

Preferred K Placement Choices for Corn and Soybean in Conservation Tillage Systems?

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Brian Ball and Ignacio Conti**

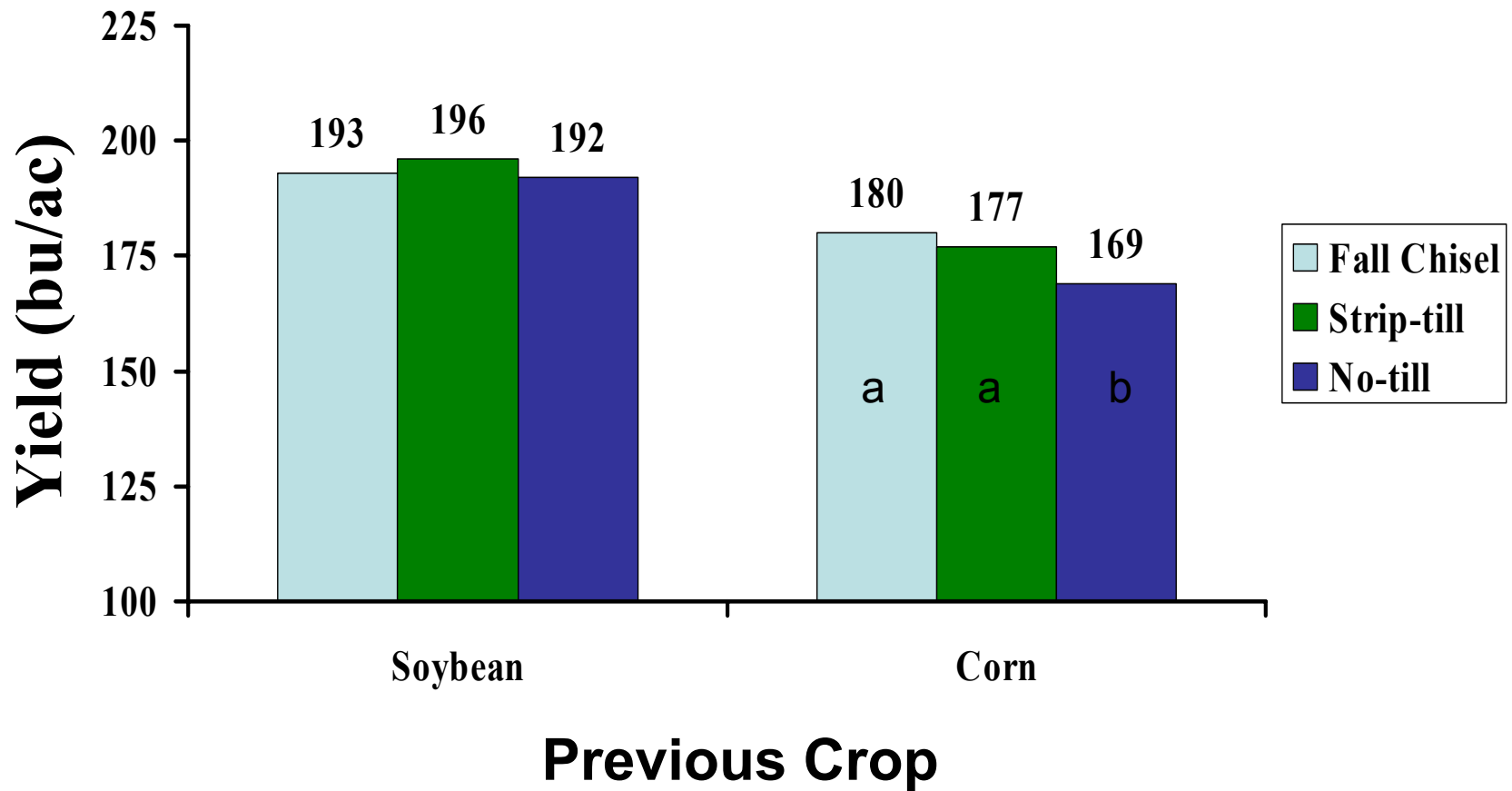
PURDUE
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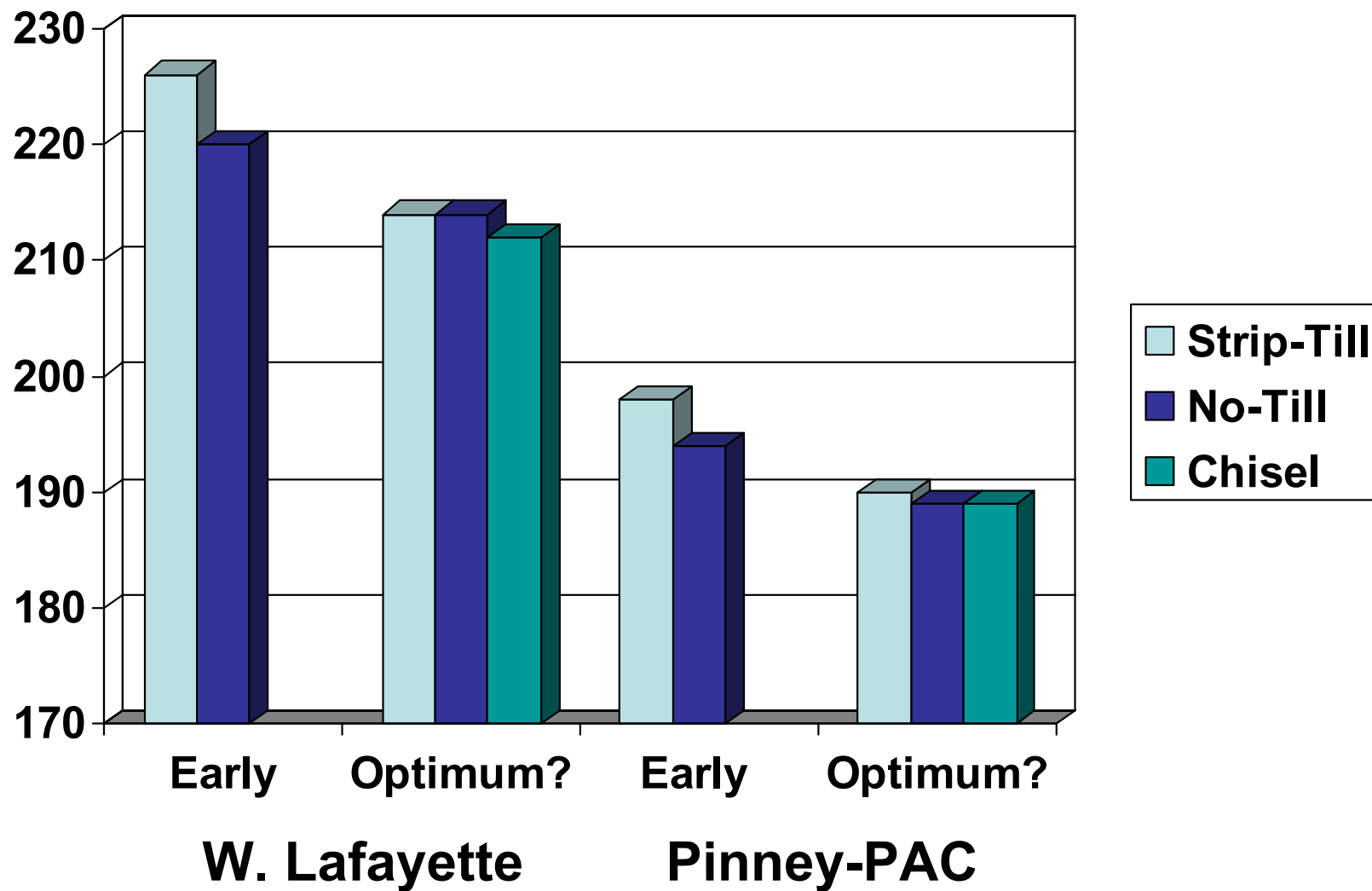
Strip Tillage with Fertilizer Banding



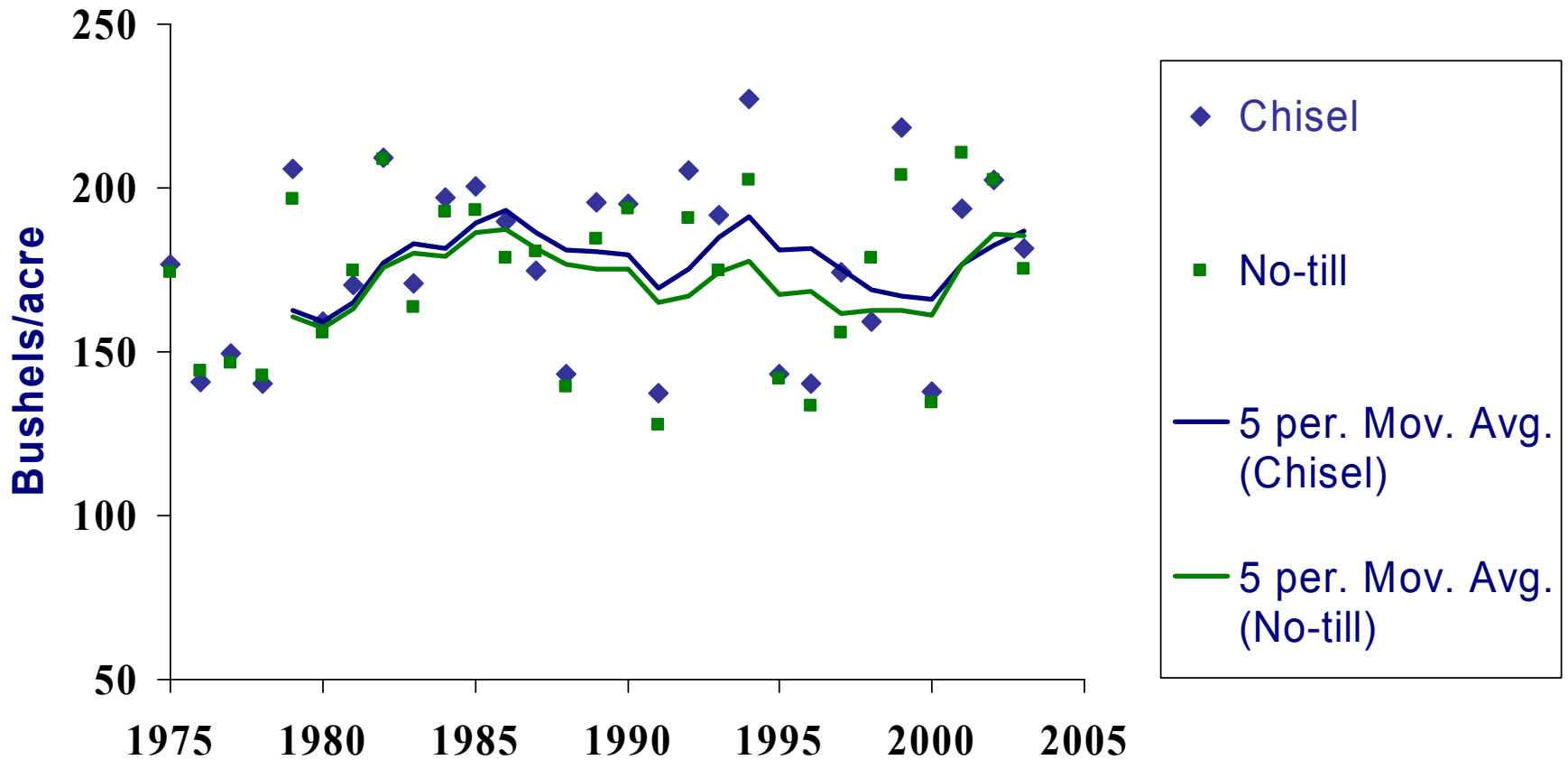
Strip Tillage for Corn in N. Indiana, Loam (2001-03)



