



# Corn Planting Decisions for Maximum Economic Yield

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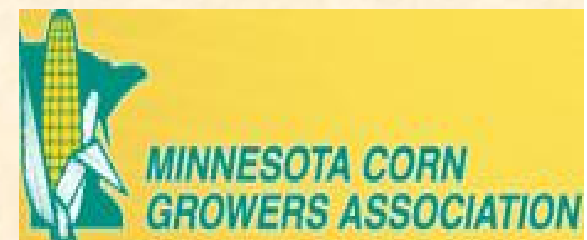
UNIVERSITY OF MINNESOTA

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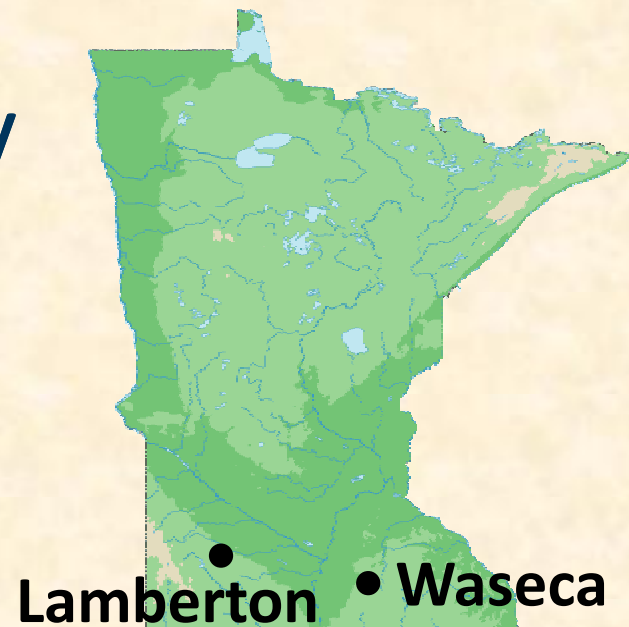
# Thanks to the Following for Funding U of M Corn Production Research

- Minnesota Corn Growers Association
- Pioneer Hi-Bred International
- National Crop Insurance Services
- BASF
- Syngenta
- Monsanto
- EMD Crop BioScience

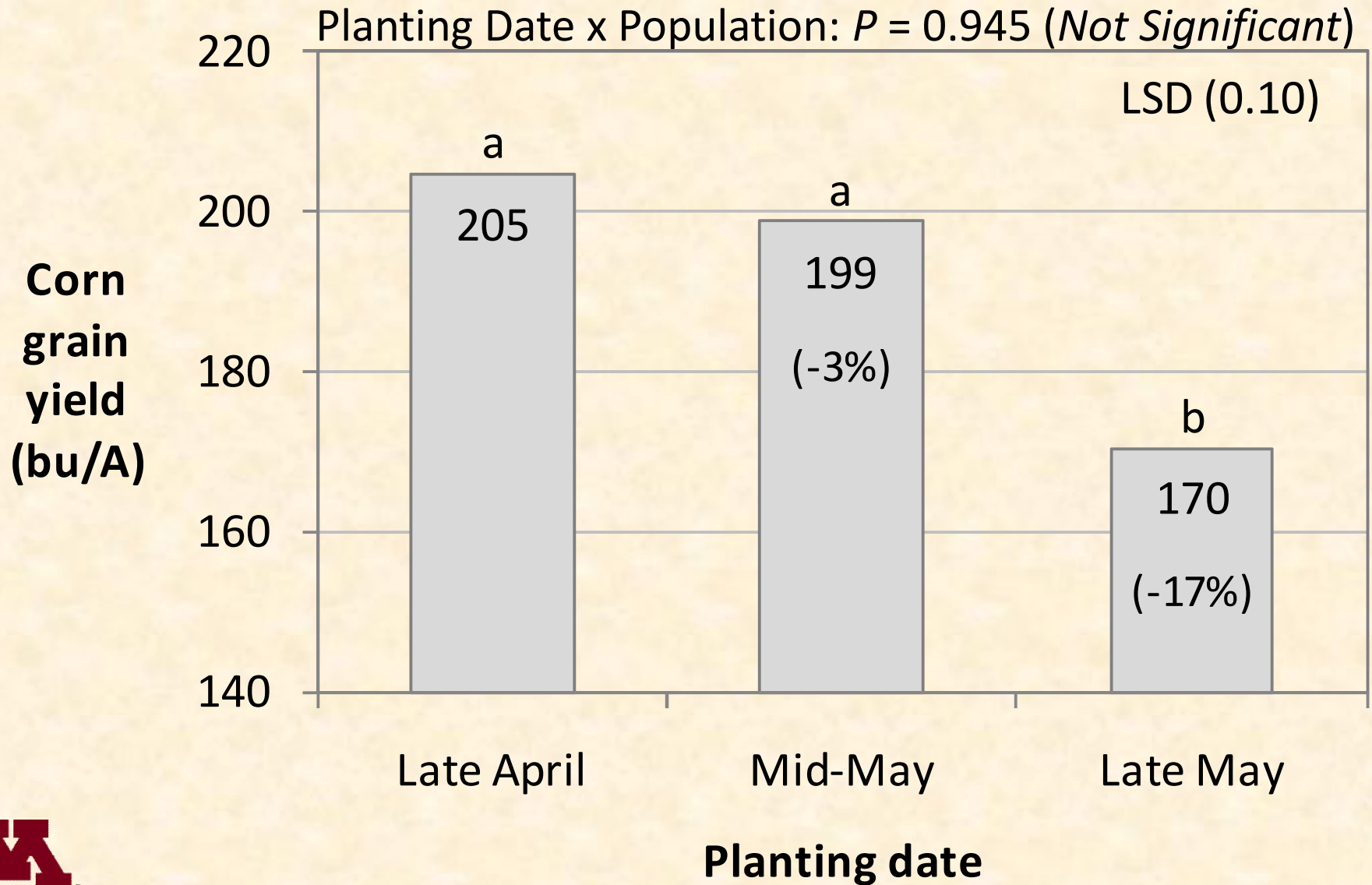


# “High-Yield” Corn Mgt. Study

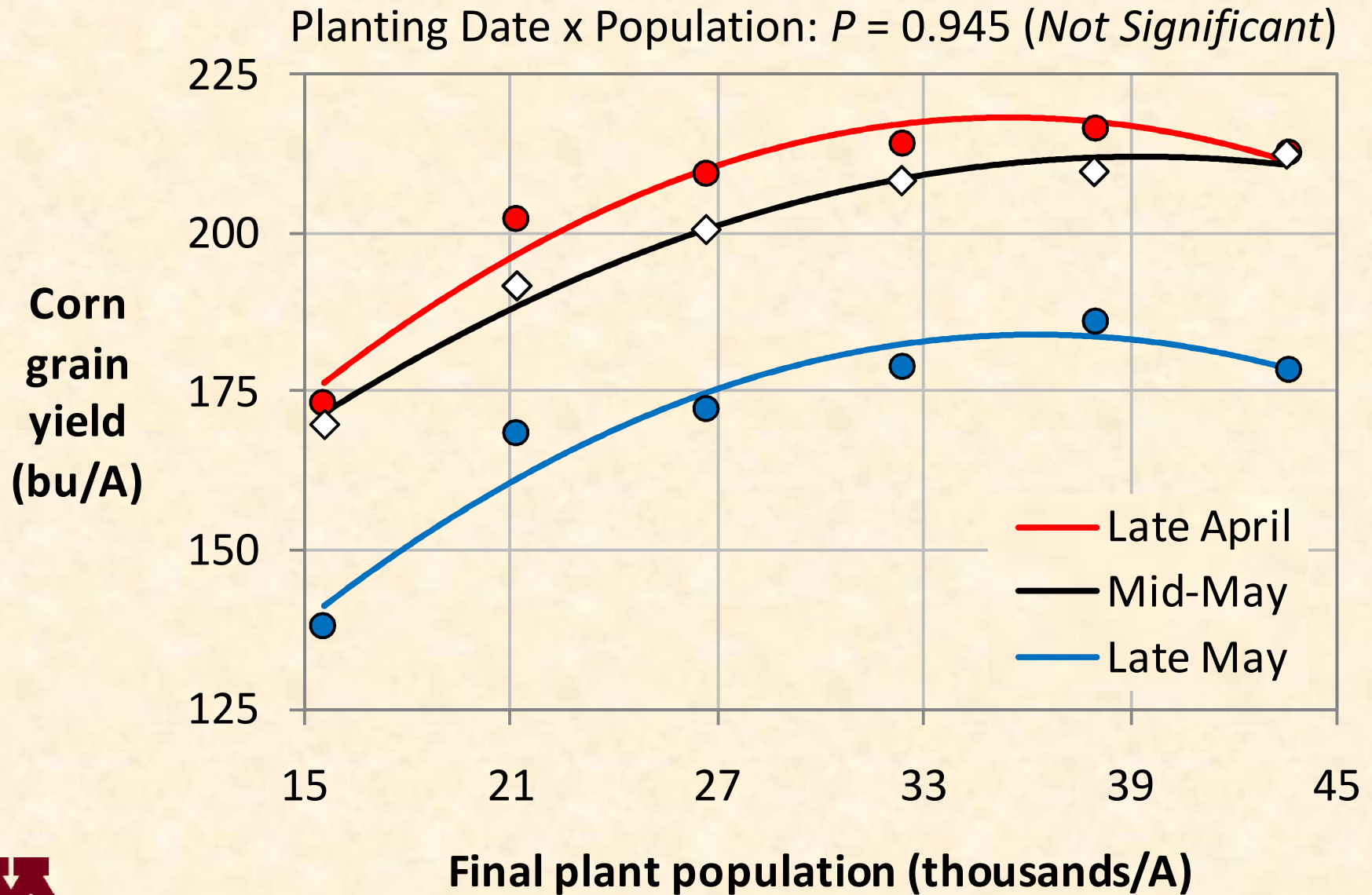
- 2008 & 2009 - following soybean
- Nicollet-Clarion-Webster clay loam
- DKC52-59 (102-day RM)
- 3 planting dates:
  - Avg: April 30, May 14, & May 28
- 6 plant populations
- Fungicide vs. none at VT:
  - Headline - 6 oz/A
  - Only on 3 populations



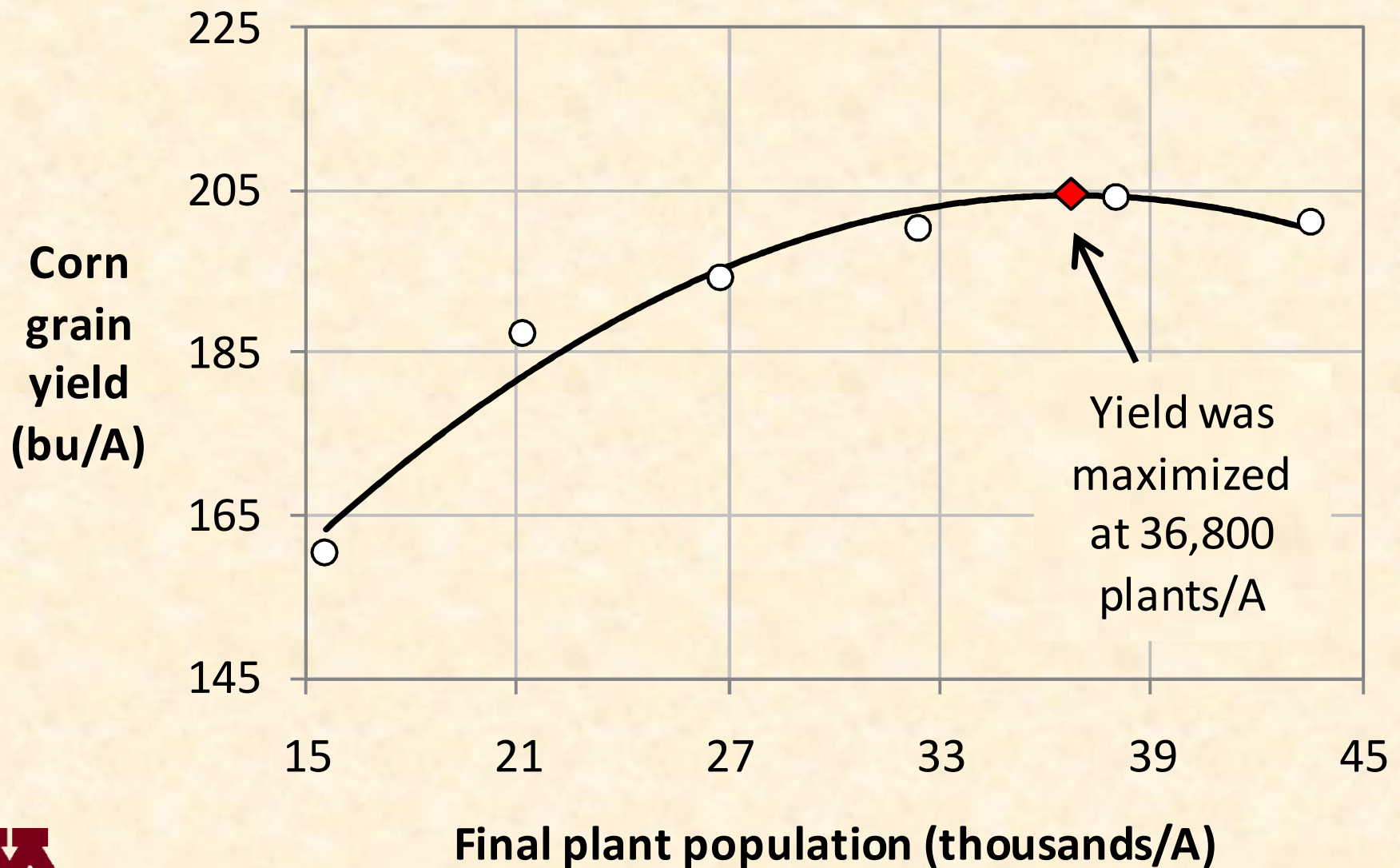
# Lamberton & Waseca, 2008 & 2009 (Averaged Over 6 Populations)



