

# **Agronomic Research**

William May and Tyler Wist

AAFC

Indian Head and Saskatoon



# Macro and Micro Nutrient Trial

Nutrients	Treatments										
	1	2	3	4	5	6	7	8	9	10	11
N	0	15	30	30	30	60	60	60	60	60	90
P	0	0	0	30	30	30	30	30	30	30	30
CL		18	18	18	18	18	0	18	18	18	18
S					15	15	15	15	15	15	15
Cu								3			
Zinc									3		
Cu, Z, Mn, B										Yes	Yes



# Locations

- **Indian Head – Indian Head Agricultural Research Foundation**
- **Swift Current - Wheatland Conservation Association**
- **Redvers – South East Research Farm**
- **Yorkton – East Central Research Foundation**
- **Melfort – Melfort Research Farm**
- **Scott – Scott Research Farm**



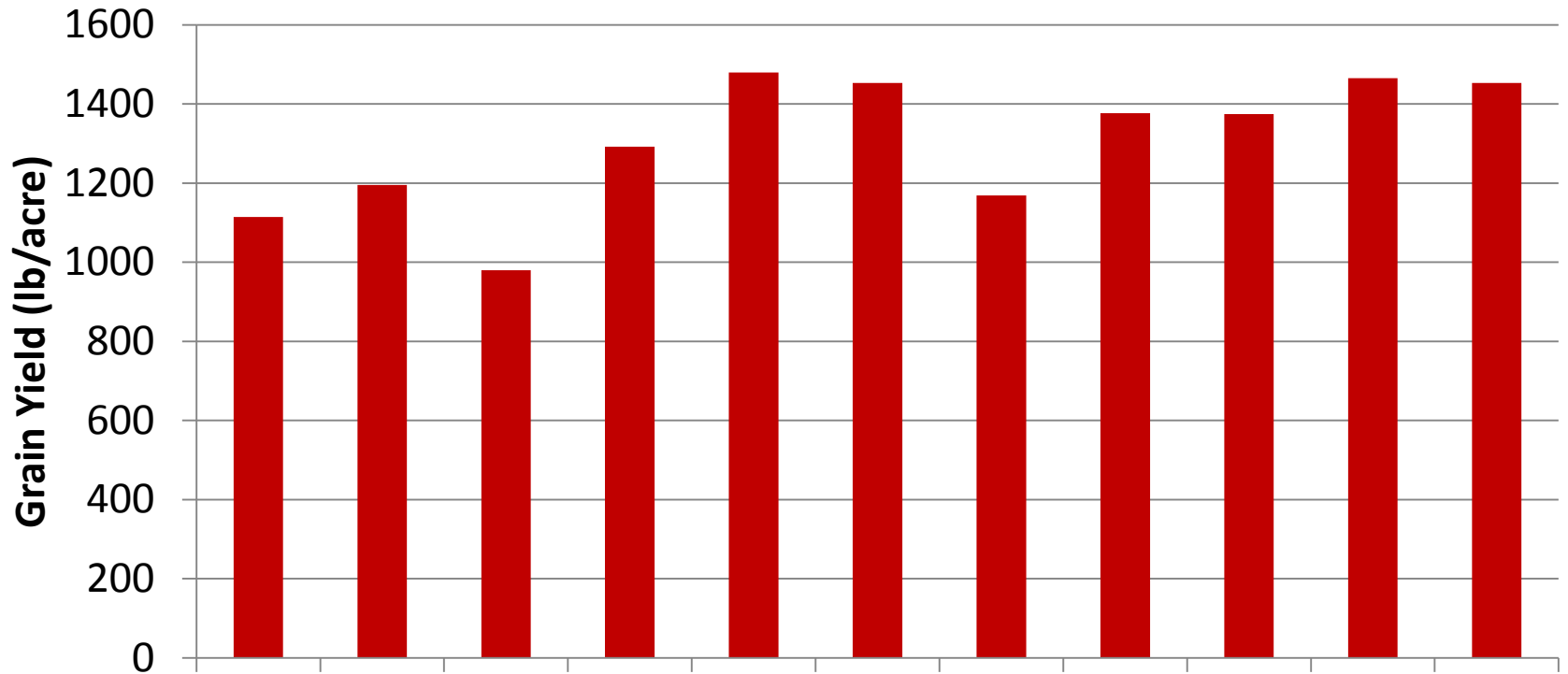
# Funding

**ADF** – Saskatchewan Ministry of Agriculture

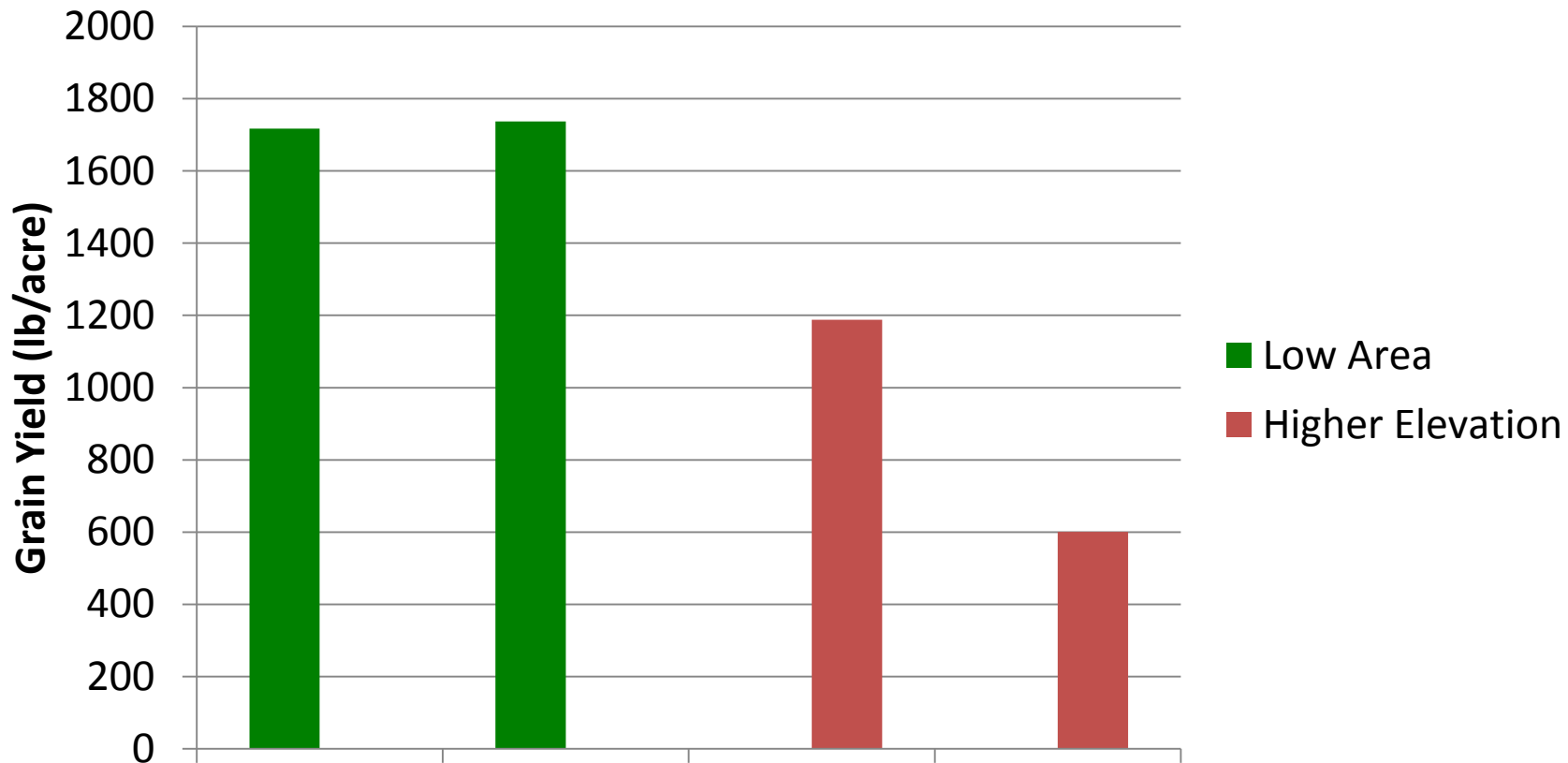
Canaryseed Development Commission of  
Saskatchewan