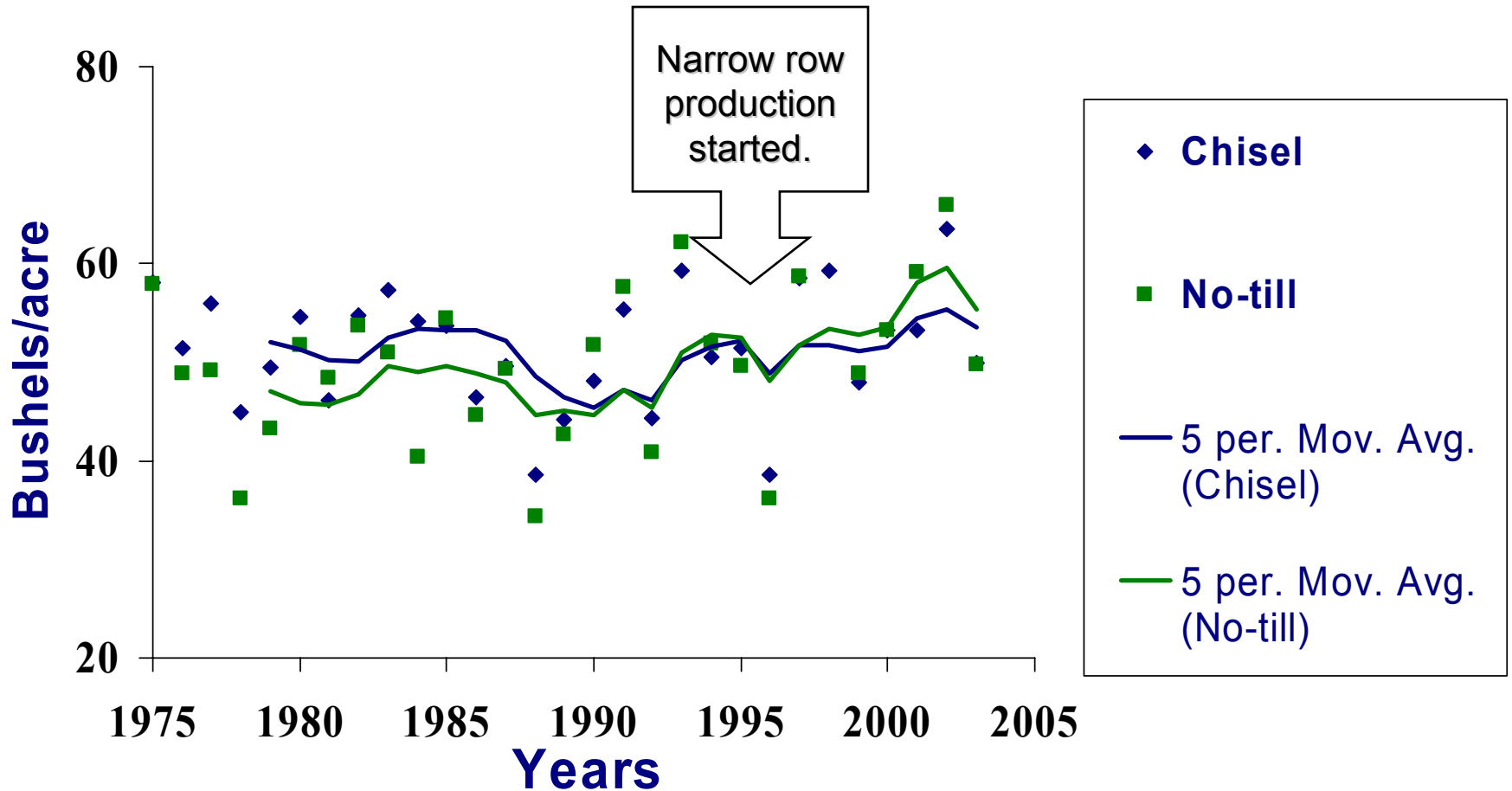
Planting Date Effects in 2003



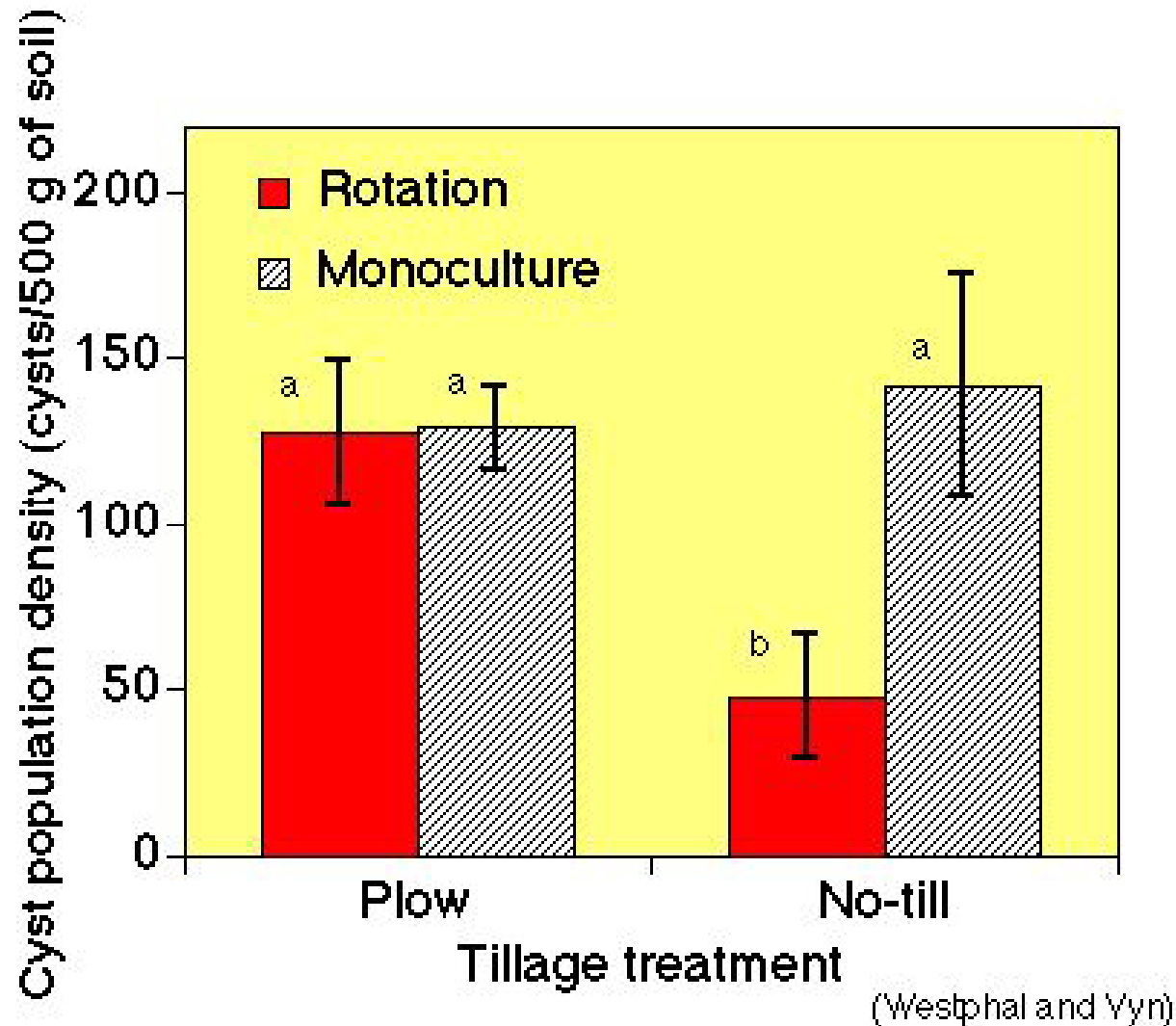
Corn Yields Following Soybeans, Chisel Vs. No-till, West Lafayette, IN, 1975-2003.



Soybean Yields Following Corn, Chisel Vs. No-till, West Lafayette, 1975-2003.



