

# Hybrid Canola – Plant Populations 101

Laryssa Grenkow<sup>1</sup>, Tristan Coelho<sup>1</sup>, Sherrilyn Phelps<sup>2</sup>,  
and Anne Kirk<sup>3</sup>

<sup>1</sup>Western Applied Research Corporation

<sup>2</sup>Saskatchewan Ministry of Agriculture

<sup>3</sup>University of Manitoba

# Why are plant populations important?

- Maximize yield potential
- Maximize net revenue
- Weed competition
- Crop uniformity
- Shorten crop maturity
- Lodging



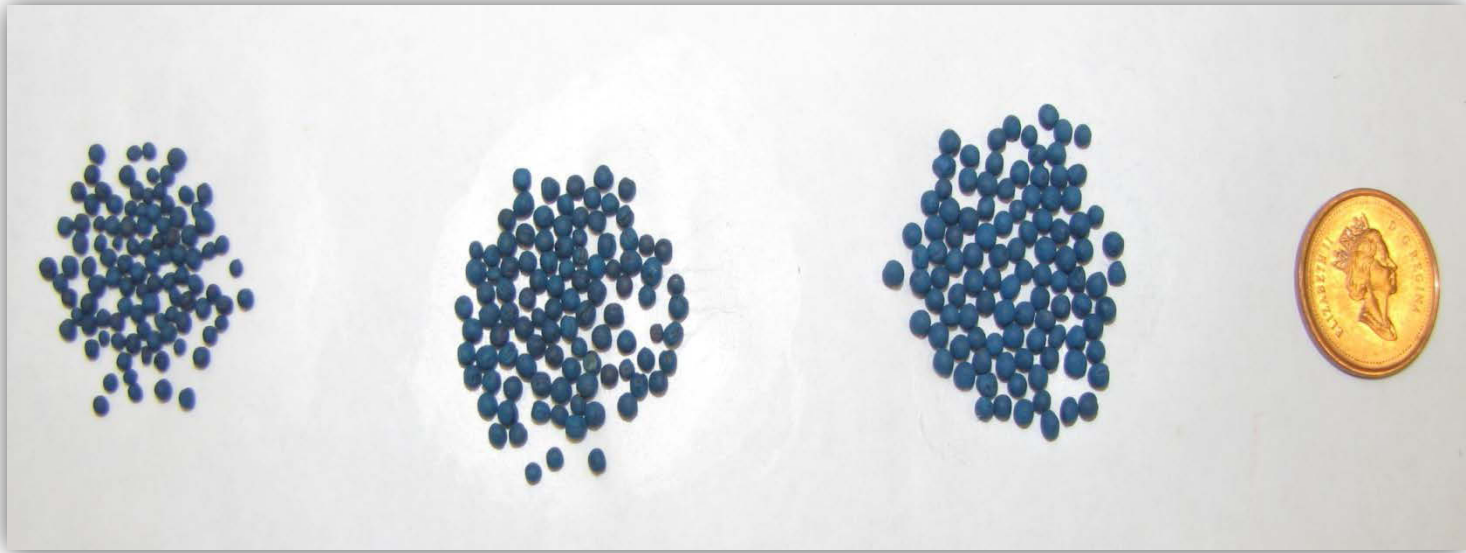
# Plant density is more important than actual seeding rate!!!



Gone are they days of bushel and a peck!



# Seed Size



**2.9 TKW**

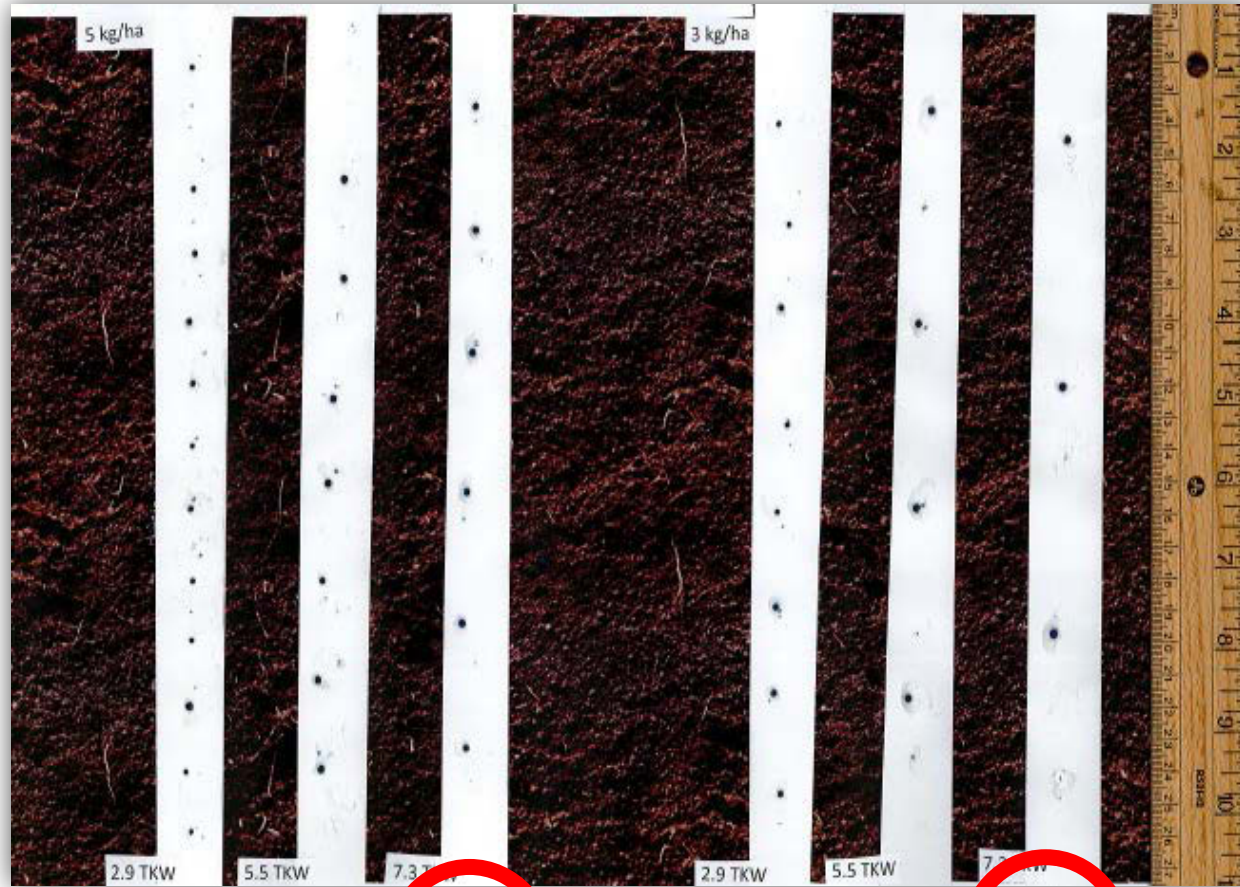
**5.5 TKW**

**7.3 TKW**

**(100 seeds of each)**

5 kg ha<sup>-1</sup>

3 kg ha<sup>-1</sup>



Example:  
Targeting 80 plants m<sup>-2</sup>

2.9 TKW = 4.6 kg/ha  
5.5 TKW = 8.8 kg/ha  
7.3 TKW = 11.7 kg/ha

TKW	5 kg ha <sup>-1</sup> seeds/m <sup>2</sup>	3 kg ha <sup>-1</sup> seeds/m <sup>2</sup>
2.9	172	103
5.5	91	55
7.3	68	41



