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# Genotype, row spacing and seeding rate effects on irrigated short-season soybean in southern Alberta

Thai, T.N.T<sup>1,2</sup>, Larney, F.J.<sup>2</sup>, Thomas J.E.<sup>1</sup>, Bandara M.S.<sup>3</sup>, Pauly, D.G<sup>4</sup> and LeRoy D.<sup>5</sup>

<sup>1</sup>Dept. of Biological Sciences, University of Lethbridge, Lethbridge, AB

<sup>2</sup>Agriculture & Agri-Food Canada, Lethbridge Research Centre, Lethbridge, AB

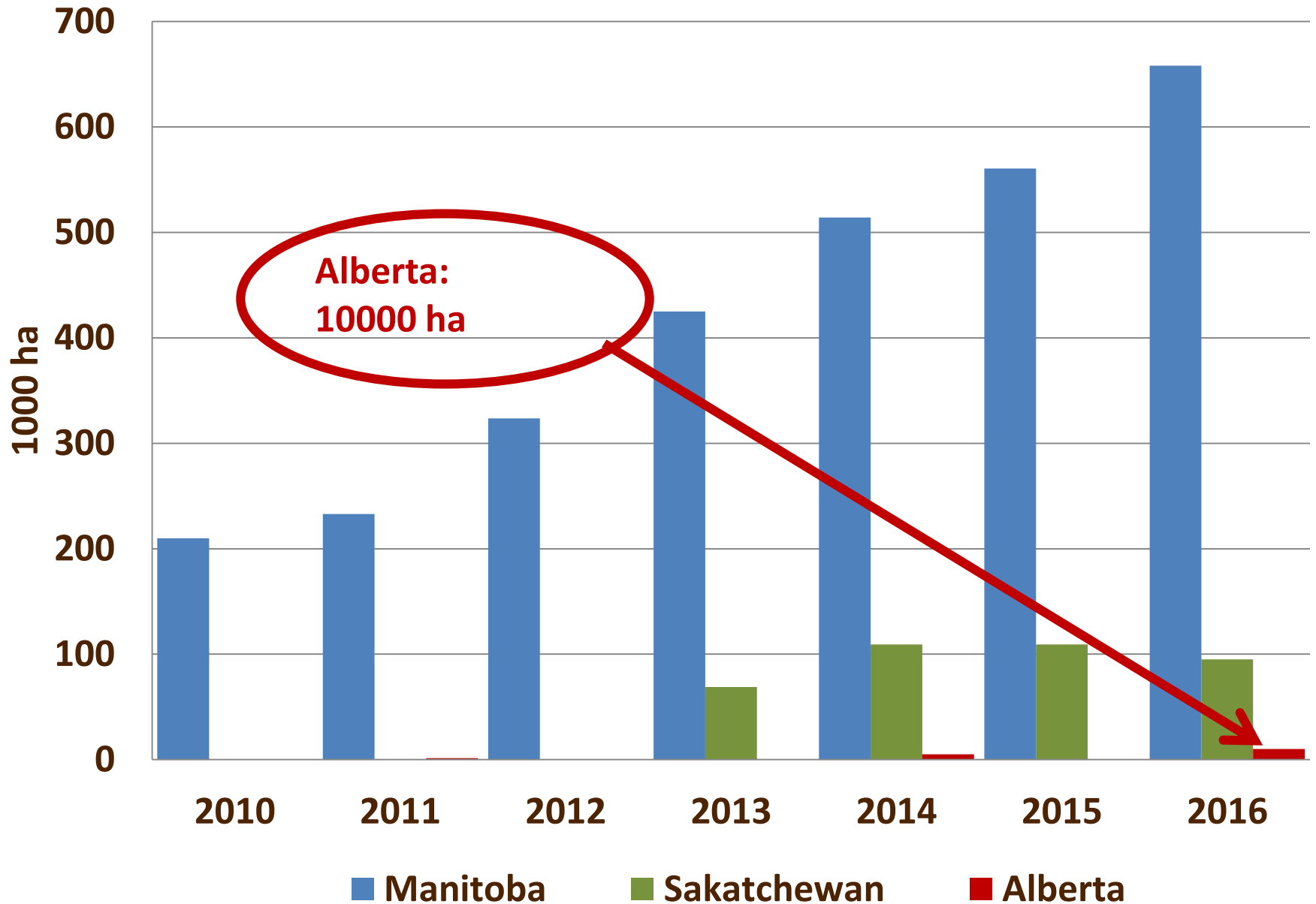
<sup>3</sup>Alberta Agriculture & Forestry, Crop Diversification Centre South, Brooks, AB