Population densities of Soybean Cyst Nematode under different crop sequences and tillage



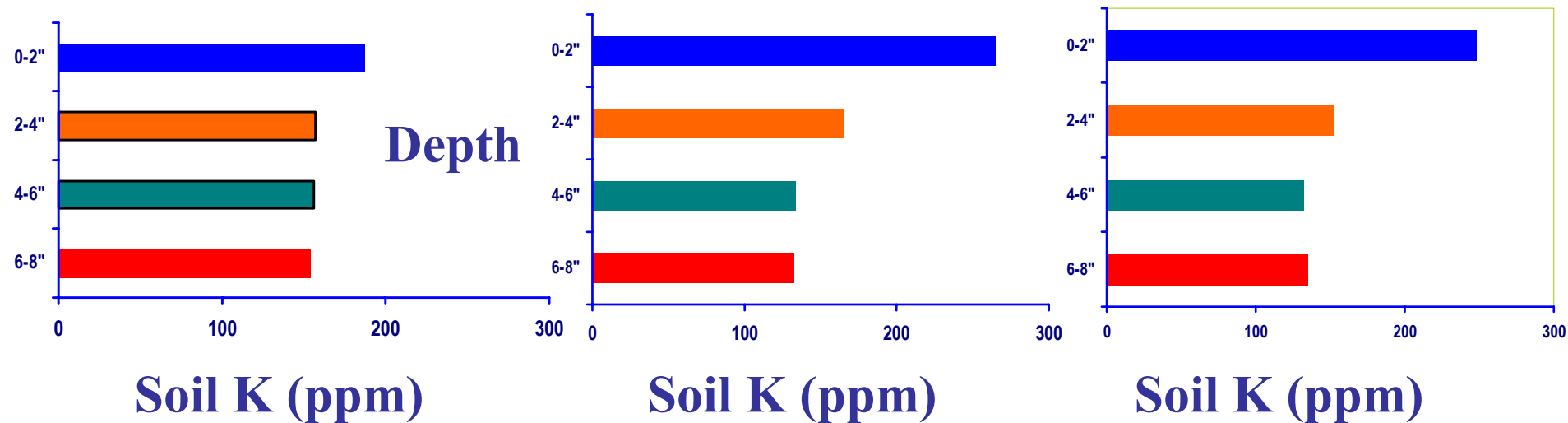
Potassium Stratification

Long-Term Tillage (IN, 1975-94)

Moldboard

Chisel

No-till



Source: Holanda et al. (1998)

Conservation Tillage Doesn't Alter K distribution appreciably



1. Does K placement Matter?
2. Implications for Management?

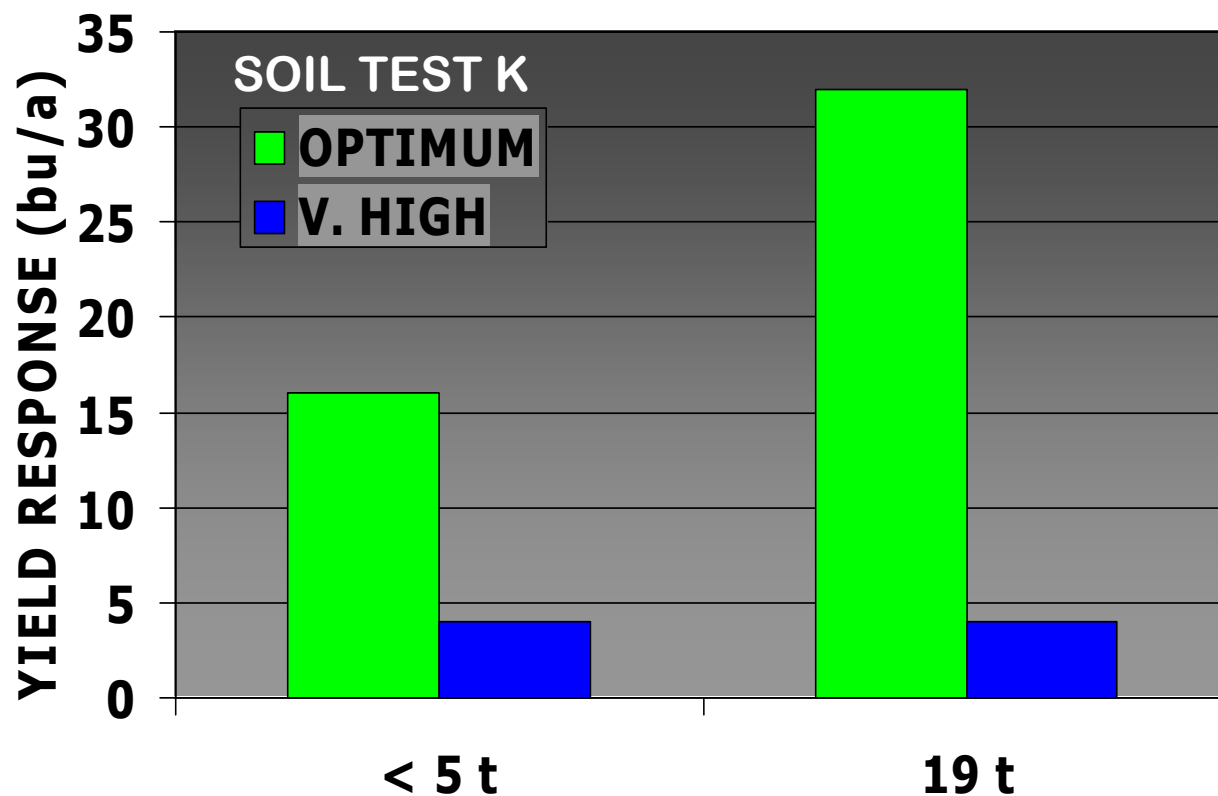


Corn Yield Response to Deep Banding in Indiana* (1984-1985)

Fertilizer Rate	Placement	Corn Yield (bu/ac)	
		No starter	Starter
15-25-50	Broadcast	144	154
	Band 5"	151	154
30-50-100	Broadcast	159	156
	Band 5"	159	160

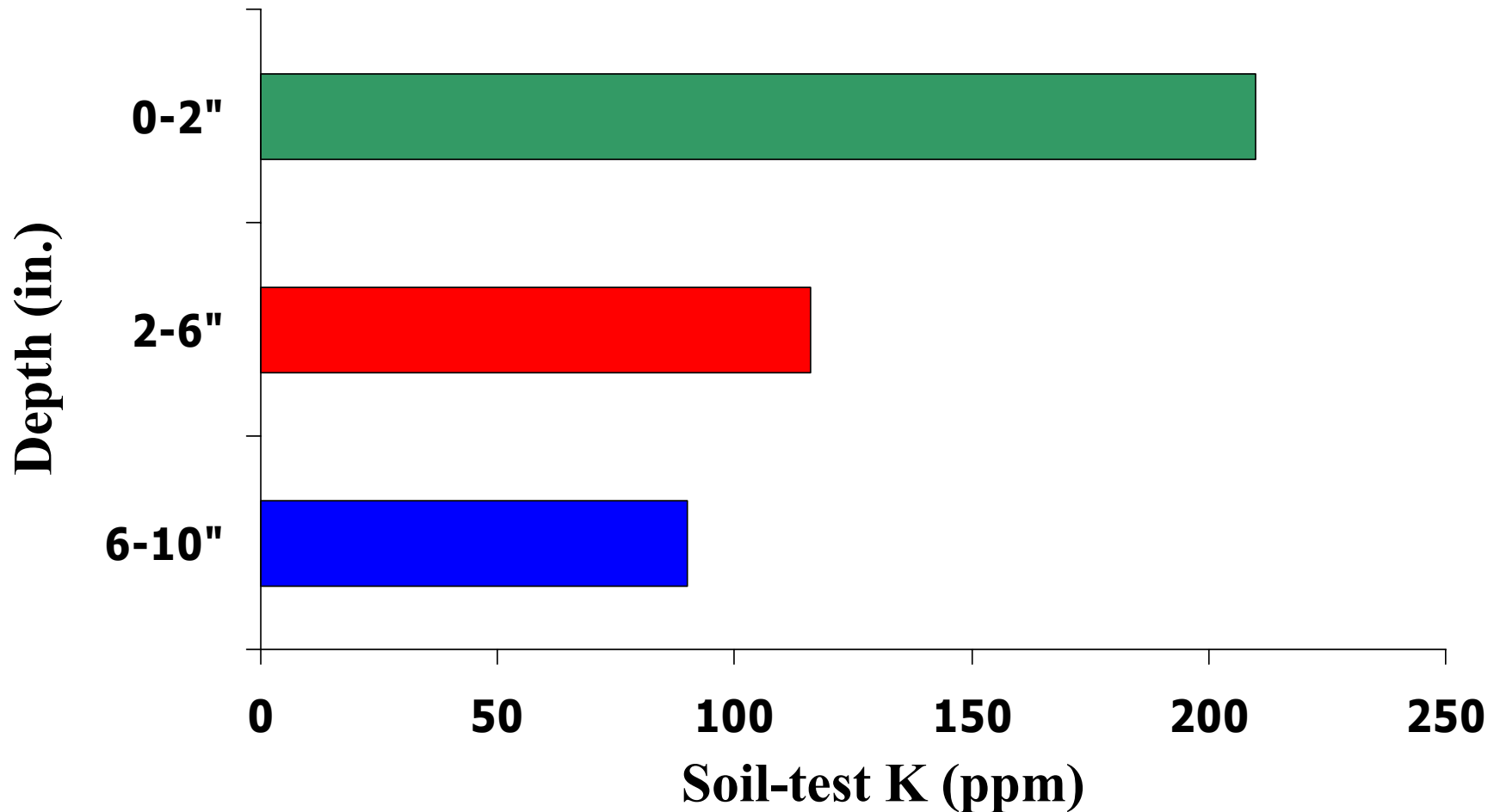
Mengel et al. 1998

RESPONSE OF CORN TO ROW-APPLIED K ON A SILTY CLAY LOAM SOIL (3 yr. avg.)



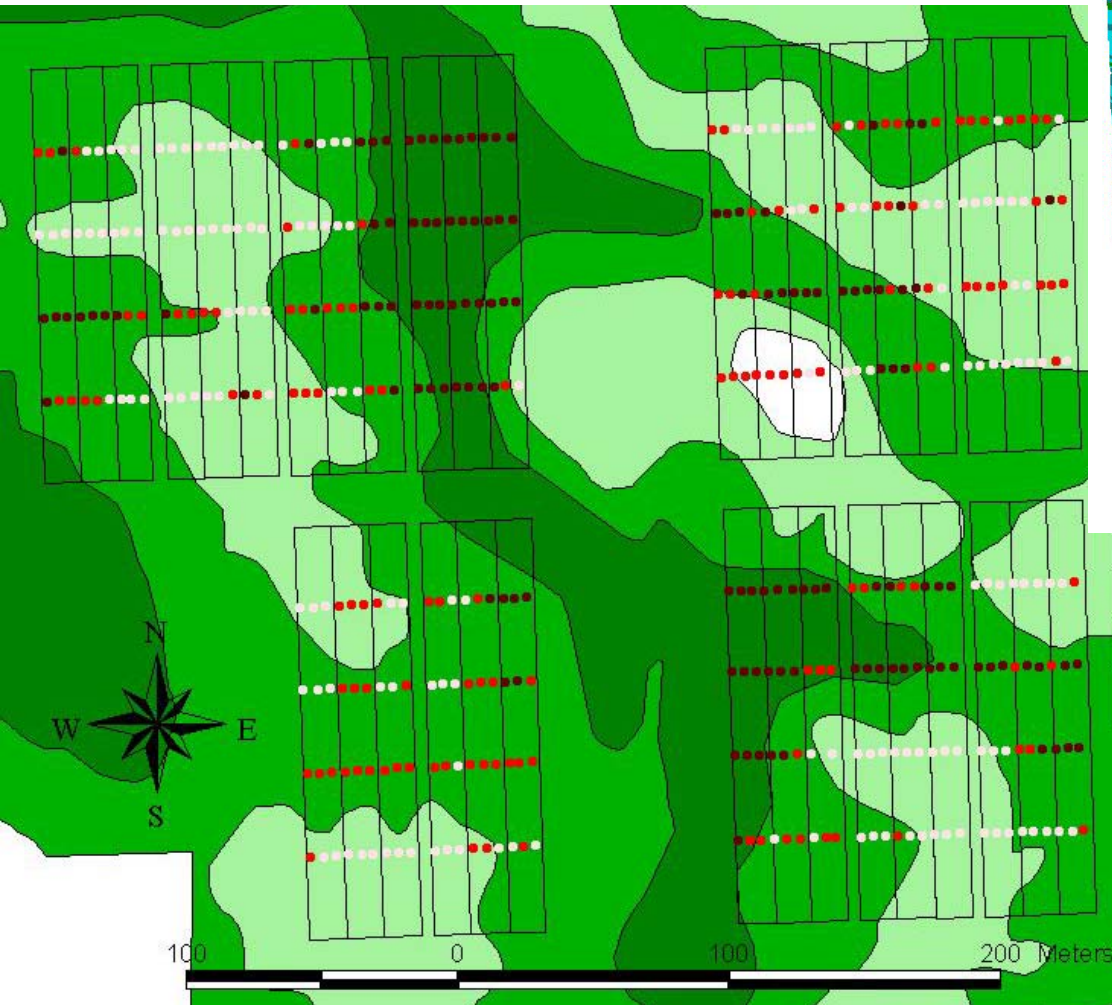
Dr. Wolkowski, UW, Oshkosh, Wis. (45 lb K₂O/a)

