

# Managing Short Stature Maize for Maximum Yield

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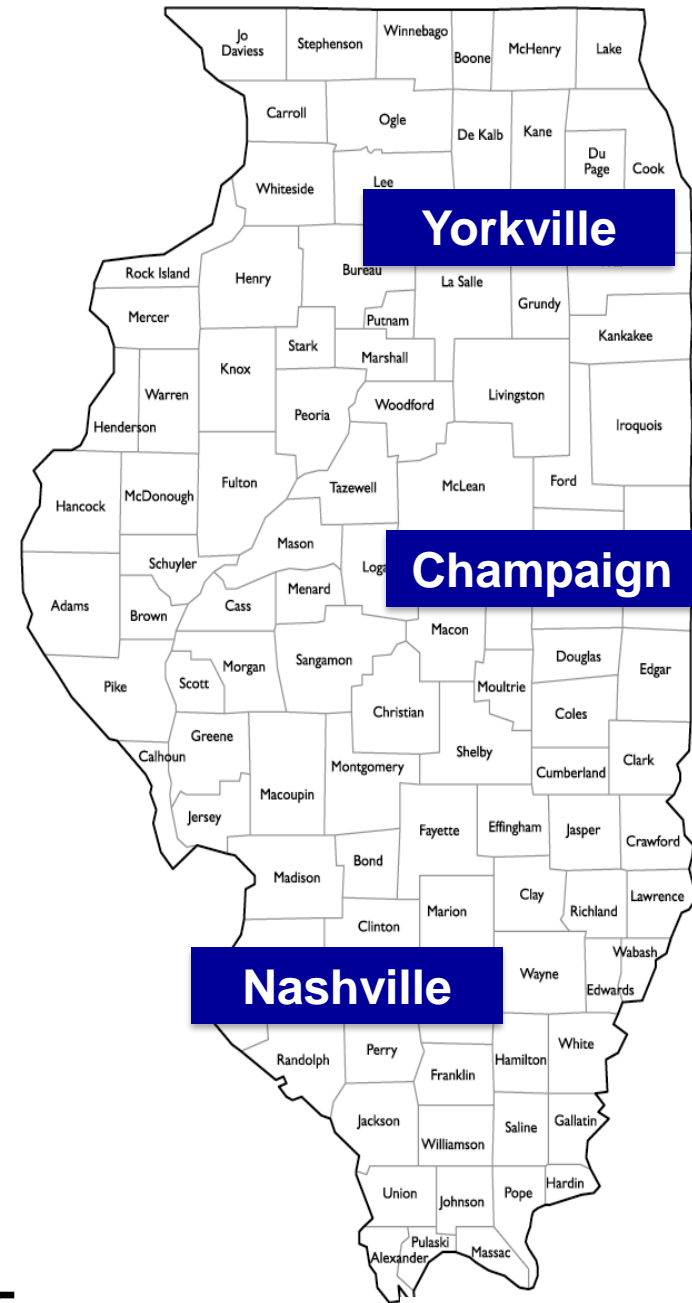
**CPL studies show that population, fertility, and foliar protection are the management factors consistently resulting in high maize grain yields**

# Research Approach

<b>Treatment description</b>	<b>Row Spacing (cm)</b>	<b>Planting Population (plants ha<sup>-1</sup>)</b>	<b>Broadcast Fertility</b>	<b>Foliar Protection</b>
Standard Population (SP)	76	84,000	None	None
SP + Broadcast Fertility	76	84,000	Preplant	None
SP + Foliar Protection	76	84,000	None	Yes – VT/R1
SP + Broadcast Fertility + Foliar Protection	76	84,000	Preplant	Yes – VT/R1
High Population (HP)	76	104,000	None	None
HP + Broadcast Fertility	76	104,000	Preplant	None
HP + Foliar Protection	76	104,000	None	Yes – VT/R1
HP + Broadcast Fertility + Foliar Protection	76	104,000	Preplant	Yes – VT/R1
SP + Broadcast Fertility + Foliar Protection	51	84,000	Preplant	Yes – VT/R1
HP + Broadcast Fertility + Foliar Protection	51	104,000	Preplant	Yes – VT/R1
Max Population + Fertility + Foliar Protection	51	124,000	Preplant	Yes – VT/R1

