

# Opportunities for Exploiting Corn Yield Potential: Row Spacing and Plant Population

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EXTENSION

## Why Twin-Rows?

- Earlier canopy closure
- Only new equipment is planter, and same planter can be used for corn & soybean
- May allow higher populations to be established while maintaining stalk quality?

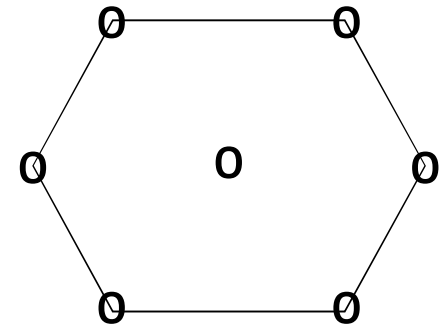
## Why Not?

- Row cultivation and POST applications become difficult
- Increased soil insecticide and starter fertilizer costs?
- Twin-row planters are costly and many do not produce desired “triangle” patterns

# Distance between plants in various row widths:

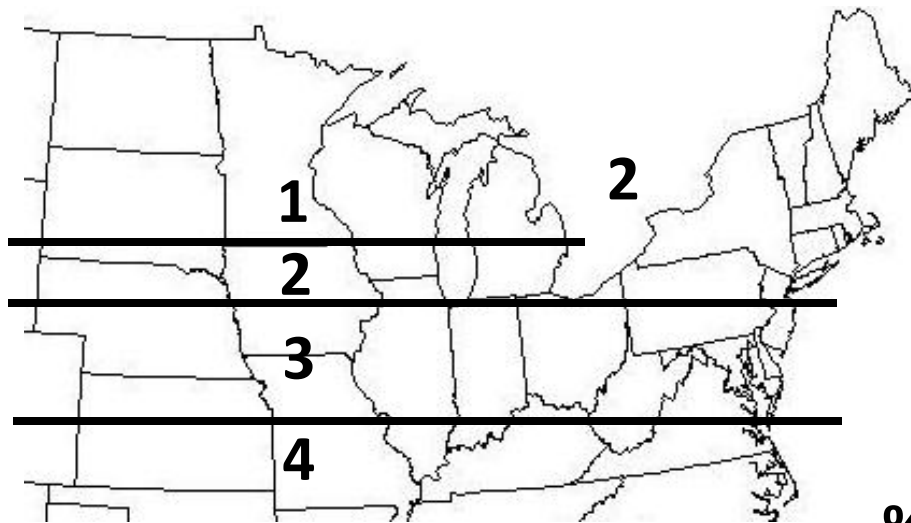
Plant Population: 32,000 plants/ac

<u>Row width</u>	<u>Distance between plants within row</u>
30"	6.5"
22.5"	8.7"
20"	9.8"
15"	13.1"

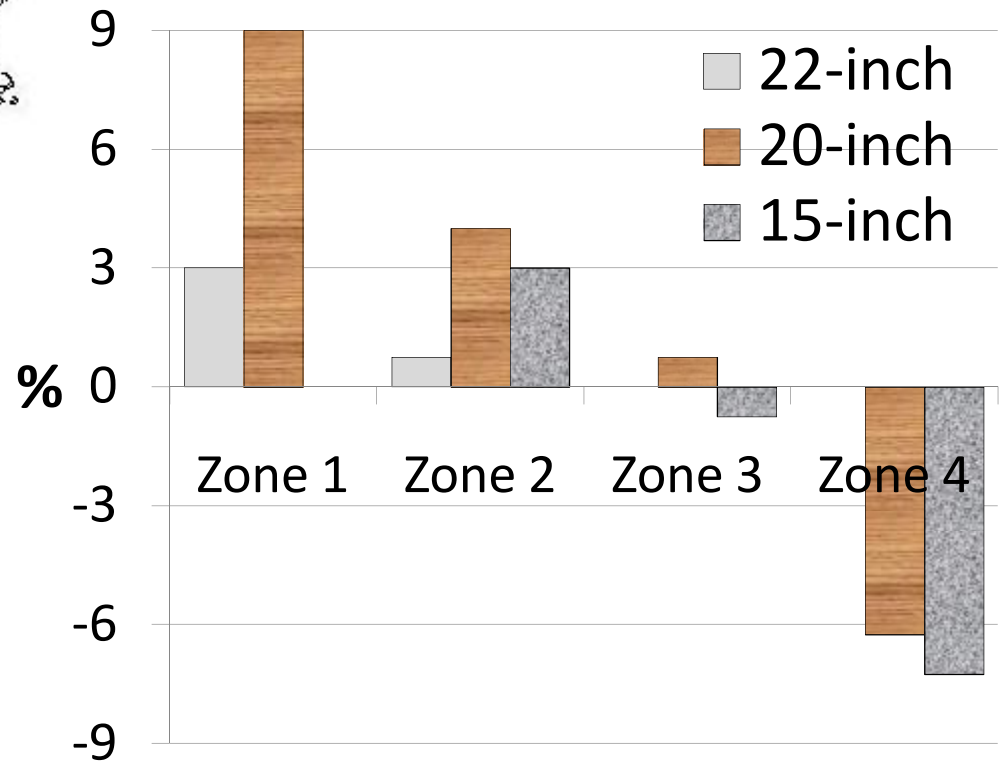


- Equidistant spacing requires a hexagonal arrangement of 6 plants around each plant
- Planting this way produces the “triangle” pattern
- 15-inch rows come close to equidistant spacing