<sup>4</sup>Alberta Agriculture & Forestry, Lethbridge, AB

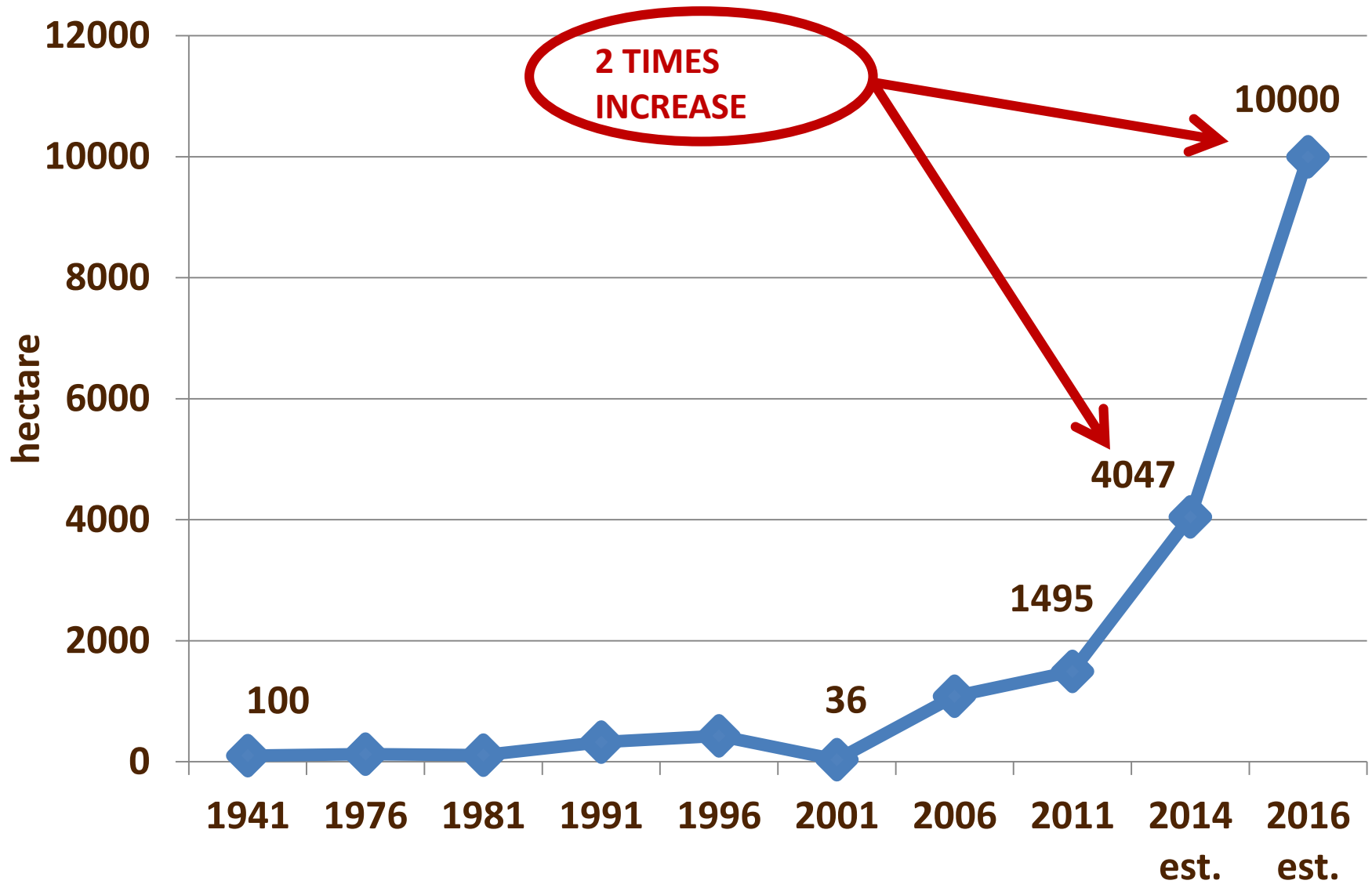
<sup>5</sup>Dept. of Economics, University of Lethbridge, Lethbridge, AB