Mean Soil-test K Stratification at Davis-PAC

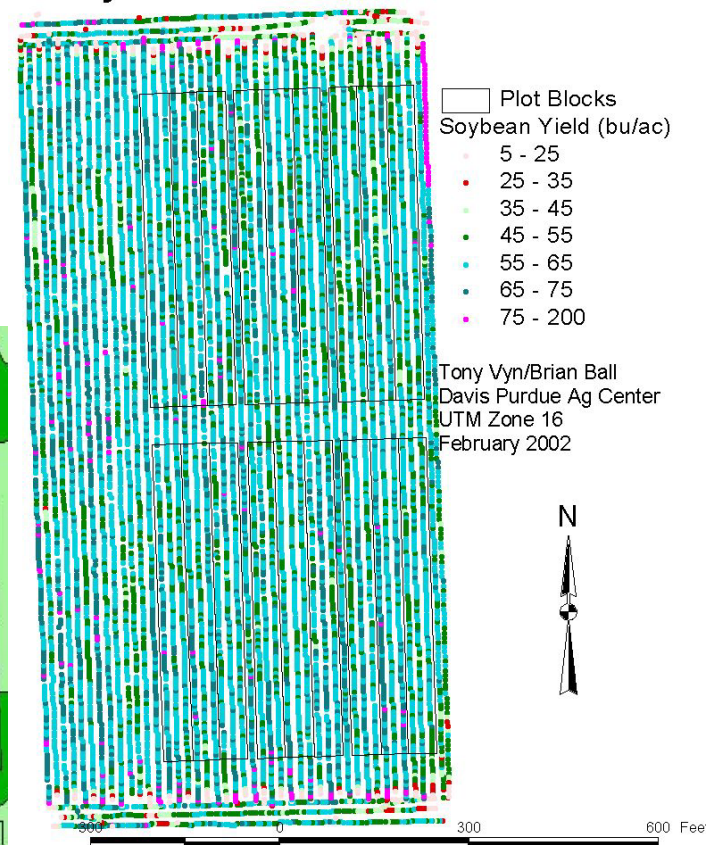


Source: Vyn et al., Better Crops #4, 2002

Placement in presence of high soil K variability?



Soybean Yields for 2001



Sample Areas

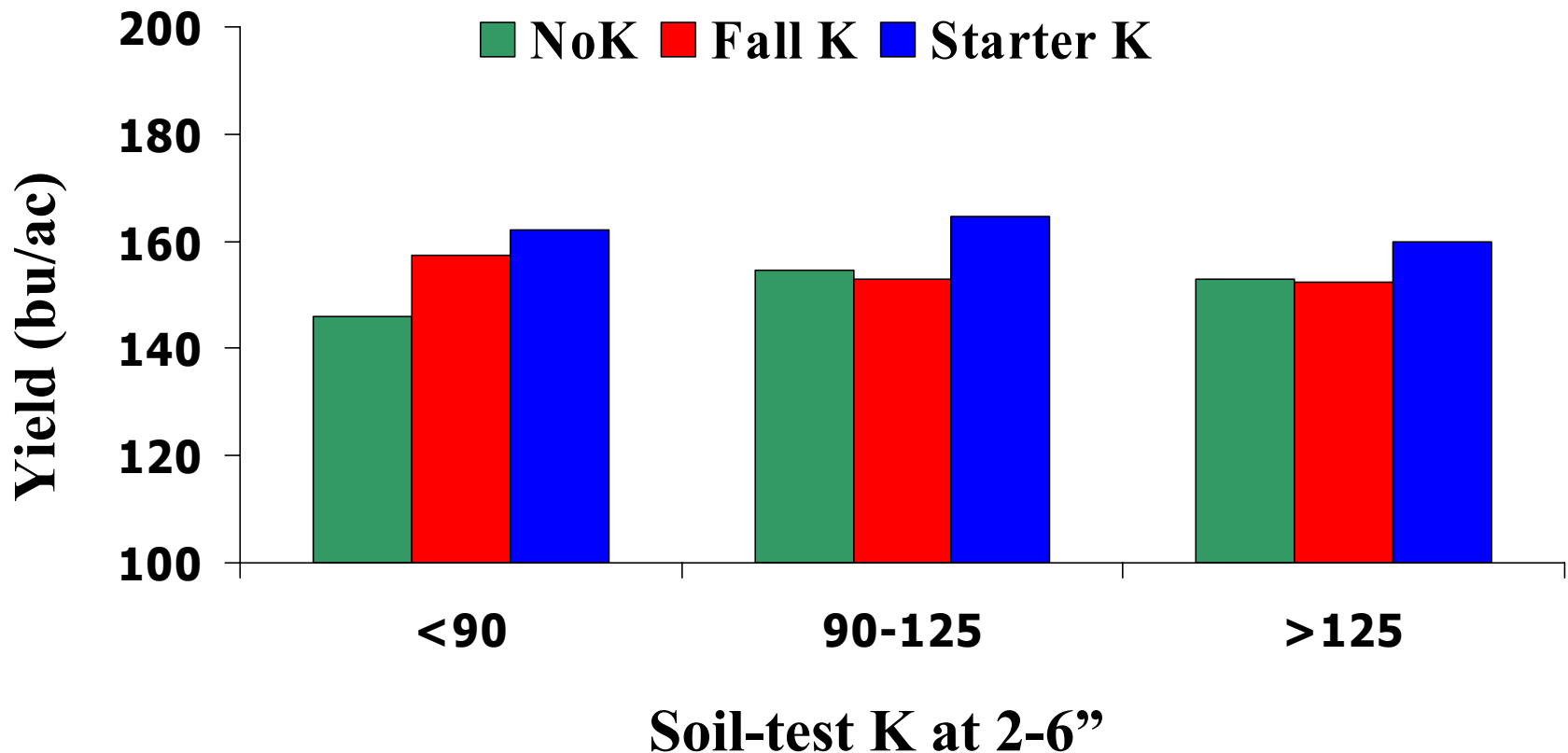
- <90 mg/kg
- 90-125 mg/kg
- >125 mg/kg

Plot Blocks

Order 1

- Condit
- Pewamo
- Blount
- Glynwood

High oil corn yields in response to K placement (Davis-PAC 2000-01)



Source: Vyn et al., Better Crops #4, 2002

No-till Soybean Height Differences at Davis PAC in 2003



No K (2000-2002)



Broadcast plus Starter K (2000,2002)

Impact of K Banding Depth in Corn?



High Yield Corn Response to Placement

Hybrids: 1. Pioneer 34B24

2. Pioneer 34M95

Populations: 1. 32,000

2. 42,000

P&K Fertilizer

Placements: 1. Control

2. Broadcast

3. Shallow Band (6")

4. Deep Band (12")

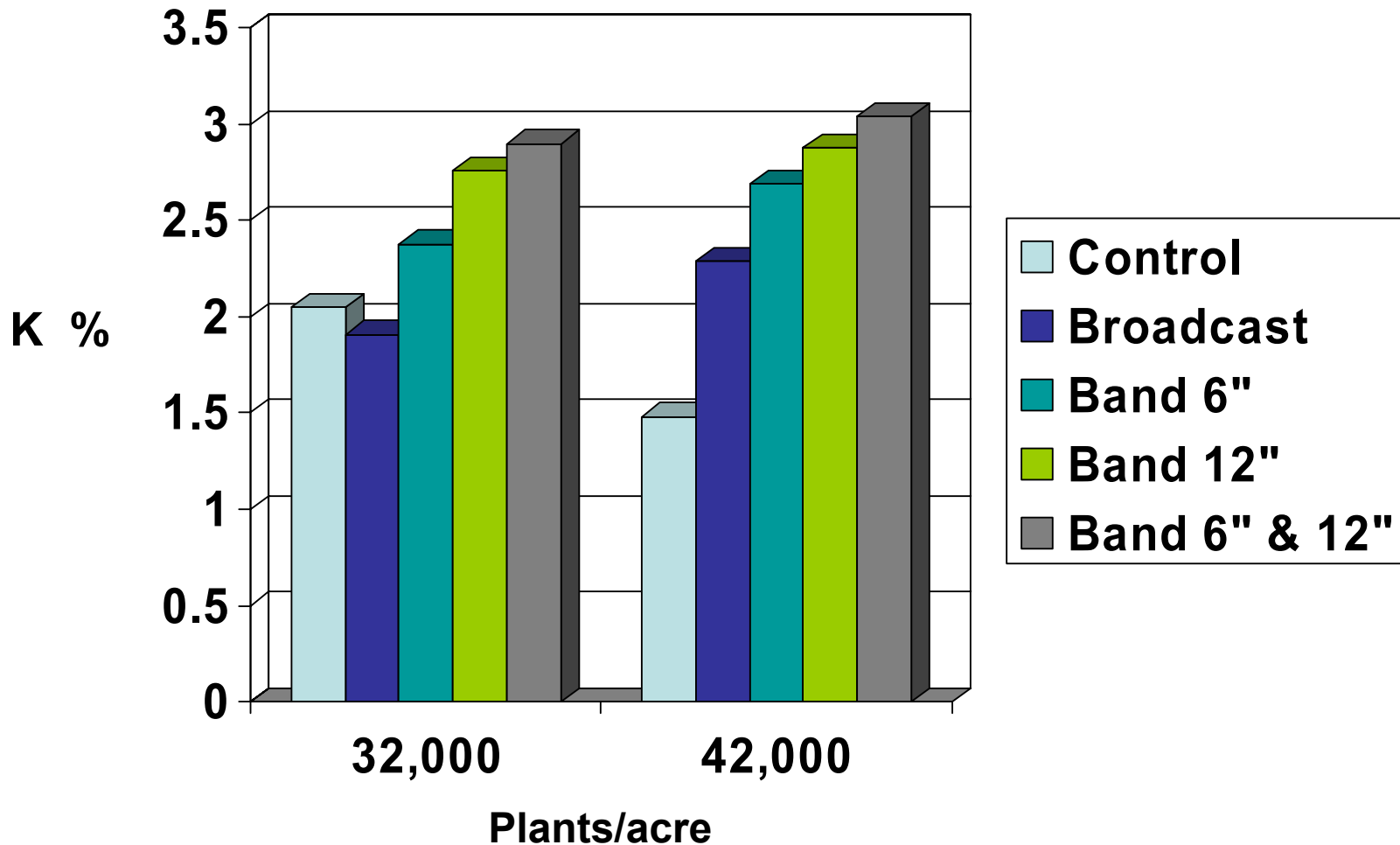
5. Shallow + Deep (6 and 12")