# Lamberton & Waseca, 2008 & 2009



# Lamberton & Waseca, 2008 & 2009 (Averaged Over 3 Planting Dates)



# Optimum Seeding Rates\*

(over 2 years, 2 locations, & 3 planting dates)

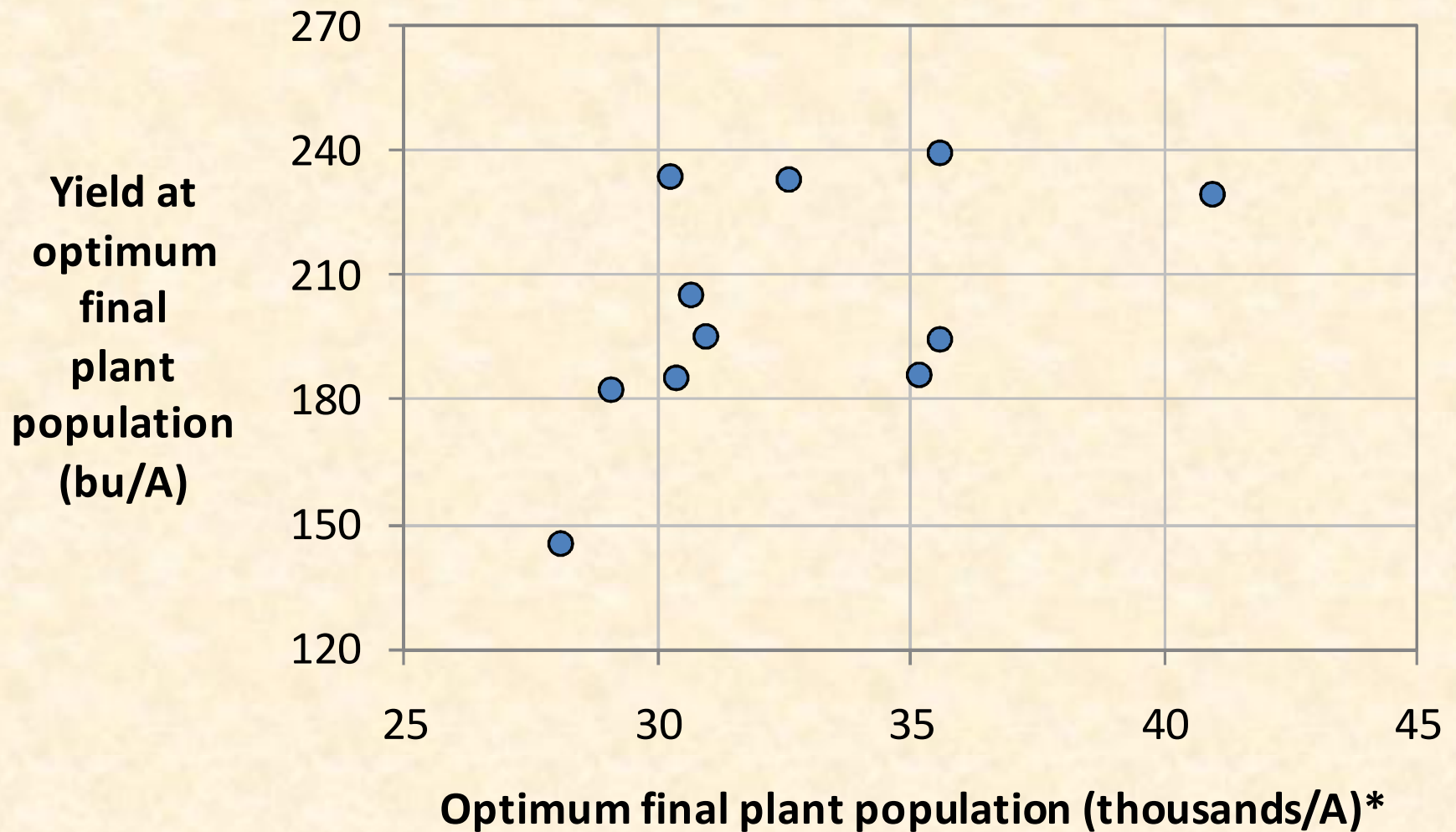
Seed cost (\$/bag)	Corn price (\$/bushel)				
	2.75	3.25	3.75	4.25	4.75
175	33,900	34,600	35,100	35,600	35,900
200	33,100	34,000	34,600	35,000	35,400
225	32,500	33,500	34,100	34,600	35,000
250	31,800	32,800	33,600	34,200	34,600
275	31,100	32,300	33,100	33,800	34,300
300	30,400	31,100	32,600	33,300	33,900

\*Seeding rates assume 5% over-planting.



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# Relationship Between Yield and Optimum Population in This Study



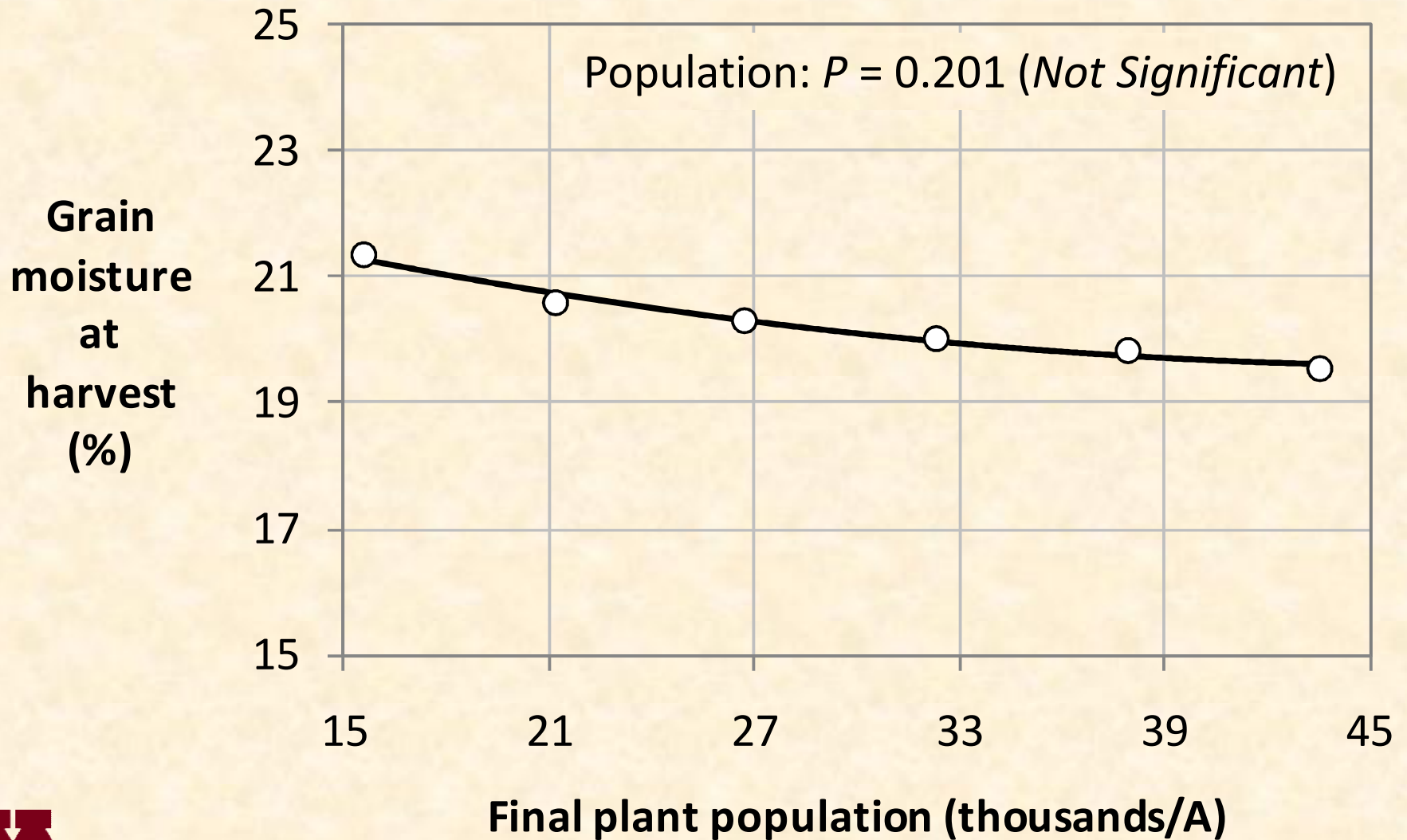
*\*Based on \$4.00/bu, \$250/bag, & 5% over-planting.*

# Relationship Between Yield Potential and Optimum Plant Population

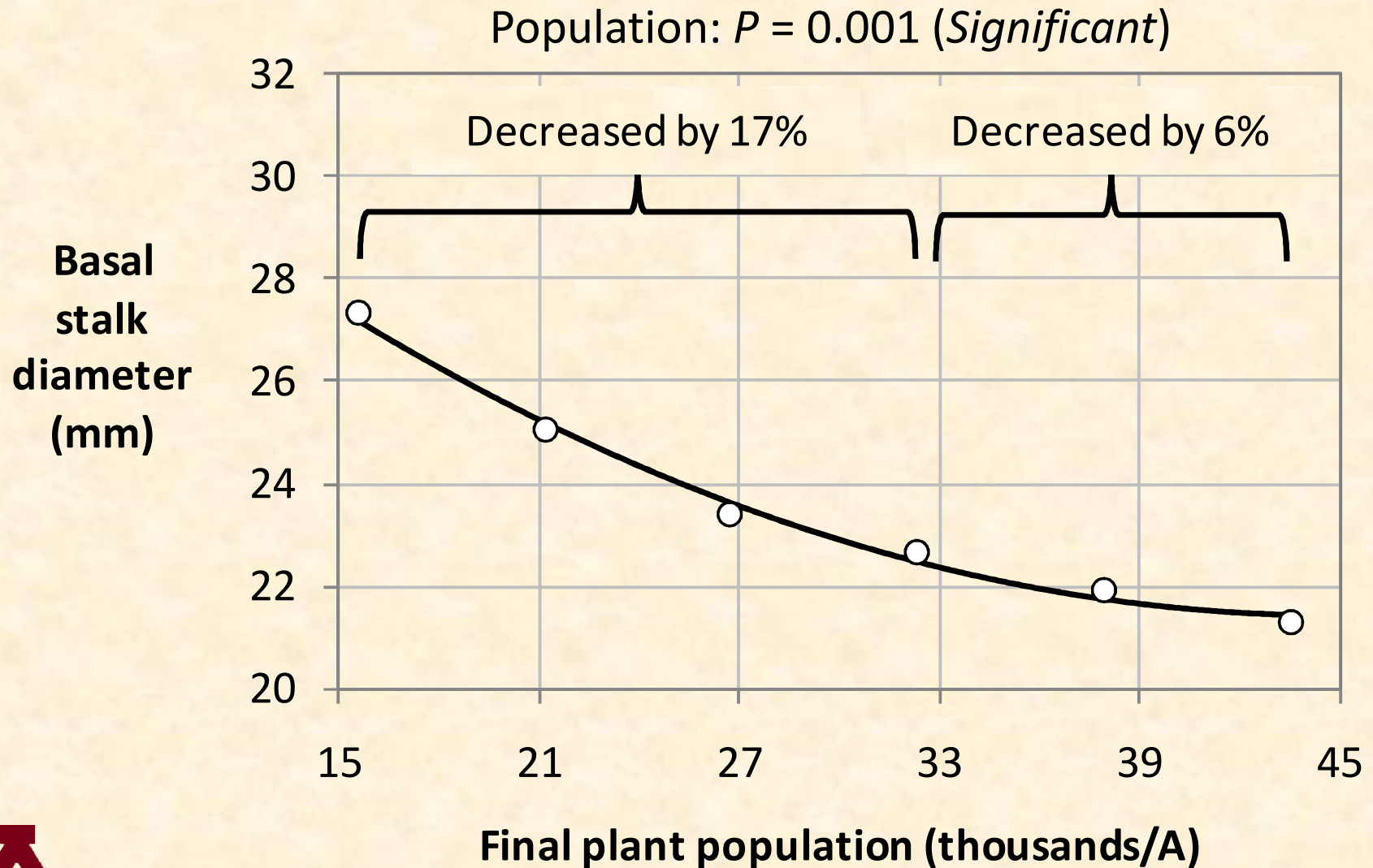
- Illinois (1991-1994): Optimum final plant population changes by **800 plants** for every **10 bu/A** change in yield potential.
- Illinois (2005-2008): Optimum final plant population changes by **940 plants** for every **10 bu/A** change in yield potential.
- A similar relationship is expected for Minnesota, but I have not found it – additional research is needed.