# Survey of researchers who have evaluated narrow rows (by Deere & Co.)



Yield increase due to rows narrower than 30" listed below:



Source: Nielsen, 1997

# Yield increase due to rows narrower than 30"

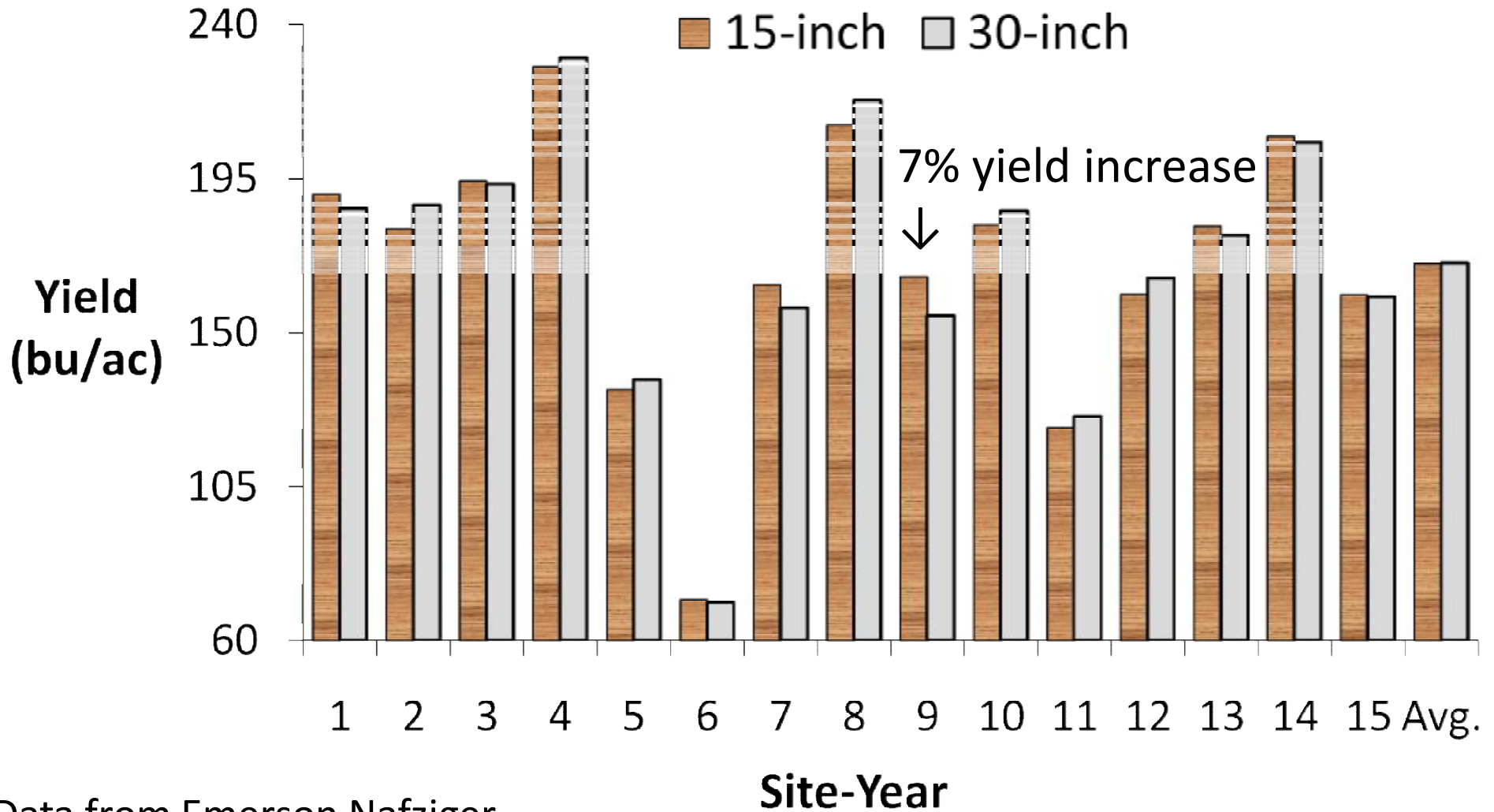


Source: Lee, 2006

# Corn row width survey, 2007 (USDA)

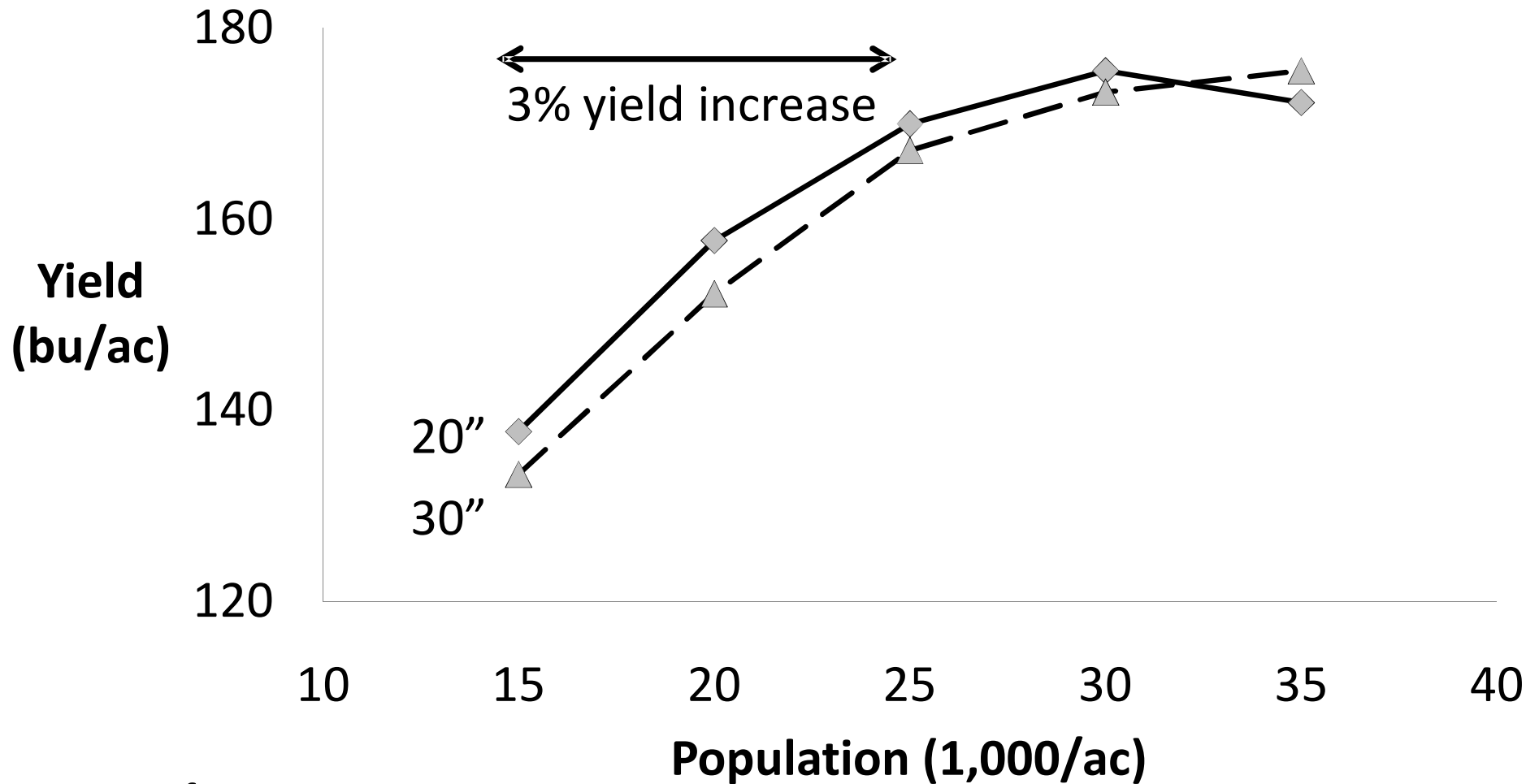
<b>Row Width</b>	<b>IA</b>	<b>MN</b>	<b>NE</b>	<b>WI</b>
20.5" or less	1.8 %	6.6%	0.4%	2.0%
20.6" to 30.5"	73.3 %	71.1%	56.3%	57.2%
Avg. row width	30.6"	28.5"	31.9"	31.1"

# University of Illinois, 2000-2002



Data from Emerson Nafziger

# University of Illinois: Yields over 2 hybrids, 2 locations, and 3 years (1992-1994)



Source: Nafziger, 2002

## University of Illinois (9 site-years, 1997-1999)

<b><u>Hybrid</u></b>	<b><u>Row Width</u></b>	<b><u>Optimum Population</u></b>	<b><u>Yield (bu/ac)</u></b>
Pioneer 3489	15-inch	26,500	188
	30-inch	31,100	183
Pioneer 3335	15-inch	29,400	194
	30-inch	27,800	193
	Overall Average	28,800	189

Source: Nafziger, 2002

# University of Illinois, 1 location in 2004

## % Light Interception

<b>Row Type*</b>	<b>Population</b>	<b>V10</b>	<b>R2</b>	<b>Yield (bu/ac)</b>
30-inch	34,500	70	99	210
Twin-row	34,500	79	99	187
15-inch	34,500	83	99	199
30-inch	27,200	63	96	195
Twin-row	27,200	71	98	190
30-inch	19,800	54	95	173