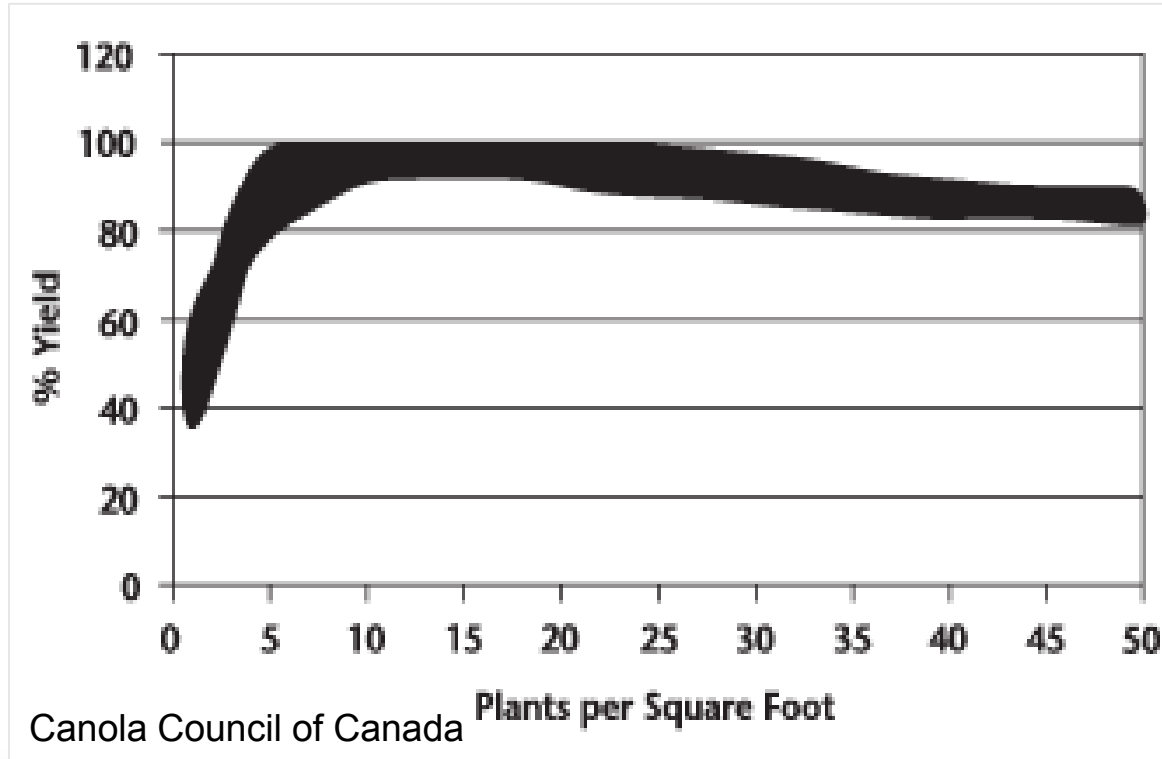
# How should you calculate seeding rates?

- Thousand kernel weight (grams)
- Expected emergence (%) – Usually 40-60% for canola
- Target plant population (plants m<sup>-2</sup>)

Seeding rate (kg/ha) = target population x  $\frac{\text{TKW}}{\text{expected seeding survival}}$

$$\text{Ex. Canola} = \frac{80 \times 5}{50} = 8 \text{ kg/ha (7 lbs/acre)}$$

# Plant Populations and Yield Potential



Canola Council recommends targeting for at least **70-140 plants m<sup>-2</sup>** (7-14 plants ft<sup>-2</sup>)

Yield is generally compromised at plant stand **below 50 plants m<sup>-2</sup>** (5 plants ft<sup>-2</sup>)

# Canola Council of Canada Recommendation < 50 plant m<sup>-2</sup>

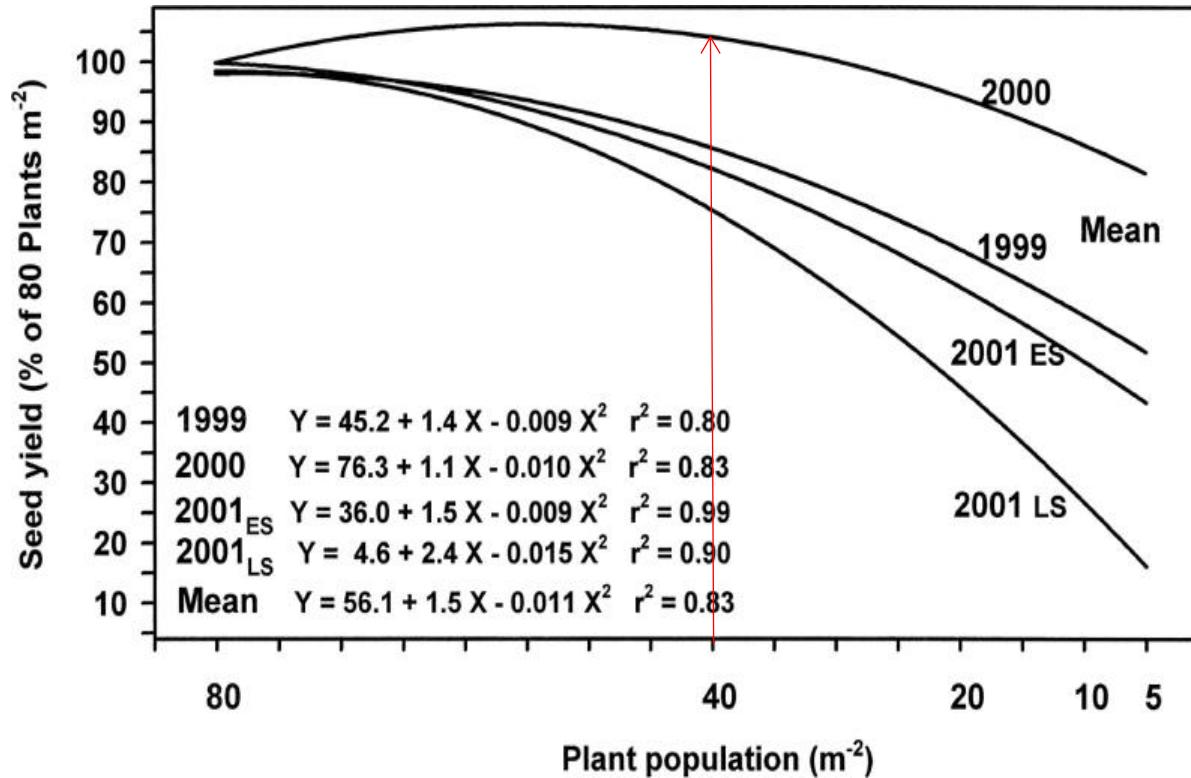
- Where did this number come from?
  - CCC - canola manipulation trials 1999 – 2002
  - Dr. Gan -2003 study
  - Dr. Shirtliffe, 2009 meta-analysis of 35 experiments



