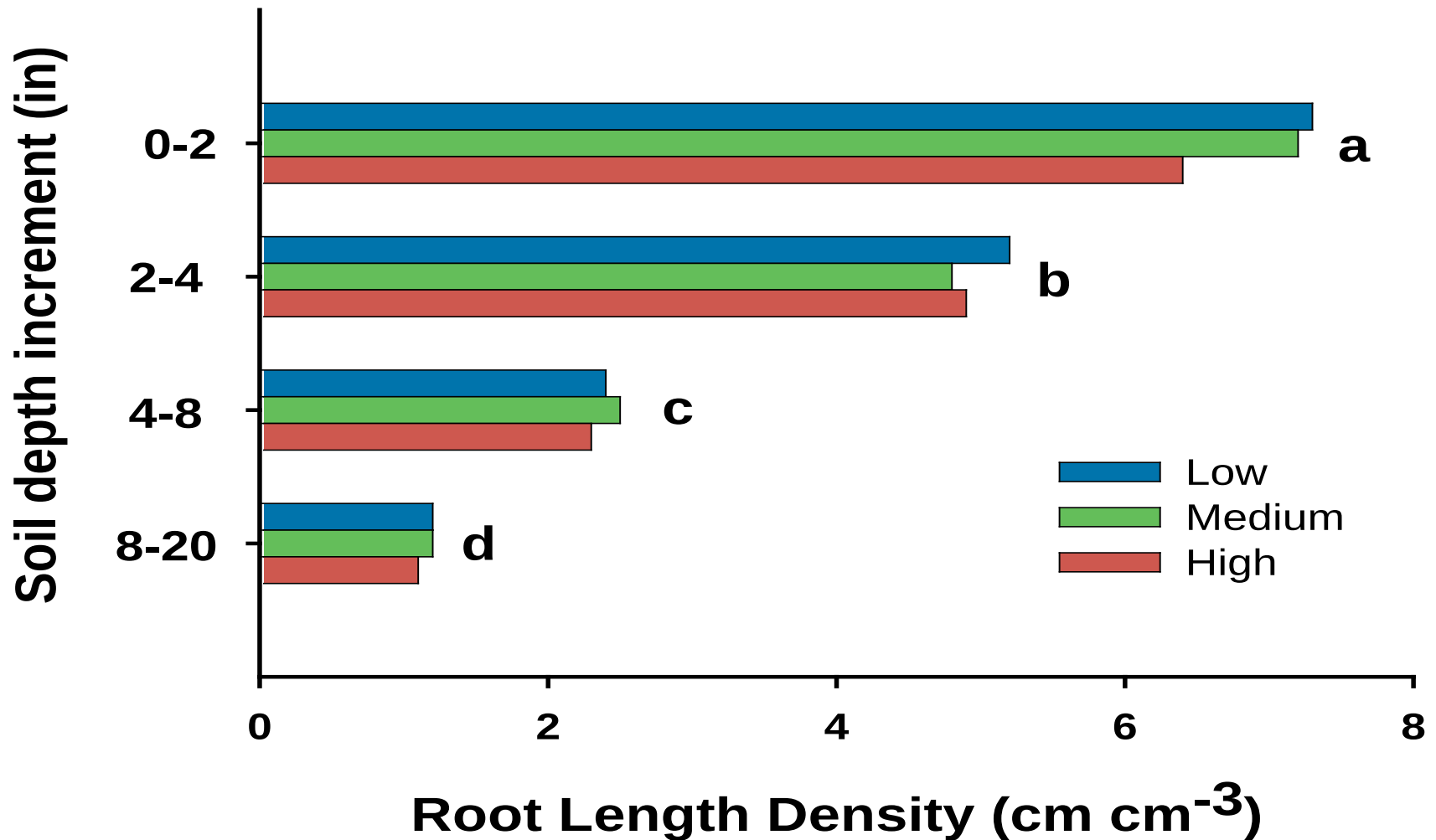
- Is deep placement of P and K better?
- Assuming root proliferation, do we want more roots deep?
 - Longer to get there
 - Less oxygen
 - Taking nutrients and water
 - Are we limiting roots?

Where Should I Place Nutrients?

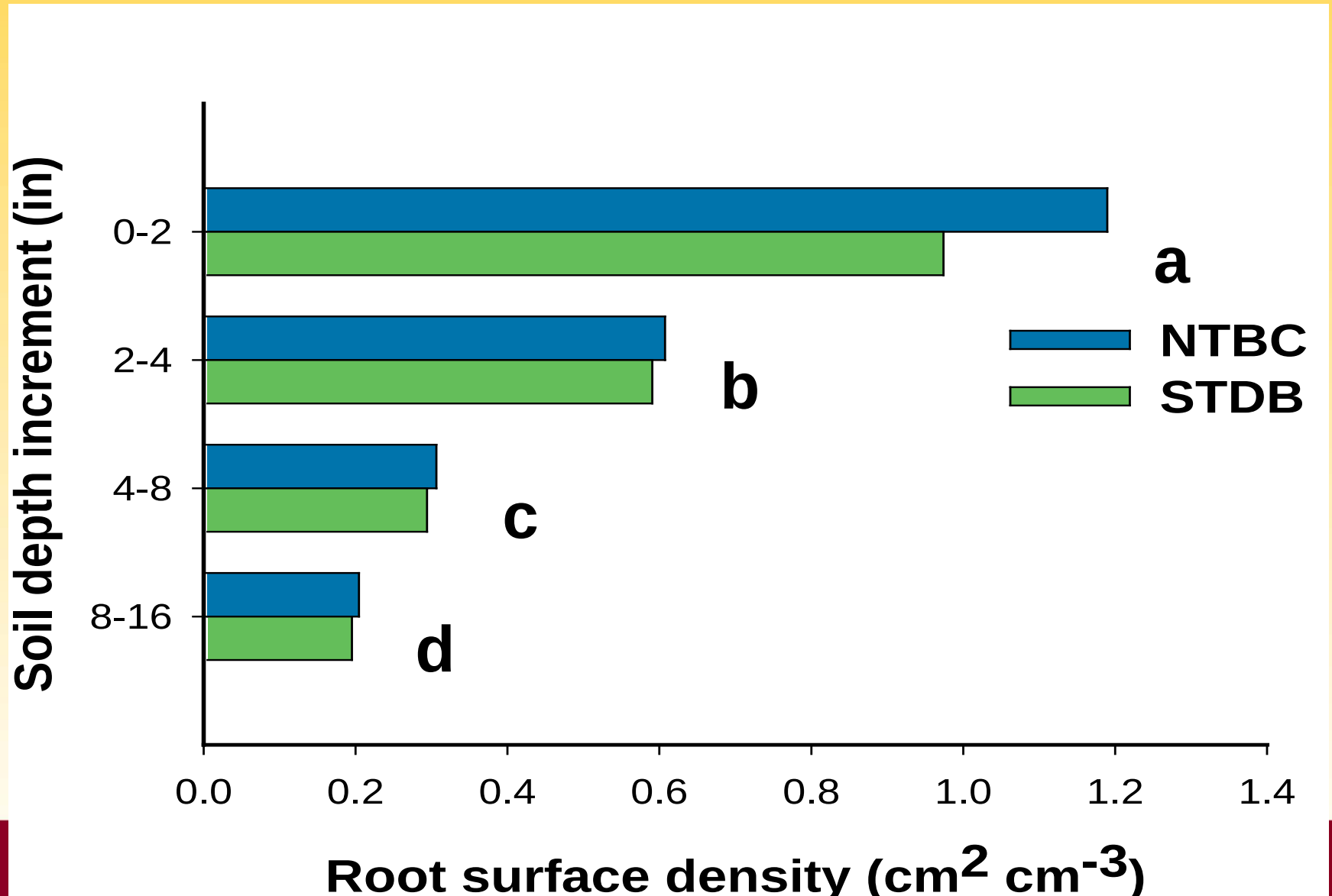
- Where are the active roots?
- Where is the water?