All row types planted using a Great Plains Precision Plant Drill

Source: Nafziger, 2006

# Ohio State University, 1 location in 2004

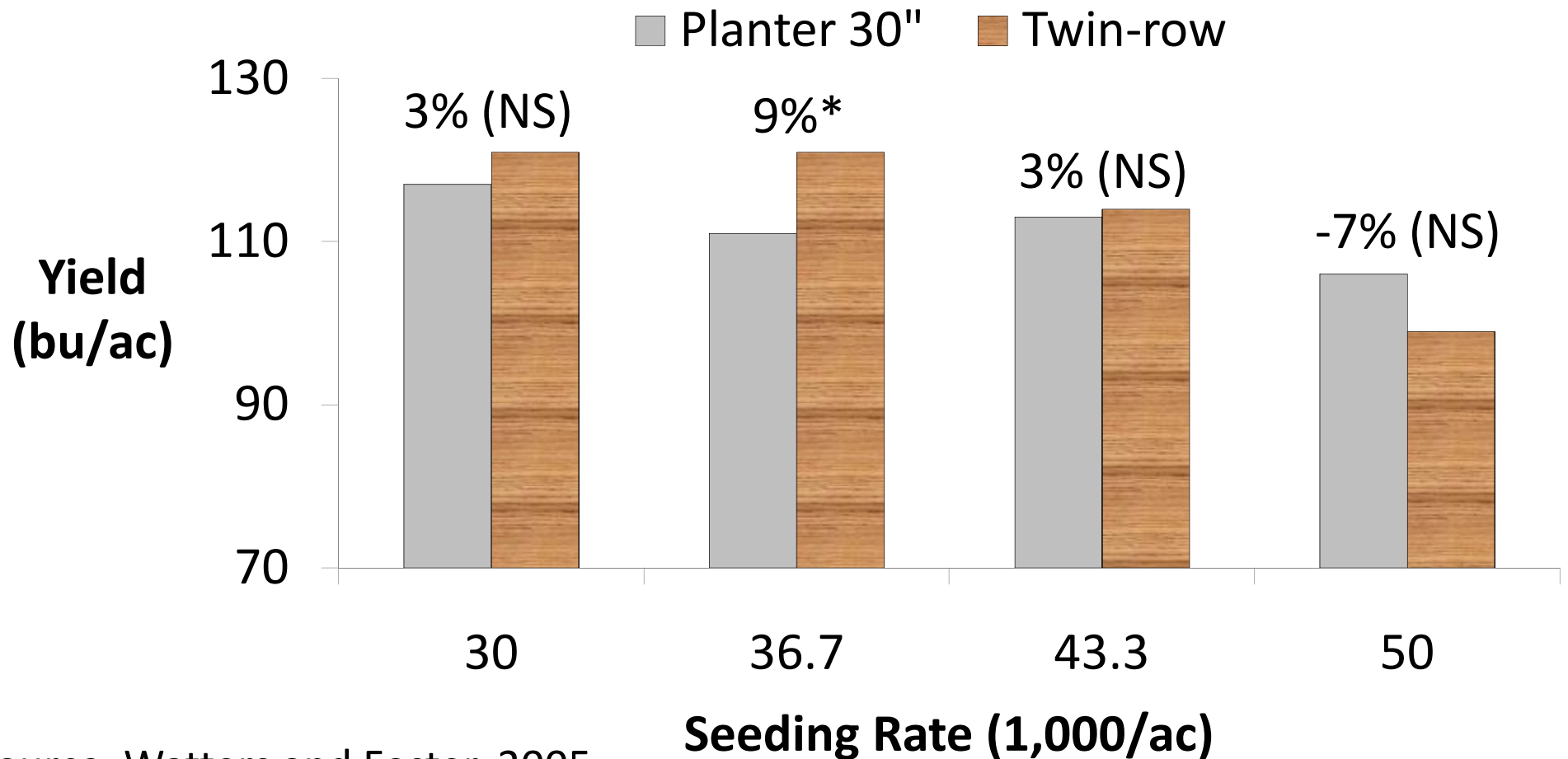
(data averaged over 2 hybrids)

<b>Row Type</b>	<b>Plant Population</b>	<b>Lodging (1-10)</b>	<b>Yield (bu/ac)</b>
Twin-row	30,500 a	2.13 a	205 b
Planter 30"	30,600 a	2.04 a	214 a
Drill 30"	31,200 a	2.62 a	213 a

Source: Watters and Foster, 2004

# Ohio State, 1 location in 2005, avg. over 2 hybrids

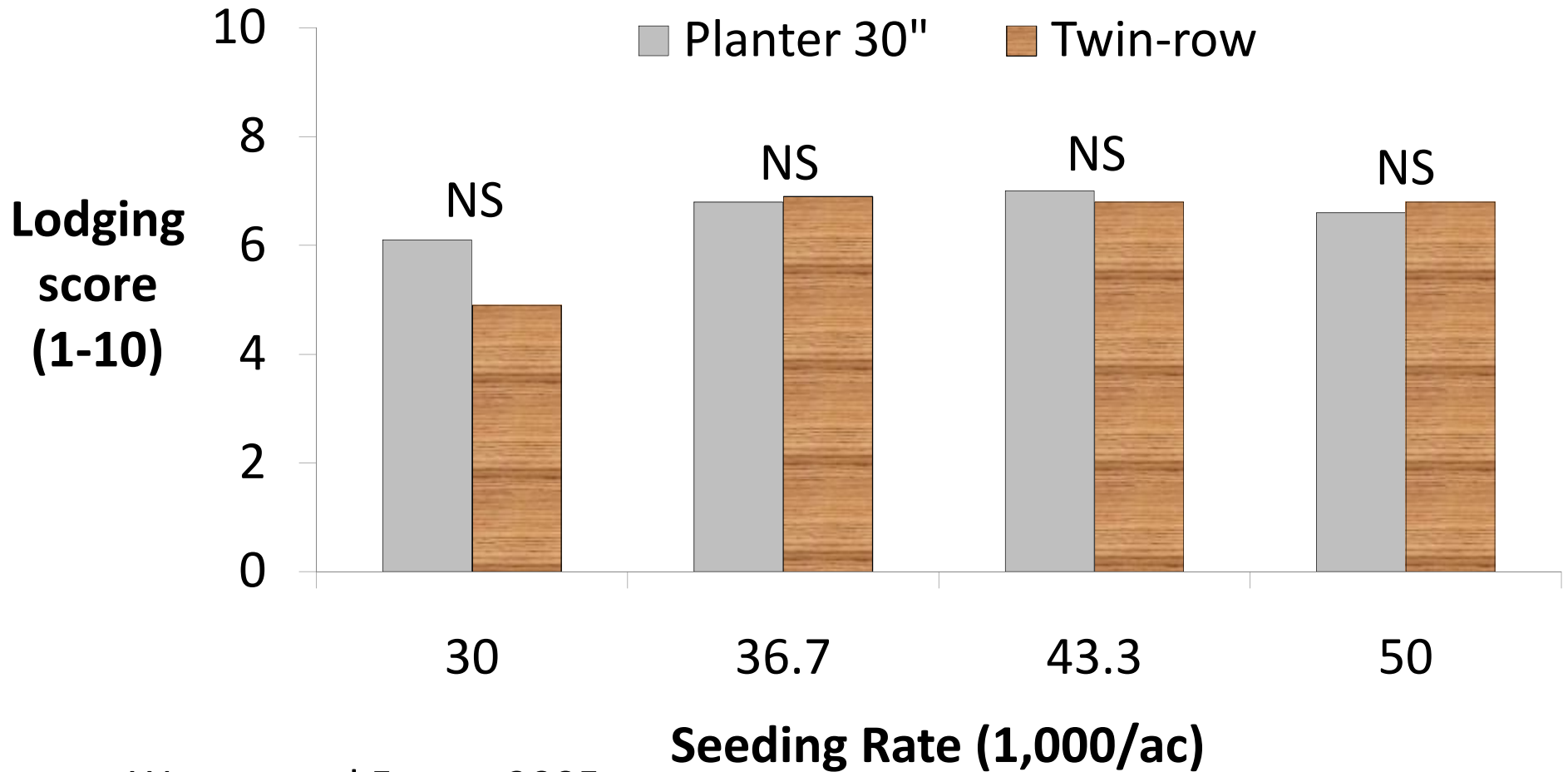
Yield increase due to twin rows listed below:



Source: Watters and Foster, 2005

# Ohio State, 1 location in 2005

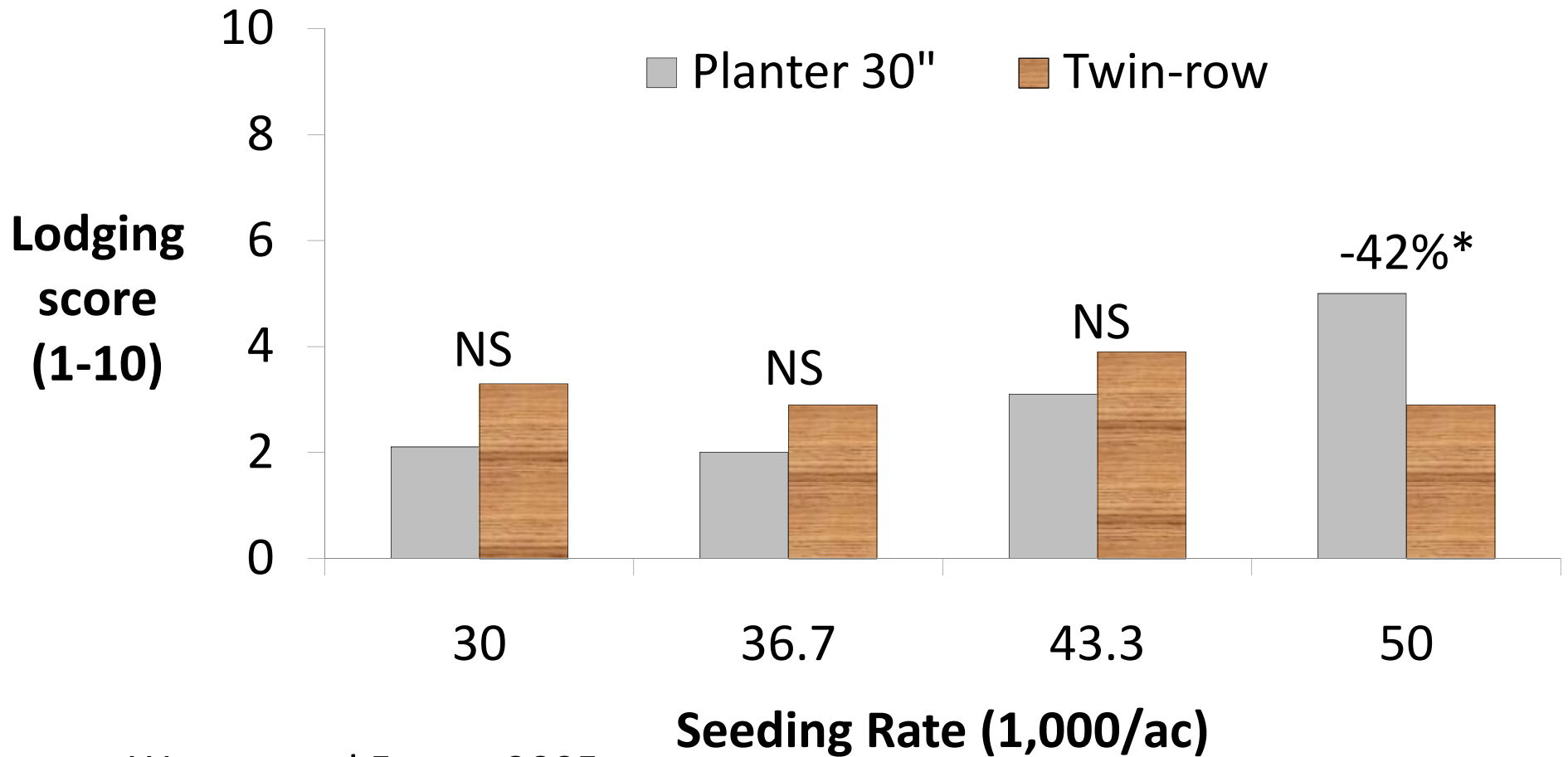
P33Y18 (tall plant with flexible ear size)



Source: Watters and Foster, 2005

# Ohio State, 1 location in 2005

P34G13 (short plant with little flexibility in ear size)