# Soil Analysis at Short Stature Maize Research Sites in 2022

	Location		
	Nashville	Champaign	Yorkville
<b>OM (%)</b>	<b>2.5</b>	<b>4.0</b>	<b>4.7</b>
<b>pH</b>	<b>6.3</b>	<b>6.1</b>	<b>5.5</b>
<b>CEC</b>	<b>22.1</b>	<b>21.4</b>	<b>22.1</b>
<b>P (mg kg<sup>-1</sup>)</b>	<b>24</b>	<b>27</b>	<b>24</b>
<b>K (mg kg<sup>-1</sup>)</b>	<b>81</b>	<b>123</b>	<b>146</b>



Each site with six replications of three hybrids: RT5575, RT6203, RT6205

# Measurements to Collect

- Emergence and Stand Assessment
- Plant and ear height at maturity
- Grain yields
- Yield Components
- Grain Quality



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# Value of Management Factors at 76 cm Row Spacing

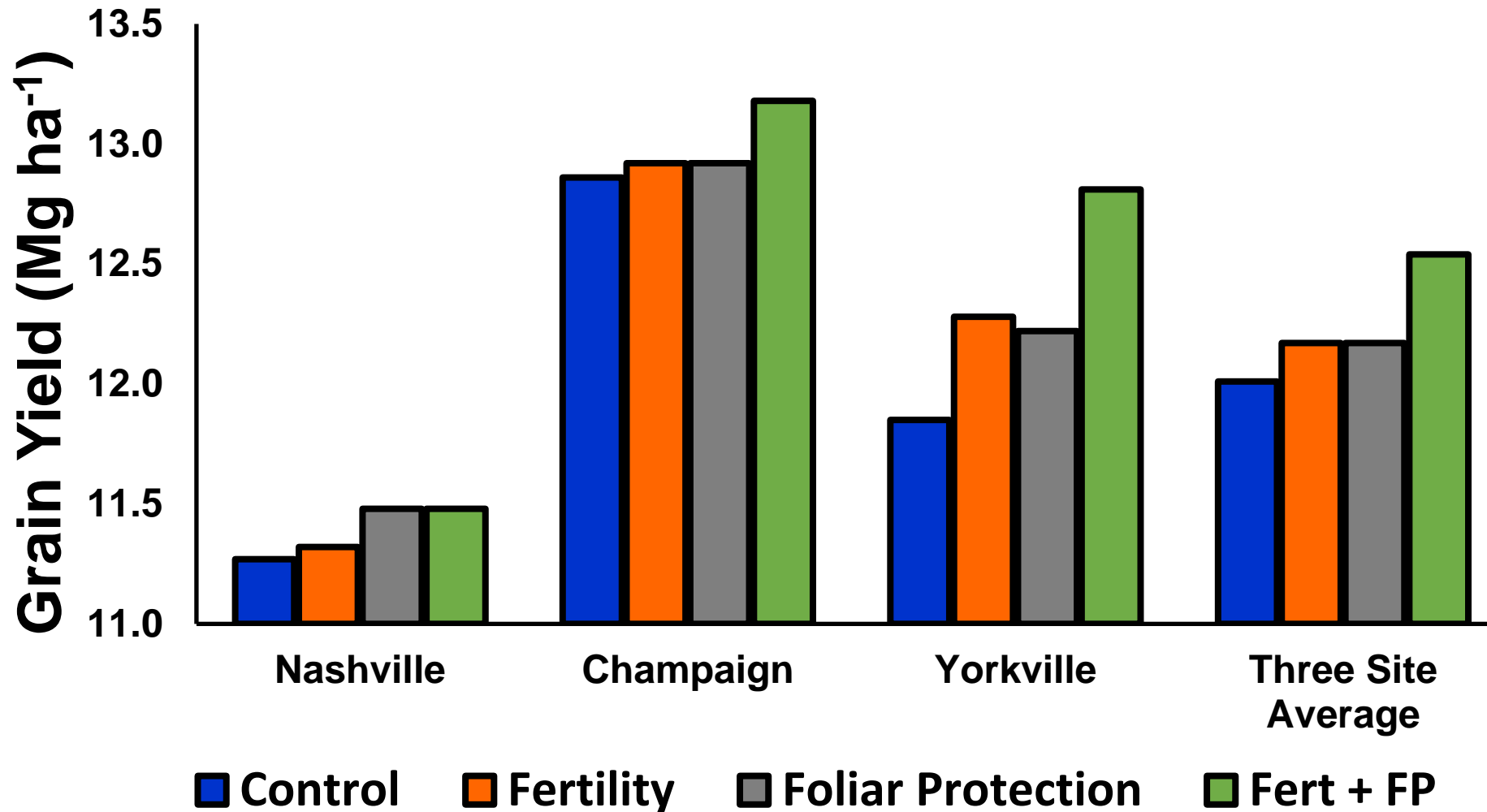
Management Factor		Nashville	Champaign	Yorkville	3-Site Avg
		Mg ha <sup>-1</sup>			
Density	84k	11.35	12.73 <sup>B</sup>	12.15 <sup>B</sup>	12.04 <sup>B</sup>
	104k	11.40	13.15 <sup>A</sup>	12.41 <sup>A</sup>	12.36 <sup>A</sup>
Fertility	None	11.35	12.84 <sup>B</sup>	11.99 <sup>B</sup>	12.04 <sup>B</sup>
	P & K	11.40	13.05 <sup>A</sup>	12.52 <sup>A</sup>	12.31 <sup>A</sup>
Foliar Protection	None	11.30	12.89 <sup>B</sup>	12.04 <sup>B</sup>	12.04 <sup>B</sup>
	F & I	11.46	12.99 <sup>A</sup>	12.52 <sup>A</sup>	12.31 <sup>A</sup>