# Indian Head - 2014



<b>N</b>	<b>0</b>	<b>15</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>90</b>
<b>P</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>
<b>CL</b>		<b>18</b>	<b>18</b>	<b>18</b>	<b>18</b>	<b>18</b>	<b>0</b>	<b>18</b>	<b>18</b>	<b>18</b>	<b>18</b>
<b>S</b>				<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>
<b>Cu</b>								<b>3</b>			
<b>Zinc</b>									<b>3</b>		
<b>Cu, Z, Mn, B</b>										<b>Yes</b>	<b>Yes</b>



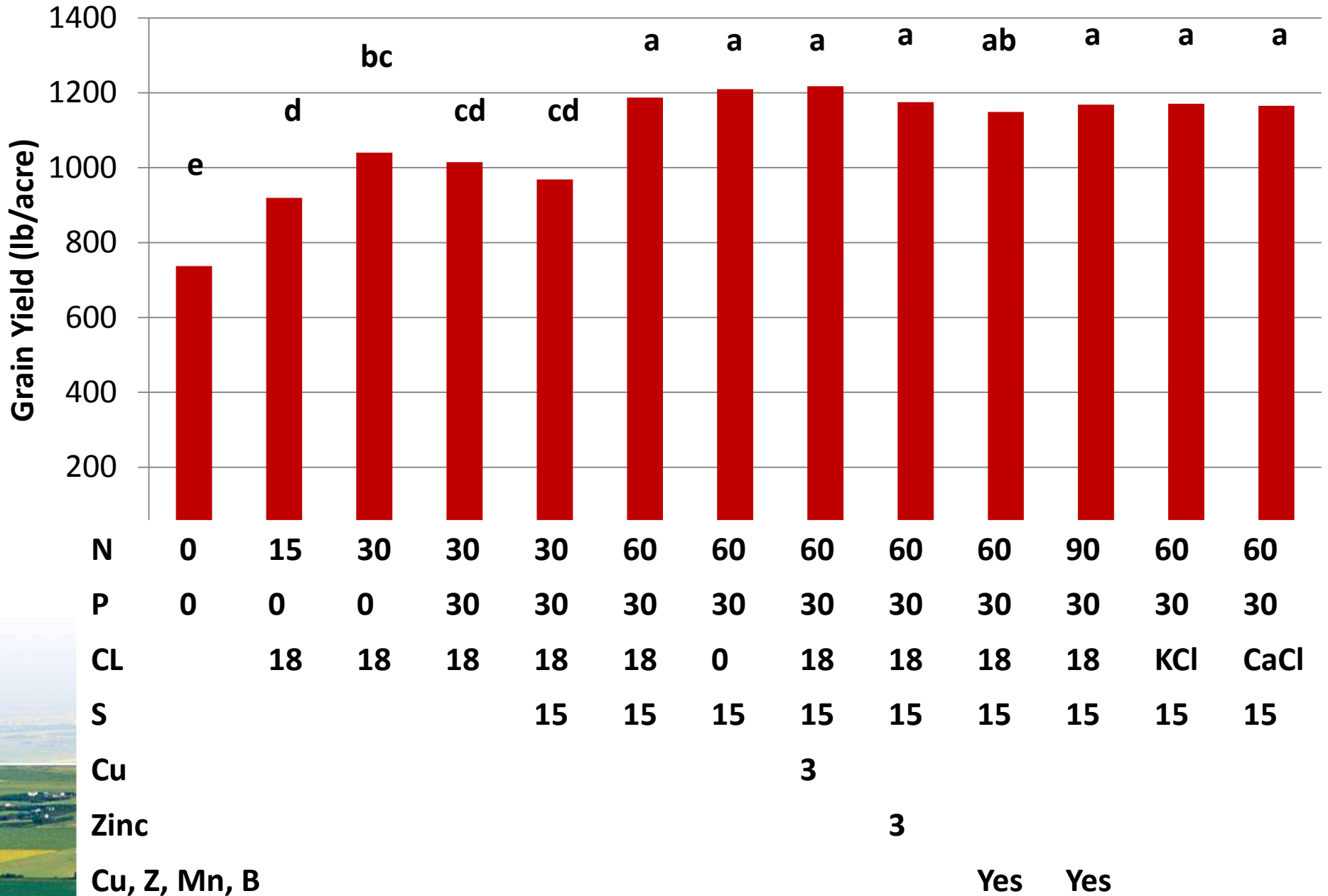
<b>N</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>
<b>P</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>
<b>CL</b>	<b>18</b>	<b>0</b>	<b>18</b>	<b>0</b>
<b>S</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>