Source: Watters and Foster, 2005

# Iowa State University

## Yield increase due to twin rows

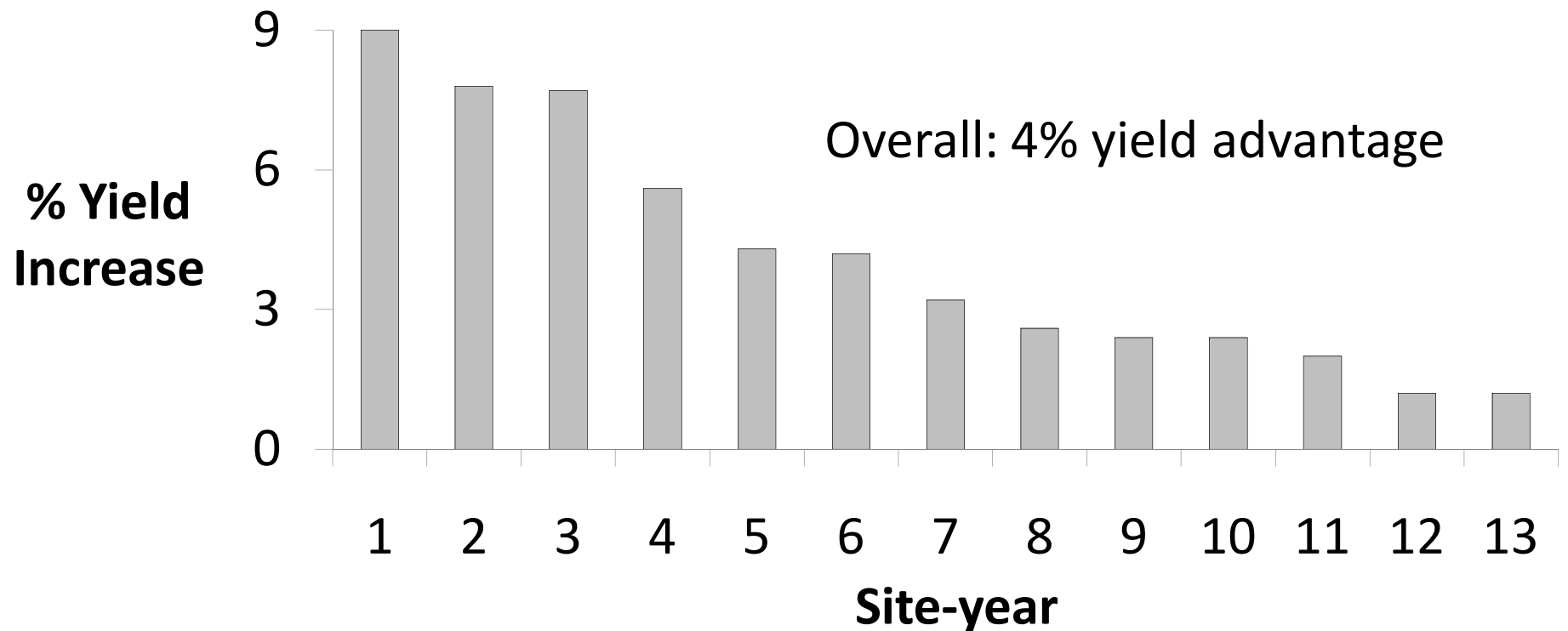
Year	(bu/ac)
2002	10.7*
2003	-2 (NS)
2004	2.3 (NS)
2005	1.6 (NS)