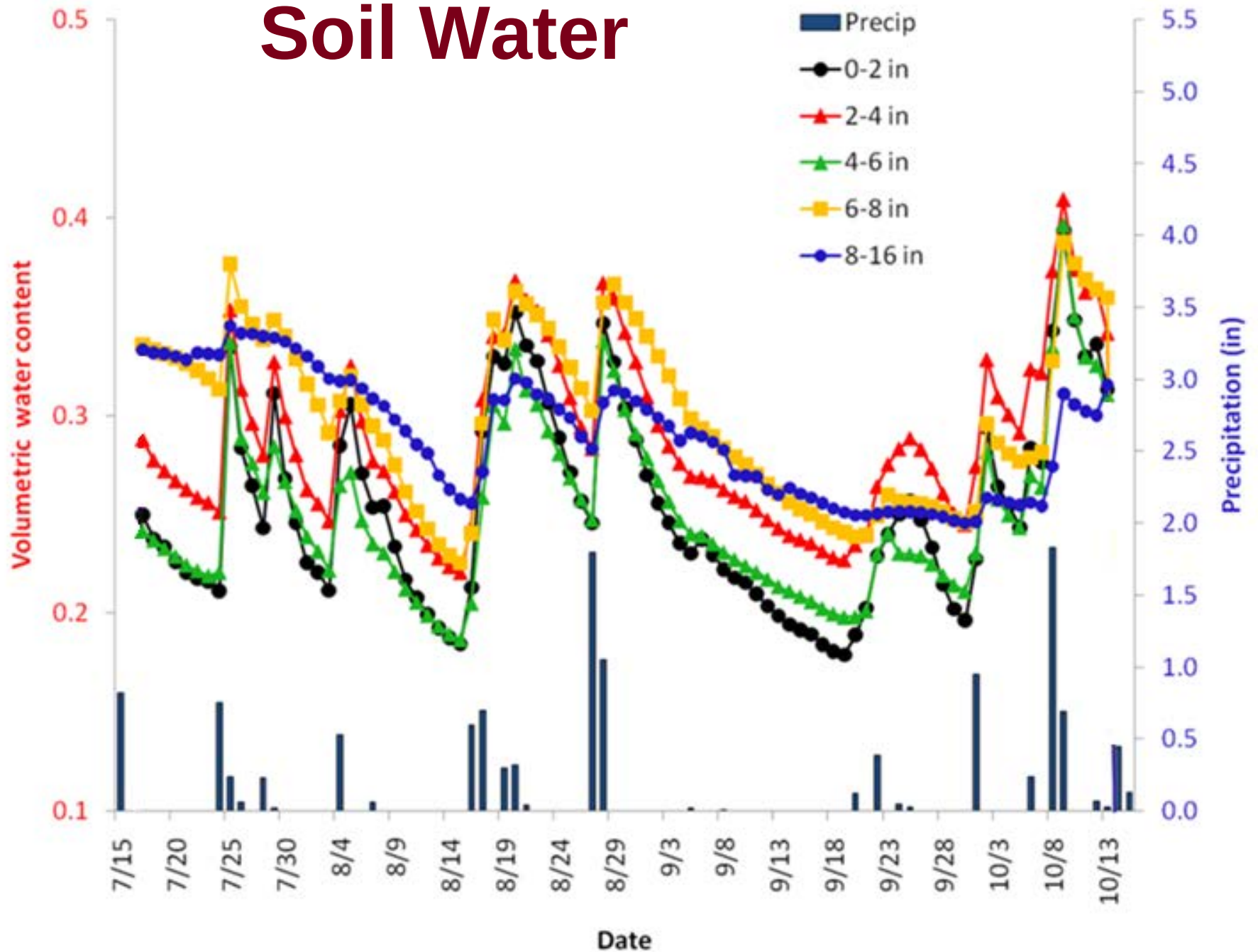
Roots Not Impacted by Nutrient Level



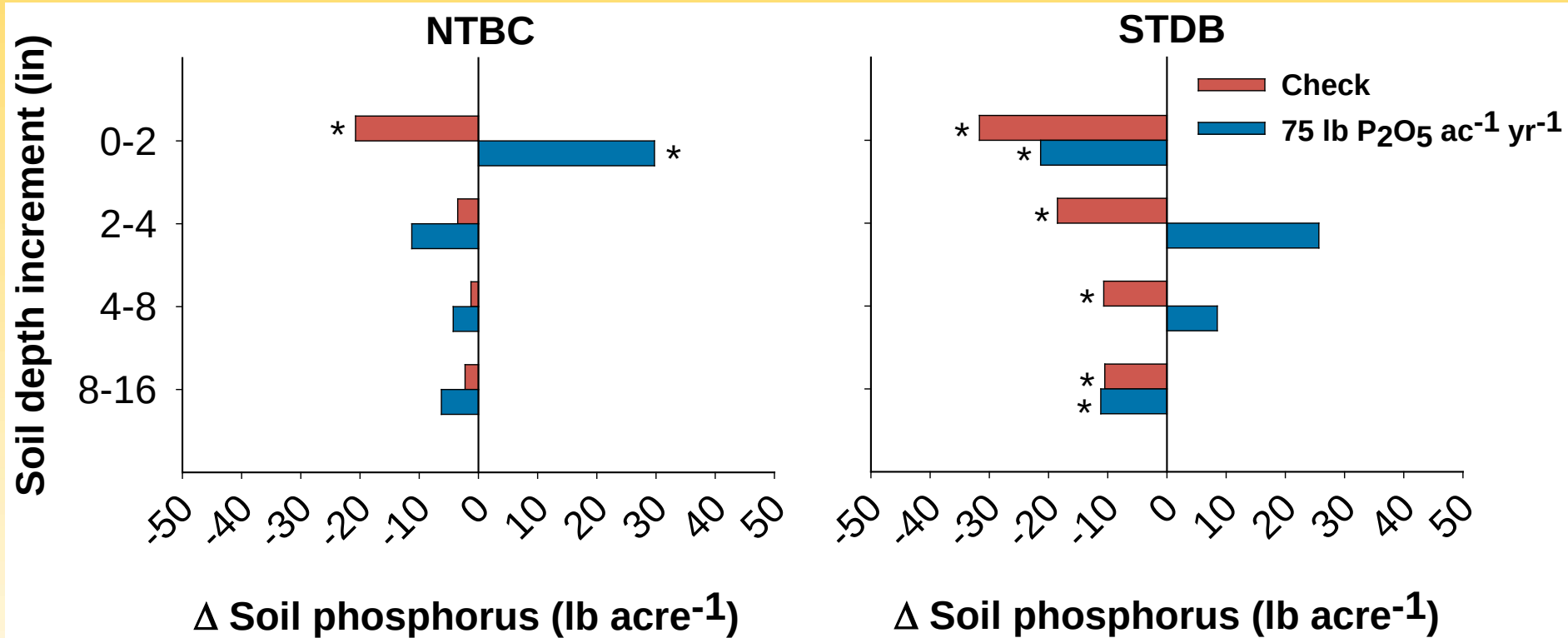
Roots Not Impacted by Nutrient Placement



Soil Water



Placement Has Little to Do With Where Roots Take Up Nutrients



Change in soil test P over a three-year period
Averaged across IR BR at R1 development stage
* indicate $P \leq 0.1$

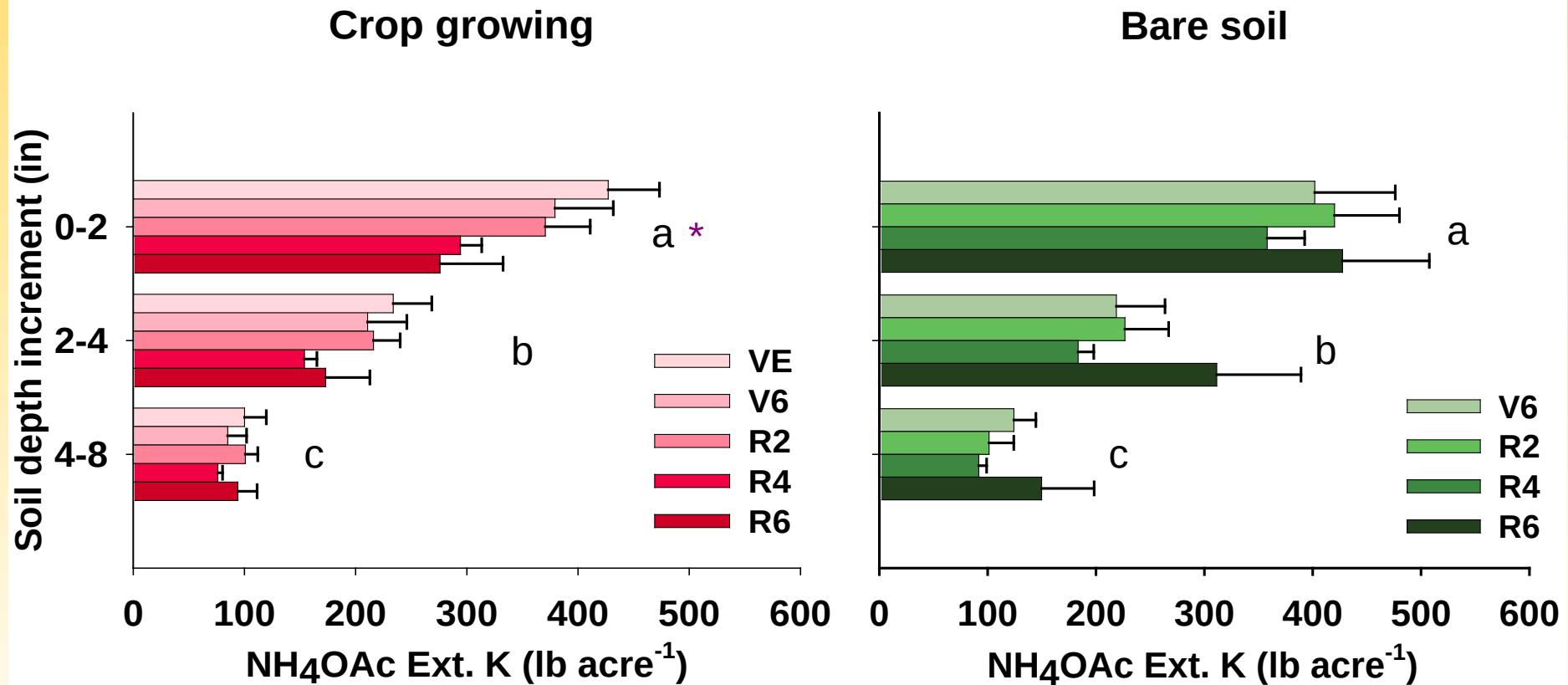


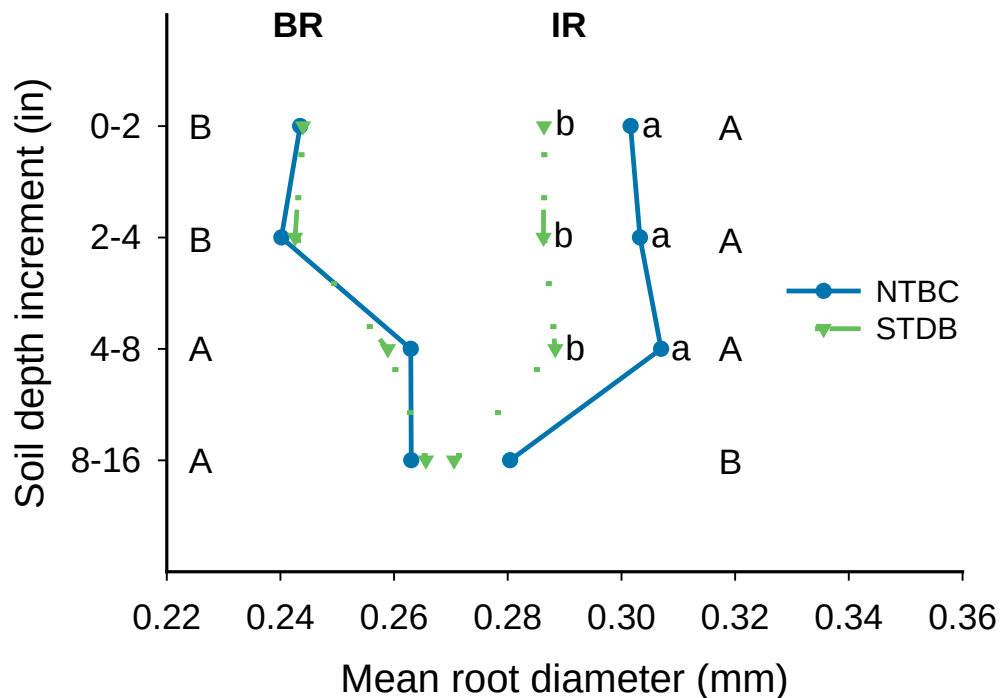
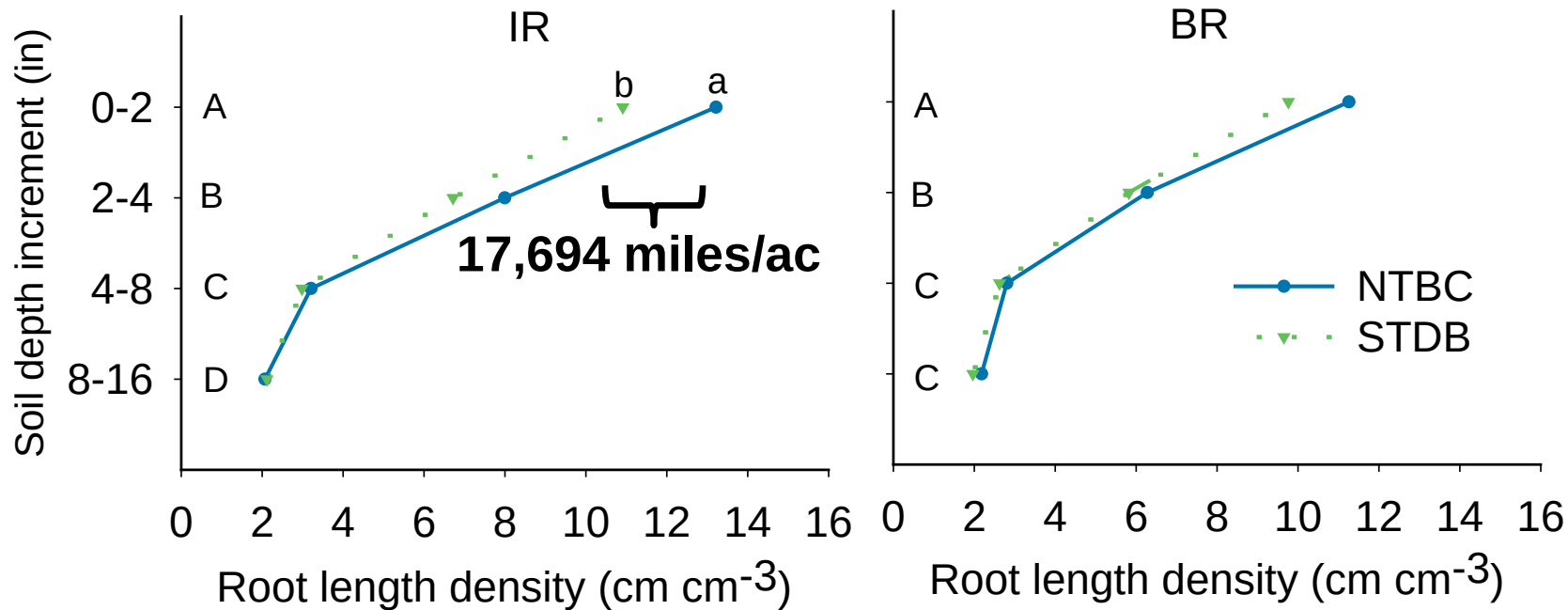
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Changes in Soil Test Levels are Related to Crop Uptake (no-till field)