Fertility = 90 kg P<sub>2</sub>O<sub>5</sub>, 67 kg K<sub>2</sub>O, 22 kg S broadcast applied ha<sup>-1</sup>

Foliar Protection = Fungicide and Insecticide at R1

Significance Declared at  $\alpha = 0.05$

# Short Stature Maize Response to Mgmt



If a single management practice was to be used it did not differ between broadcast fertility or foliar protection. FP has a lower associated cost in this case.

Managements tended to be synergistic as locations moved from south to north

Presented data is averaged across three hybrids at each site and only refers to yields in a 76 cm row  
Fertility × Foliar Protection Interaction = NS (Fertility or Foliar Protection were significant at  $\alpha = 0.05$ )



# Value of Management Factors To Short Stature Maize

Management Factor	Nashville	Champaign	Yorkville
	————— kg per ha —————		
Population	53	424	265
Fertility	53	53	424
Foliar Protection	212	53	371
Fertility & Foliar	212	318	955
51 cm Rows	?	?	?

Population = 84 vs 104 thousand plants per ha

Fertility = 90 kg P<sub>2</sub>O<sub>5</sub>, 67 kg K<sub>2</sub>O, 22 kg S broadcast applied per ha

Foliar Protection = Fungicide and Insecticide at R1

# Nashville Grain Yield

Agronomic Management System			Hybrid Evaluated			Average
Row Spacing	Target Stand	Management	RT5575	RT6203	RT6205	
Mg per ha						
76 cm	84,000	None	12.04	11.14	10.82	<b>11.35<sup>C</sup></b>
		Fertility	11.62	11.14	10.93	<b>11.24<sup>C</sup></b>
		Foliar Protection	11.72	11.30	11.19	<b>11.40<sup>C</sup></b>
		Fertility + Foliar Protection	12.25	11.24	11.03	<b>11.51<sup>C</sup></b>
	104,000	None	11.77	11.24	10.61	<b>11.19<sup>C</sup></b>
		Fertility	11.67	11.14	11.40	<b>11.40<sup>C</sup></b>
		Foliar Protection	11.62	11.51	11.30	<b>11.46<sup>C</sup></b>
		Fertility + Foliar Protection	11.24	11.51	11.67	<b>11.51<sup>C</sup></b>
51 cm	84,000	Fertility + Foliar Protection	12.62	13.15	12.04	<b>12.62<sup>B</sup></b>
	104,000	Fertility + Foliar Protection	13.74	13.68	13.15	<b>13.53<sup>A</sup></b>
	124,000	Fertility + Foliar Protection	13.58	13.74	14.16	<b>13.84<sup>A</sup></b>