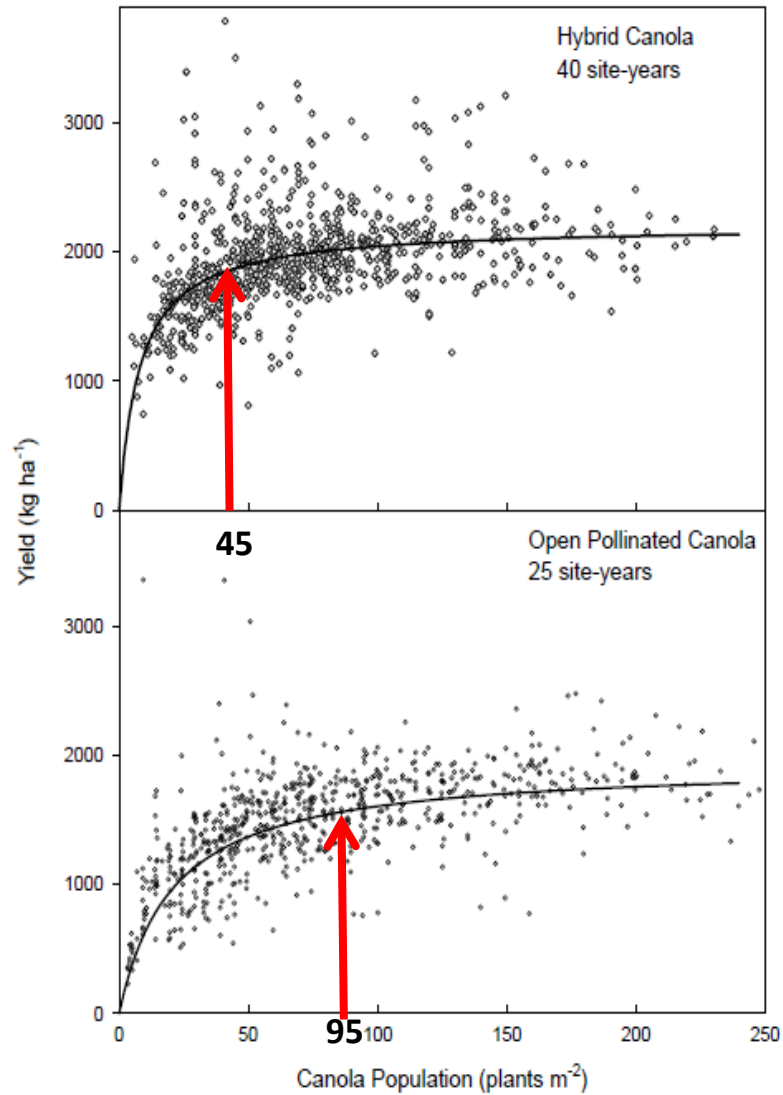
# Canola Manipulation Trial Results (CCC 2002)

Seeding Rate (lbs/acre)	Plants/ m <sup>2</sup>	Yield (bu/ac)	Average Maturity (days)	Range Maturity (Days)
Early Planting Date				
1	20	30	103	84-122
3	50	35	99	82-113
5	80	37	98	82-113
Normal Planting Date				
1	28	31	100	81-114
3	59	36	98	81-113
5	95	37	97	80-111

# Dr. Gan and associates (1999-2001)



# Shirtliff & Hartmann (2009)



## Other factors leading up to this project:

- 1. Late spring frosts** = many acres of canola affected, reseeding decisions
- 2. New hybrids available** – high yields even with lower plant densities
- 3. Increasing seed costs** – producers wanting to reduce seeding rates

# Questions:

At low plant populations  
can new hybrids  
compensate?

At what population is yield  
of hybrid canola reduced?

Does it pay to re-seed?

What should we target for  
plant populations?







# Plant Population Trial

Objective: Determine the **minimum plant population** required to reach **maximum hybrid canola yield**

# 5 locations (2010 – 2012)

- Scott - WARC
  - Saskatoon – U of S
  - Melfort - NARF
  - Swift Current – Wheatland Conservation
  - Indian Head – IHARF
- 
- Total usable site years = 11
  - 5440 LL variety used