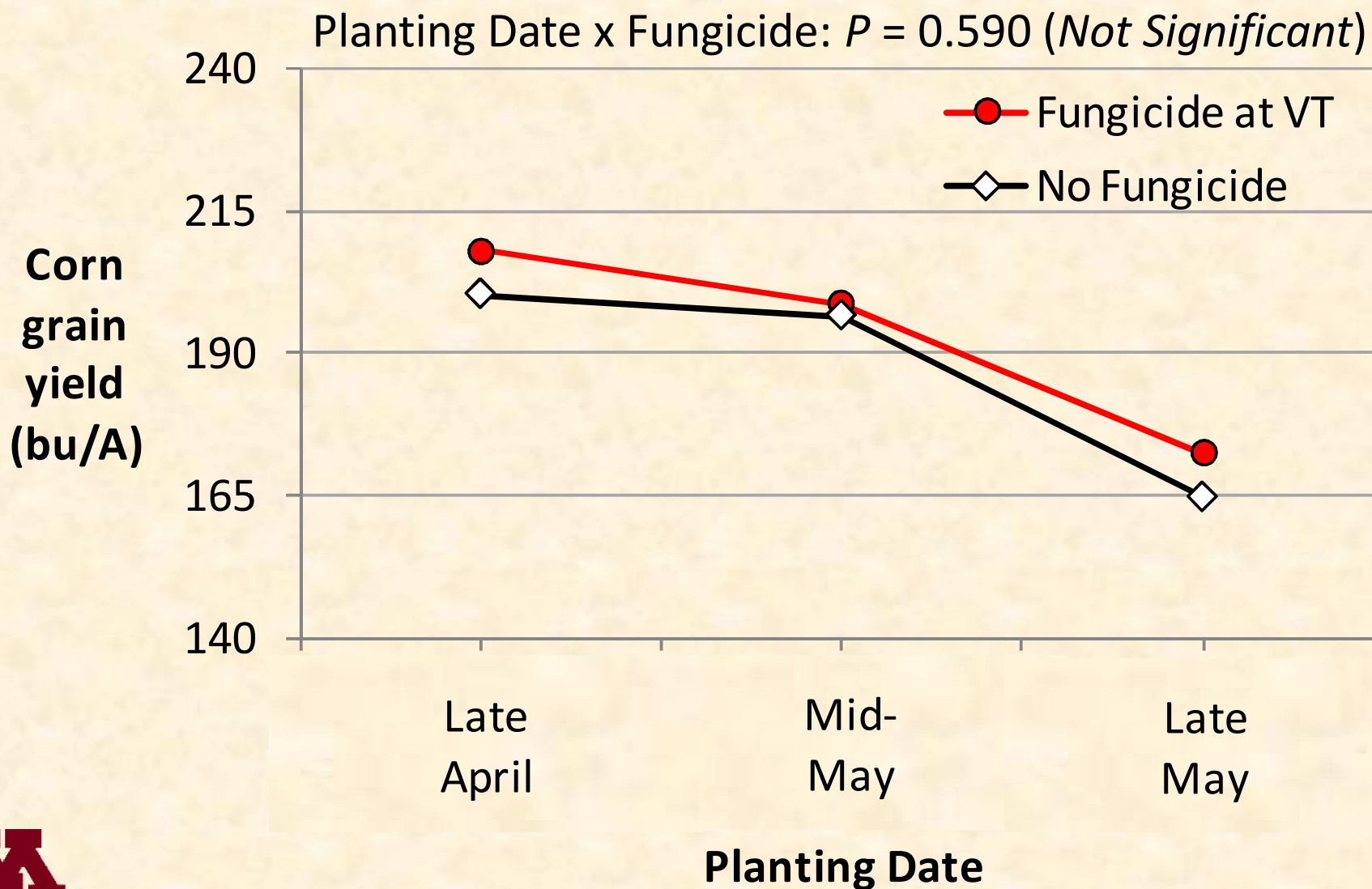
# Lamberton & Waseca, 2008 & 2009 (Averaged Over 3 Planting Dates)



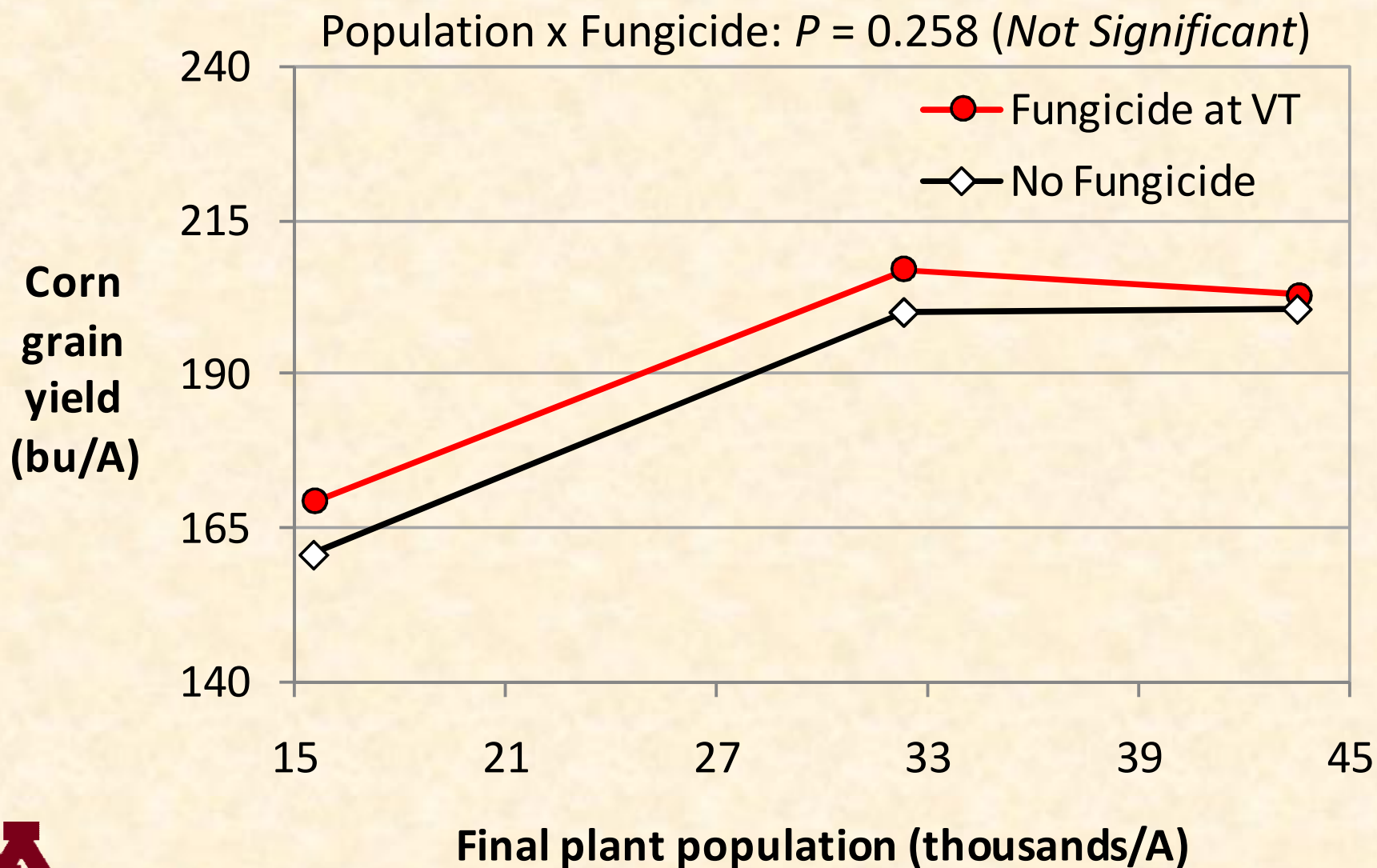
# Lamberton & Waseca, 2008 & 2009 (Averaged Over 3 Planting Dates)



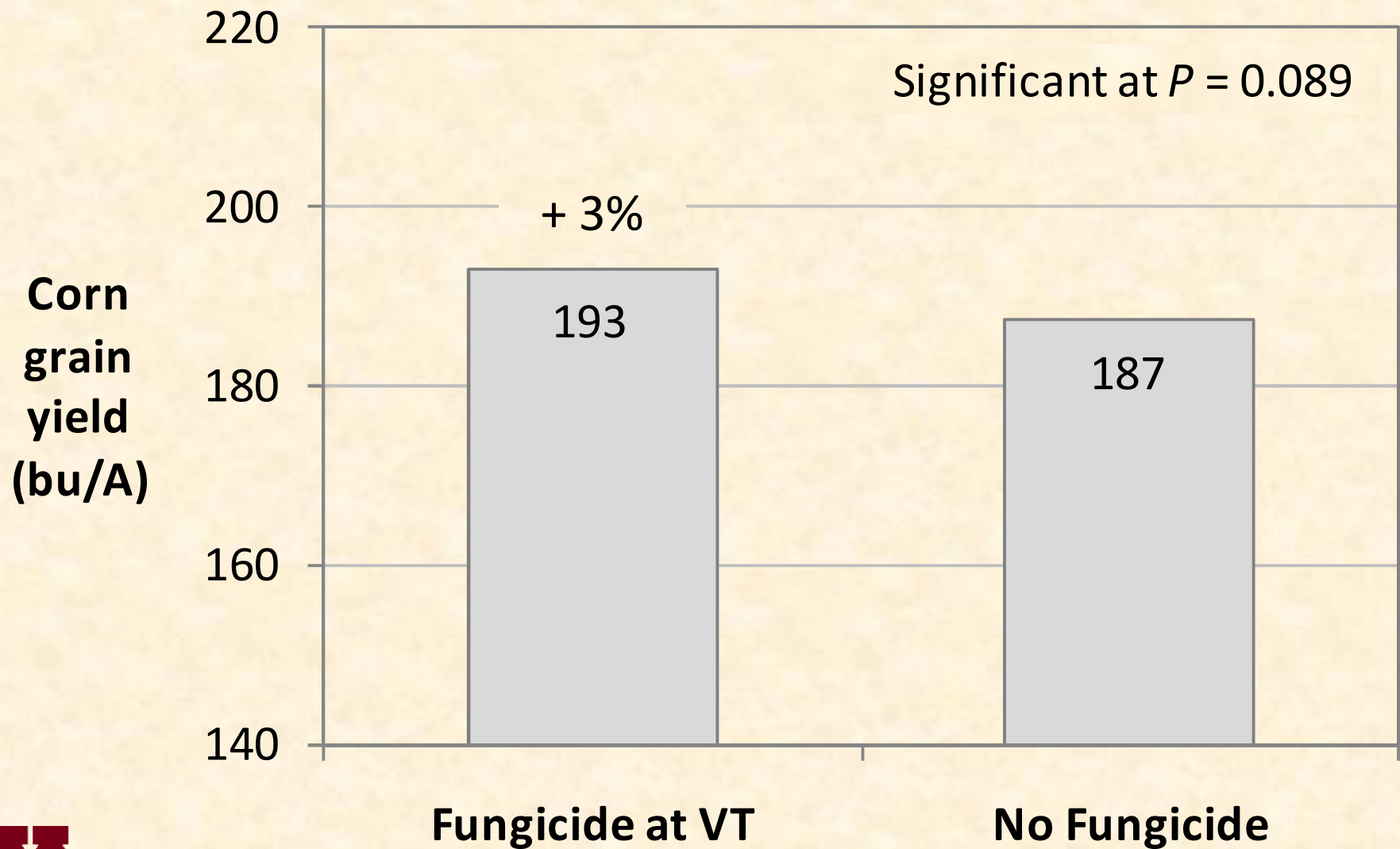
# Lamberton & Waseca, 2008 & 2009 (Averaged Over 3 Populations)