29,000 plants/ac, twin rows planted with a 30" planter

Source: McGrath et al., 2006

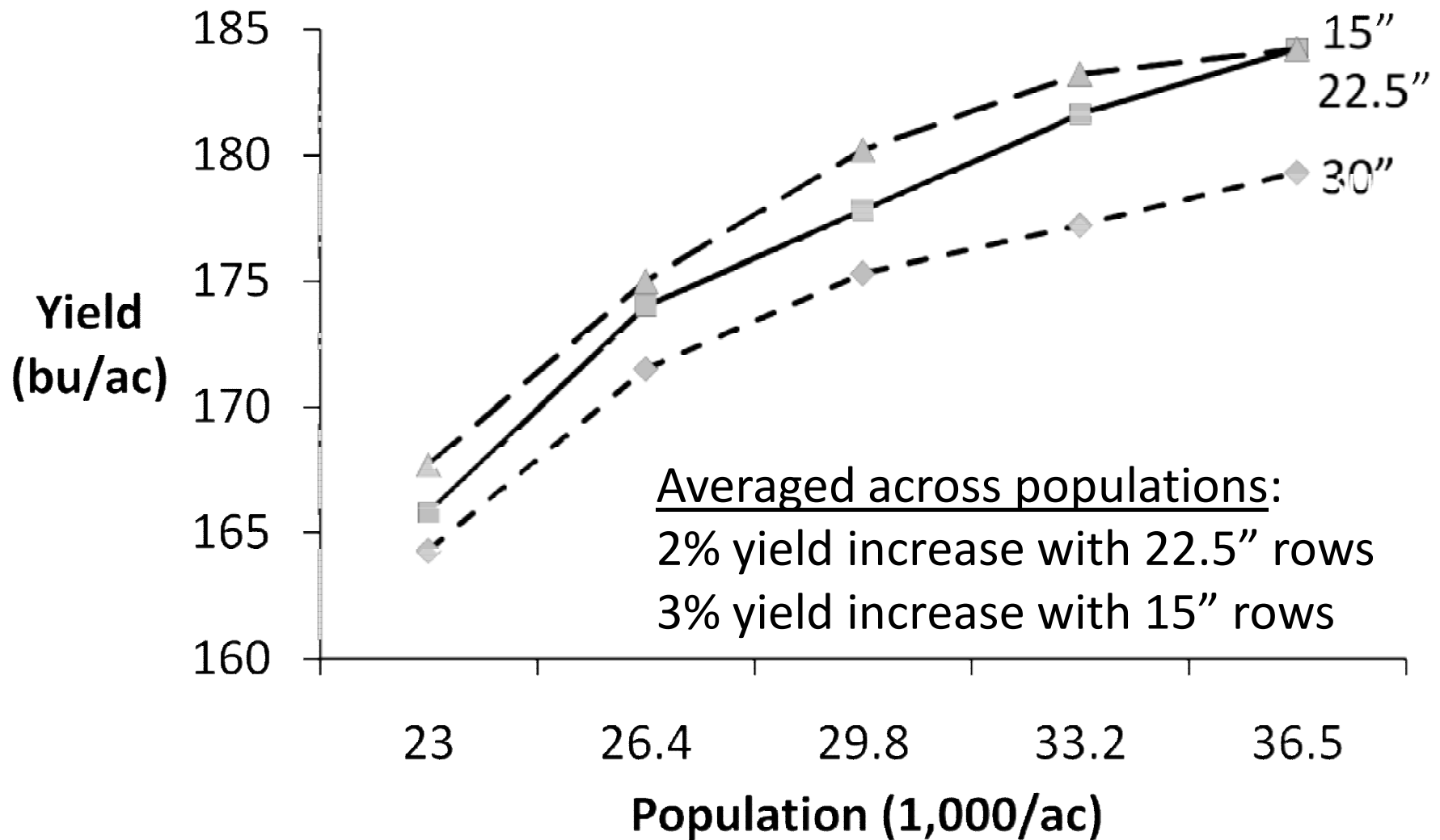
# Yield increase with 22.5" rows vs. 30" rows in IA, MN, ND, and SD, 1991-1994

(data are averages from 4 hybrids in each site-year)



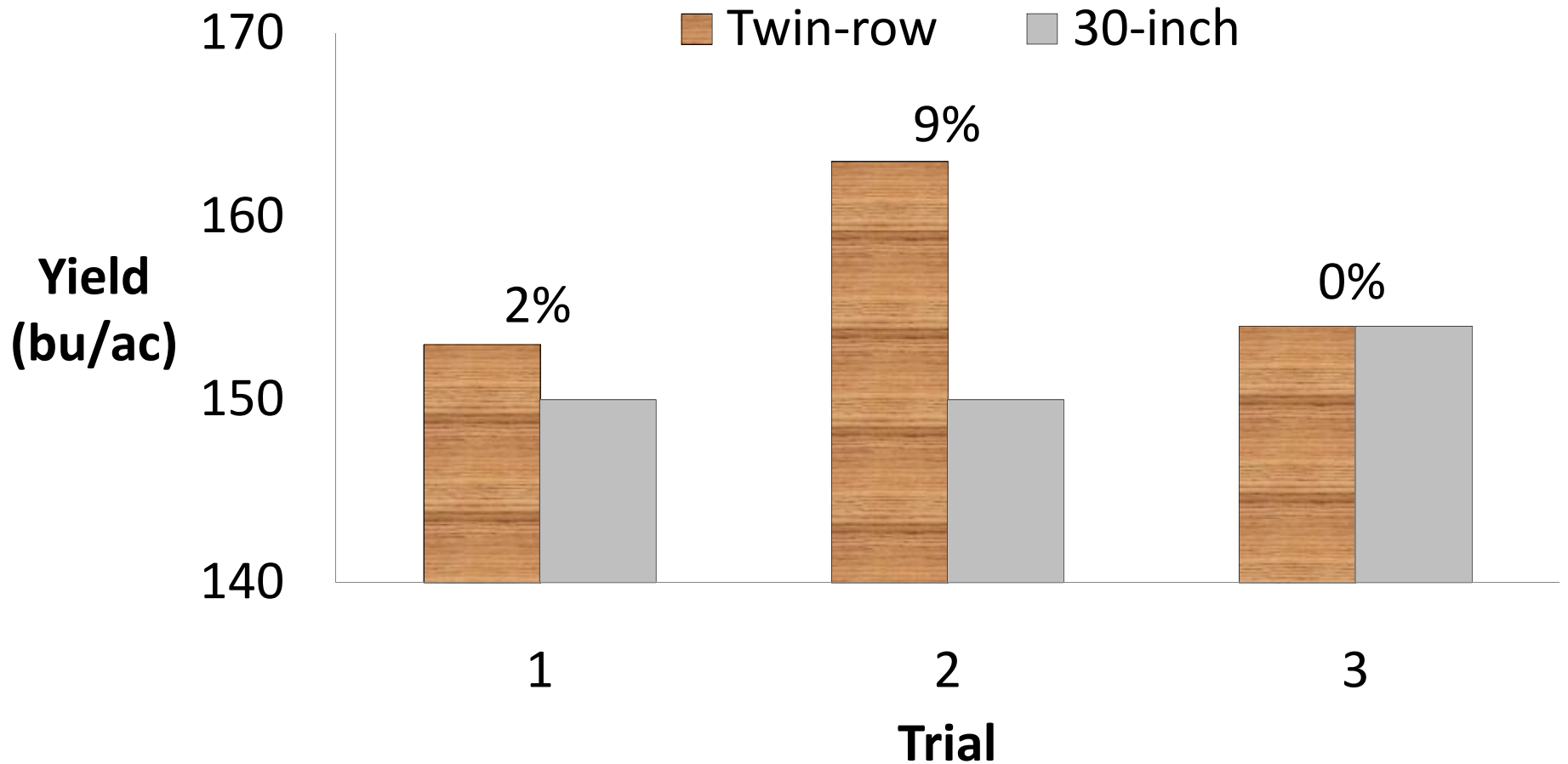
Data from Pioneer Hi-Bred. Source: Nielsen, 1997

# Michigan State University, 3-yr averages



Data from Kurt Thelen. Source: Emerson Nafziger.