5, 10, 20, 40, 80, 150, 300 seeds/m<sup>2</sup>

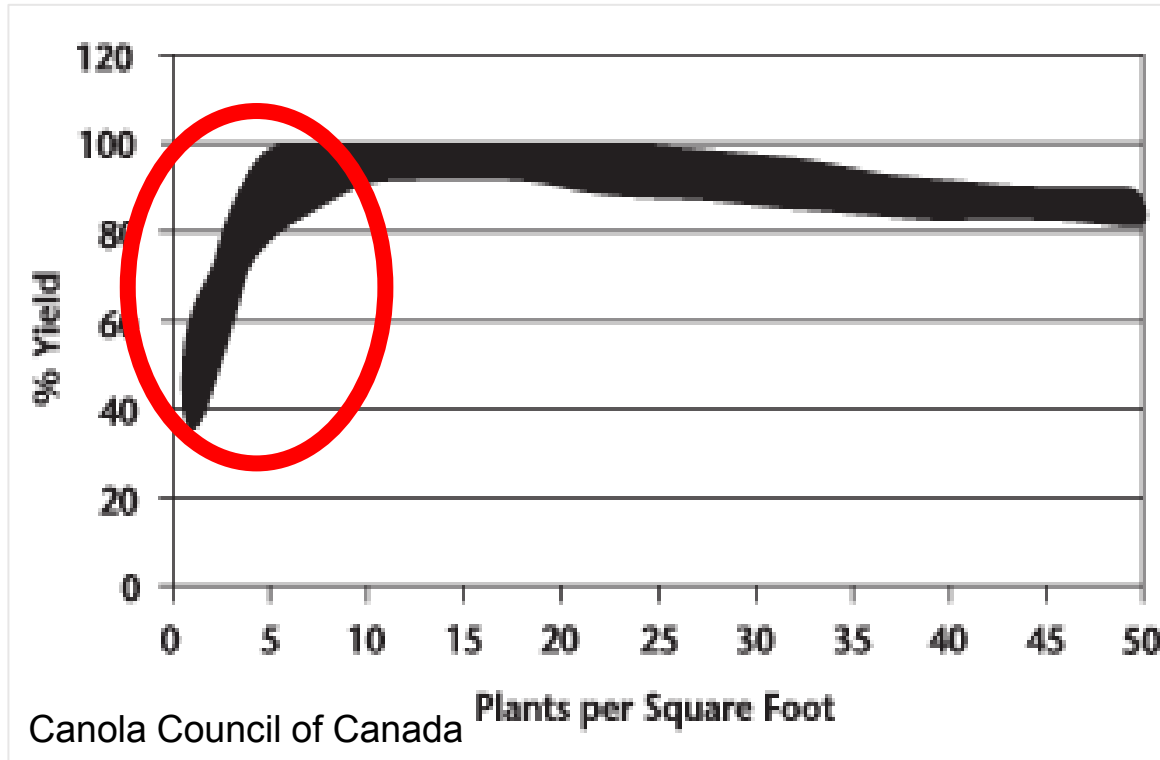
5 seeds/m<sup>2</sup>



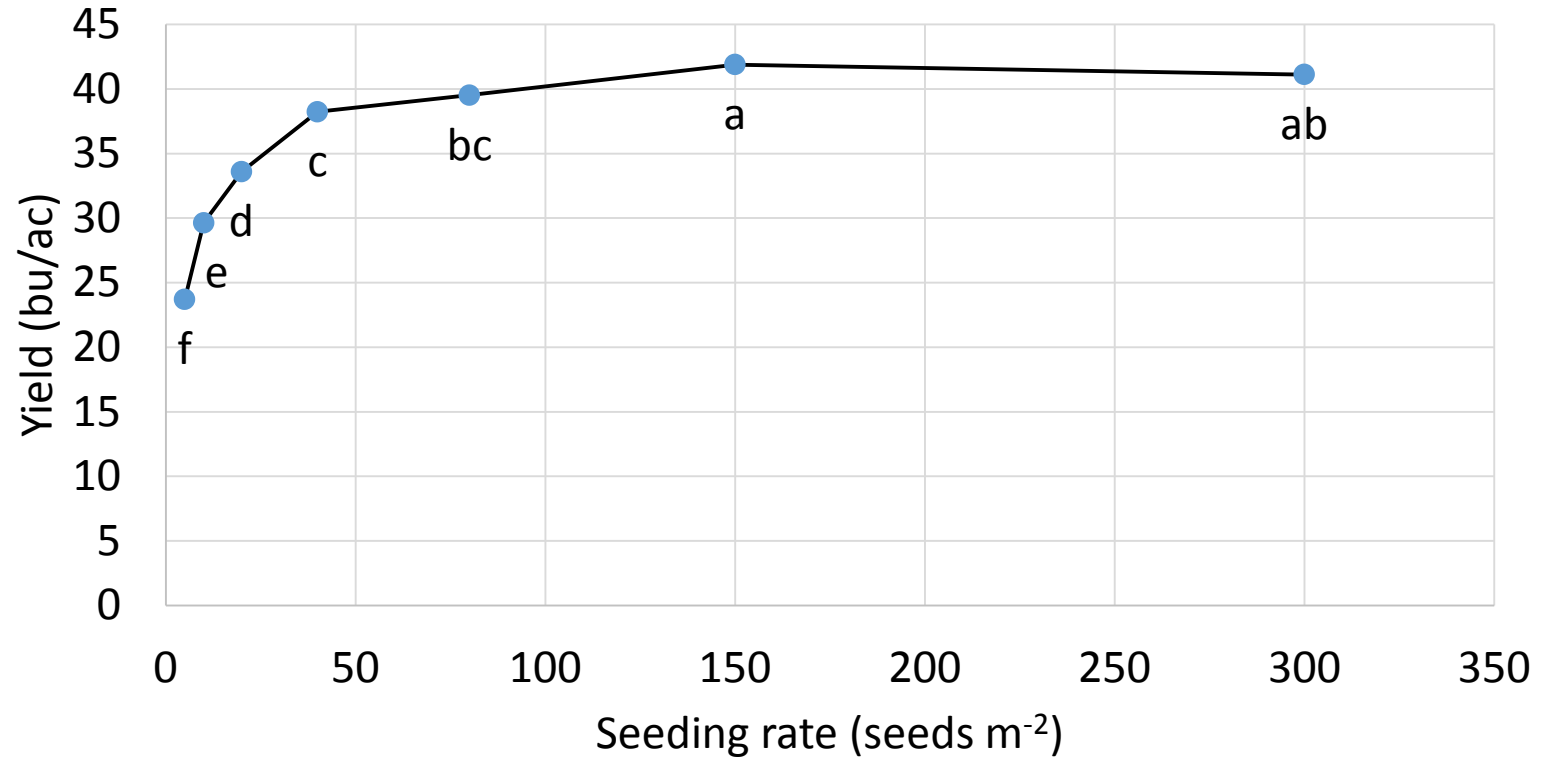
150 seeds/m<sup>2</sup>



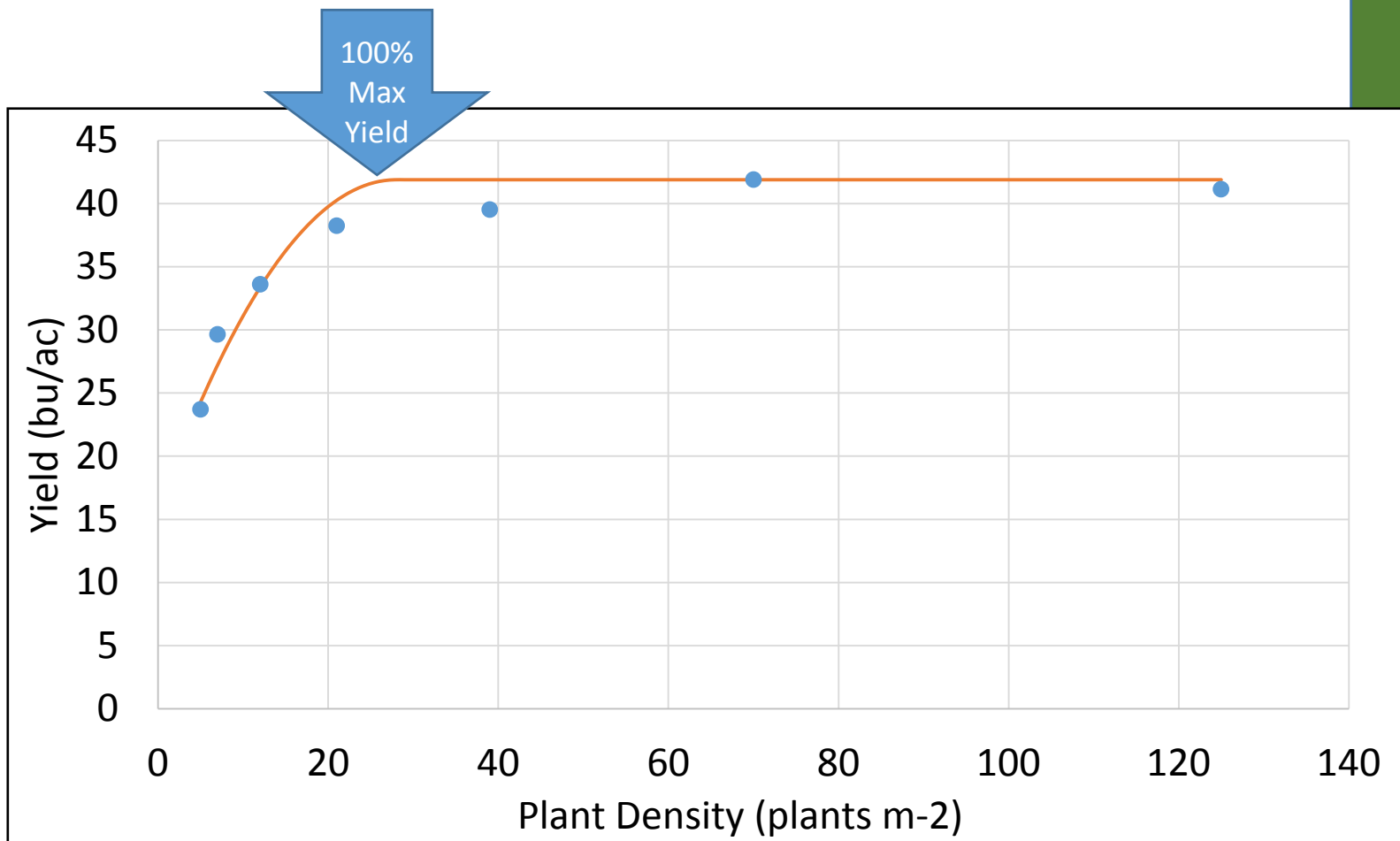