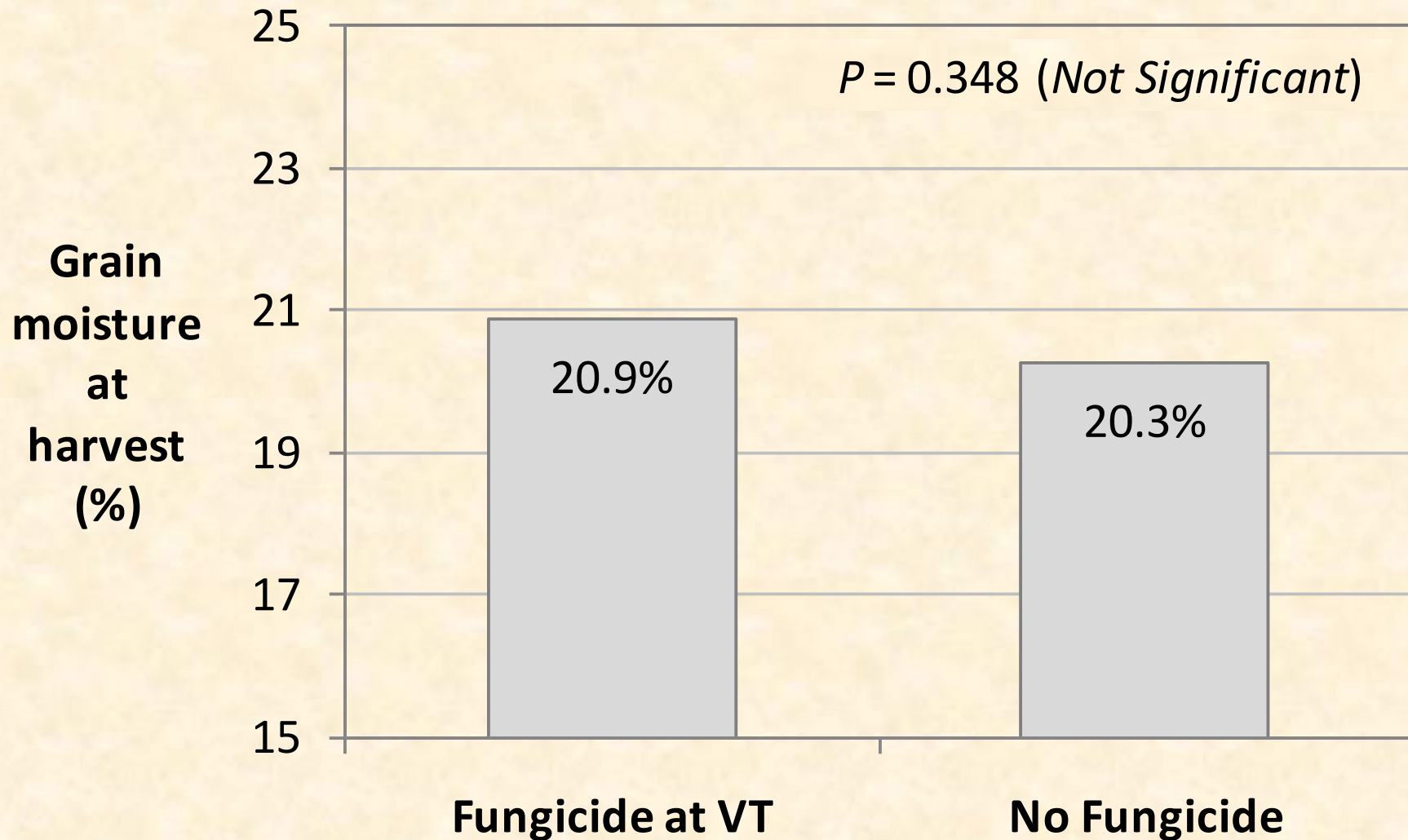
# Lamberton & Waseca, 2008 & 2009 (Averaged Over 3 Planting Dates)



# Lamberton & Waseca, 2008 & 2009 (Avg. Over 3 Planting Dates and 3 Populations)



# Lamberton & Waseca, 2008 & 2009 (Avg. Over 3 Planting Dates and 3 Populations)



# Conclusions from “High-Yield” Corn Study

- Planting in late April vs. mid-May increased yield 3%
- Optimum final plant population was similar regardless of planting date
- No relationship found between yield potential and optimum final plant population
- Yield was maximized at 36,800 plants/A
- Optimum seeding rates:
  - 32,800 seeds/A at \$3.25/bu and \$250/bag
  - 35,000 seeds/A at \$4.25/bu and \$200/bag
- Fungicide at tasseling increased yield 3%



# Future Yield Improvement in Corn

- Corn has limited ability to take advantage of increased resources (water, nutrients) under sub-optimal plant populations.
- Future yield improvement will likely be related to greater stress tolerance.
- Greater stress tolerance = higher “individual plant” yield when stress is imposed.  
= increased yield at high plant populations.



**44,000 plants/A**

**4.75" between plants in 30" rows**



**Narrow rows may reduce plant-to-plant competition, allowing increased yield at high populations.**

**44,000 plants/A  
20-inch rows**



**44,000 plants/A  
30-inch rows**



**30" rows**




**Twin-rows (8" / 22")**



**Photos by Emerson Nafziger**

# Is this the future?



84,000  
TWIN ROWS

Photo by Emerson Nafziger

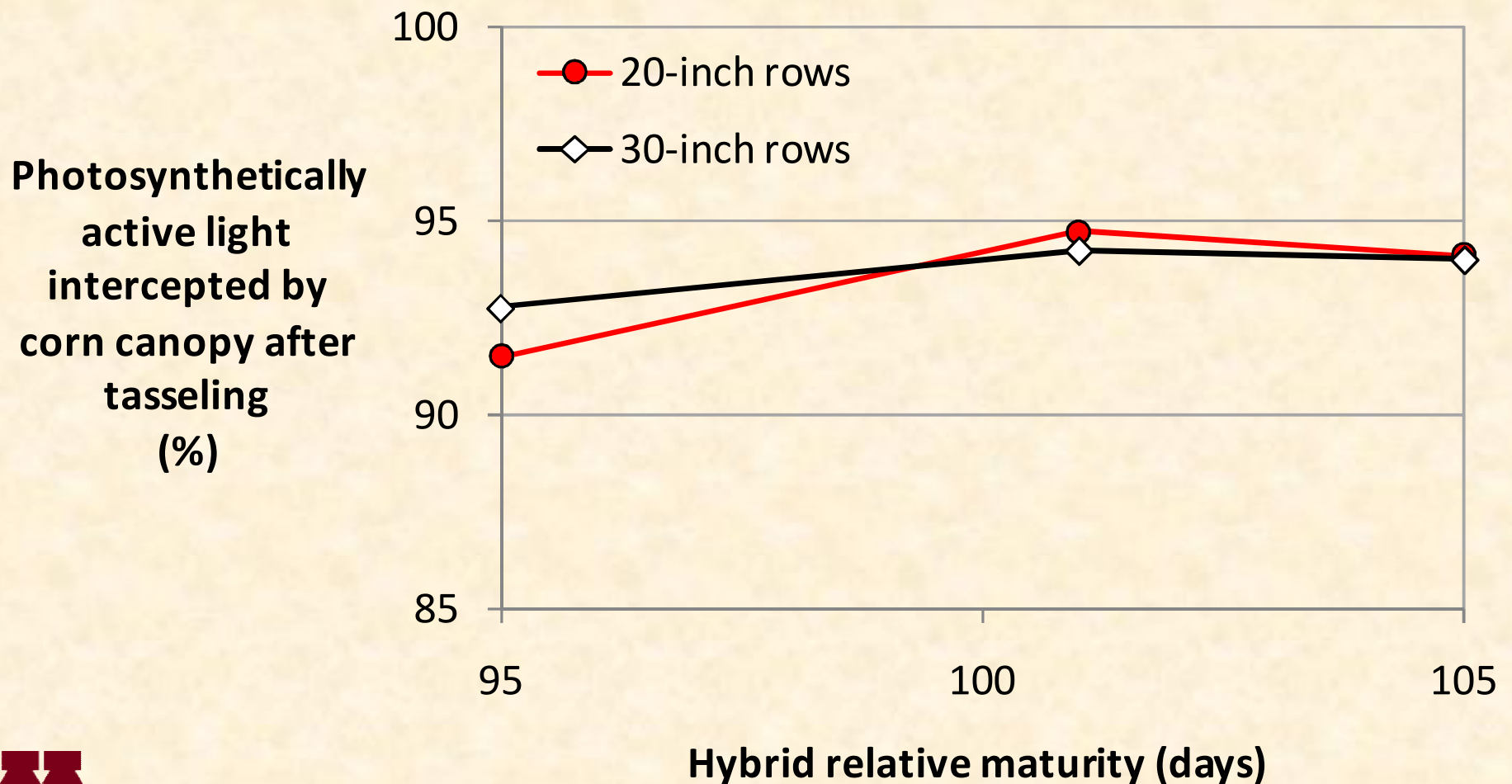
# Row Width x Hybrid Maturity Study

- Do narrow rows increase yield or affect the optimum plant population?
  - Is this influenced by hybrid maturity?
- Lamberton and Waseca, 2009 – following corn
- Nicollet-Clarion-Webster clay loam
- 3 maturity groups:
  - i) 95-day RM (Pioneer 38P43)
  - ii) 101-day RM (Pioneer 37N68)
  - iii) 105-day RM (Pioneer 35F44)
- 6 plant populations



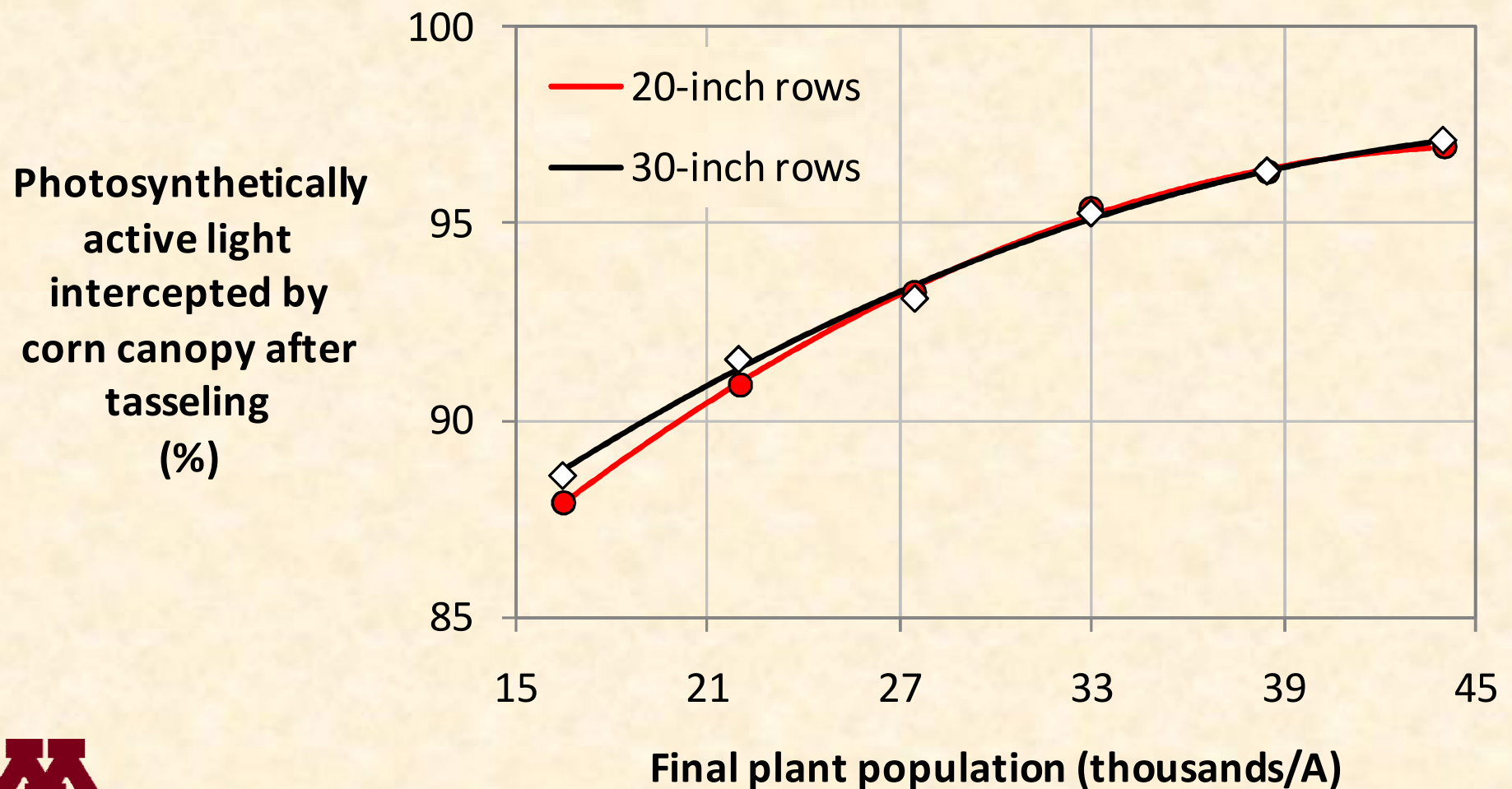
# Lamberton & Waseca, 2009 (Averaged Over 6 Populations)

Row Width x Hybrid Maturity:  $P = 0.179$  (Not Significant)