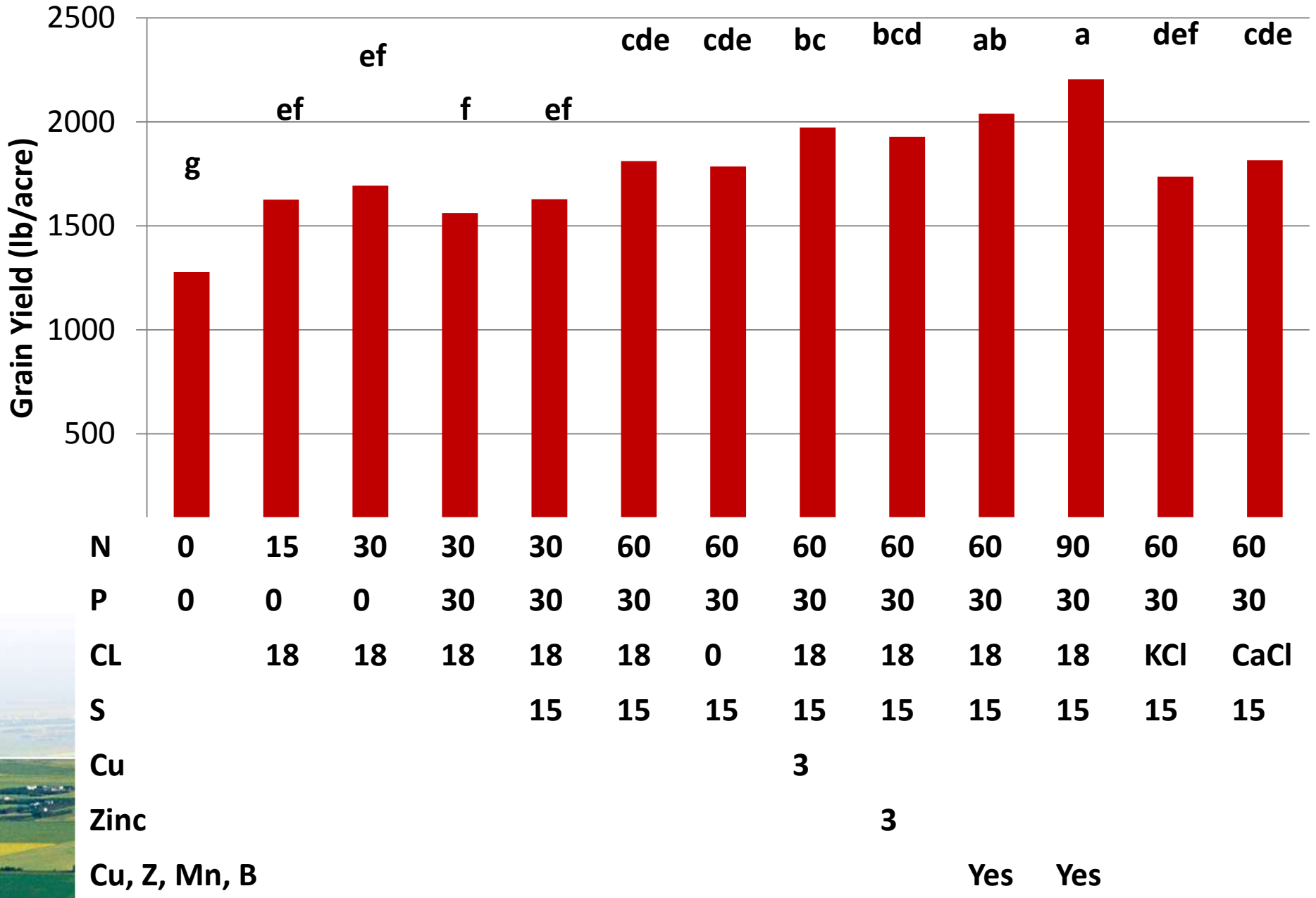


# Indian Head - 2016