# Plant Populations and Yield Potential



## Influence of Seeding Rate on Canola Yield

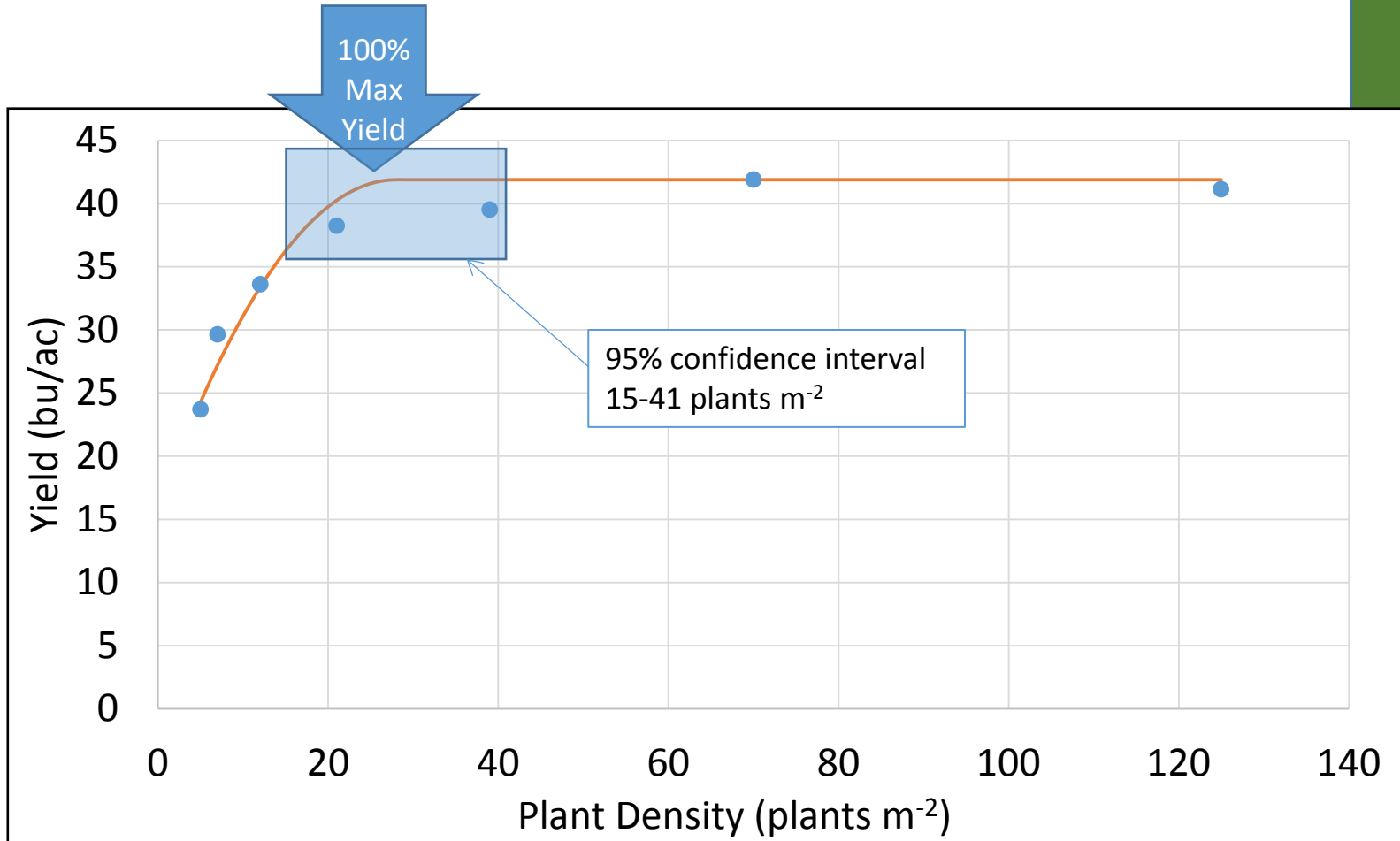






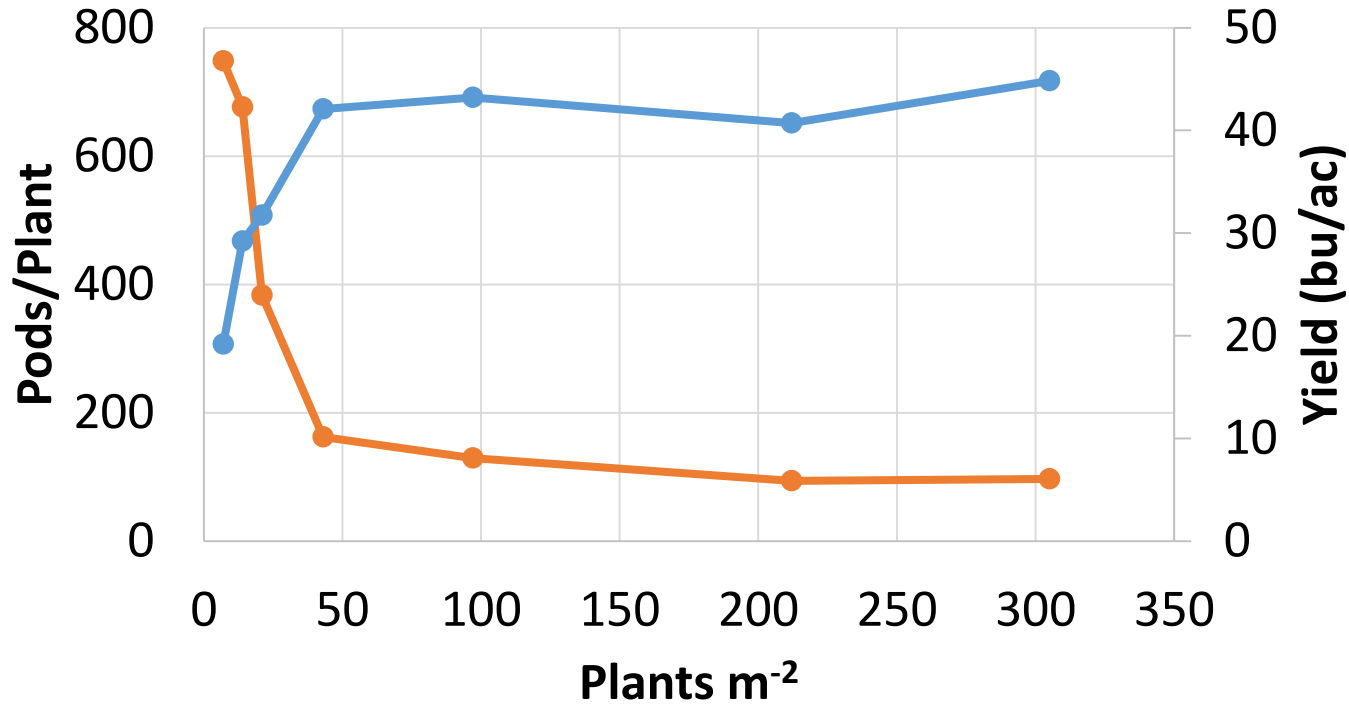
**90% of maximum yield achieved at 18 plants m<sup>-2</sup>**