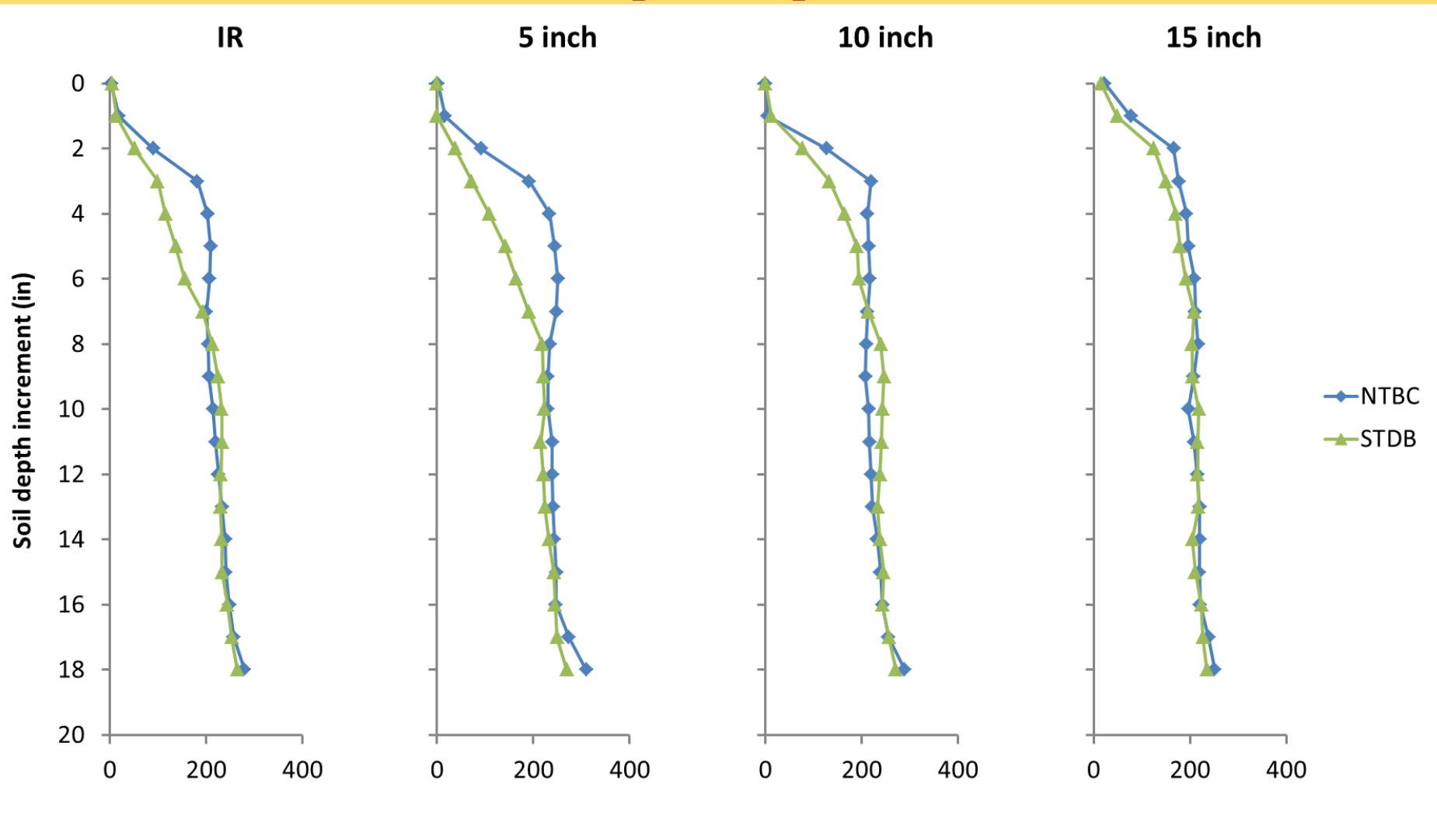




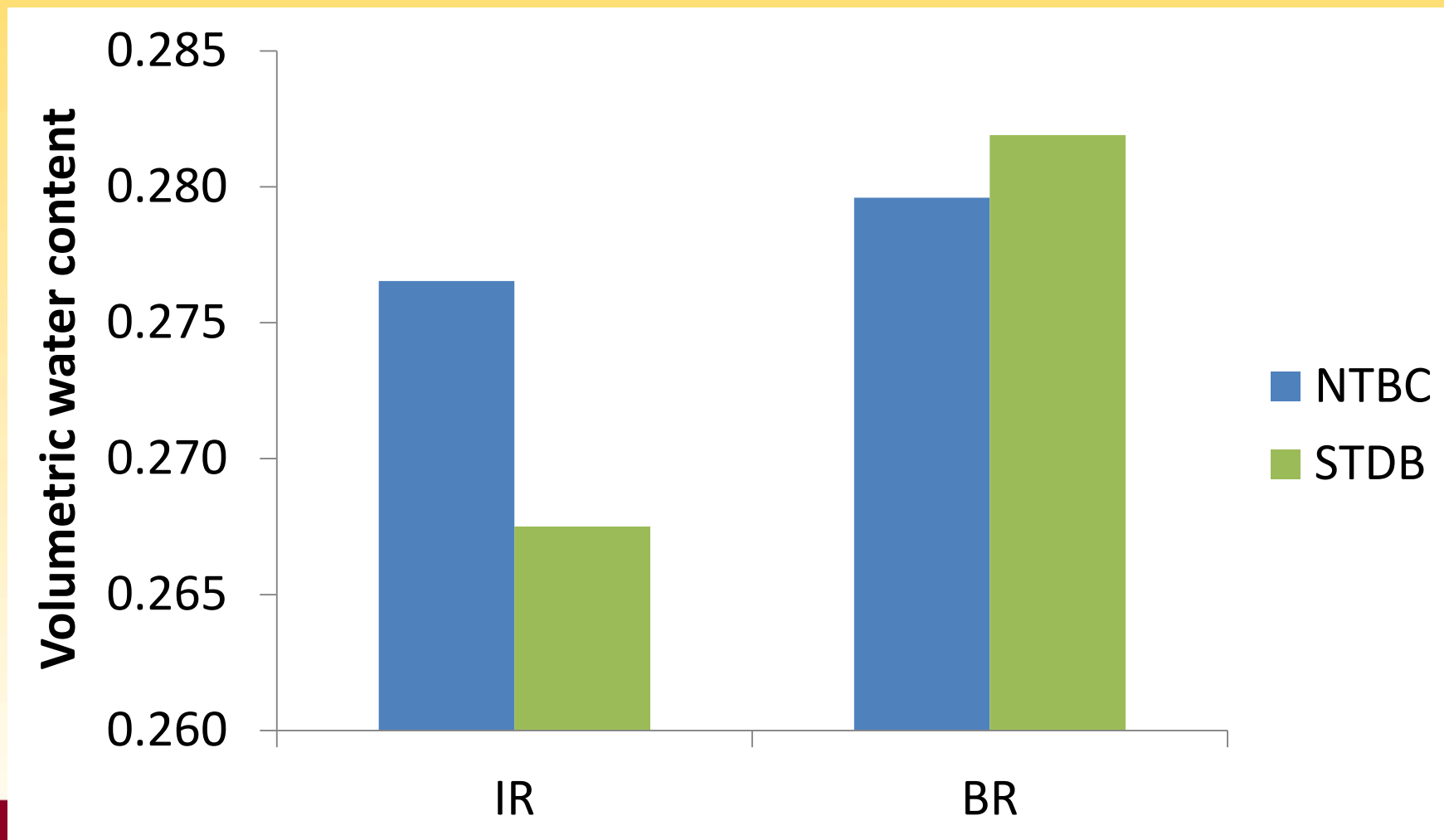
Nutrition

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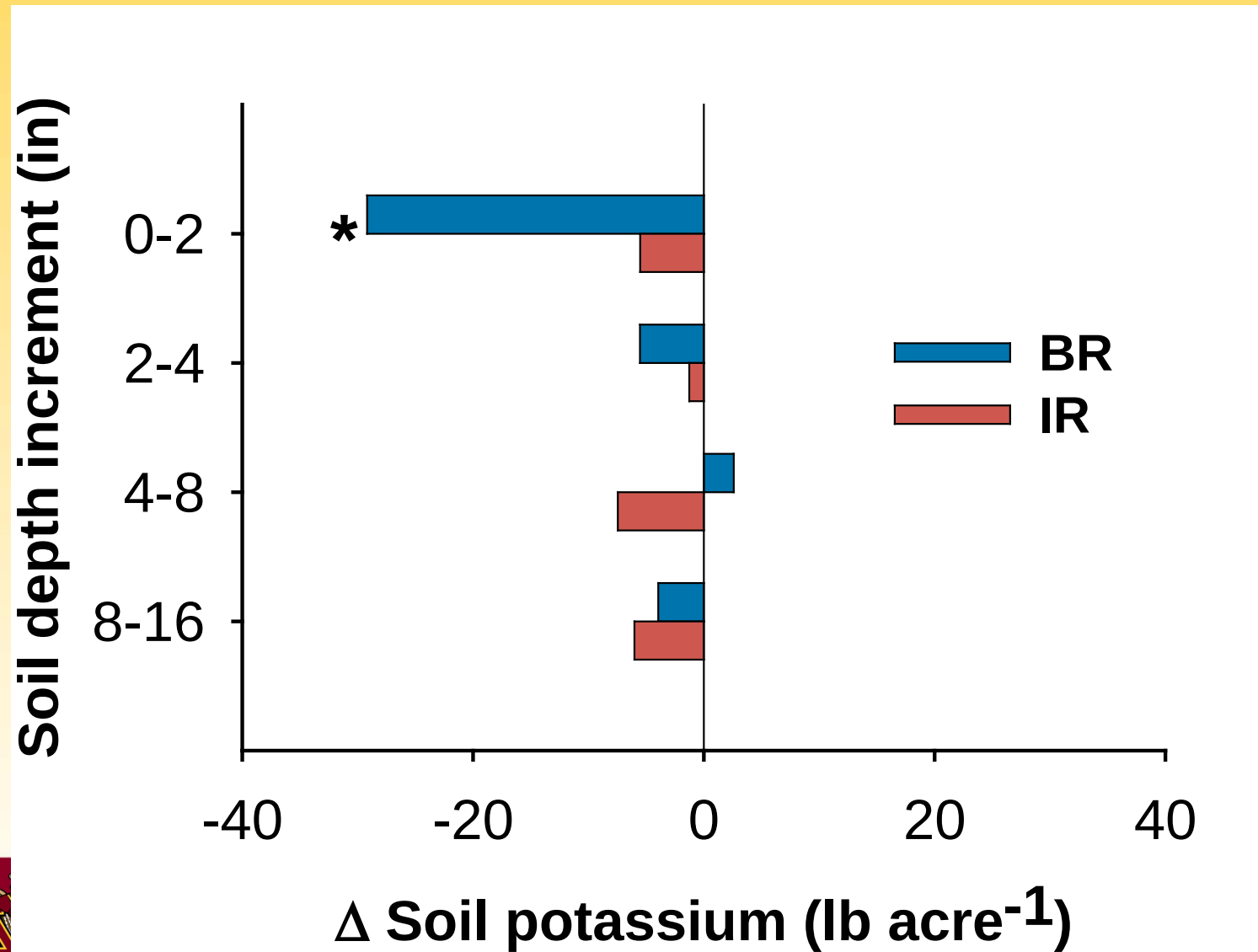
Soil Penetration Resistance (PSI)