Hybrid Average			<b>12.15<sup>A</sup></b>	<b>11.88<sup>B</sup></b>	<b>11.67<sup>B</sup></b>	

# Champaign Grain Yield

Agronomic Management System			Hybrid Evaluated			Average
Row Spacing	Target Stand	Management	RT5575	RT6203	RT6205	
————— Mg per ha —————						
76 cm	84,000	None	12.62	12.89	12.68	<b>12.73<sup>FG</sup></b>
		Fertility	12.73	12.73	12.73	<b>12.73<sup>FG</sup></b>
		Foliar Protection	12.62	12.62	12.57	<b>12.62<sup>G</sup></b>
		Fertility + Foliar Protection	12.99	13.05	12.57	<b>12.89<sup>EFG</sup></b>
	104,000	None	12.78	13.15	12.94	<b>12.94<sup>DEF</sup></b>
		Fertility	12.89	13.15	13.15	<b>13.10<sup>DE</sup></b>
		Foliar Protection	13.05	13.21	13.21	<b>13.15<sup>D</sup></b>
		Fertility + Foliar Protection	13.37	13.53	13.47	<b>13.47<sup>C</sup></b>
51 cm	84,000	Fertility + Foliar Protection	14.48	13.95	14.27	<b>14.21<sup>B</sup></b>
	104,000	Fertility + Foliar Protection	14.74	14.59	15.22	<b>14.85<sup>A</sup></b>
	124,000	Fertility + Foliar Protection	14.69	14.43	14.74	<b>14.64<sup>A</sup></b>
Hybrid Average			<b>13.37</b>	<b>13.37</b>	<b>13.42</b>	

# Yorkville Grain Yield

Agronomic Management System			Hybrid Evaluated			Average
Row Spacing	Target Stand	Management	RT5575	RT6203	RT6205	
Mg per ha						
76 cm	84,000	None	11.77	11.83	11.51	<b>11.72<sup>H</sup></b>
		Fertility	11.93	12.57	11.88	<b>12.09<sup>FG</sup></b>
		Foliar Protection	12.20	12.20	11.77	<b>12.09<sup>FG</sup></b>
		Fertility + Foliar Protection	12.62	12.84	12.36	<b>12.62<sup>D</sup></b>
	104,000	None	11.83	12.36	11.62	<b>11.93<sup>GH</sup></b>
		Fertility	12.25	12.89	12.20	<b>12.41<sup>DE</sup></b>
		Foliar Protection	12.36	12.20	12.31	<b>12.31<sup>EF</sup></b>
		Fertility + Foliar Protection	12.89	13.37	12.73	<b>12.99<sup>C</sup></b>
51 cm	84,000	Fertility + Foliar Protection	13.58	14.16	13.58	<b>13.79<sup>B</sup></b>
	104,000	Fertility + Foliar Protection	14.11	14.80	13.84	<b>14.27<sup>A</sup></b>
	124,000	Fertility + Foliar Protection	14.16	14.64	14.06	<b>14.27<sup>A</sup></b>
Hybrid Average			<b>12.68<sup>B</sup></b>	<b>13.10<sup>A</sup></b>	<b>12.52<sup>C</sup></b>	