**100% of maximum yield achieved at 28 plants m<sup>-2</sup>**

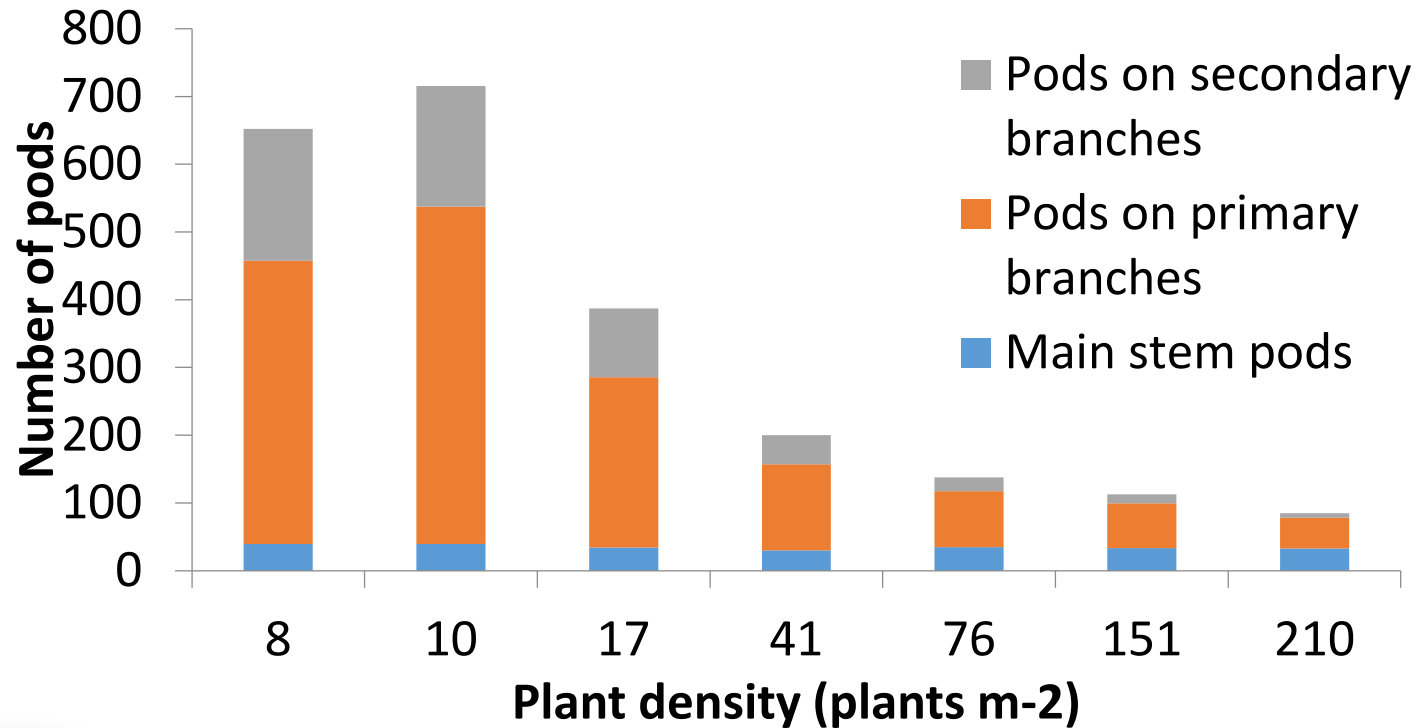


**90% of maximum yield achieved at 18 plants m<sup>-2</sup>**  
**100% of maximum yield achieved at 28 plants m<sup>-2</sup>**

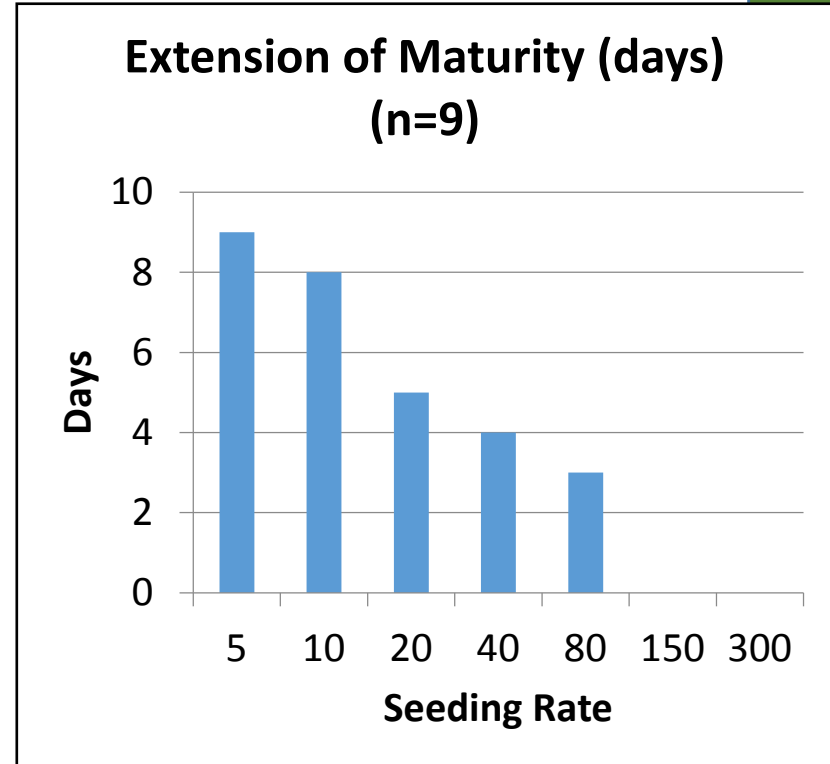
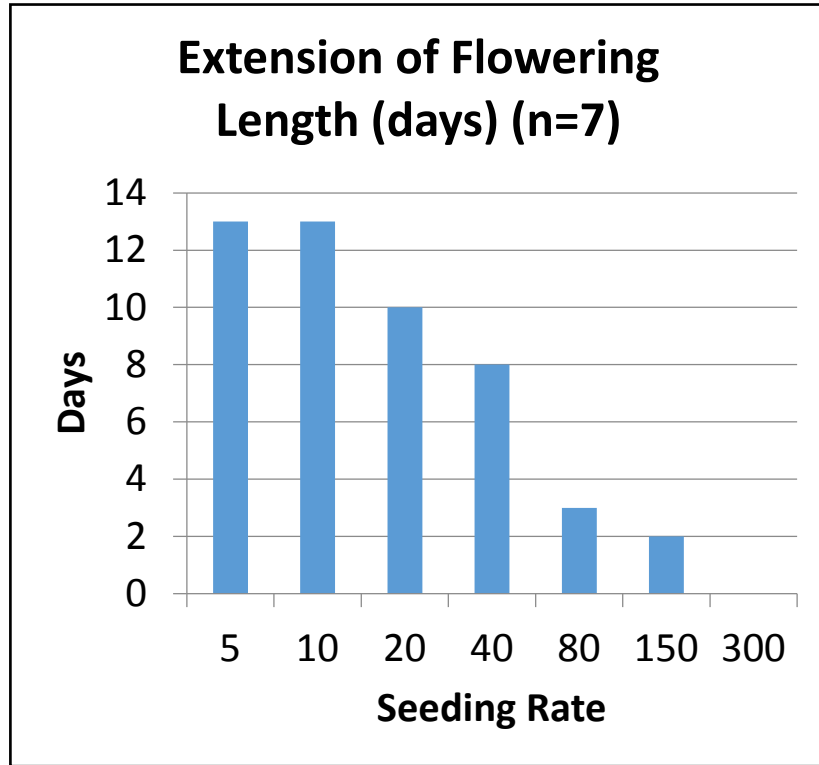
## Effect of Plant Population on Total Pods per Plant per Plant



# Canola Plasticity.....



# Other considerations....





# Plant Population Study Conclusions

- Maximum yield can be reached, on average, with 28 plants/m<sup>2</sup> (15-41 range) under **good** environmental conditions
- A **uniform** plant stand is crucial at low plant populations
- Good weed control is important with low plant populations
- When plant stands are inadequate, what are our options?



# Re-Seeding Canola Trial

Objective: Determine the **yield response** and **economic returns** of re-seeding canola

# Treatments

## Control

- 5440 LL – 40 seeds/m<sup>2</sup>  
(low plant population)
- 5440 LL – 150 seeds/m<sup>2</sup>  
(high plant population)
  
- Seeded Early- to Mid-May

## Re-seeded

- 5440 LL – 150 seeds/m<sup>2</sup>
- 9350 RR – 150 seeds/m<sup>2</sup>
- ACS-18 polish – 150 seeds/m<sup>2</sup>
  