Soil-Water Content With Respect to the Crop-Row (season average, top 16 in)



In-Season Soil K Change, V12-R2 ($\pm 70\%$ of K)

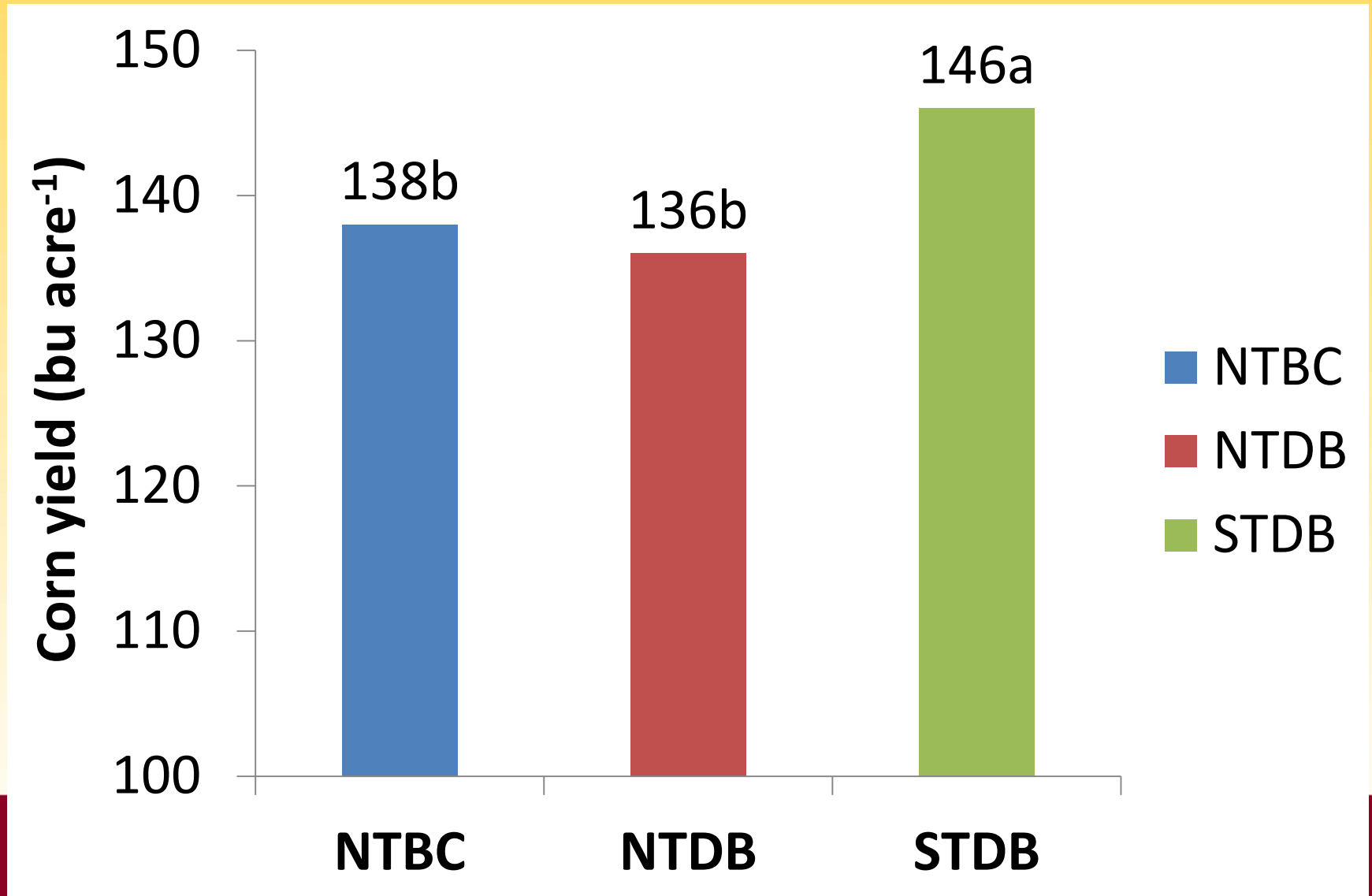


Efficiency

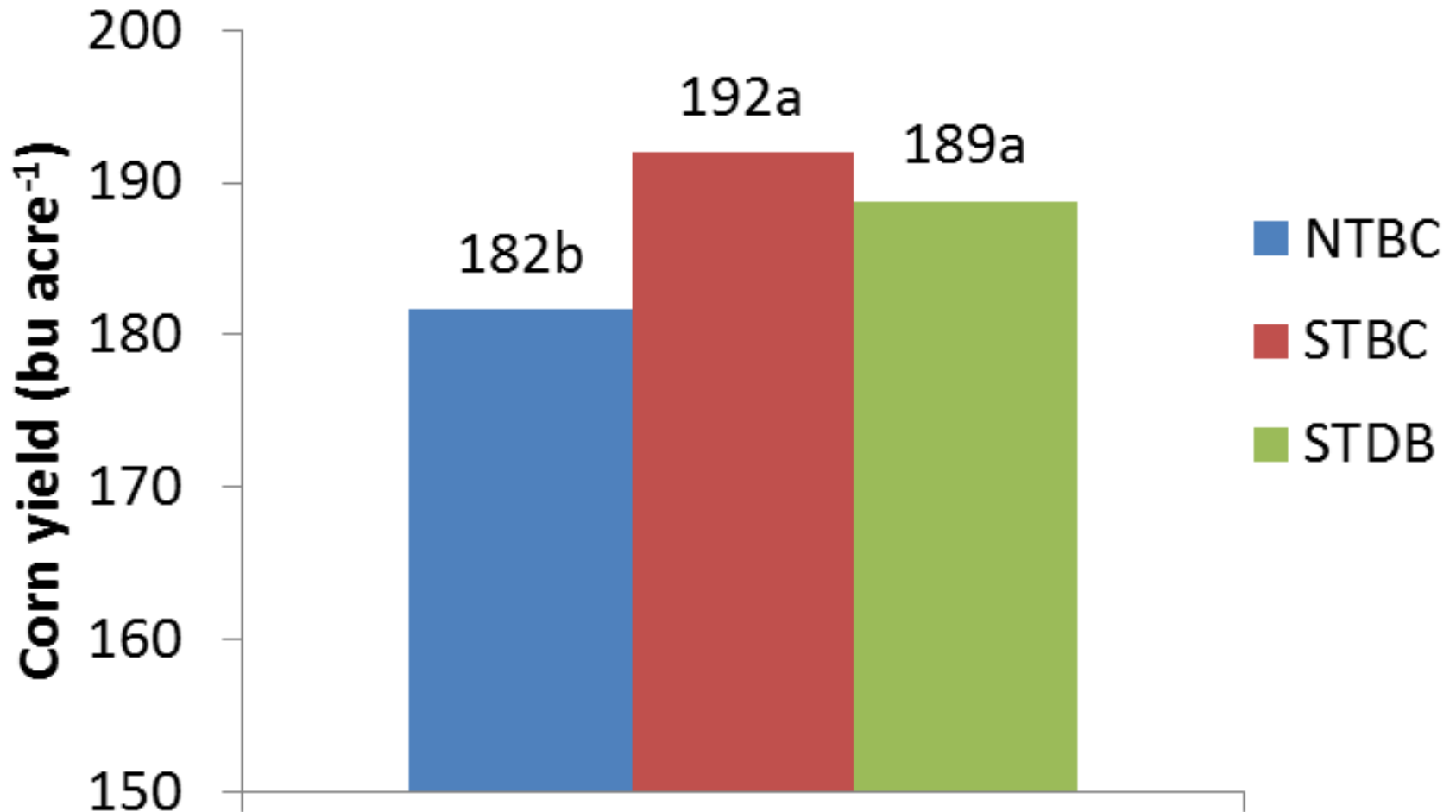
Tillage/fert. placement	RSD	Apparent uptake rate	
		P	K
	$\text{cm}^2 \text{ cm}^{-3}$	$\text{—mg m}^{-2} \text{ day}^{-1}\text{—}$	
NTBC	0.47a	3.02b	26.58b
STDB	0.40b	3.74a	32.67a