# Response to Narrow Rows

Treatment description	Row Spacing (cm)	Planting Population (plants ha <sup>-1</sup> )	Broadcast Fertility	Foliar Protection
Standard Population (SP)	76	84,000	None	None
SP + Broadcast Fertility	76	84,000	Preplant	None
SP + Foliar Protection	76	84,000	None	Yes – VT/R1
<b>SP + Broadcast Fertility + Foliar Protection</b>	<b>76</b>	<b>84,000</b>	<b>Preplant</b>	<b>Yes – VT/R1</b>
High Population (HP)	76	84,000	None	None
HP + Broadcast Fertility	76	84,000	Preplant	None
HP + Foliar Protection	76	84,000	None	Yes – VT/R1
<b>HP + Broadcast Fertility + Foliar Protection</b>	<b>76</b>	<b>84,000</b>	<b>Preplant</b>	<b>Yes – VT/R1</b>
<b>SP + Broadcast Fertility + Foliar Protection</b>	<b>51</b>	<b>84,000</b>	<b>Preplant</b>	<b>Yes – VT/R1</b>
<b>HP + Broadcast Fertility + Foliar Protection</b>	<b>51</b>	<b>104,000</b>	<b>Preplant</b>	<b>Yes – VT/R1</b>
Max Population + Fertility + Foliar Protection	51	124,000	Preplant	Yes – VT/R1

# Response to Narrow Rows for Short Stature Maize

Row Spacing	Nashville	Champaign	Yorkville	Average
	Mg per ha			
76 cm	11.51	13.21	12.84	12.52
51 cm	13.10	14.53	14.06	13.90
$\Delta$	1.59	1.33	1.22	1.38

Averaged Across 84,000 and 104,000 planting densities with fertility and foliar protection

# Response to Narrow Rows for Short Stature Maize

Row Spacing	Nashville	Champaign	Yorkville	Average
	————— Kernels per plant —————			
<b>76 cm</b>	<b>405</b>	<b>431</b>	<b>431</b>	<b>422</b>
<b>51 cm</b>	<b>489</b>	<b>470</b>	<b>460</b>	<b>473</b>
<b>Δ</b>	<b>84</b>	<b>39</b>	<b>29</b>	<b>51</b>

Averaged Across 84,000 and 104,000 planting densities with fertility and foliar protection

**76 cm**



**51 cm**





# Value of Management Factors To Short Stature Maize

Management Factor	Nashville	Champaign	Yorkville
	kg per ha		
Population	53	424	265
Fertility	53	53	424
Foliar Protection	212	53	371
51 cm Rows	1590	1330	1220
System Value	2180	2220	2550

Population = 84 vs 104 thousand plants per ha

Fertility = 90 kg P<sub>2</sub>O<sub>5</sub>, 67 kg K<sub>2</sub>O, 22 kg S broadcast applied per ha

Foliar Protection = Fungicide and Insecticide at R1

# Key Takeaways - Yield

- **All sites achieved highest yield under 51 cm row spacing.**
- **104,000 plants per ha tended to be optimal planting density for both row spacings**
- **Highest yields were achieved when fertility and foliar protection were supplied at 51 cm row spacing and a density of 104,000 plants per ha**

# What About Tall Maize?

# Management Comparison of Short Stature Maize to Tall Maize (average of three locations)

Management Factor	Short	Tall
	kg per ha	
Population	318	0
Fertility	159	583
Foliar Protection	159	424
Fertility & Foliar	530	690
51 cm Rows	1379	690

Population = 84 vs 104 thousand plants per ha

Fertility = 90 kg P<sub>2</sub>O<sub>5</sub>, 67 kg K<sub>2</sub>O, 22 kg S broadcast applied per

Foliar Protection = Fungicide and Insecticide at R1

# Key Takeaways

- **Short stature maize was more responsive to management than tall maize in 2022, especially to 51 cm rows**
- **Highest yields were achieved with a full system approach**

# Special Thanks to Bayer!

For More Information:

**Crop Physiology Laboratory**

**University of Illinois**

<http://cropphysiology.cropsci.illinois.edu>