# Soybean seeded areas in Prairie provinces



# Soybean seeded areas in Alberta



# Growing Soybean in Alberta

## PROS ? CONS

### Pros:

- ✓ Varieties are NOW available for low CHU conditions
- ✓ Potential market
- ✓ Pulse crop – growing awareness (soil conservation, human health, etc.)

### Cons:

- Varieties: requires at least 2200 – 2450 CHU
- Irrigated land
- Warm season: Soil temperature  $>10^{\circ}\text{C}$  to germinate; short-day to flower and frost-free day  $> 100$  days;
  - ❖ No agronomic practices for soybean!!!
  - ❖ Soybean yield is still LOW!!!!



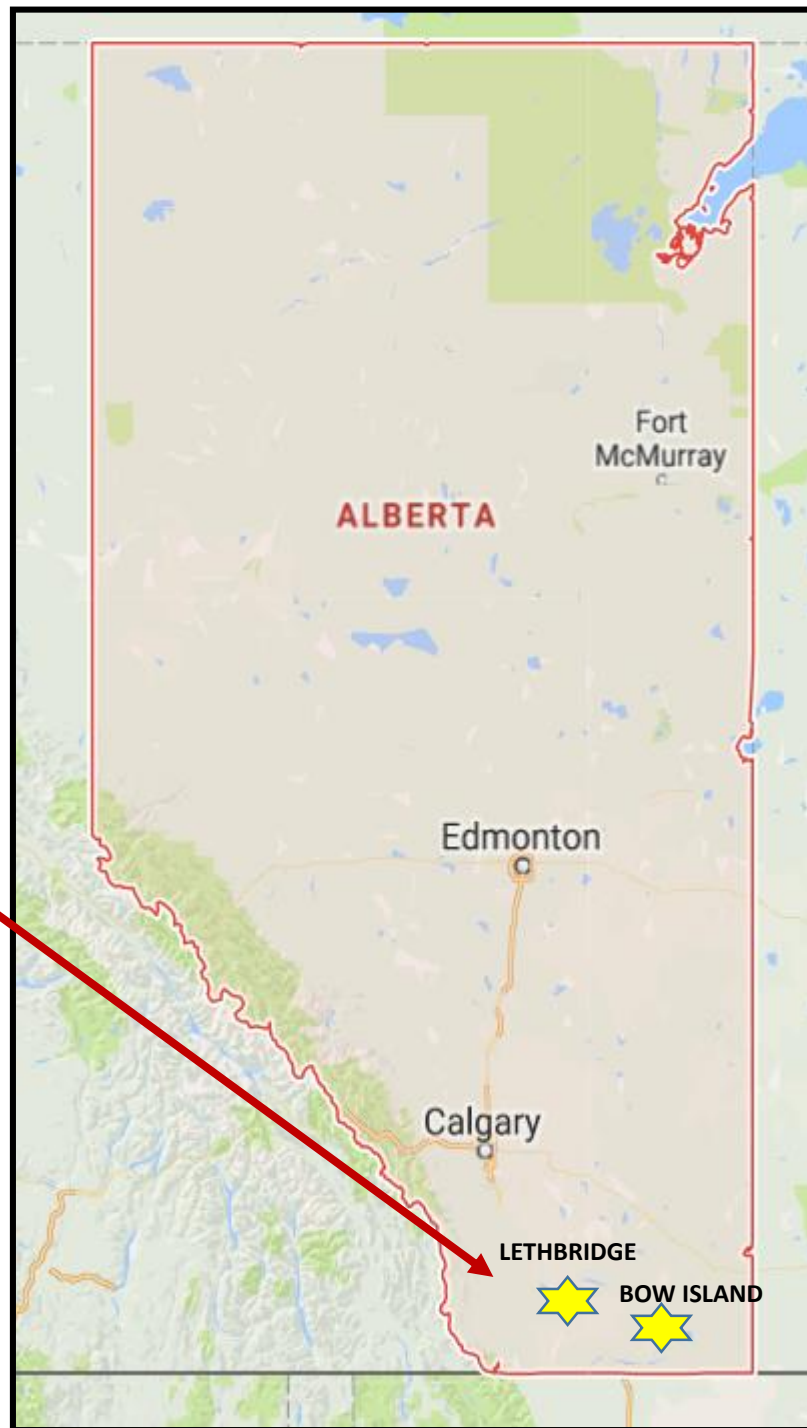
# Objectives of the research

## Determining the optimum:

- **Genotype**
- **Seeding density**
- **Row spacing**

**For a higher soybean seed yield in southern Alberta**

Location of the  
research



# Materials and methods



- **3 seeding densities**  
(30, 50 and 80 seeds  $m^{-2}$ )
- **2 row-spacings**  
(Narrow: 17.5 cm; Wide: 35 cm)
- **2 RR soybean cultivars**
- **Irrigated land**
- **2 locations (Bow Island and Lethbridge)**
- **2 years (2014, 2015)**
- **RCBD design**
- **PROC MIXED analysis**





# Effect of genotype, row spacing & seeding density on soybean yield

|                                      |                | Grain yield<br>(kg ha <sup>-1</sup> ) | Straw yield<br>(kg ha <sup>-1</sup> ) | Grain N uptake<br>(kg ha <sup>-1</sup> ) | Straw N uptake<br>(kg ha <sup>-1</sup> ) | Total N uptake<br>(kg ha <sup>-1</sup> ) |
|--------------------------------------|----------------|---------------------------------------|---------------------------------------|--|--|--|
|                                      |                |                                       |                                       |  |  |  |
|                                      |                |                                       |                                       |  |  |  |
|                                      |                |                                       |                                       |  |  |  |
|                                      |                |                                       |                                       |  |  |  |
| Genotype                             | Co-op F045R #3 | 2615                                  | 4682                                  | 160                                      | 37                                       | 197 A                                    |
|                                      | NSC Tilston    | 2639                                  | 4313                                  | 153                                      | 28                                       | 182 B                                    |
|                                      | <i>P-value</i> | <i>NS</i>                             | <i>&lt;.001</i>                       | <i>0.003</i>                             | <i>&lt;.001</i>                          | <i>&lt;.001</i>                          |
|                                      |                |                                       |                                       |  |  |  |
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|                                      |                |                                       |                                       |  |  |  |
|                                      |                |                                       |                                       |  |  |  |
| Environment*Genotype                 |                | 0.001                                 | NS                                    | 0.002                                    | 0.01                                     | NS                                       |
| Environment*Row spacing              |                | <.001                                 | 0.03                                  | <.001                                    | 0.005                                    | <.001                                    |
| Seeding Density*Genotype*Row spacing |                | NS                                    | 0.007                                 | NS                                       | NS                                       | NS                                       |

Other interactions which are not mentioned are non-significant  
NS: Non-significant