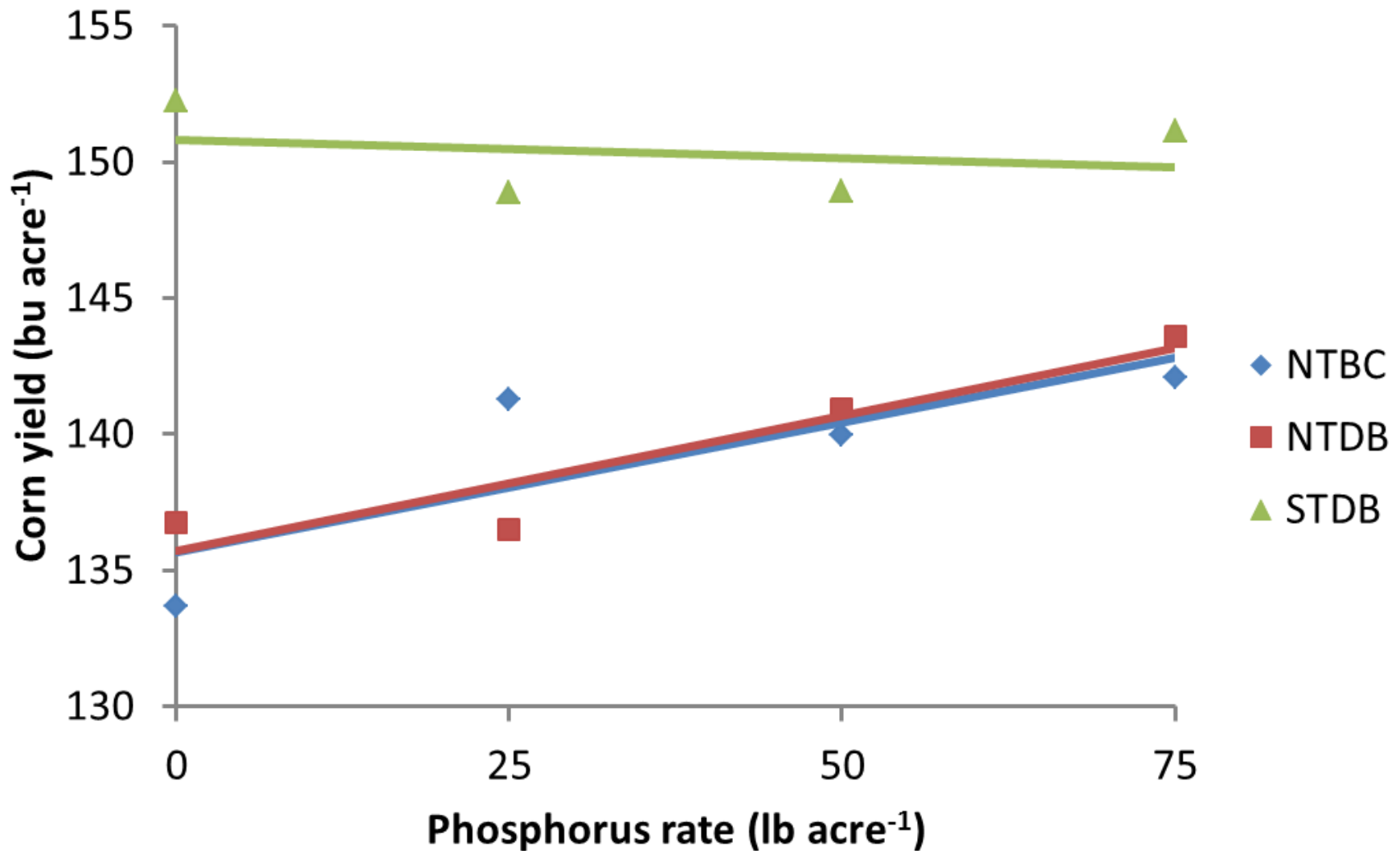
Strip-Till Vs. No-Till, Research Farm



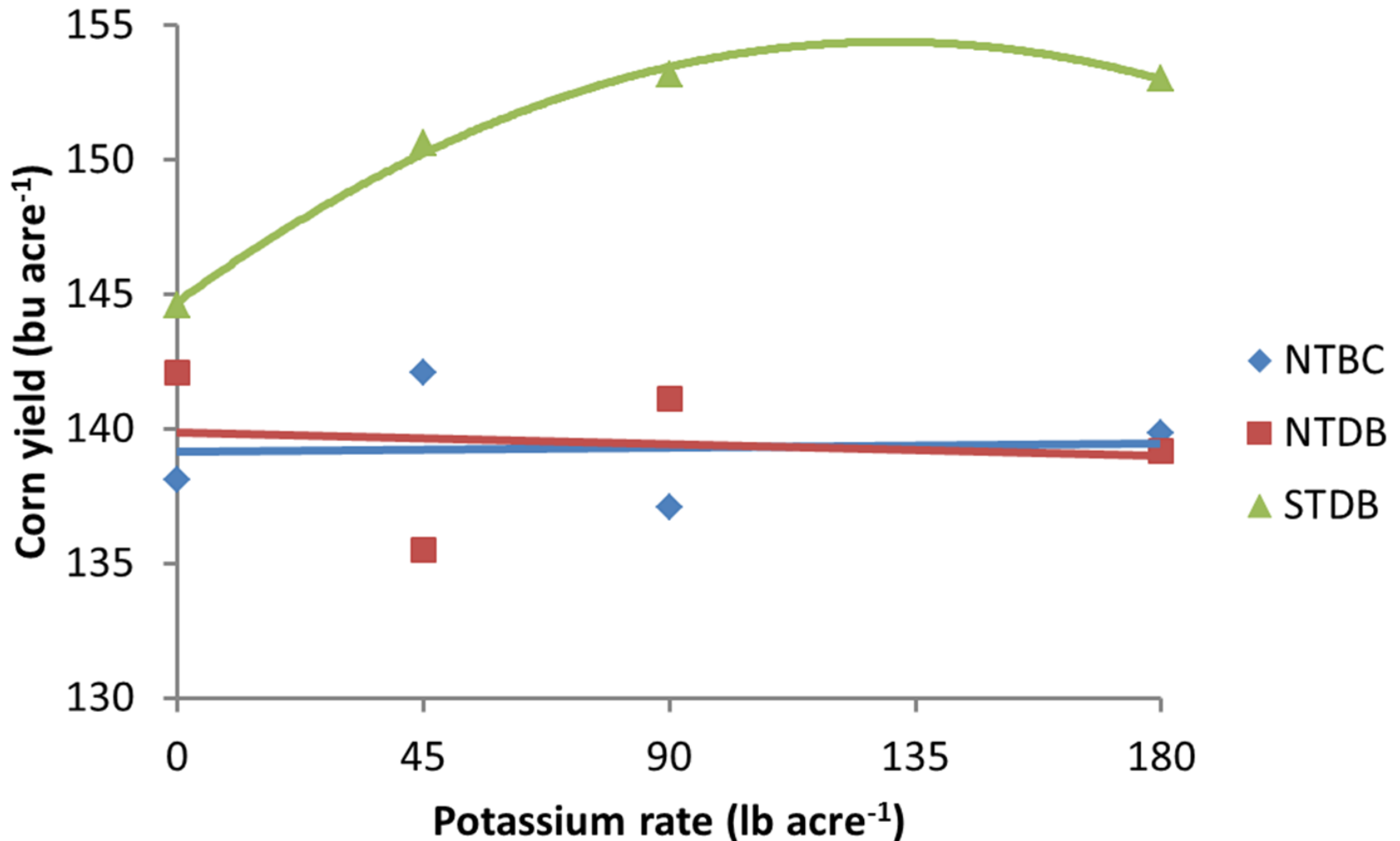
Strip-Till Vs. No-Till, Farmer Field



Can Rate be Reduced with Band Applications?



Can Rate be Reduced with Band Applications?