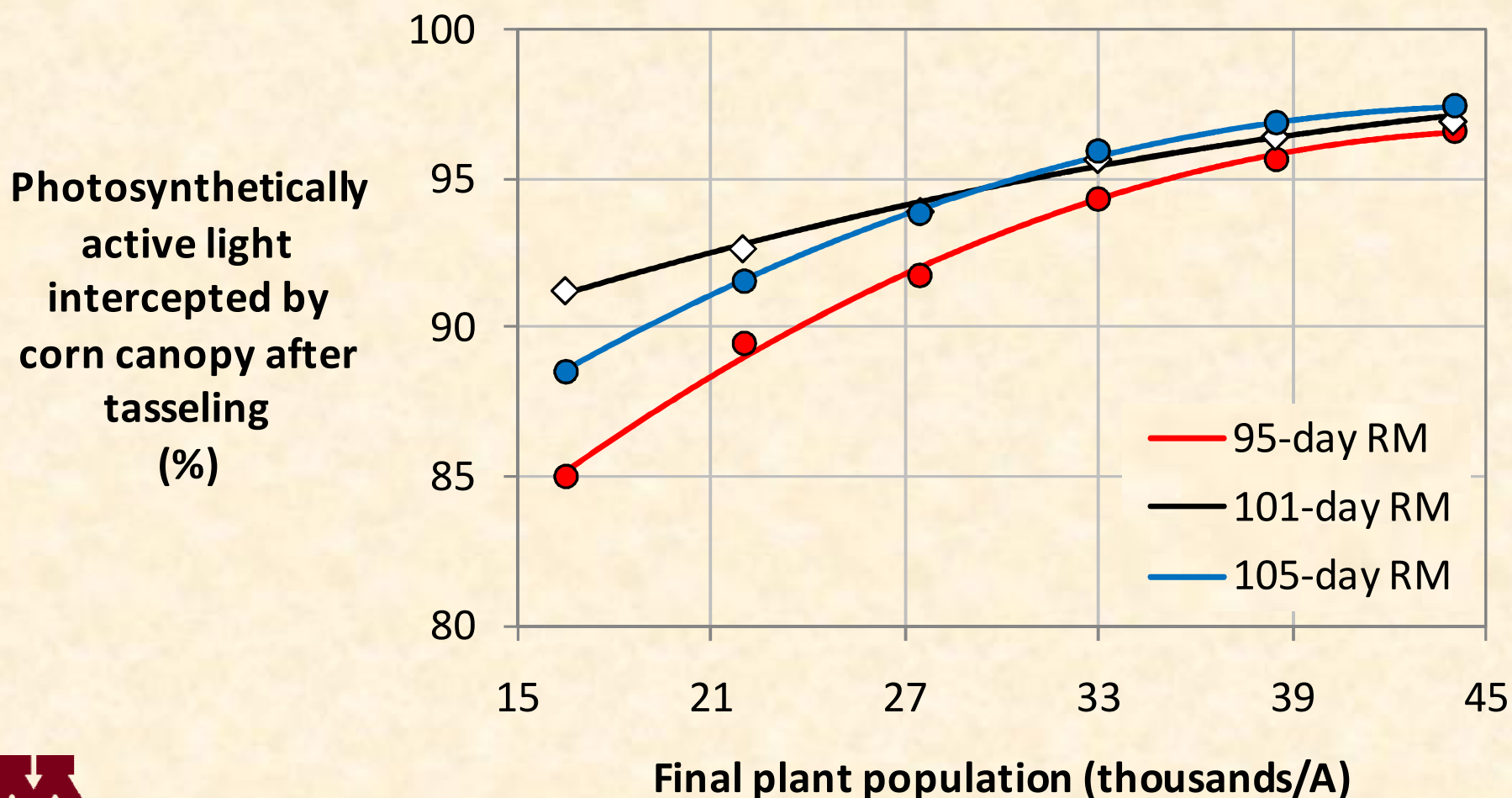
# Lamberton & Waseca, 2009 (Averaged Over 3 Hybrids)

Row Width x Population:  $P = 0.899$  (Not Significant)



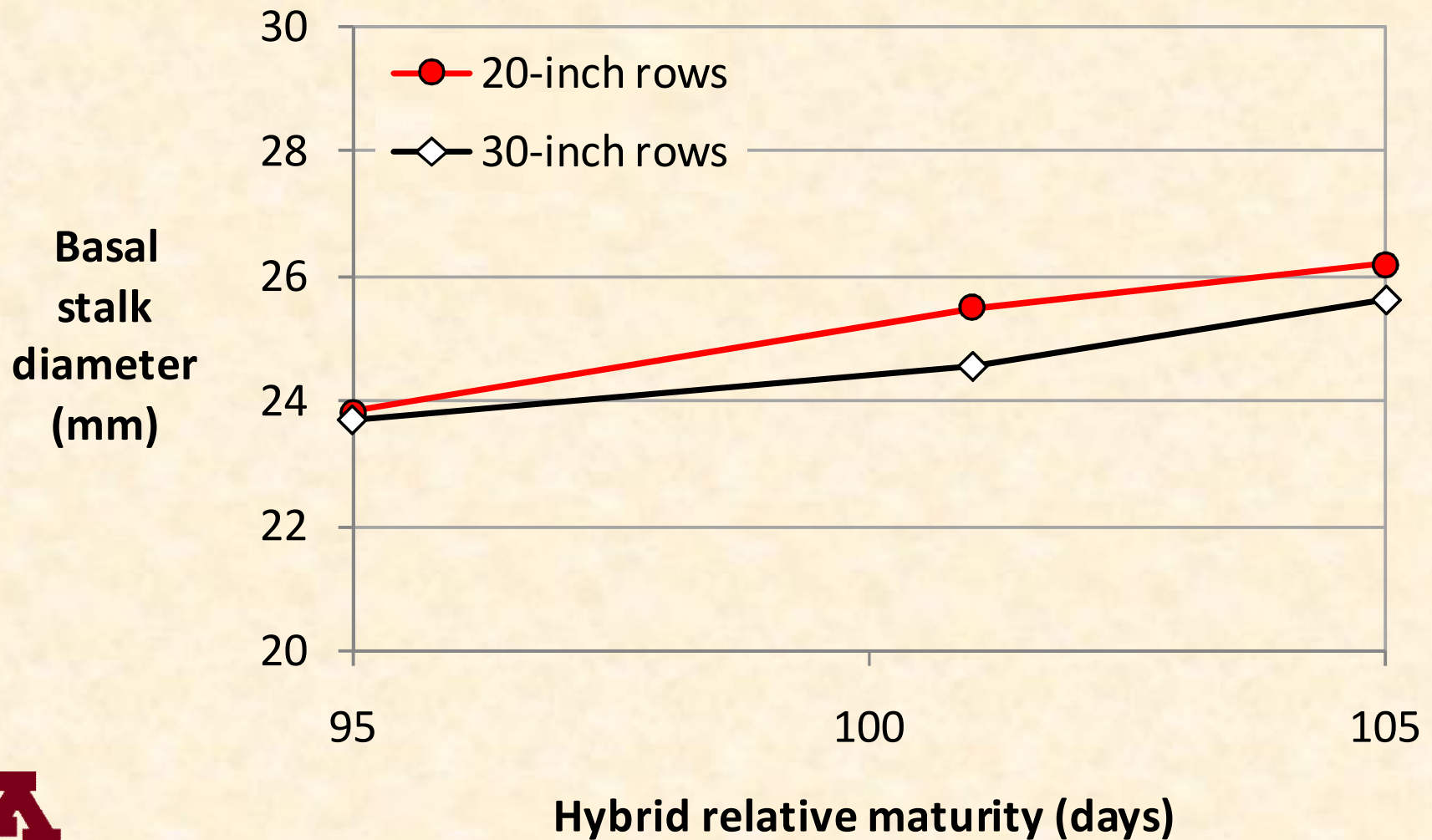
# Lamberton & Waseca, 2009 (Averaged Over 2 Row Widths)

Hybrid Maturity x Population:  $P = 0.001$  (Significant)



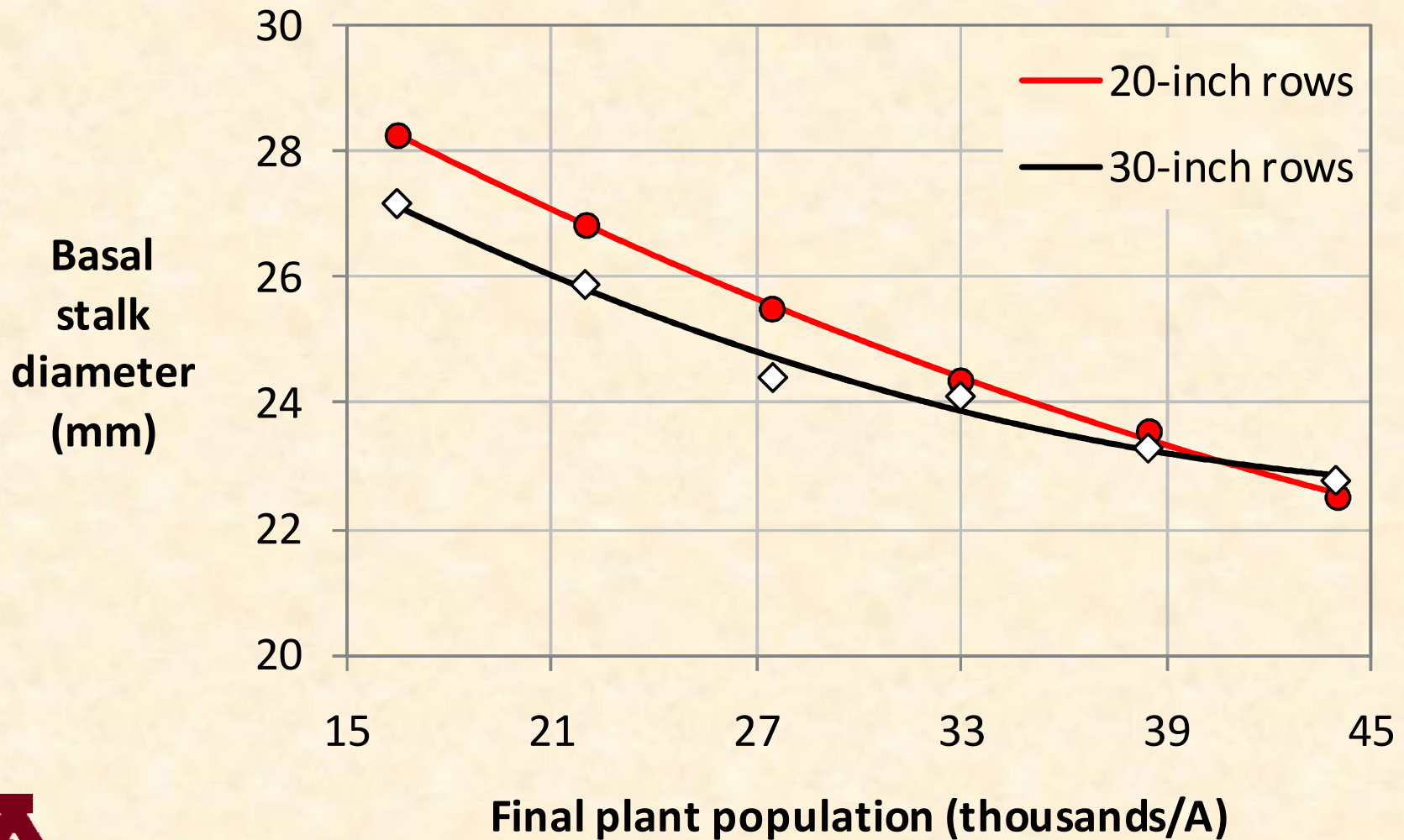
# Lamberton & Waseca, 2009 (Averaged Over 6 Populations)

Row Width x Hybrid Maturity:  $P = 0.166$  (Not *Significant*)



# Lamberton & Waseca, 2009 (Averaged Over 3 Hybrids)

Row Width x Population:  $P = 0.085$  (Significant)