# Effect of genotype, row spacing & seeding density on soybean yield

|   |                  | Grain yield<br>(kg ha <sup>-1</sup> ) | Straw yield<br>(kg ha <sup>-1</sup> ) | Grain N uptake<br>(kg ha <sup>-1</sup> ) | Straw N uptake<br>(kg ha <sup>-1</sup> ) | Total N uptake<br>(kg ha <sup>-1</sup> ) |
|---|------------------|---------------------------------------|---------------------------------------|--|--|--|
|   |                  |                                       |                                       |  |  |  |
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|   |                  |                                       |                                       |  |  |  |
|   |                  |                                       |                                       |  |  |  |
| <b>Row spacing<br/>BE<br/>OVERULED</b>      | Wide (35 cm)     | <b>2610</b>                           | <b>4541</b>                           | <b>157</b>                               | <b>33</b>                                | <b>190</b>                               |
|   | Narrow (17.5 cm) | <b>2644</b>                           | <b>4455</b>                           | <b>156</b>                               | <b>32</b>                                | <b>189</b>                               |
|   | <i>P-value</i>   | <i>NS</i>                             | <i>NS</i>                             | <i>NS</i>                                | <i>NS</i>                                | <i>NS</i>                                |
|   |                  |                                       |                                       |  |  |  |
|   |                  |                                       |                                       |  |  |  |
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|   |                  |                                       |                                       |  |  |  |
|   |                  |                                       |                                       |  |  |  |
| <b>Environment*Genotype</b>                 |                  | <b>0.001</b>                          | <b>NS</b>                             | <b>0.002</b>                             | <b>0.01</b>                              | <b>NS</b>                                |
| <b>Environment*Row spacing</b>              |                  | <b>&lt;.001</b>                       | <b>0.03</b>                           | <b>&lt;.001</b>                          | <b>0.005</b>                             | <b>&lt;.001</b>                          |
| <b>Seeding Density*Genotype*Row spacing</b> |                  | <b>NS</b>                             | <b>0.007</b>                          | <b>NS</b>                                | <b>NS</b>                                | <b>NS</b>                                |

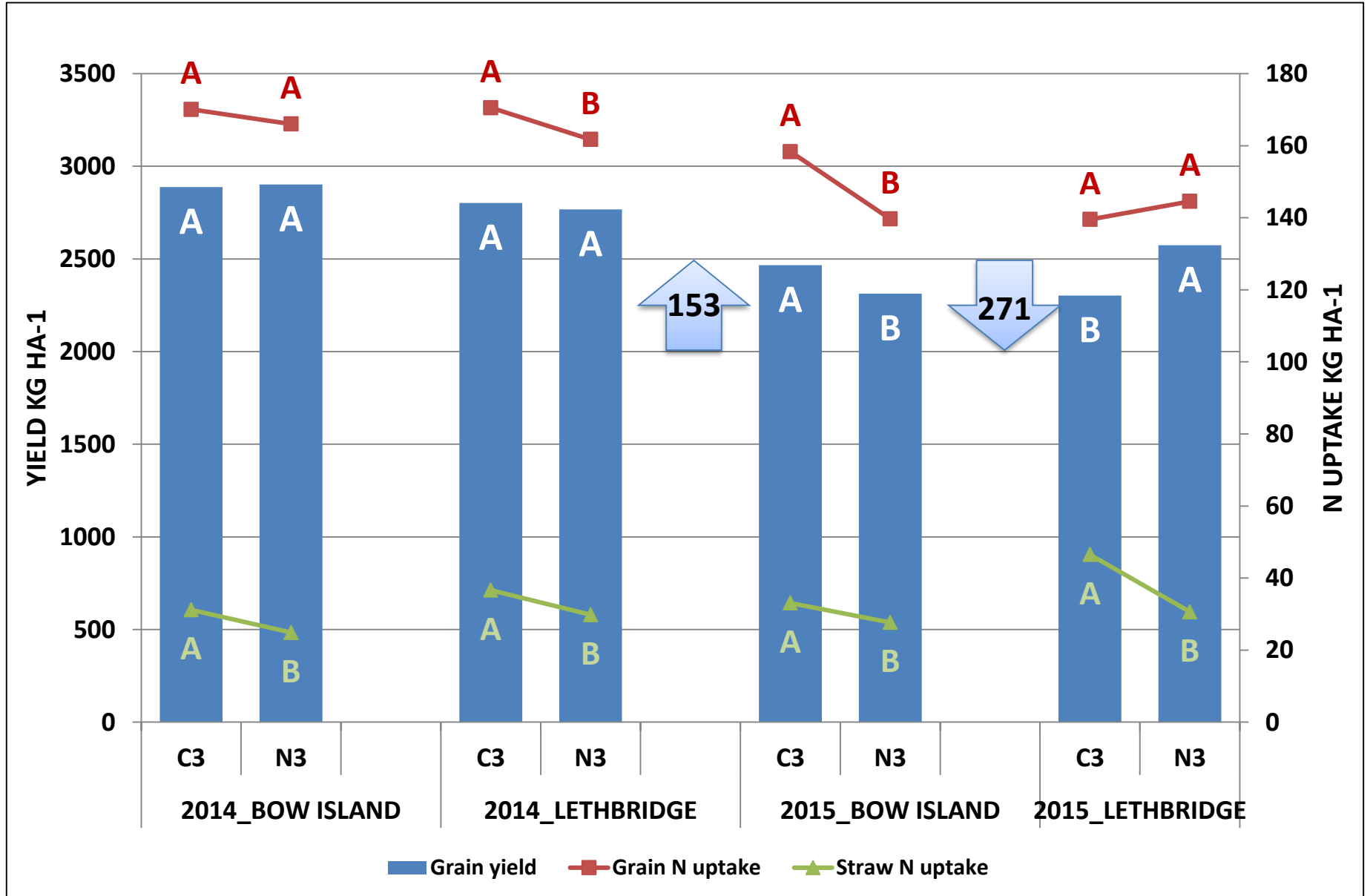
Other interactions which are not mentioned are non-significant  
NS: Non-significant