- Seeded Early- & Mid-June



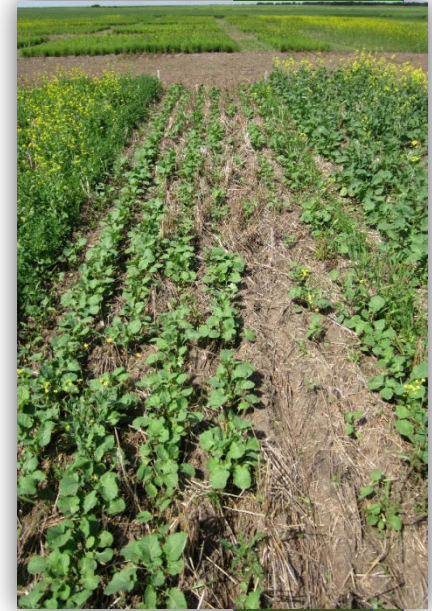
**Early May  
(Low Population)**



**Early May  
(High Population)**



**Early June  
(Re-Seed)**



**Mid June  
(Re-Seed)**



# Low vs. Normal Early May (5440LL)



# Early June vs. Mid June (5440LL)





# Early June vs Mid June (9350 RR)

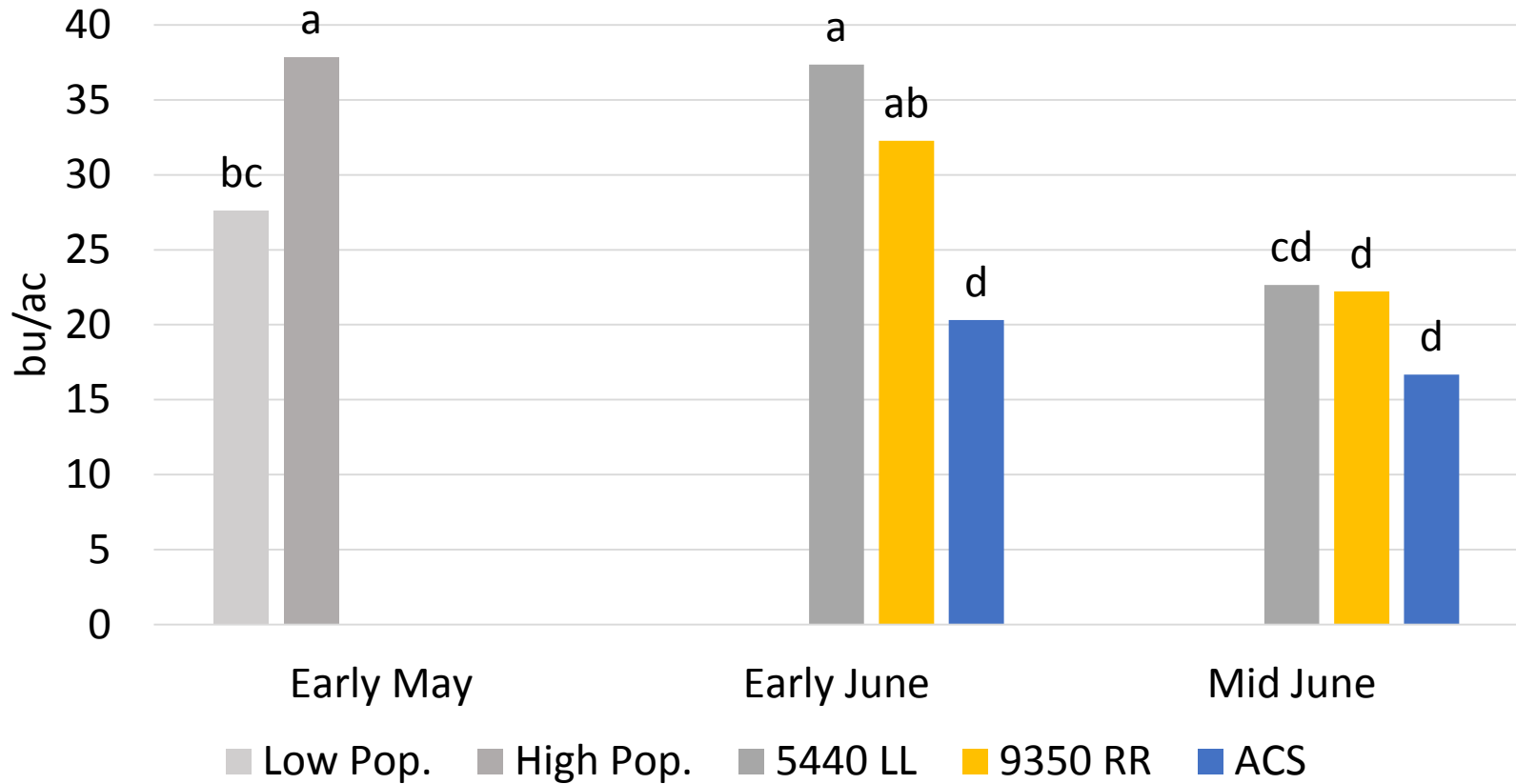


# Early June vs Mid June (Polish – ACS-C18)



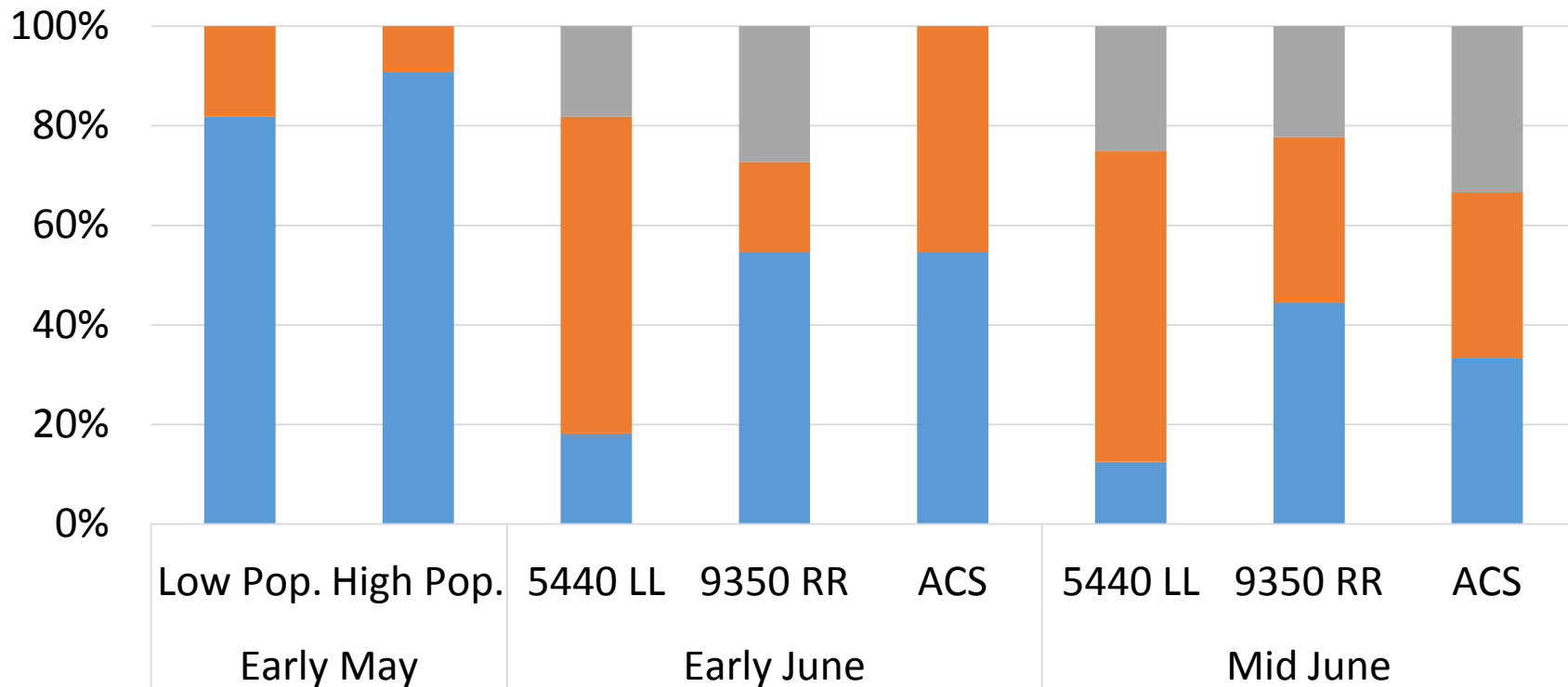


## Average Yield Response to Various Re-Seeding Dates and Cultivars



## Frequency of Sample Grade based on % Green Seed

■ No. 1 ■ No. 2 ■ No. 3



# Economic Analysis - Cost Calculations

**Seeding** (5 lbs/acre) or (5.6 kg/ha)

Hybrid      \$12.4/lb = \$62/acre

Polish      \$4.75/lb = \$23.75/acre

Seeding      \$15.44/acre

(Seed costs obtained in spring 2013 from industry and seeding cost from Custom Rate Guide)