Sponsor: PPI-FAR 2001-2003

Placement Effects on Leaf K %

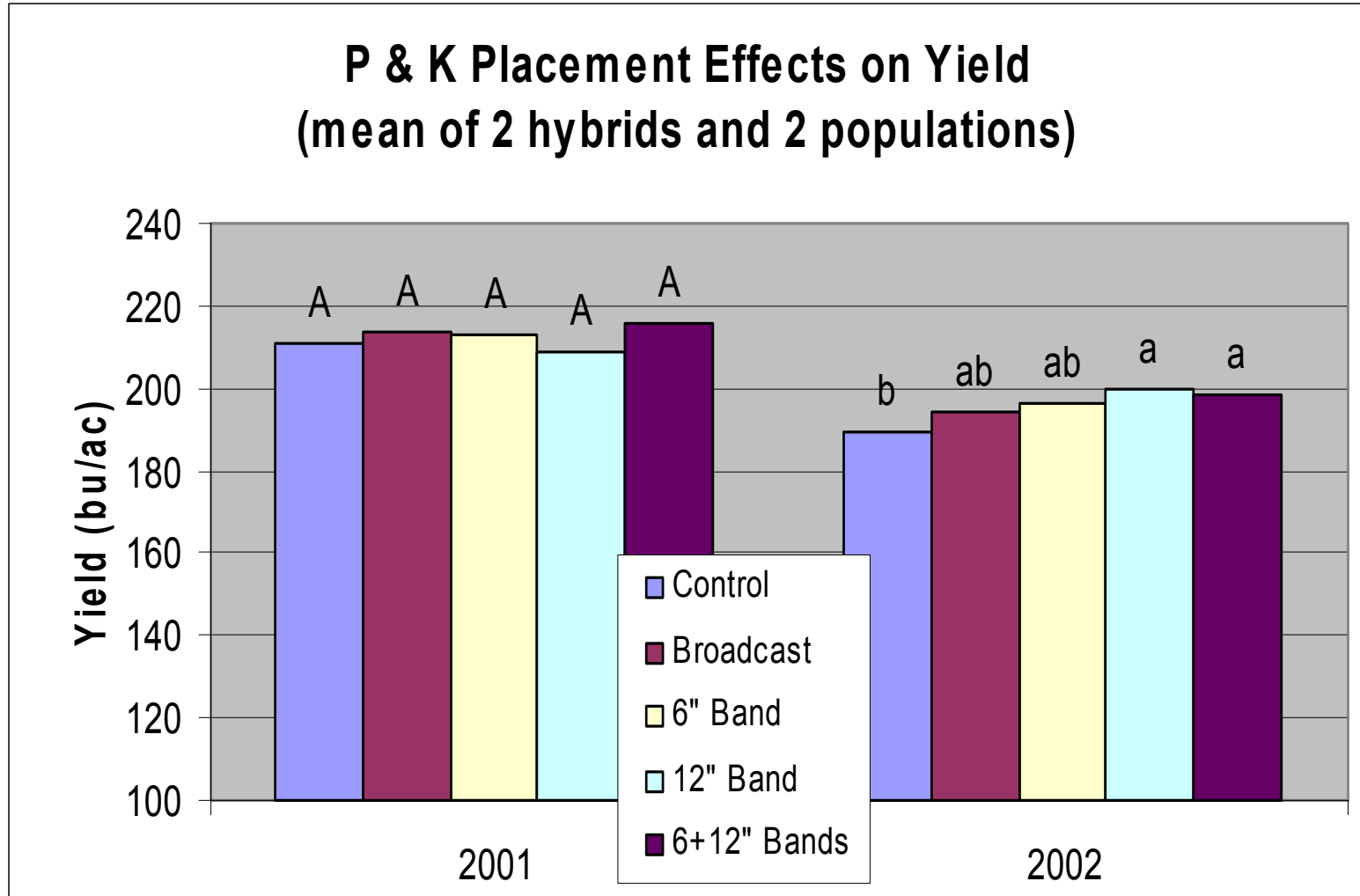
Pion. 34M95 in 2003



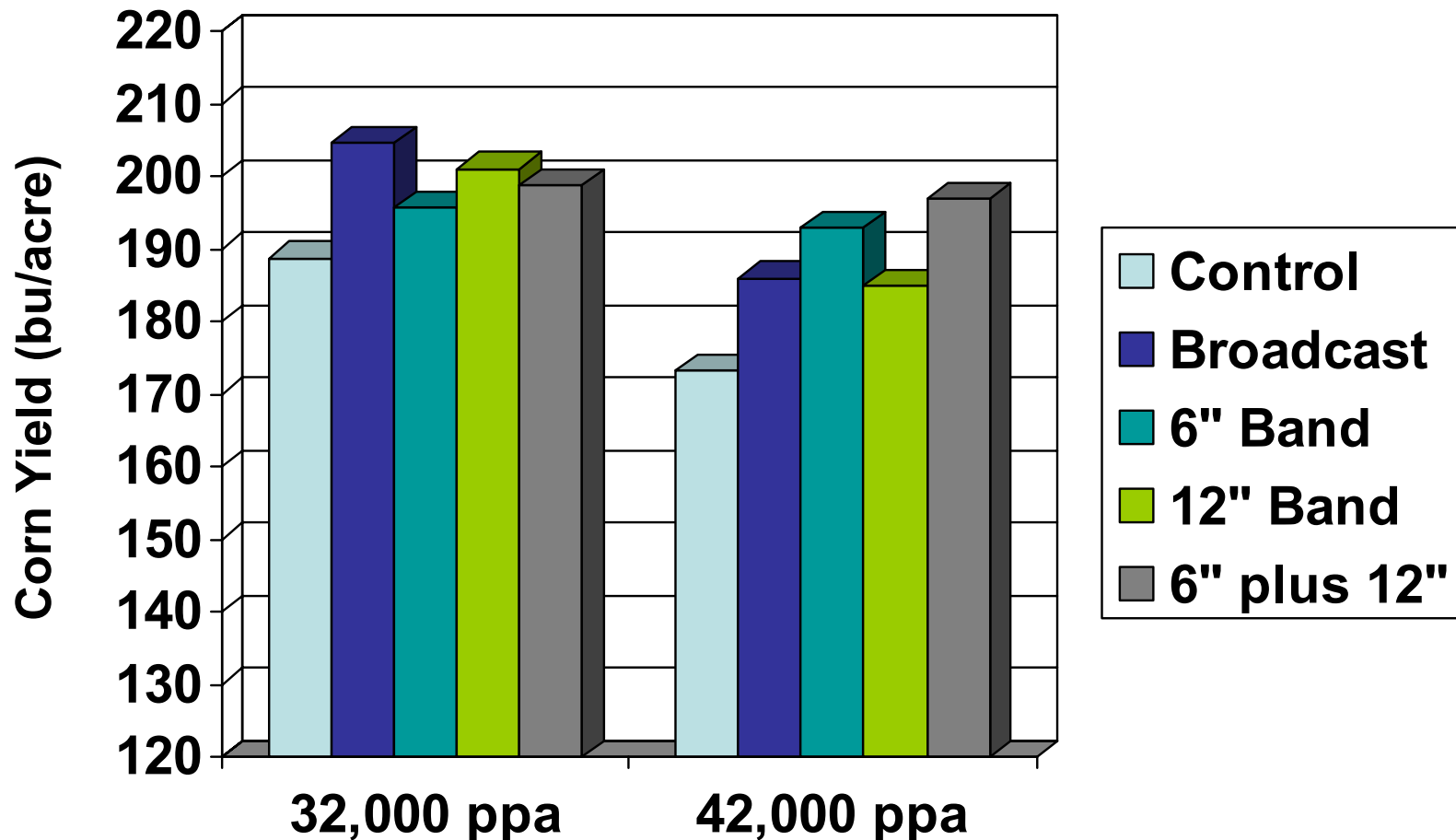
Yield Evaluation



Yield Responses to Placement in 2001-2002



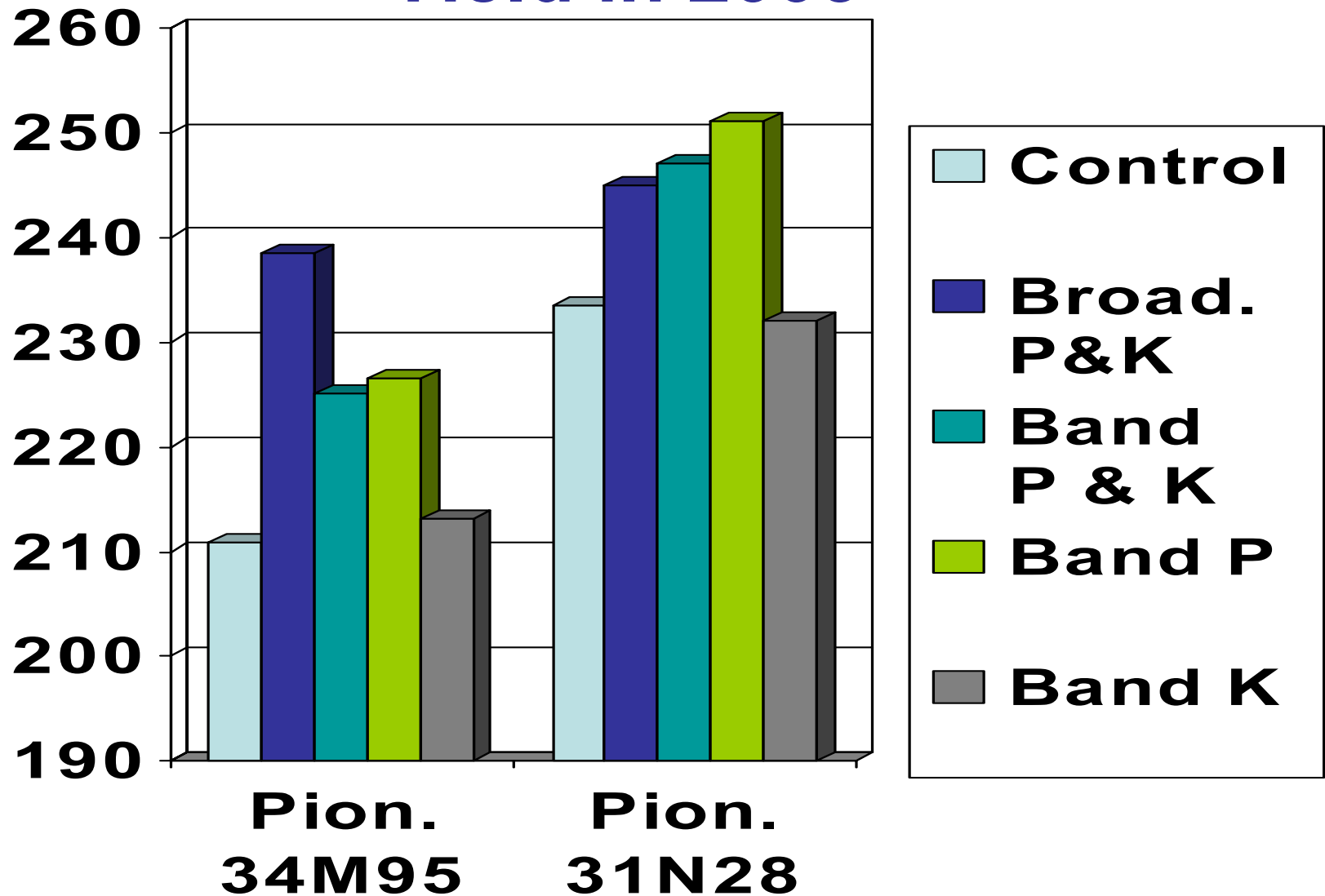
Corn Yield Response of Pion. 34M95 to Alternate P plus K Placements in 2003



Consistency of Resource Availability in High Population Environments ?



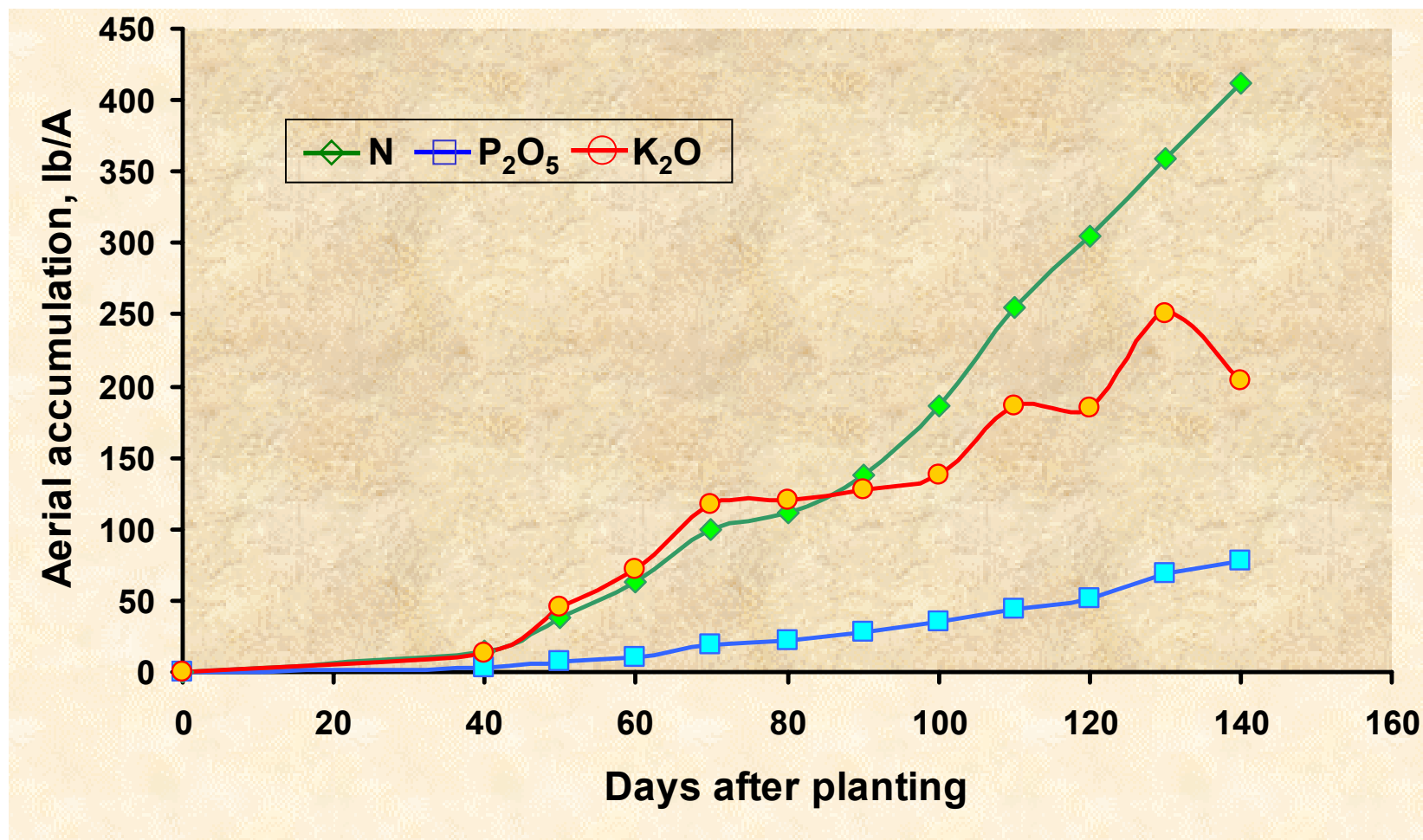
6-7" Placement Effects on Corn Yield in 2003