# Effect of genotypes, row spacings & seeding density on soybean yield

|                                      |                         | Grain yield<br>(kg ha <sup>-1</sup> ) | Straw yield<br>(kg ha <sup>-1</sup> ) | Grain N<br>uptake<br>(kg ha <sup>-1</sup> ) | Straw N<br>uptake<br>(kg ha <sup>-1</sup> ) | Total N<br>uptake<br>(kg ha <sup>-1</sup> ) |
|--------------------------------------|-------------------------|---------------------------------------|---------------------------------------|---|---|---|
|                                      |                         |                                       |                                       |   |   |   |
|                                      |                         |                                       |                                       |   |   |   |
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|                                      |                         |                                       |                                       |   |   |   |
|                                      |                         |                                       |                                       |   |   |   |
| Seeding density                      | 30 seed m <sup>-2</sup> | <b>2303 C</b>                         | 3922                                  | <b>136 C</b>                                | <b>28 B</b>                                 | <b>163 C</b>                                |
|                                      | 50 seed m <sup>-2</sup> | <b>2612 B</b>                         | 4415                                  | <b>154 B</b>                                | <b>30 B</b>                                 | <b>185 B</b>                                |
|                                      | 80 seed m <sup>-2</sup> | <b>2965 A</b>                         | 5156                                  | <b>179 A</b>                                | <b>40 A</b>                                 | <b>220 A</b>                                |
|                                      | <i>P-value</i>          | <.001                                 | <.001                                 | <.001                                       | <.001                                       | <.001                                       |
| Environment*Genotype                 |                         | <b>0.001</b>                          | NS                                    | <b>0.002</b>                                | <b>0.01</b>                                 | NS  |
| Environment*Row spacing              |                         | <b>&lt;.001</b>                       | <b>0.03</b>                           | <b>&lt;.001</b>                             | <b>0.005</b>                                | <b>&lt;.001</b>                             |
| Seeding Density*Genotype*Row spacing |                         | NS                                    | <b>0.007</b>                          | NS  | NS  | NS  |