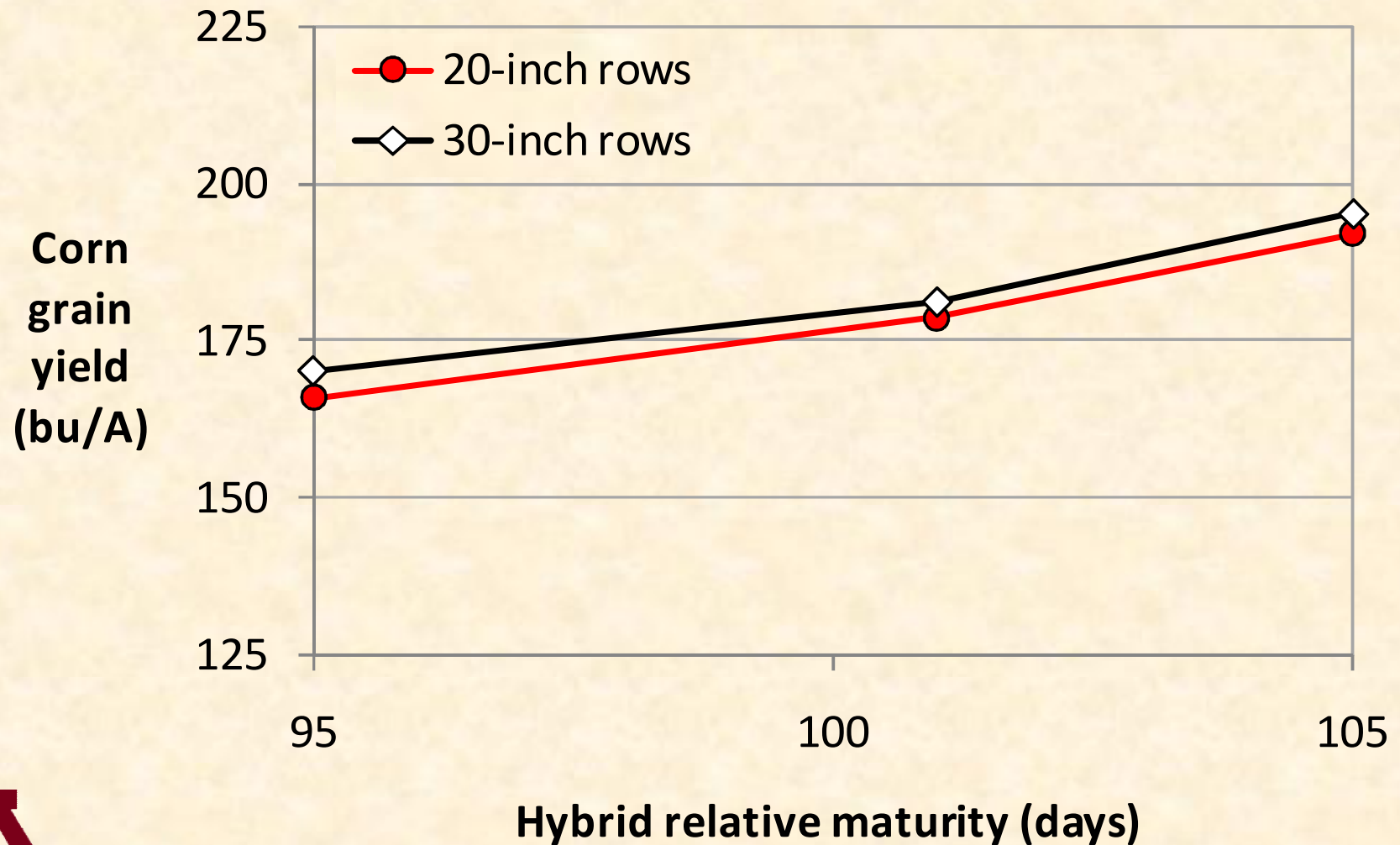


**What about the bottom line?**



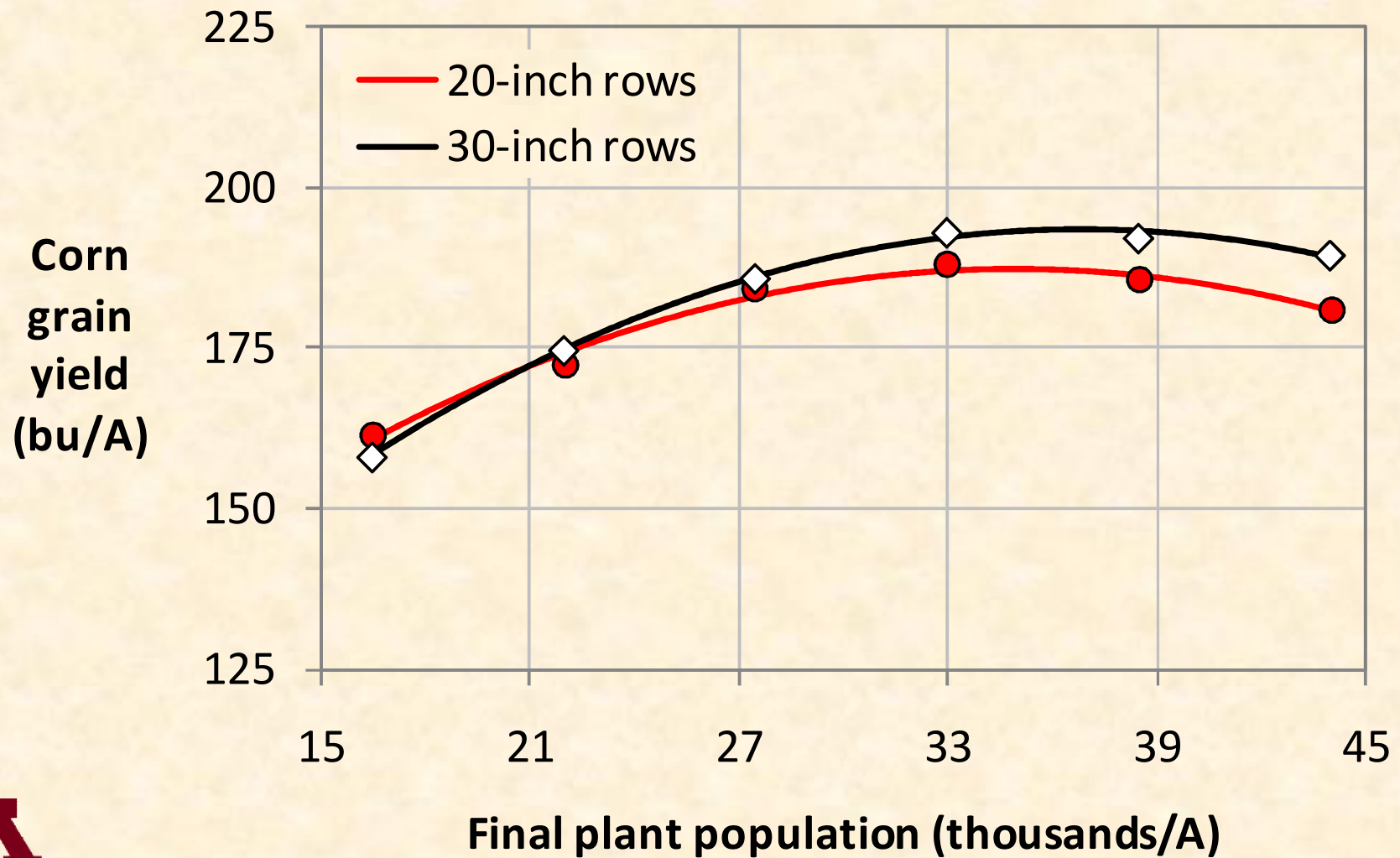
# Lamberton & Waseca, 2009 (Averaged Over 6 Populations)

Row Width x Hybrid Maturity:  $P = 0.921$  (Not *Significant*)



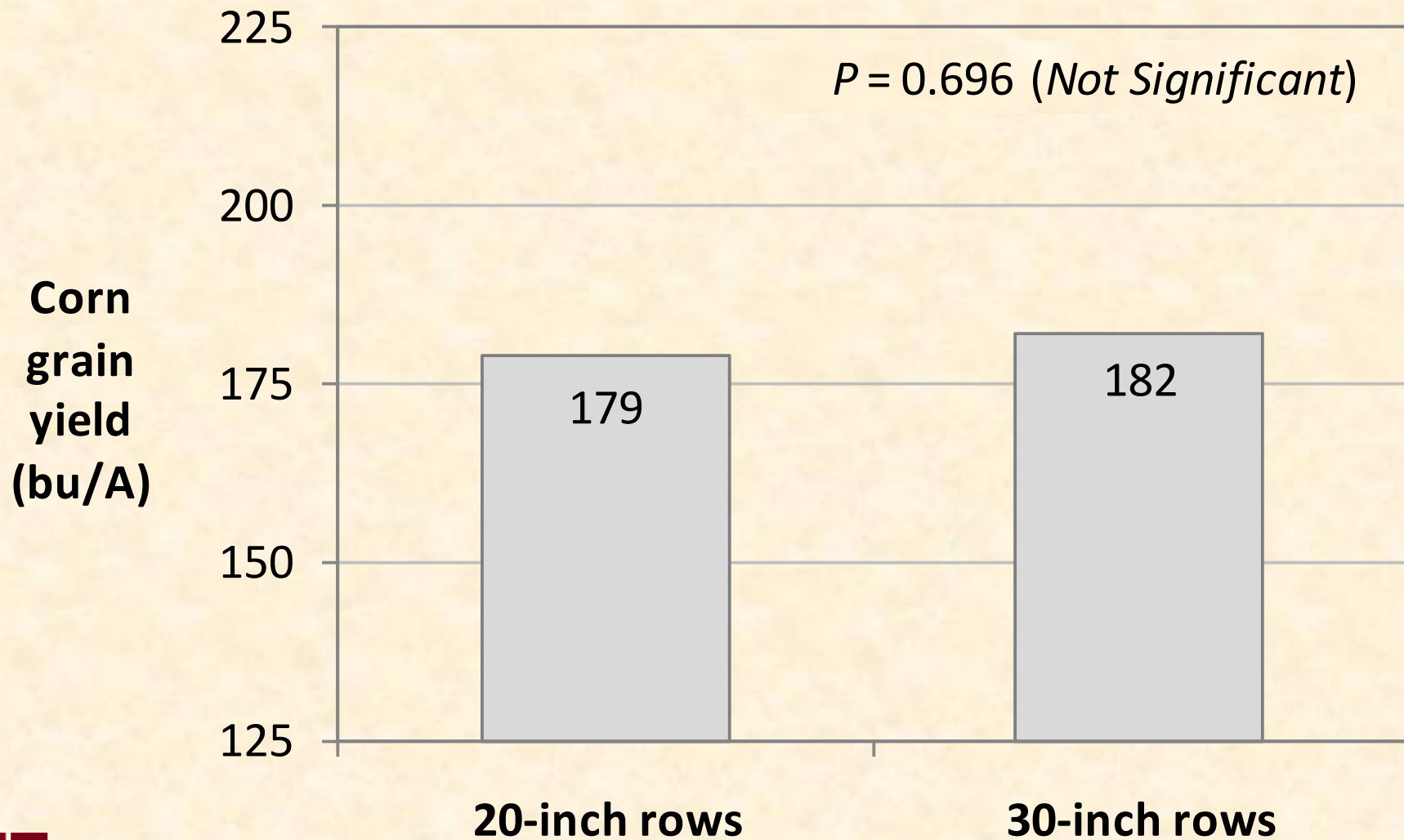
# Lamberton & Waseca, 2009 (Averaged Over 3 Hybrids)

Row Width x Population:  $P = 0.265$  (Not Significant)



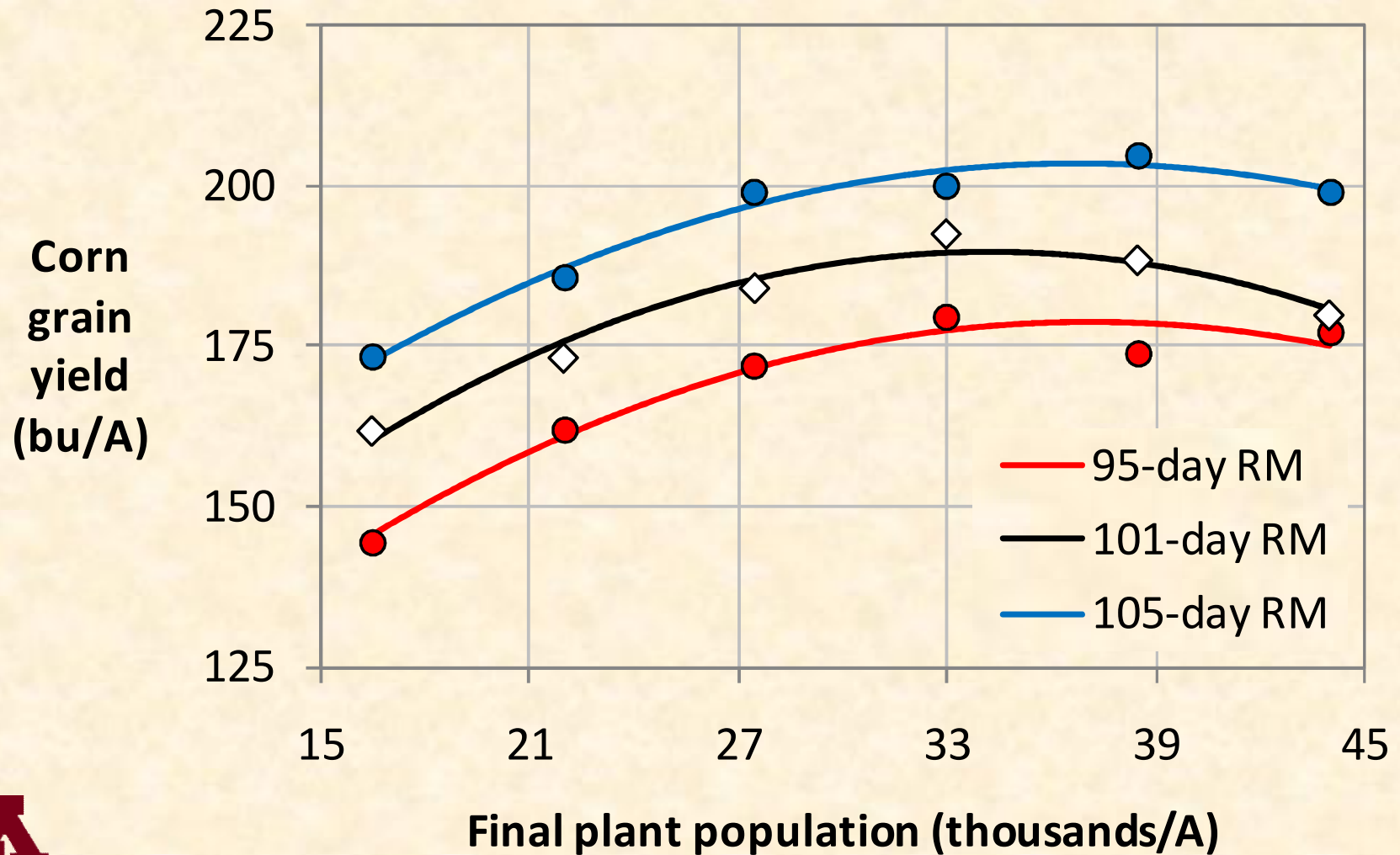
# Lamberton & Waseca, 2009

(Avg. Over 3 Hybrids and 6 Populations)