Soybean Response to K Placement



Aerial accumulation of N, P, and K by soybean (80 bu/A)



Source: Henderson, J.B., and E.J. Kamprath. 1970. Tech. Bull. 197. NC Agric. Exp. Stn., Raleigh. NC

Soybean Yield Responses to K fertilization and Placement in No-Till in Iowa (1994 to 1997)

Trial Type	Site-Years	Initial Soil K	K Fertilizer Rate
		----- ppm ----	----- lb ac ⁻¹ -----
Long-term	20	115 to 262	29 & 59
Short-term	11	90 to 258	29 & 118

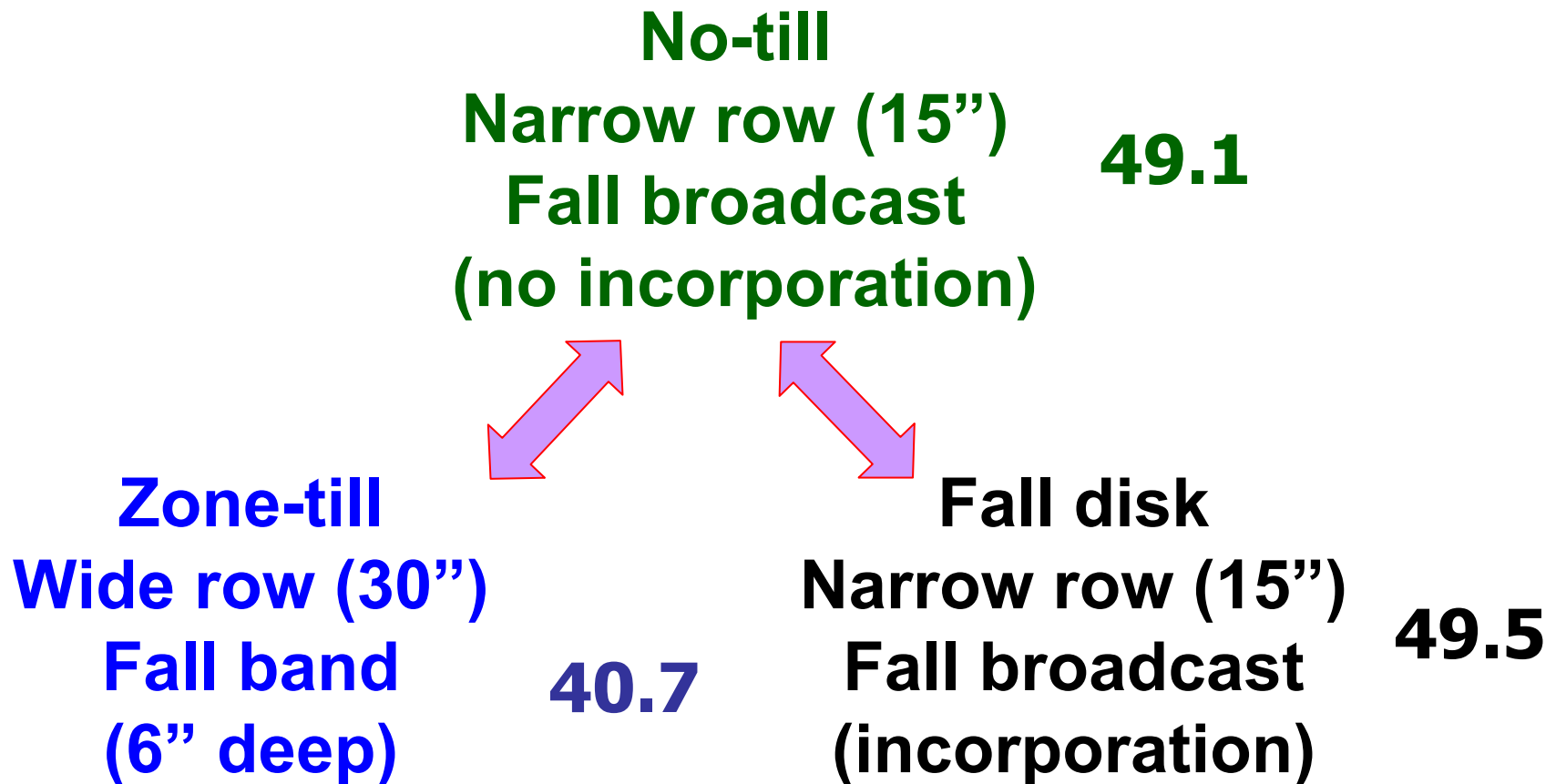
Borges and Mallarino, 2000. Agron. J. 92:380-388