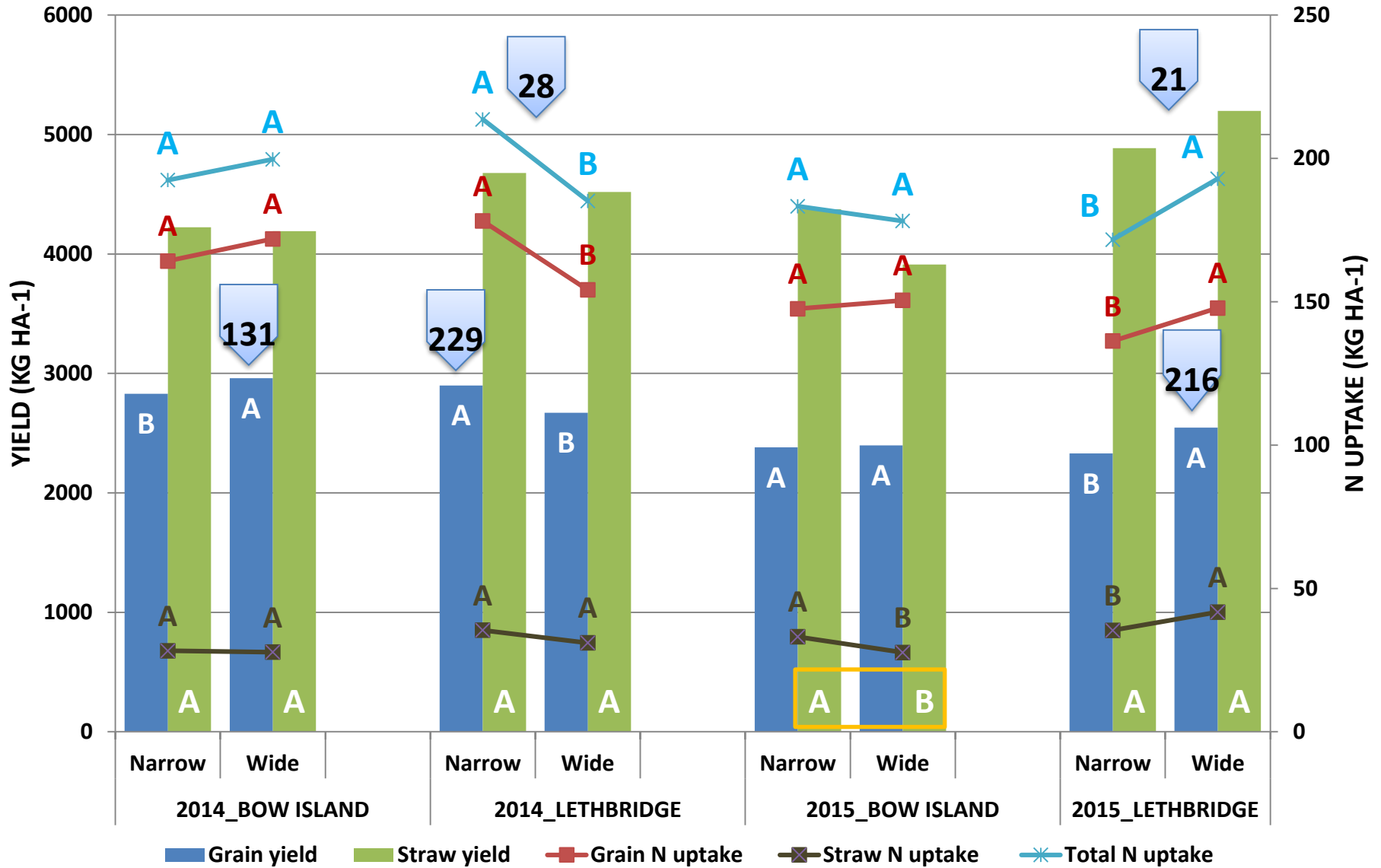
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NS: Non-significant