Soil Testing When P & K are Banded



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10 ft

Row

$\frac{1}{2}$
15

$\frac{1}{4}$ $\frac{3}{4}$
7.5 22.5

30 in

10 ft



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10 ft

10 ft

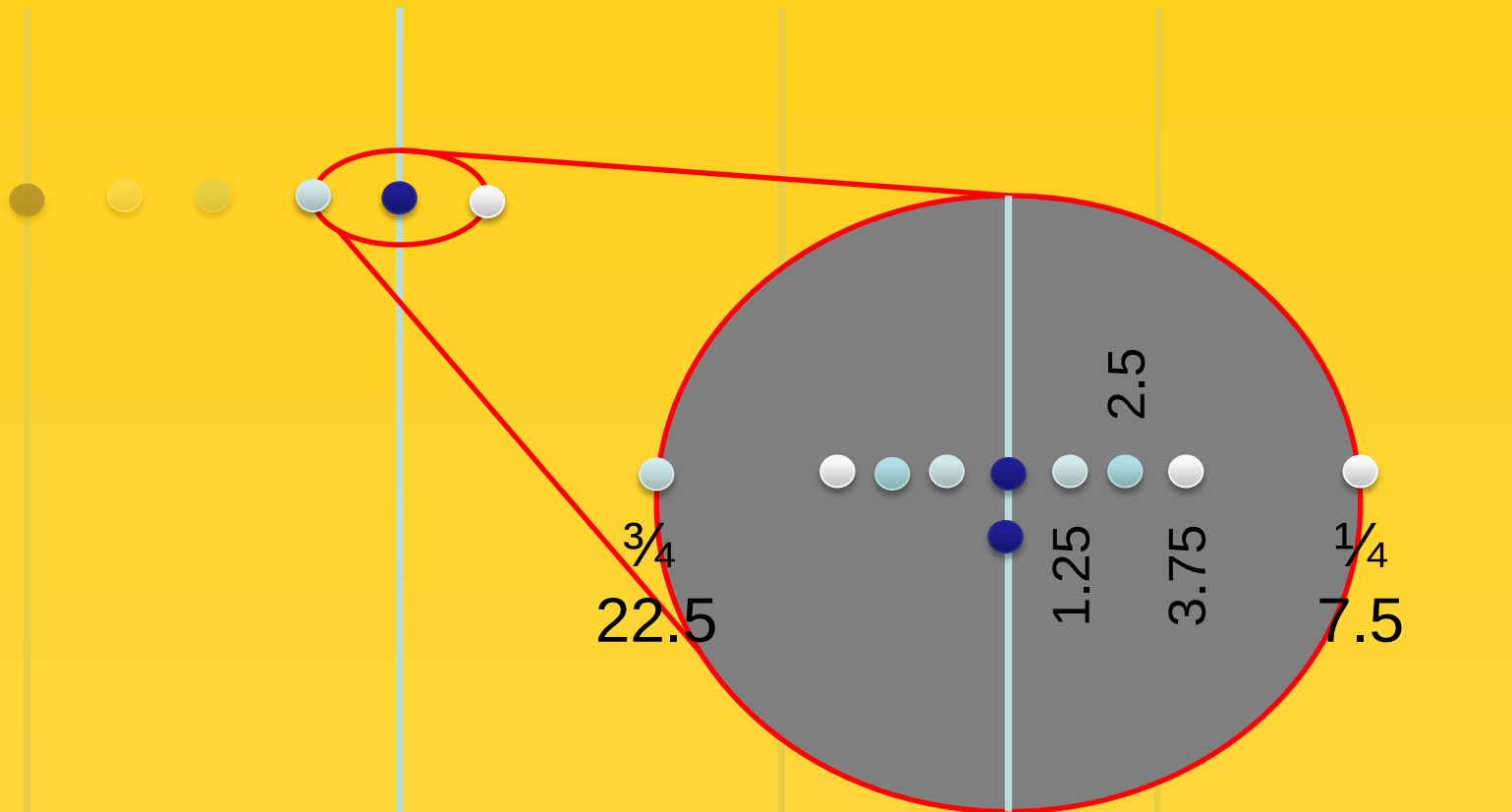


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10 ft



10 ft

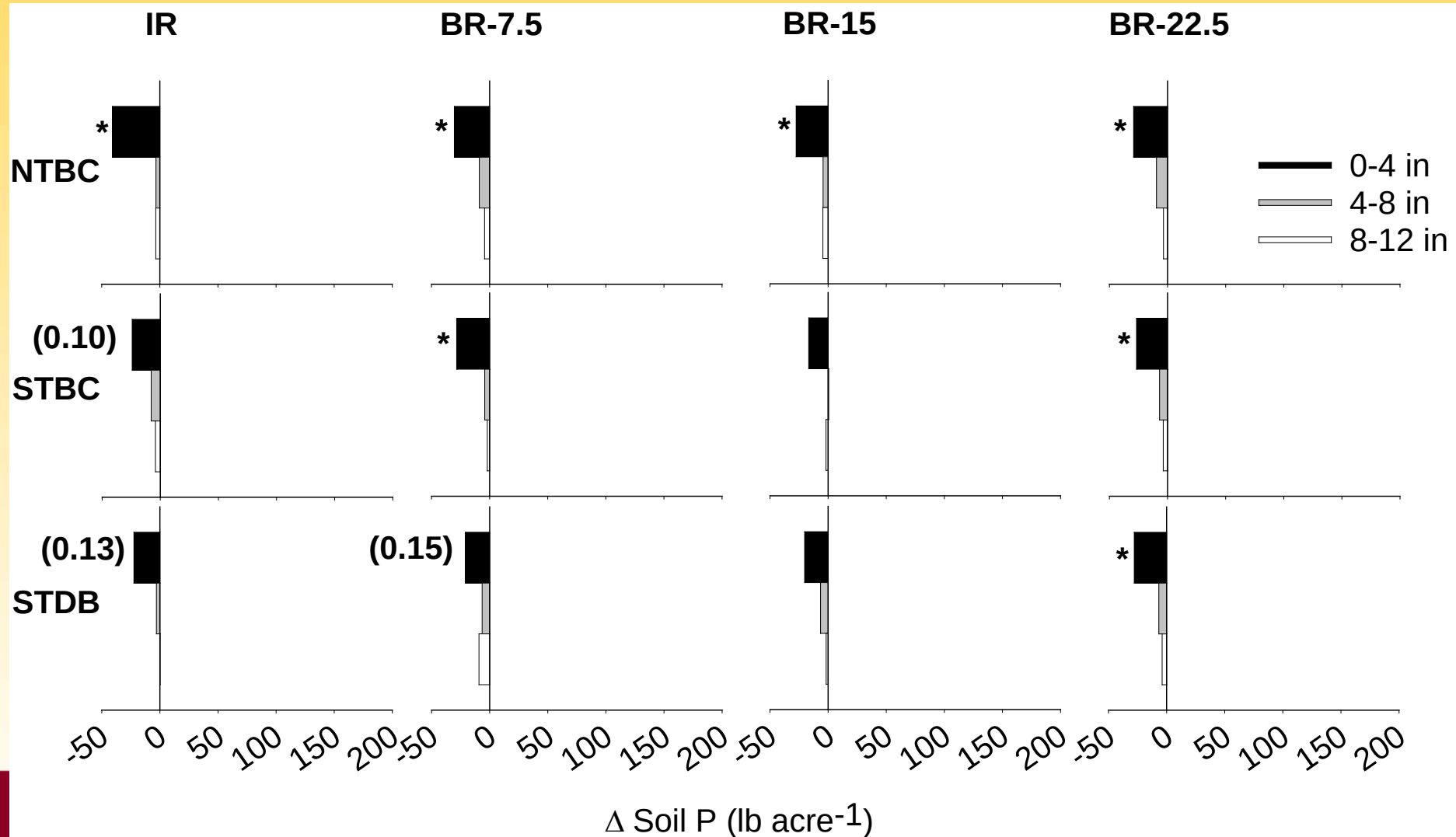


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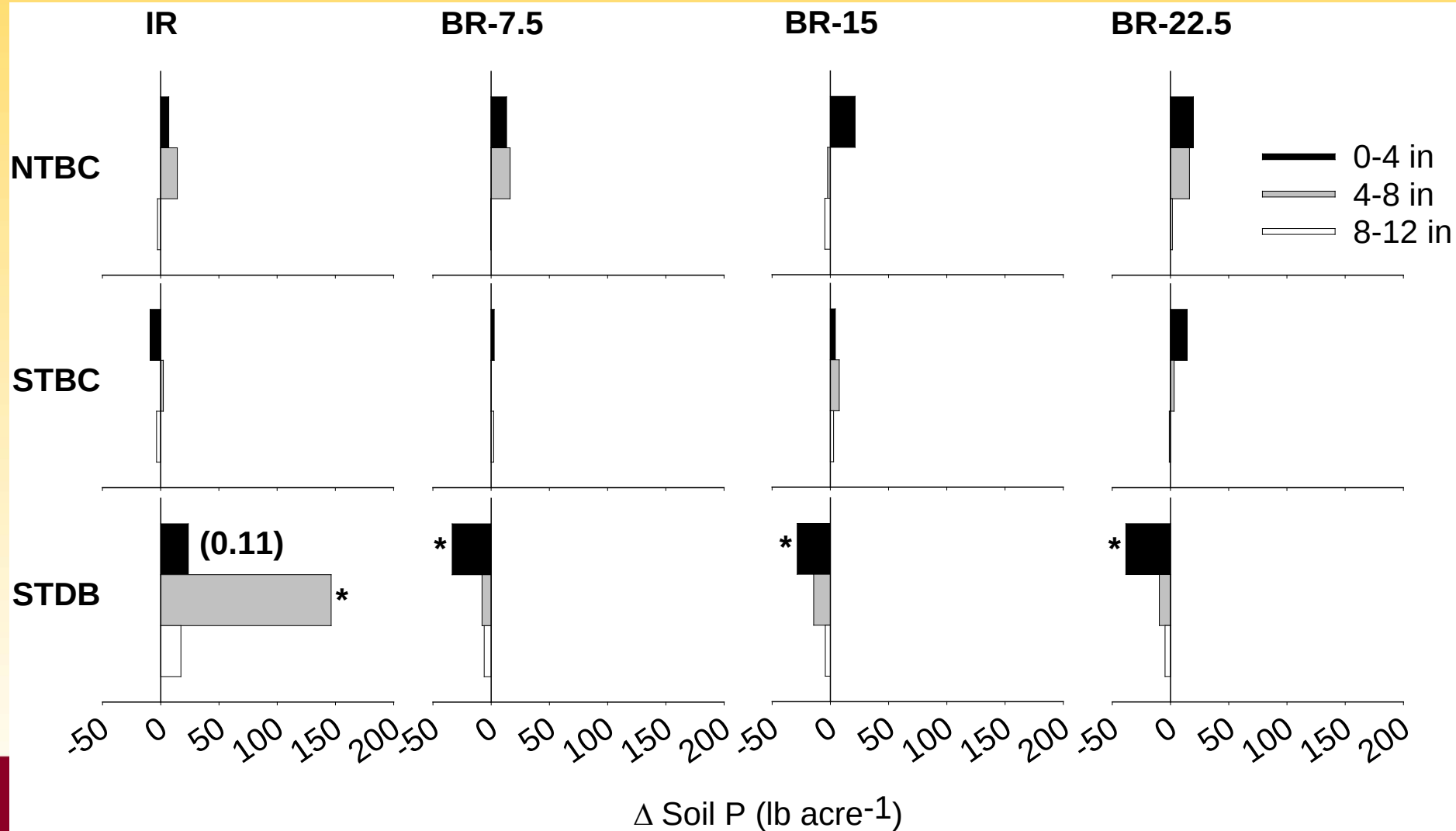


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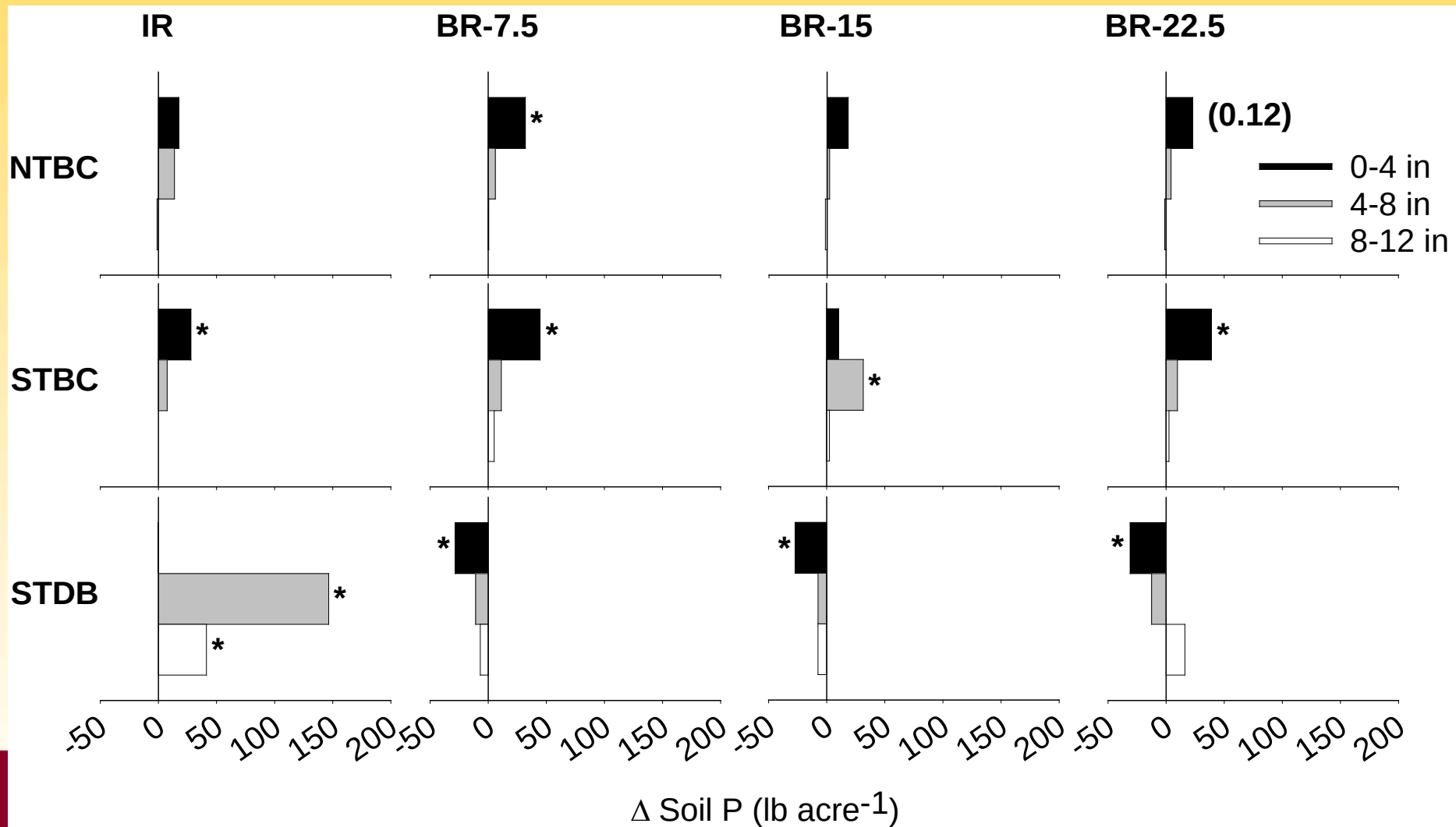
Check (0 lb P_2O_5)



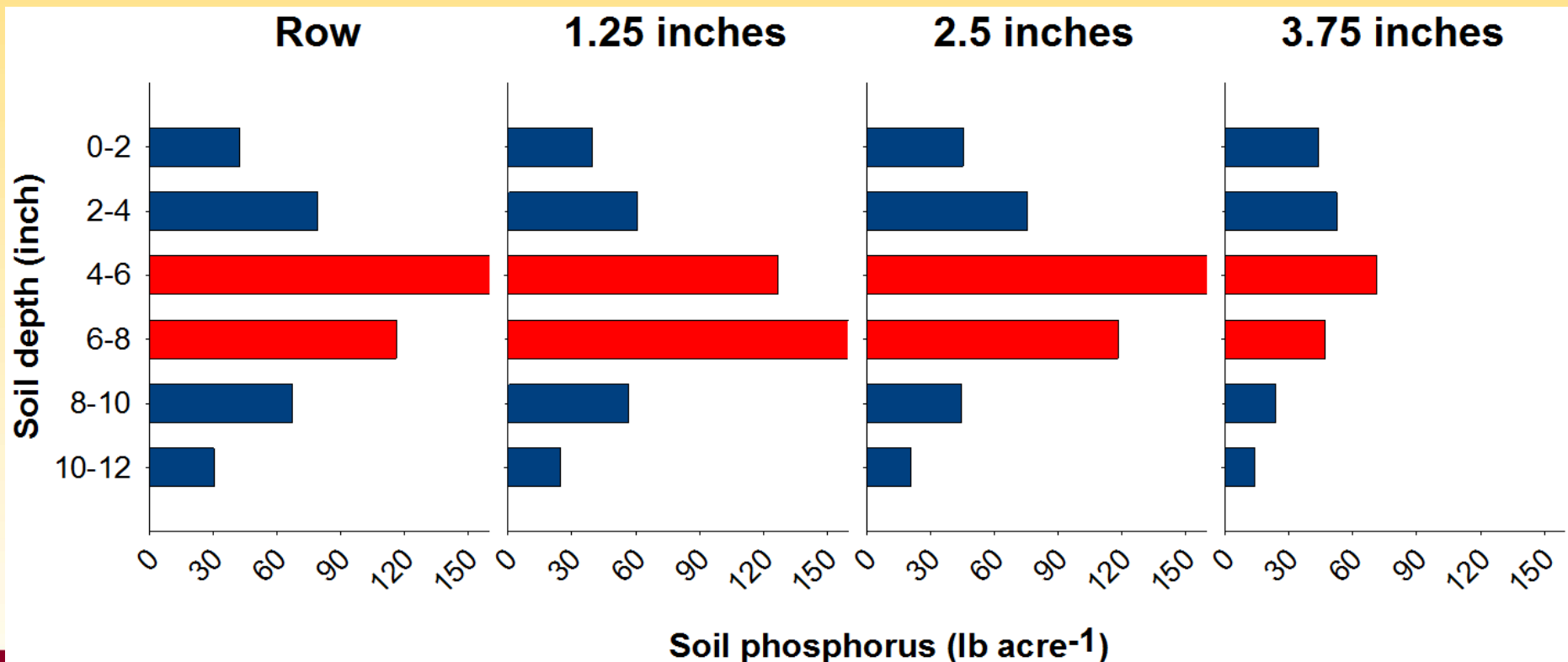
Maintenance (115 lb P_2O_5)