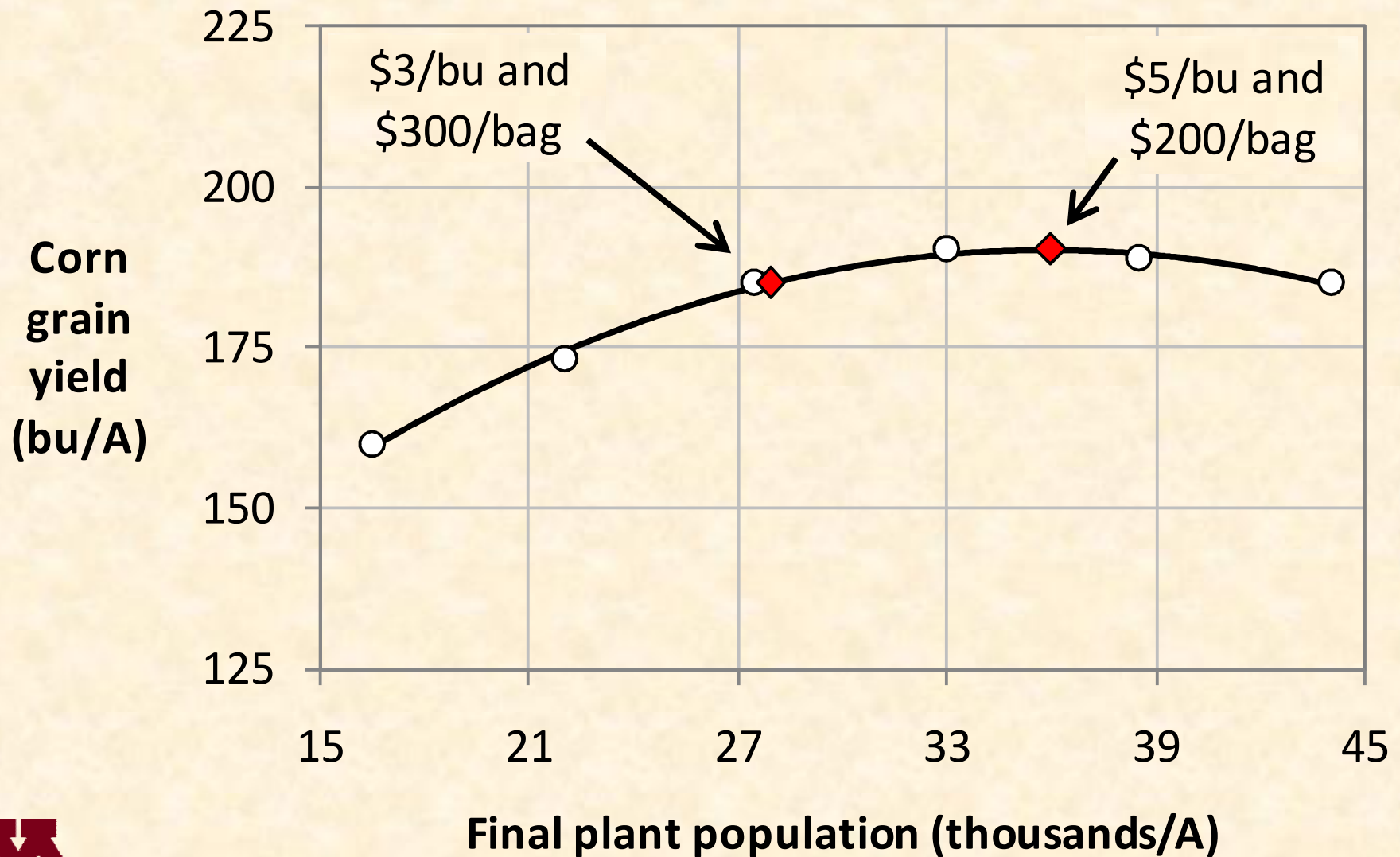
# Lamberton & Waseca, 2009 (Averaged Over 2 Row Widths)

Hybrid Maturity x Population:  $P = 0.592$  (Not Significant)



# Lamberton & Waseca, 2009

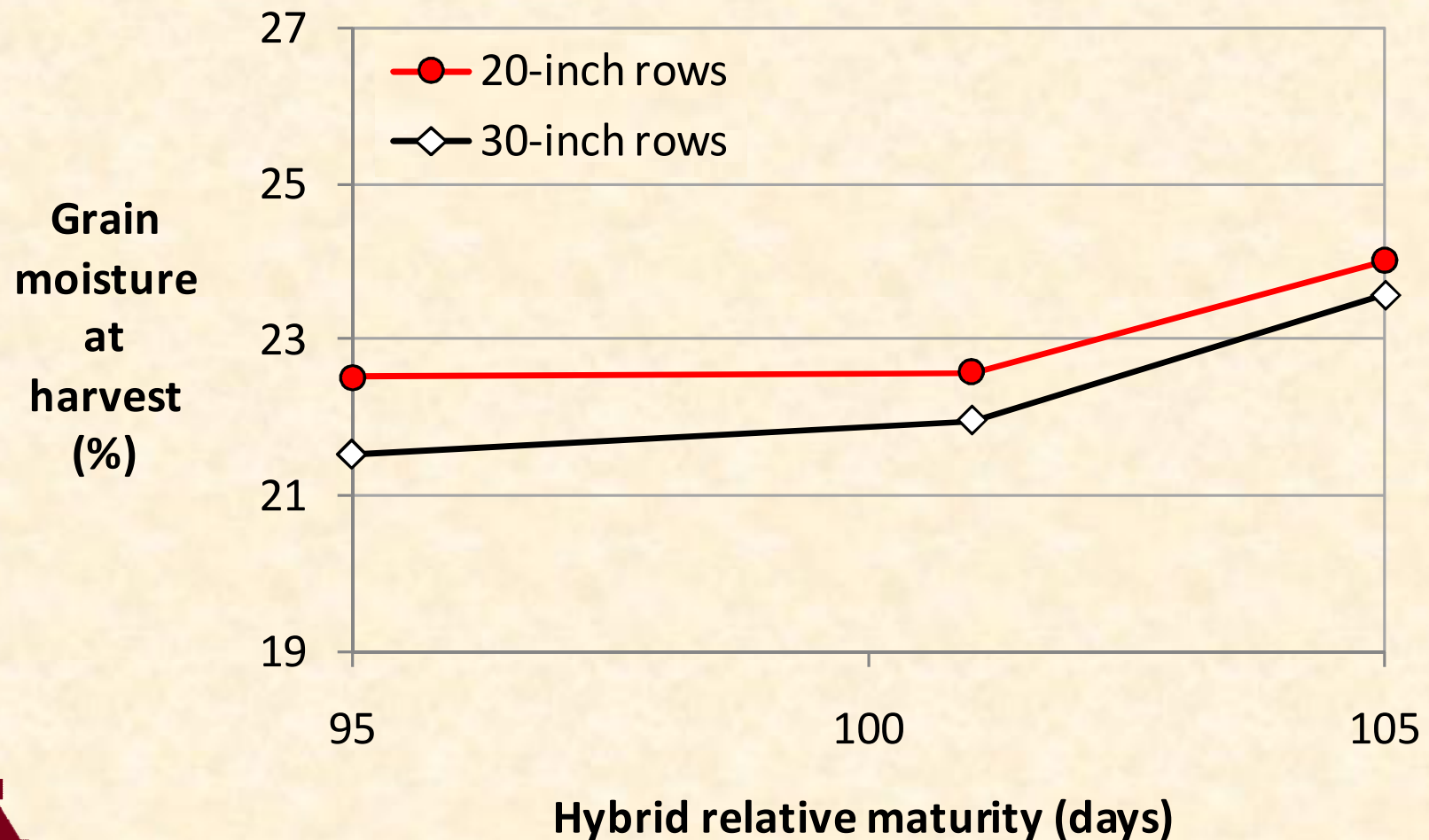
(Averaged Over 2 Row Widths and 3 Hybrids)



# Lamberton & Waseca, 2009 (Averaged Over 6 Populations)

Row Width:  $P = 0.646$  (Not Significant)

Row Width x Hybrid Maturity:  $P = 0.748$  (Not Significant)

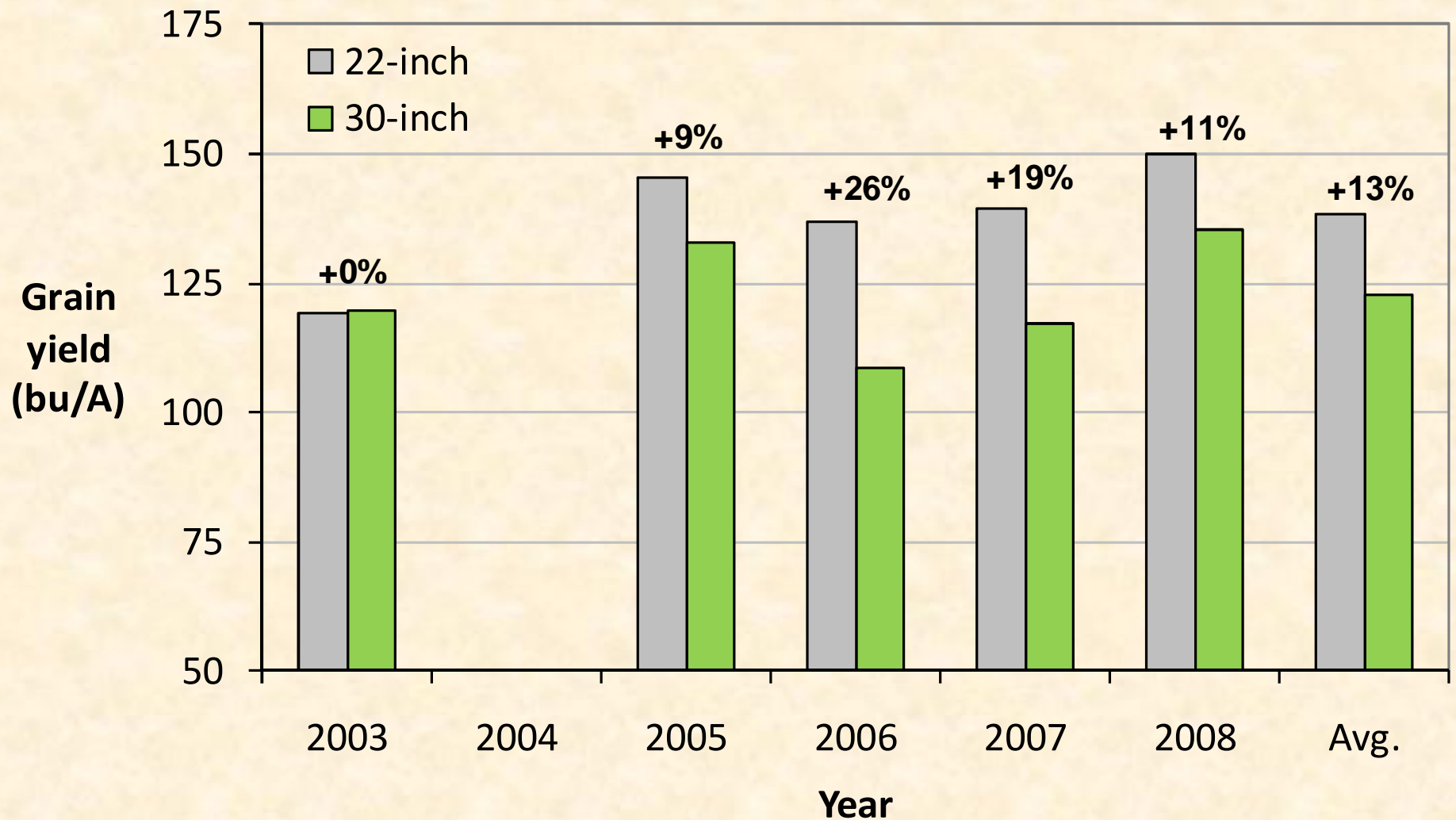


# Conclusions from Southern MN Row Width Study

- Narrow rows did not improve crop light interception during grain fill.
- The early-maturing hybrid intercepted less light during grain fill, especially at sub-optimal populations.
- Narrow rows resulted in thicker stalks, but only at sub-optimal populations.
- Row width did not affect yield or harvest moisture.
- The optimum plant population was not influenced by row width or hybrid maturity.