No-till Soybean Yield Responses to K fertilization and Placement in No-Till in Iowa (Cont.) Average of 1994 to 1997

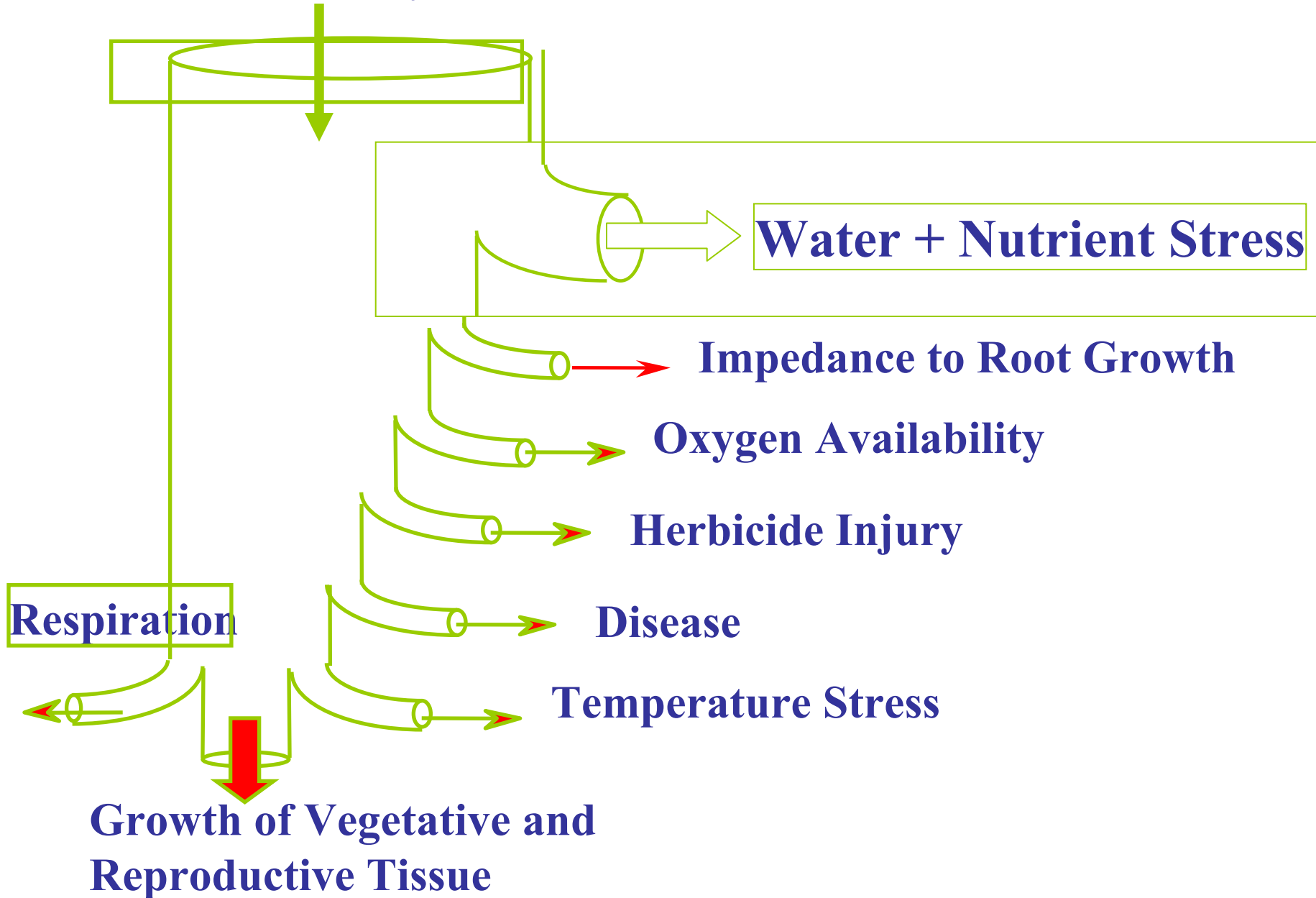
Trial Type	Treatment				Statistics	
	Zero <u>K</u>	Broad- cast K	Deep- band K	Starter- band K	Fert	Place
	----- bu ac ⁻¹ -----				----- (P > F) -----	
Long-term	49.5	50.2	51.0	50.5	0.01	0.10
Short-term	44.4	46.8	45.9		0.01	0.22

Borges & Mallarino, 2000

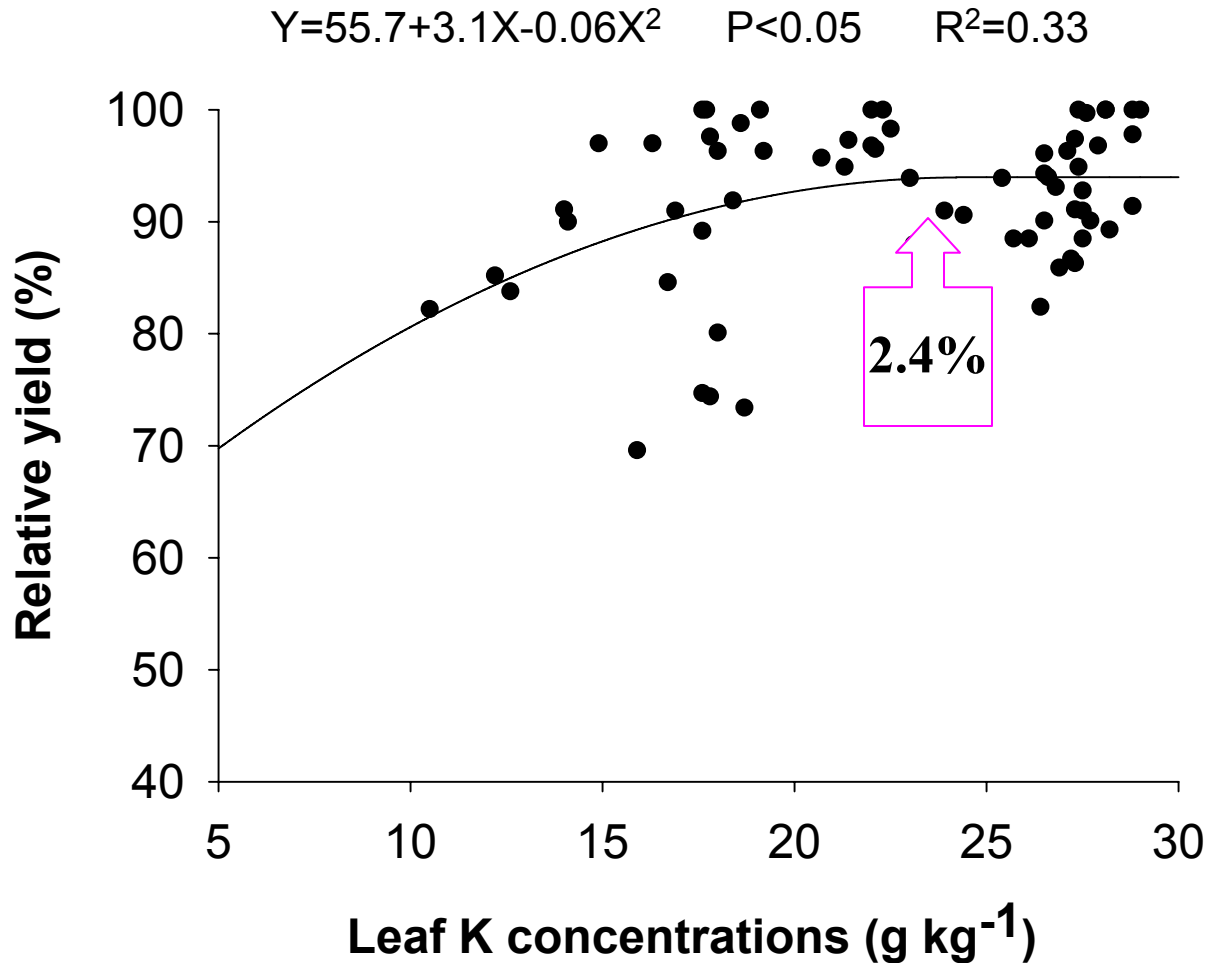
Comparison of no-till with zone-till and fall disk systems



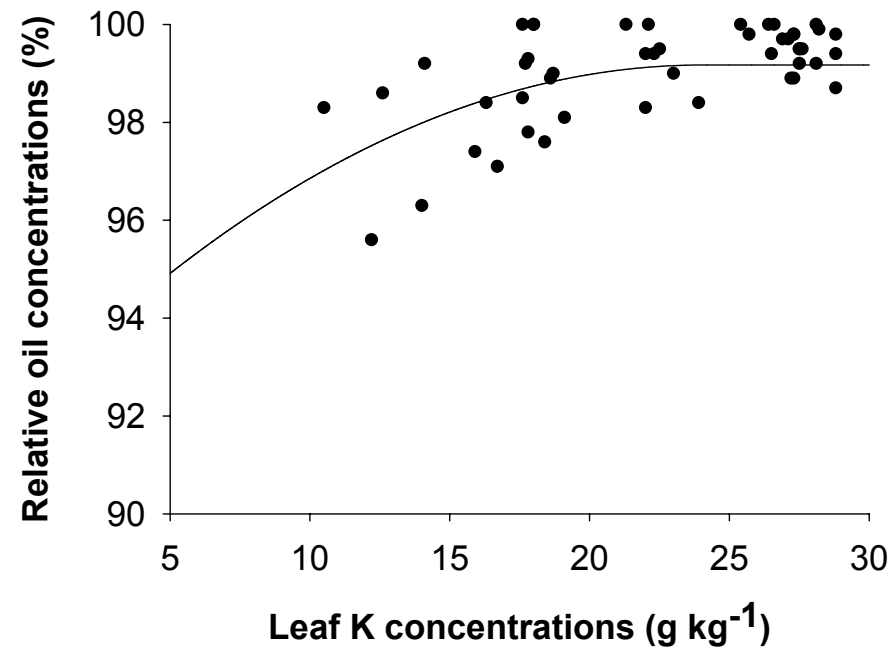
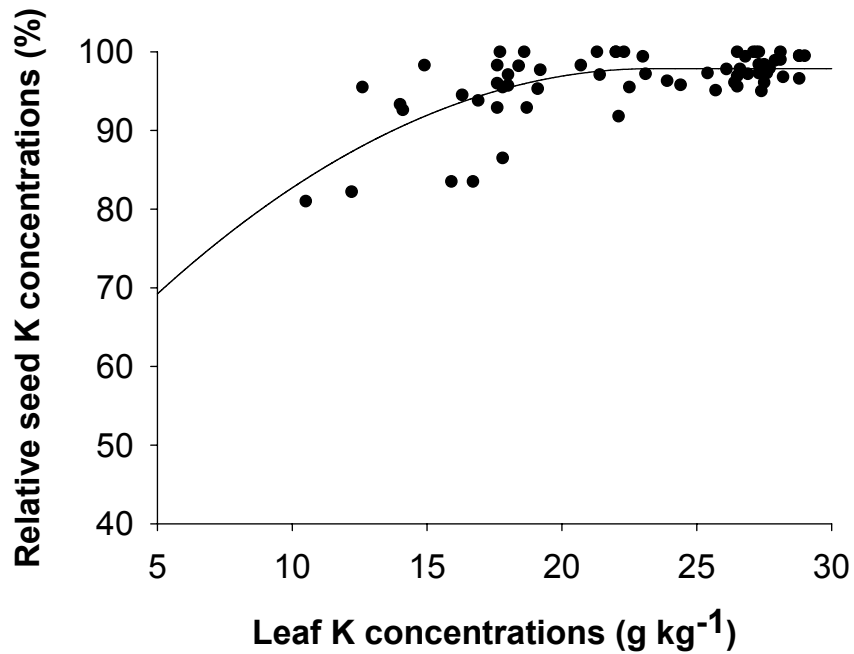
Potential Daily Growth