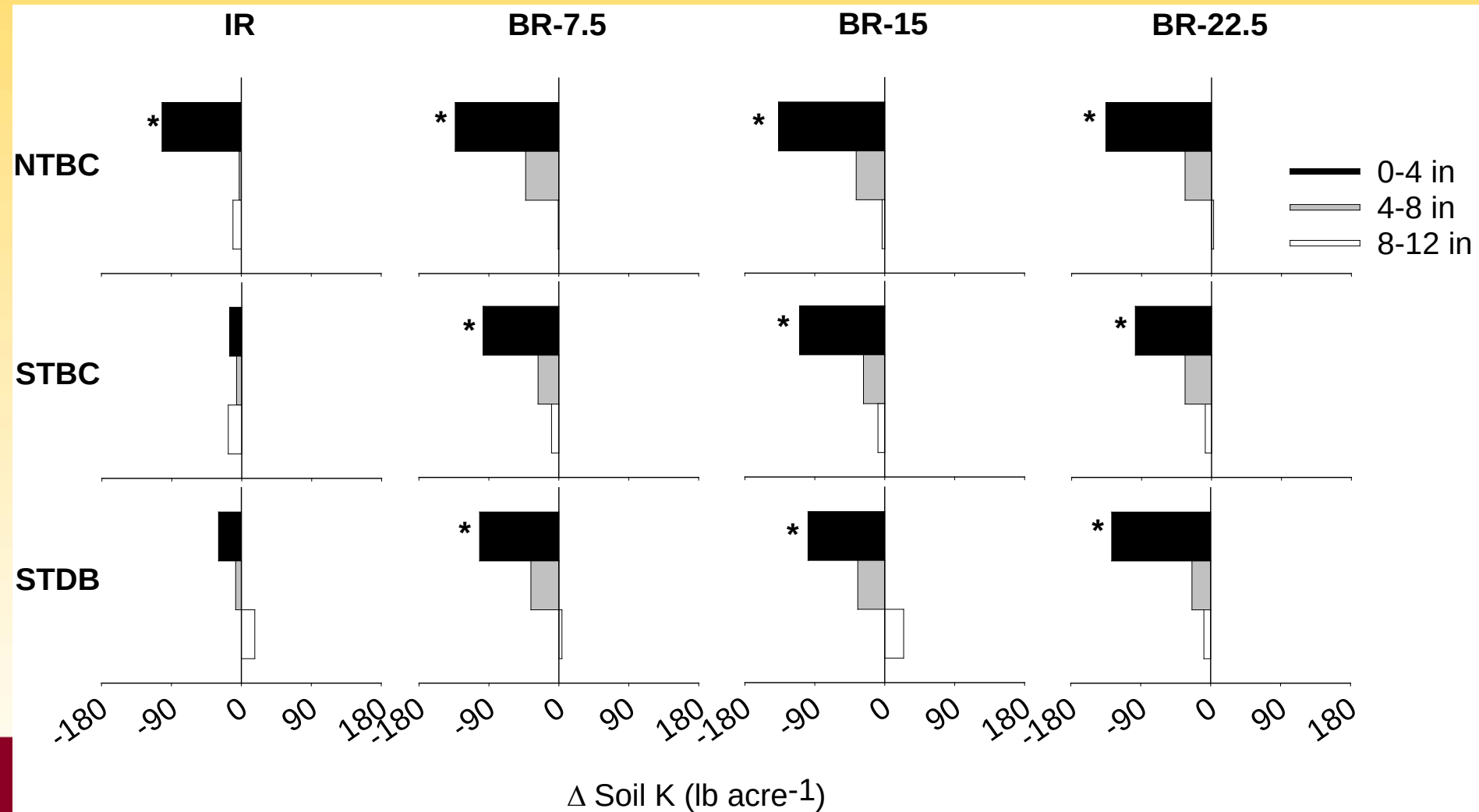
Highest Rate (161 lb P₂O₅)



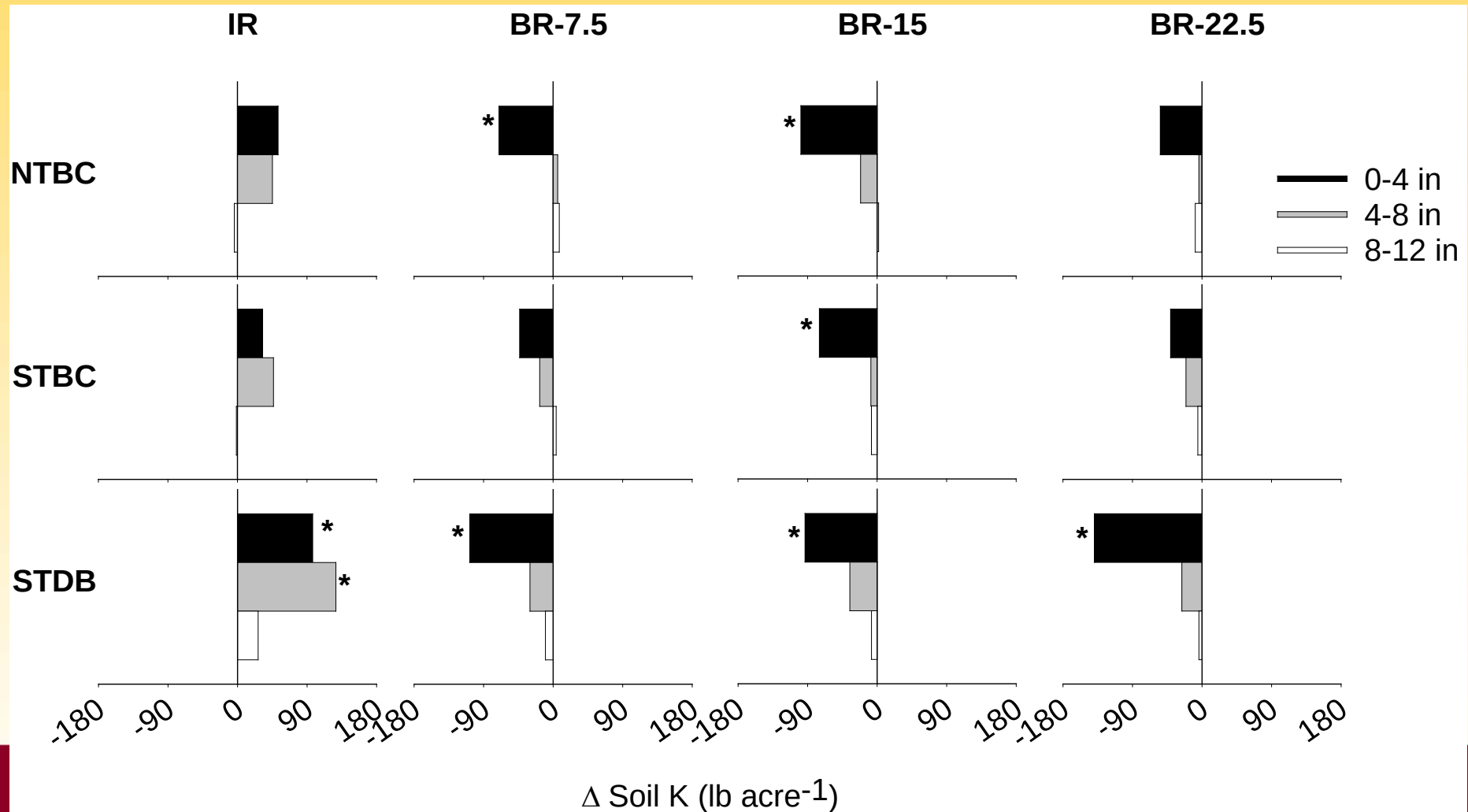
Small-Scale Fertilizer Movement/Application Variability (STDB, 161 lb P₂O₅)



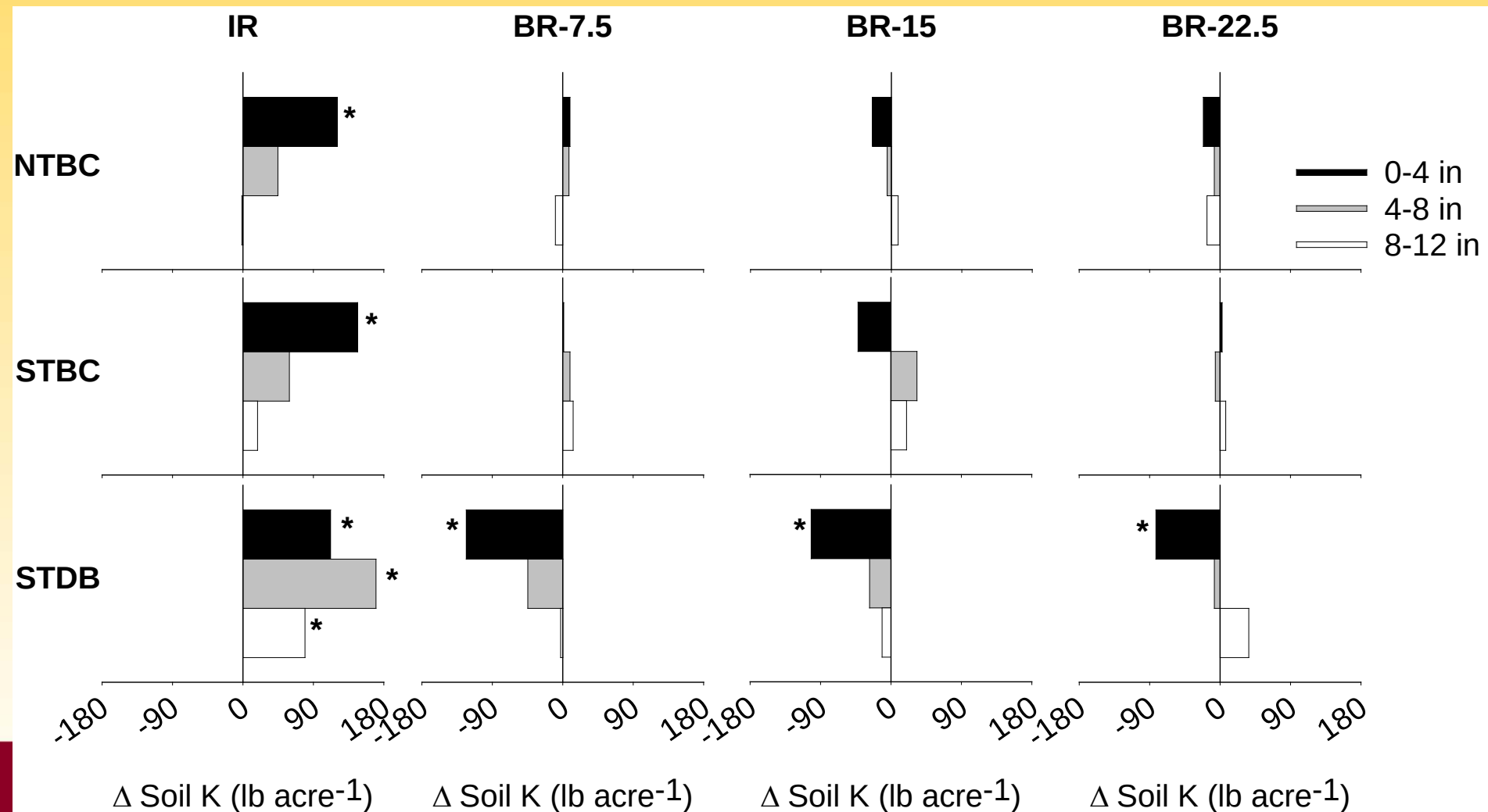
Check (0 lb K₂O)