# Yields Reported by Growers in Northwest MN



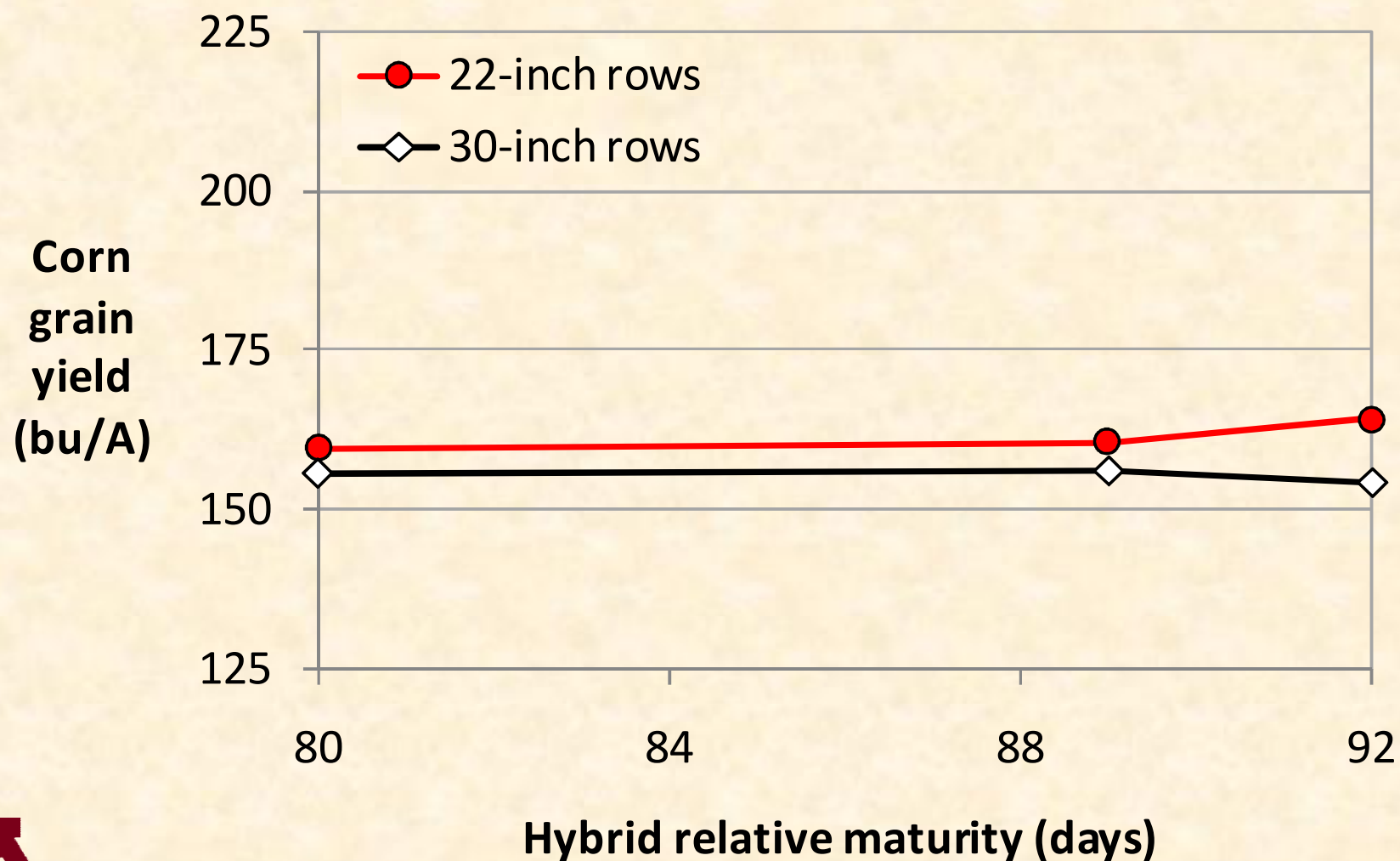
# Row Width x Hybrid x Population Study

- Crookston, 2009 – following soybean
- 2 row widths (22-inch vs. 30-inch)
- 3 hybrids:
  - i) 80-day RM (Pioneer 39V09)
  - ii) 89-day RM (Pioneer 39N99)
  - iii) 92-day RM (Pioneer 38H08)
- 6 plant populations



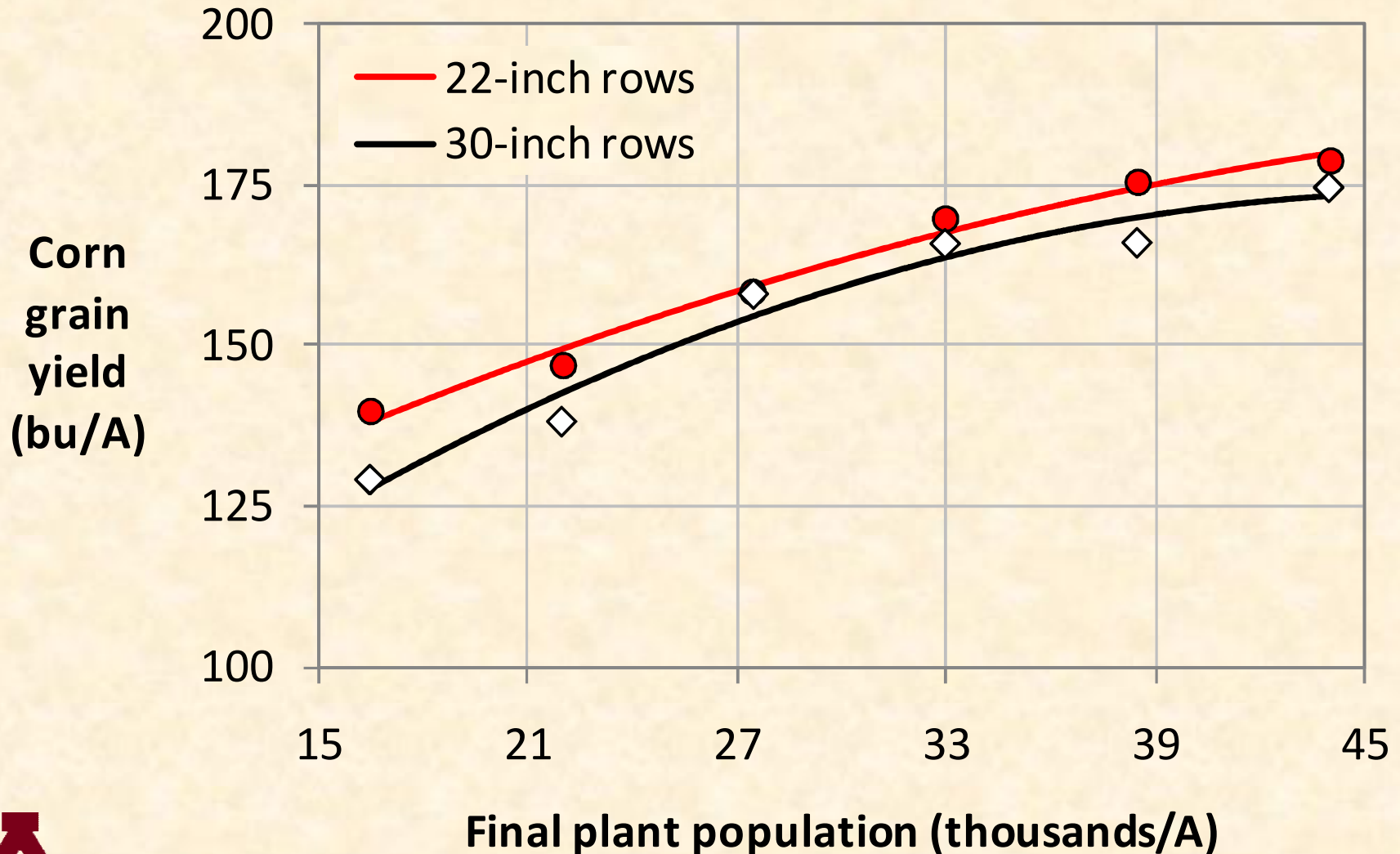
# Crookston, 2009 (Averaged Over 6 Populations)

Row Width x Hybrid Maturity:  $P = 0.540$  (Not Significant)



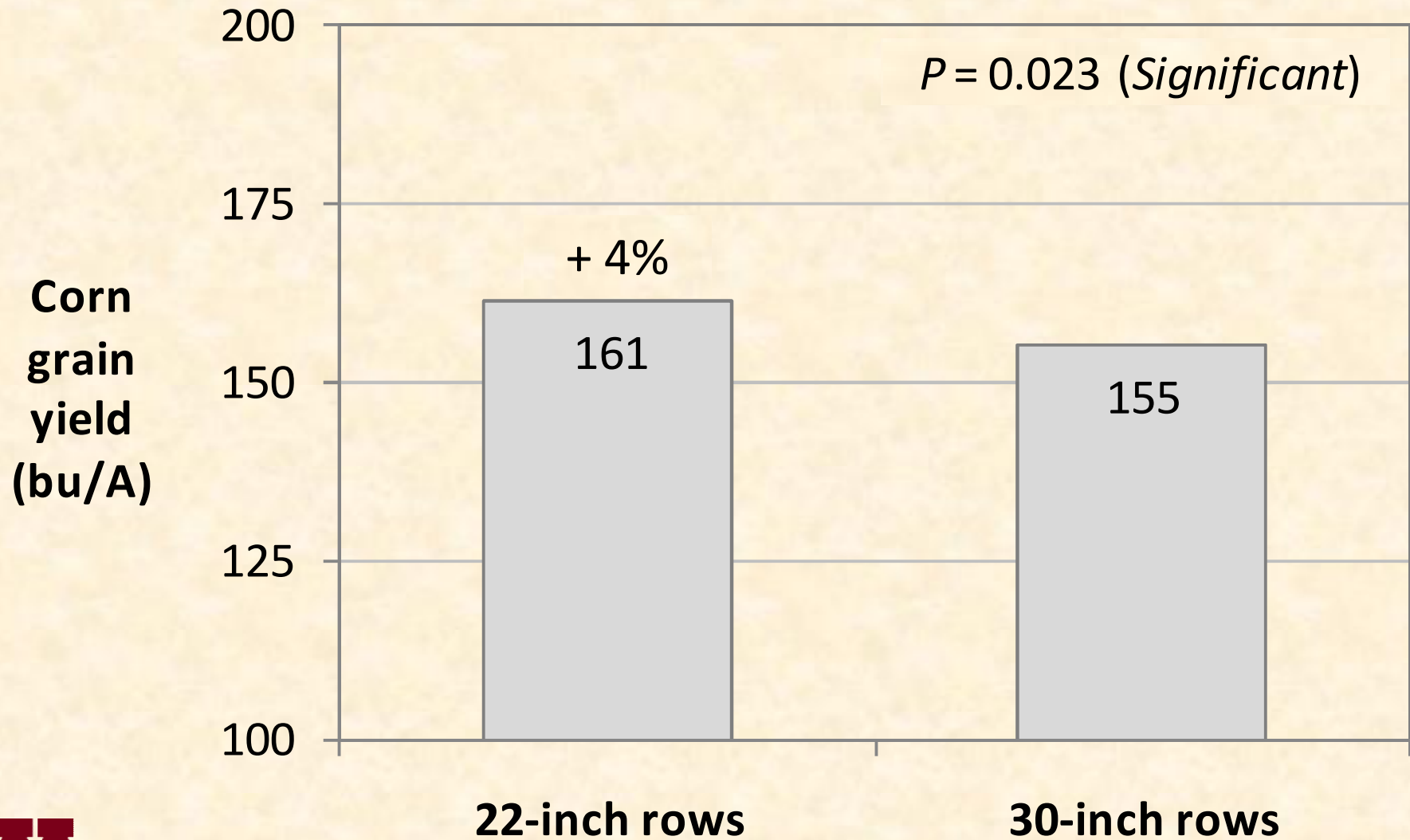
# Crookston, 2009 (Averaged Over 3 Hybrids)

Row Width x Population:  $P = 0.795$  (Not Significant)



# Crookston, 2009

(Avg. Over 3 Hybrids and 6 Populations)



# Conclusions from Northwest MN Row Width Study

- Narrow rows increased yield 4%.
  - This was consistent among hybrids.
  - This increase was smaller than expected.
- The optimum plant population was not influenced by row width or hybrid maturity.
  - These results are similar to those from the southern MN experiments.





# Thanks!



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