# Environment x Genotype interactions on grain yield, grain N uptake and straw N uptake



C3: Co-op F045 #3; N3: NSC Tilston

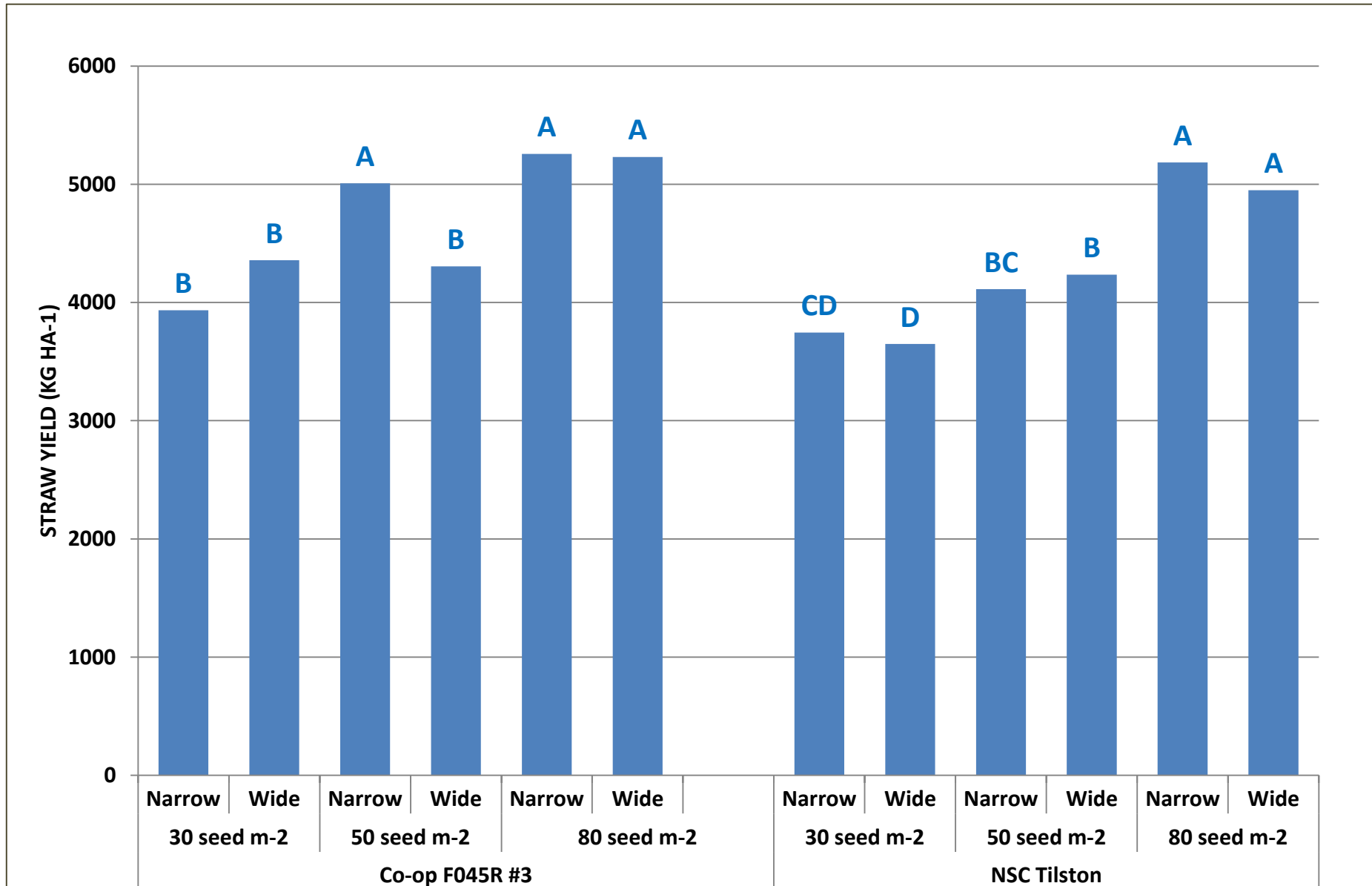
# Environment x Row spacing interactions on grain yield, straw yield, grain N uptake, straw N uptake and total N uptake



Narrow row (17.5 cm);

Wide row (35 cm)

# Seeding density x Row spacing x Genotype interaction on Straw yield



Wide row (35 cm);    Narrow row (17.5 cm)

# CONCLUSIONS

## Genotypes:

- It is recommended to plant C3 at Bow Island and N3 at Lethbridge for GRAIN YIELD but consider C3 for a higher N UPTAKE.

## Row spacing: INCONSISTENT results

- Narrow row yielded more than wide row 229 kg grain ha<sup>-1</sup> and 28 kg N ha<sup>-1</sup> at Lethbridge in 2014;
- Wide row yielded more than narrow row from 216 kg grain ha<sup>-1</sup> and 21 kg N ha<sup>-1</sup> at Lethbridge in 2015.

## Seeding rates:

- Maximum yield (2965 kg ha<sup>-1</sup>; 220 kg N ha<sup>-1</sup>) was attained at the densities of 80 plants/m<sup>2</sup>

→ Soybean production in Southern Alberta would benefit from high planting densities but this may also increase production costs associated with greater seeding rates.

# ACKNOWLEDGEMENT

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## THANK YOU!



QUESTIONS  
**tram.thai@uleth.ca**