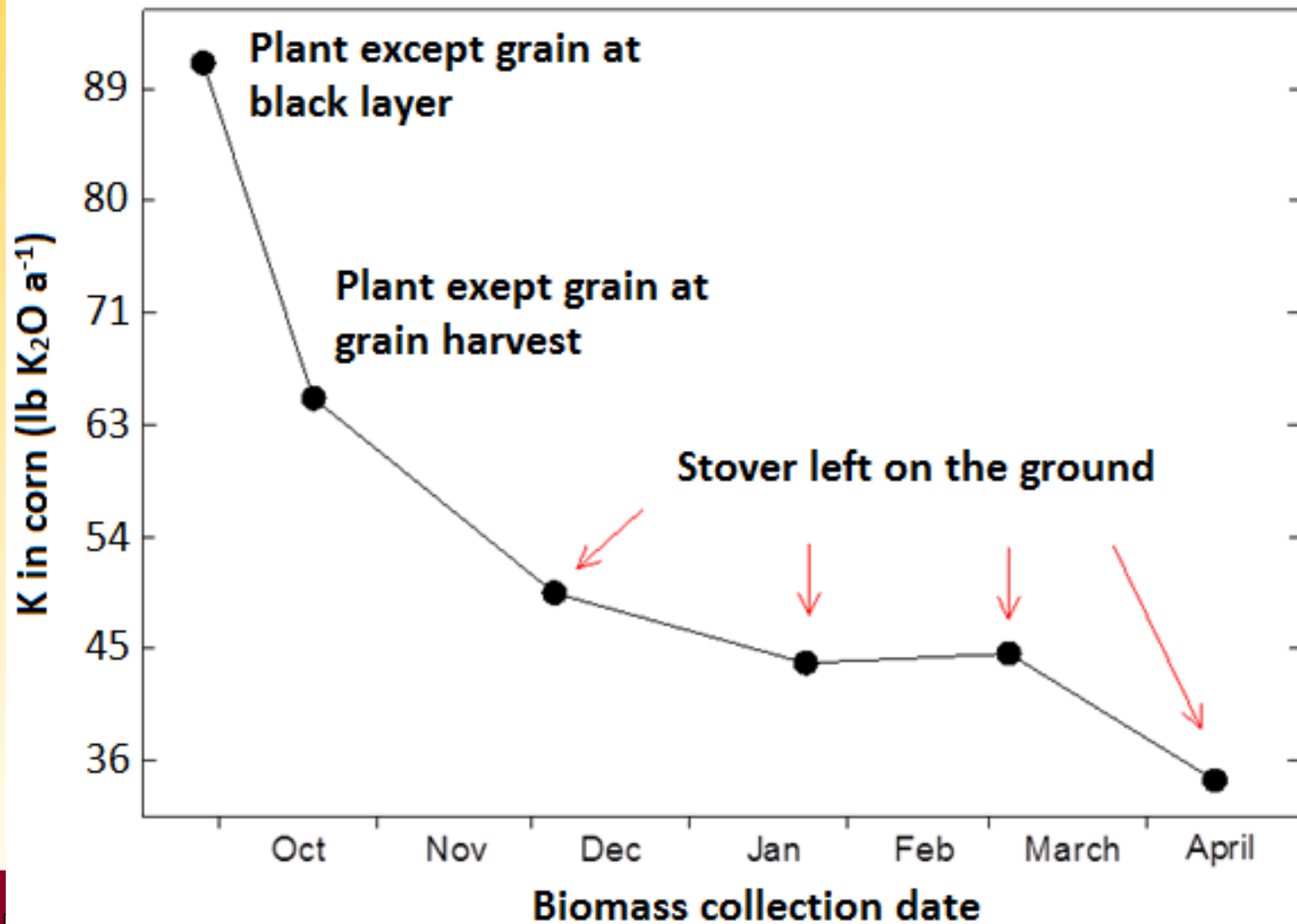
Maintenance (115 lb K₂O)



Highest Rate (161 lb K₂O)



Nutrient in Crop Residue



How to Quantify P and K Fertility In Fields With Band Applications



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P&K	"True"	STBC				
	1:3	1:3	1:2	1:1	1:0	0:3
lb acre ⁻¹	lb P acre ⁻¹					
0	23	35	34	33	29	37
46	41	39	38	38	36	39
69	39	42	41	39	32	45
92	32	44	43	41	35	46
115	51	48	48	46	41	51
138	47	60	59	56	47	65
161	52	66	65	64	61	67
	lb K acre ⁻¹					
0	256	250	254	262	287	237
46	279	264	271	285	327*	243
69	285	295	304	322*	374*	269
92	270	271	276	285	314*	257
115	302	293	300	313	353*	273
138	315	301	309	325	375*	276
161	310	322	329	344	385*	298

P&K	“True”	STDB				
	1:3	1:3	1:2	1:1	1:0	0:3
lb acre ⁻¹	lb P acre ⁻¹					
0	23	24	24	23	21	25
46	41	30	33	38	52	23*
69	39	39	42	49	70*	28*
92	32	49*	58*	74*	125*	24
115	51	50	59	76*	128*	24*
138	47	51	60	77*	133*	25*
161	52	45	53	67	111*	23*
	lb K acre ⁻¹					
0	256	239	243	249	269	230*
46	279	262	271	288	340*	236*
69	285	276	286	306	366*	246*
92	270	297*	309*	335*	411*	259
115	302	292	306	335*	422*	249*
138	315	323	343*	382*	498*	265*
161	310	306	323	357*	460*	254*

Take Home Message

- Don't take shortcuts when taking soil samples
- Adequate P and K levels are more important than fertilizer placement
- Tillage and not P and K placement had an important effect in corn and soybean yields in our studies
- No evidence that P and K rates can be reduced when banding the fertilizer
- When P and K are banded, for each core taken in the fertilizer band, 2-3 cores need to be taken away from the band



Nitrogen Minnesota's Grand Challenge & Compelling Opportunity Conference

Friday March 6, 2015

**Best Western Plus Kelly Inn
St. Cloud, MN**

**100 4th Avenue South
St. Cloud, Minnesota 56301**

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 **Minnesota Department
of Agriculture**

<http://z.umn.edu/Nconference>

Registration Opens at 8:00 am

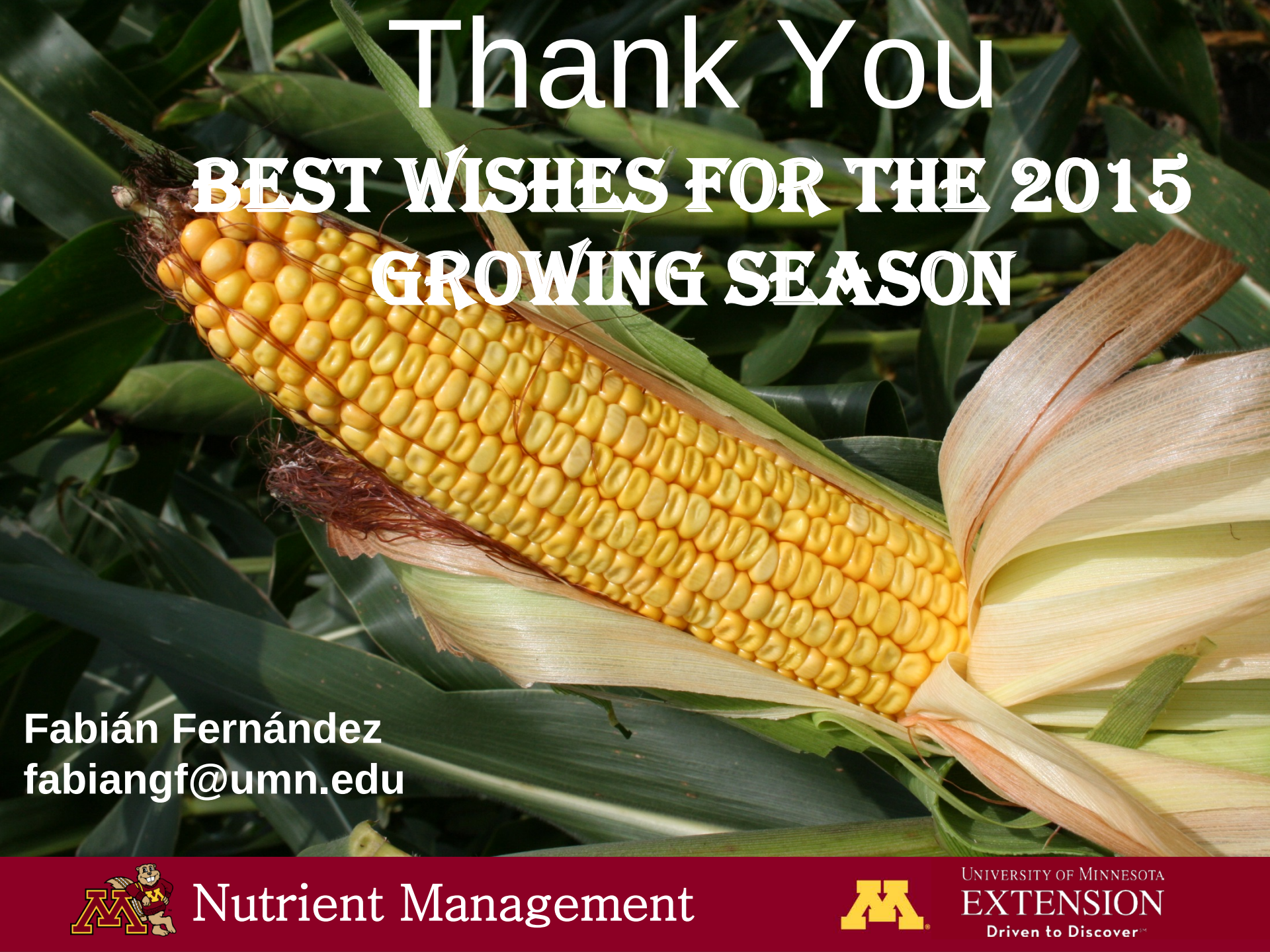
Morning Sessions 9:00 am – 12:25pm

		Speaker	Organization
9:00-9:05	Welcome	Dr. Fabián Fernández	University of Minnesota
9:05-9:55	Nitrogen Market Update	Dr. Robert Mullen	Potash Corp
9:55-10:45	Climate Trends And Their Implications	Dr. Mark Seeley	University of Minnesota
10:45-11:35	Irrigated Corn N Guidelines - What Are They And Where Did They Come From?	Dr. John Lamb	University of Minnesota
11:35-12:25	Can We Protect Groundwater Supplies Beneath Our Outwash Sands?	Bruce Montgomery	Minnesota Department of Agriculture

12:25-1:15 Lunch *(provided by conference)*

Breakout Sessions 1:15 pm – 3:45 pm

		Speaker	Organization
Breakout Session 1. Predicting Nitrogen In-Season			
1:15-2:05	Database-Driven Guidelines To Manage Nitrogen Rate Decisions	Dr. John Sawyer	Iowa State University
2:05-2:55	Utility Of Sensor Technology For Making In-Season Recommendations For N	Dr. Daniel Kaiser	University of Minnesota
2:55-3:45	Opportunities And Challenges When Applying Nitrogen In-Season	Dr. Fabián Fernández	University of Minnesota
Breakout Session 2. Nitrogen Credits			
1:15-2:05	Manure Management To Minimize Nitrogen Loss And Improve Crop Use Efficiency	Kevan Klingberg	University of Wisconsin
2:05-2:55	Nitrogen Management For First- And Second-Year Corn Following Alfalfa	Dr. Jeffrey Coulter	University of Minnesota
2:55-3:45	Interseeded Cover Crops In Corn-Based Cropping Systems	Dr. Scott Wells	University of Minnesota
Breakout Session 3. Nitrogen Management for Sandy Soils			
1:15-2:05	Nitrogen Fertilizer Use Efficiency For Corn And Its Relationship To Groundwater Quality	Dr. Richard Ferguson	University of Nebraska
2:05-2:55	Evaluation Of Nitrogen Technologies For Sandy Soils	Dr. Carl Rosen	University of Minnesota
2:55-3:45	Fertigation As A Management Tool In Irrigated Corn	Joshua Stamper	University of Minnesota



Thank You

BEST WISHES FOR THE 2015 GROWING SEASON

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