# In Crop Herbicide Application Costs

LL Canola	Liberty	\$10.50/acre
	Centurion	\$3/acre
RR Canola	Glyphosate	\$2.25/acre (0.5L)
Polish	Muster	\$20/acre
	graminicide	\$6/acre

Spraying application cost \$5/acre

# Extra Expenses Associated with Reseeding

	Spring Seeded		Reseeded Crops		
	5440LL Normal	5440LL low pp	5440LL	9350	ACS-18
seed			\$ 62.00	\$ 62.00	\$ 23.75
seeding equipment			\$ 15.44	\$ 15.44	\$ 15.44
in crop herb	\$ 24.00	\$ 24.00	\$ 13.50	\$ 2.25	\$ 26.00
burn to reseed	\$ -	\$ -	\$ 2.25	\$ 2.25	\$ 2.25
spray cost	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00
<b>TOTAL</b>	<b>\$ 34.00</b>	<b>\$ 34.00</b>	<b>\$ 103.19</b>	<b>\$ 91.94</b>	<b>\$ 77.44</b>
Extra Costs for reseeded			\$ 69.19	\$ 57.94	\$ 43.44

# Re-seeding gain or loss compared to leaving low plant stand

			Reseeded Crops					
Seeding Date	early May		early June			Mid June		
	5440LL	5440LL						
<b>INCOME</b>	Normal	low pp	5440LL	9350	ACS-18	5440LL	9350	ACS-18
<b>yield (bu/acre)</b>	37.9	27.6	37.3	32.3	20.3	22.7	22.2	16.7
<b>crop value \$/acre</b>	\$492	\$359	\$485	\$419	\$264	\$295	\$289	\$217
<b>Added expenses</b>			\$69	\$58	\$43	\$69	\$58	\$43
<b>Difference from low pp</b>	<b>\$133</b>		<b>\$57</b>	<b>\$2</b>	<b>(\$139)</b>	<b>(\$134)</b>	<b>(\$128)</b>	<b>(\$186)</b>

(Crop Value = \$13 bu)

# With SCIC Establishment Benefit (\$60/acre)

			Reseeded Crops					
Seeding Date	early May		early June			Mid June		
	5440LL	5440LL						
<b>INCOME</b>	Normal	low pp	5440LL	9350	ACS-18	5440LL	9350	ACS-18
<b>yield (bu/acre)</b>	37.9	27.6	37.3	32.3	20.3	21.3	16.7	16.7
<b>crop value \$/acre</b>	\$492	\$359	\$485	\$419	\$104	\$295	\$217	\$217
<b>Added expenses</b>			\$69	\$58		\$43		\$43
<b>Difference from low pp</b>	\$133		\$57	\$2	(\$13)	(\$15)	(\$128)	(\$186)
<b>Add SCIC reseeding Benefit</b>			\$117	\$62	(\$79)	(\$74)	(\$68)	(\$126)

# SCIC Re-seeding Program

## Hybrid Canola

40+	Established
12 – 40	Choice
<12	Not Established

- Other factors also considered (uniformity across field, plant vigor, frost free days, etc.)
- Will pay \$60/acre



# Gain or loss where plant density in SCIC Choice Range

Early June Reseed	Stoon 2010	Melfort 2012	IH 2010	SC 2011	Stoon 2012	SC 2012	Average	+ SCIC
plts/m2	29	28	19	18	17	16	21	
5440LL	\$297	\$68	\$37	(\$129)	(\$6)	(\$156)	\$19	\$79
9350RR	\$222	(\$18)	\$4	(\$87)	\$30	(\$133)	\$3	\$63
<b>Choice Range</b>								

50/50 chance no SCIC for reseed to pay  
 40/60 chance with SCIC for reseed to pay

# Summary of Economics

- Best to target good plant populations in the first place (70-140 plants  $m^{-2}$ )
- What to do when “stuff” happens
  - Re-seeding to polish canola does not pay
  - Re-seeding to canola in mid June does not pay
  - Re-seeding to high yielding hybrid canola in early June when in the choice range (12-40 plants  $m^{-2}$ ) has 50% chance of showing positive returns
  - SCIC EB (\$60/acre) makes re-seeding in early June the more economical choice and helps cover risks



# Things to consider

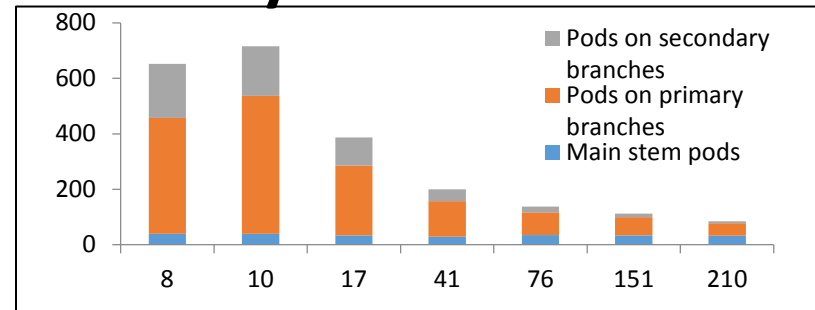
- EB with SCIC does cover extra costs to re-seed
- Re-seeding when in choice range provides also gives you production coverage (up to 80%)
- When in “choice range”, make decisions to re-seed based on:
  - Plant uniformity of field
  - Ability to control weeds
  - Soil moisture conditions and forecasts
  - Harvest management (low plant stands more variable)



Questions:

**At low plant populations can new hybrids compensate?**

**YES by branching**



**At what population is yield of hybrid canola reduced?**

WARC - **28** (15 to 41) vs 50 (Gan & CCC) for max yield

WARC – **18** vs 45 (Shirtliff) to achieve 90% max yield

**SCIC – 12 - 40** is range of choice

# Does it pay to re-seed?

Not in mid June and not to polish canola

50/50 chance without SCIC early June

SCIC EB covers additional reseeding costs

- Make decisions based on:
  - Uniformity of field
  - Ability to control weeds
  - Soil moisture conditions and forecasts
  - Harvest management (low plant stands more variable)
  - Frost free days left in growing season



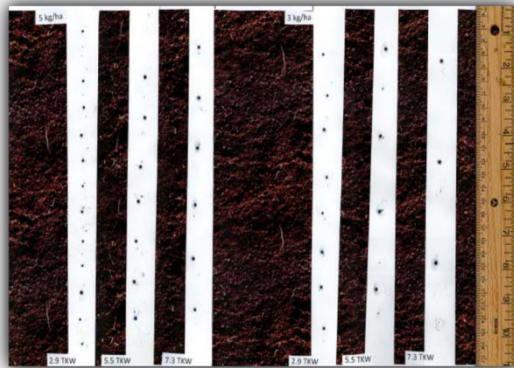
# What should we target for plant populations?

Good question....

We know < 41-50 plants m<sup>-2</sup> yields can start decreasing

Target 1.5 to 2x this rate = 60 to 100 plants/m<sup>2</sup>

CCC recommendation of 70 as a minimum ..... up to 140?



# Thank You

- **SaskCanola – Pat Flaten**
- **Site Collaborators:**
  - **IHARF – Indian Head – Chris Holzapfel**
  - **NARF – Melfort – Cecil Vera**
  - **U of S – Saskatoon – Steve Shirtliff**
  - **Wheatland Conservation – Swift Current – Bryan Nybo**
- **Sherrilyn Phelps, Anne Kirk, Tristan Coelho, Morley Ayars, & Eric Johnson**