# Ontario Research: Data averaged over multiple hybrids (plant populations were 30 to 35,000)



Source: Stewart, 2006

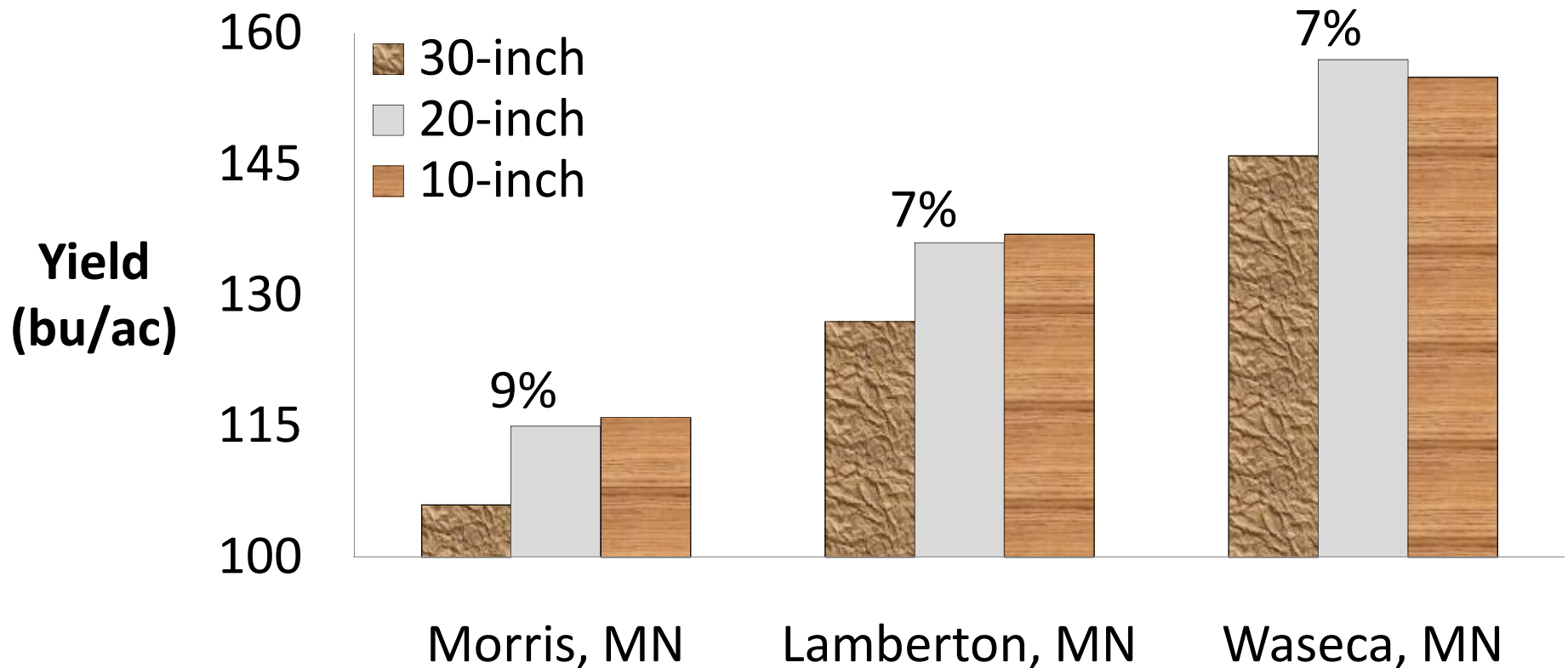
## 2 Ontario studies, 1995-1999

	<u>28,000 ppa</u>	<u>36,000 ppa</u>
<b>Study #1:</b> Twin-row	143	153
30-inch	141	146
	<u>30,000 ppa</u>	<u>36,000 ppa</u>
<b>Study #2:</b> Twin-row	171	174
30-inch	157	163

Source: Stewart, 2006

University of Minnesota: Data averaged over multiple hybrids and 4 populations (25 to 40,000), 1992-1994

Yield increase due to rows narrower than 30" listed below:



Source: Porter et al., 1997

# Summary

- Yield advantage due to narrow (22.5" or less) and twin rows is greatest north of I-90
  - Results are variable, but there does not appear to be any serious penalty with narrow rows
  - Expect a 3 to 9% yield increase with narrow rows in MN
  - No advantage to rows narrower than 20"
- Narrow and twin rows produce a more equidistant plant arrangement than 30" rows, but optimal plant population does not appear to be affected

# References

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- Waters, H., and S. Foster. 2004. Twin row corn: An alternative to narrow row corn production [Online]. Available at <http://agcrops.osu.edu/research/2004%20On-Farm%20Project%20Reports/Twin%20Row%20CornWatFos%20final.pdf> (verified 10 Sep. 2008). Ohio State Univ., Columbus.