Trifoliolate Leaf K at R1 ?



Leaf K Concentrations and Soybean Seed Composition



Yin and Vyn, 2002

Narrow-Row Soybeans Following Corn with Alternate K Placement



1. Extent of vertical and horizontal soil exchangeable K distribution
2. Actual soybean row widths
3. Environment and genetic impacts on root system distribution

USB-FAR Projects in 2003



Split-split plot Treatments:

Prior Corn Hybrids (2)

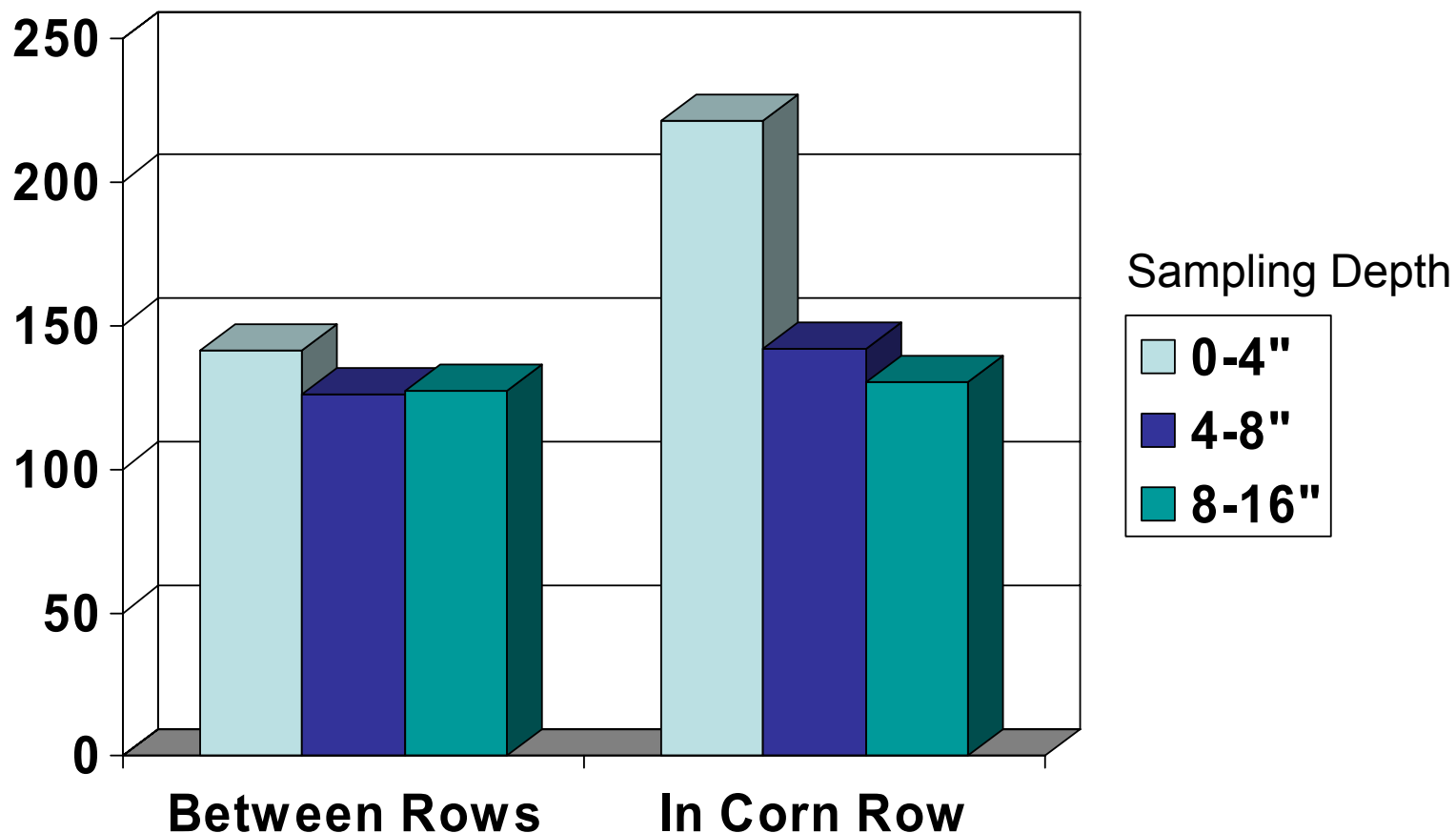
Prior Fertility:

- 1. Control**
- 2. Broadcast P and K**
- 3. Band P and K (6")**
- 4. Band P alone**
- 5. Band K alone**

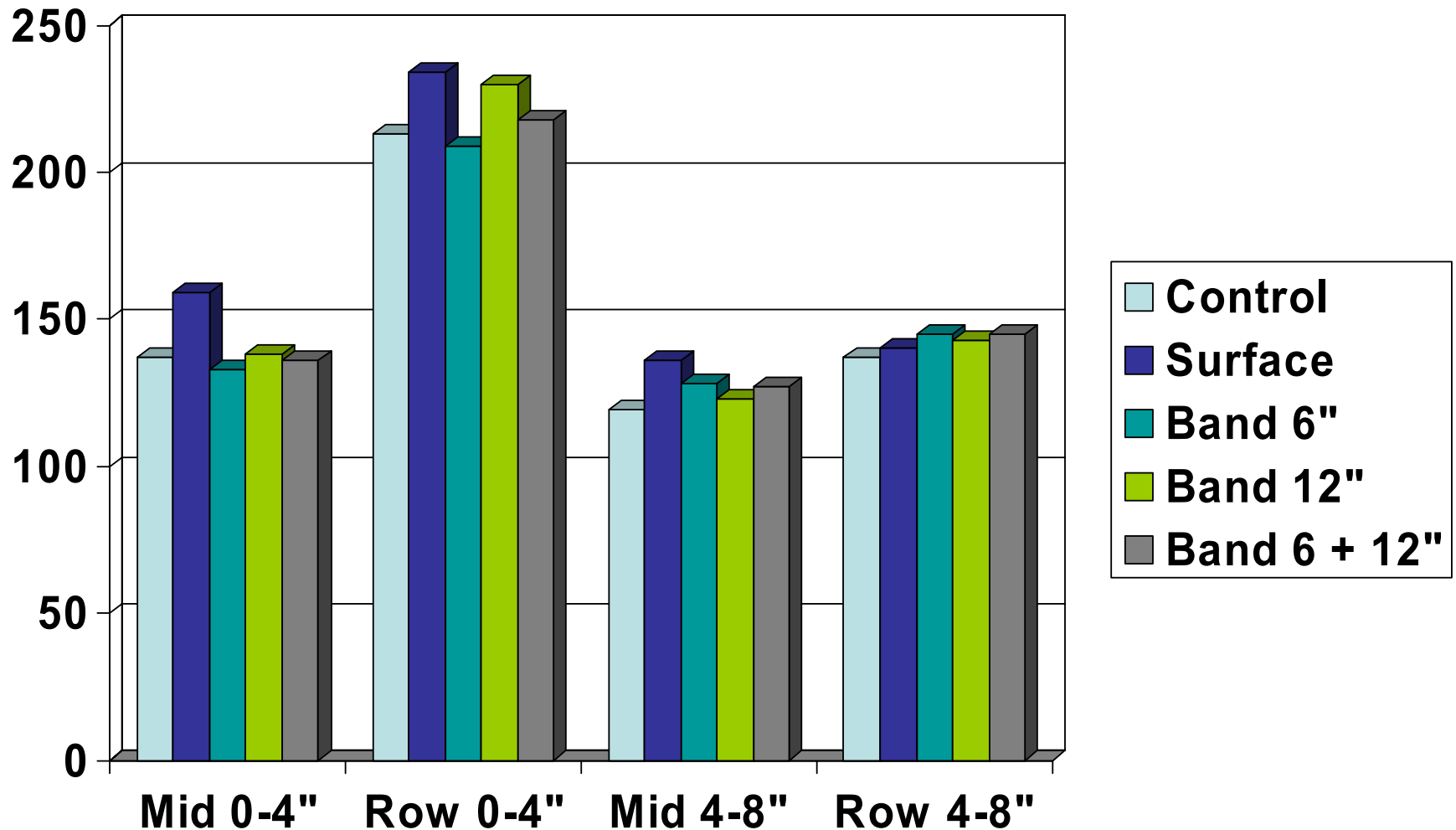
Potassium in 2003:

- 1. None**
- 2. Broadcast**

Row position effects on Exch. K ppm High Yield Corn Plots, 2002



Row Position Effects on Soil Exc. K at 2 Depths (0-4" and 4-8")



Strip Tillage with Fertilizer Banding?



Conclusions

- 1. Banding of K has possible advantages in stratified soils, dry summers, and in high yield situations.**
- 2. Banded K may be more beneficial with certain corn hybrids and environments (high populations)**
- 3. Banded K for corn may be detrimental to narrow row soybean in lower K soils.**
- 4. More research required on rates, mixtures, and impact on no-till soybean.**

Thanks!

**Funding: PPI-FAR
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Case**

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