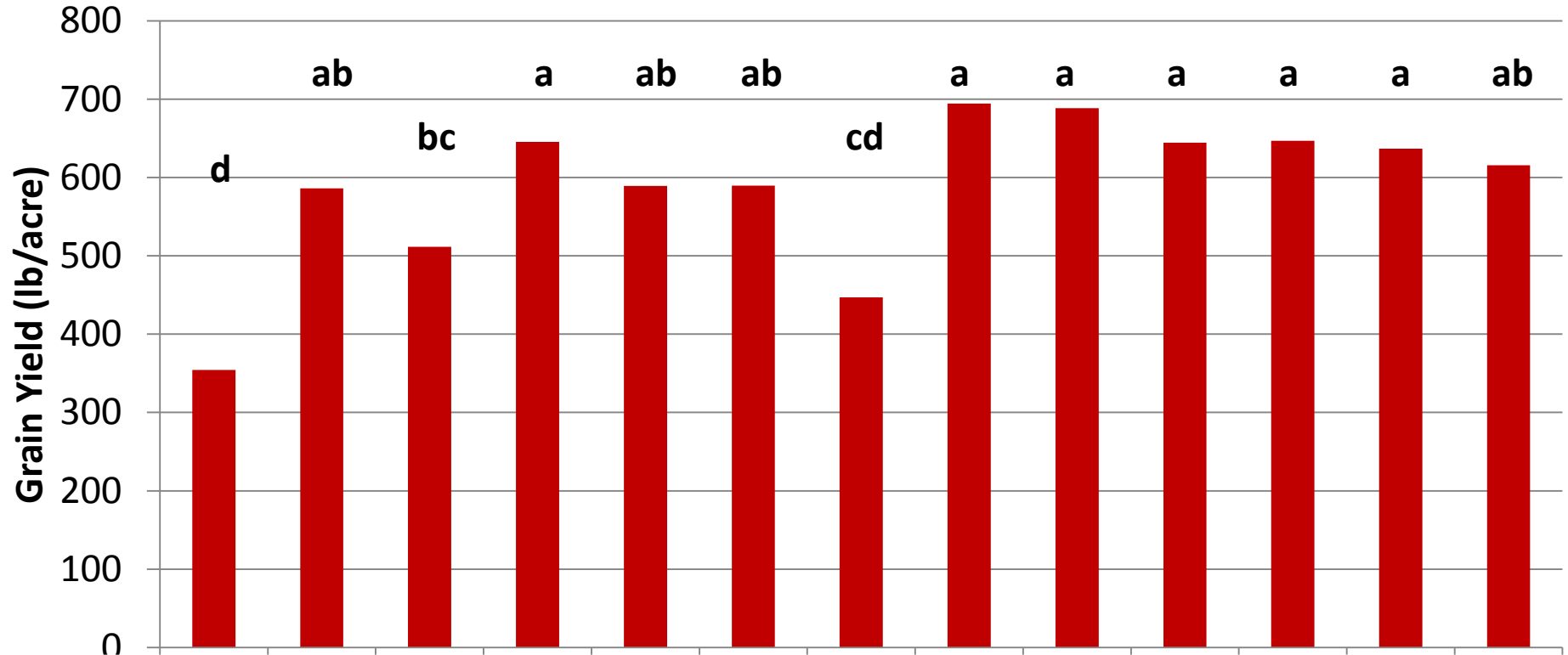




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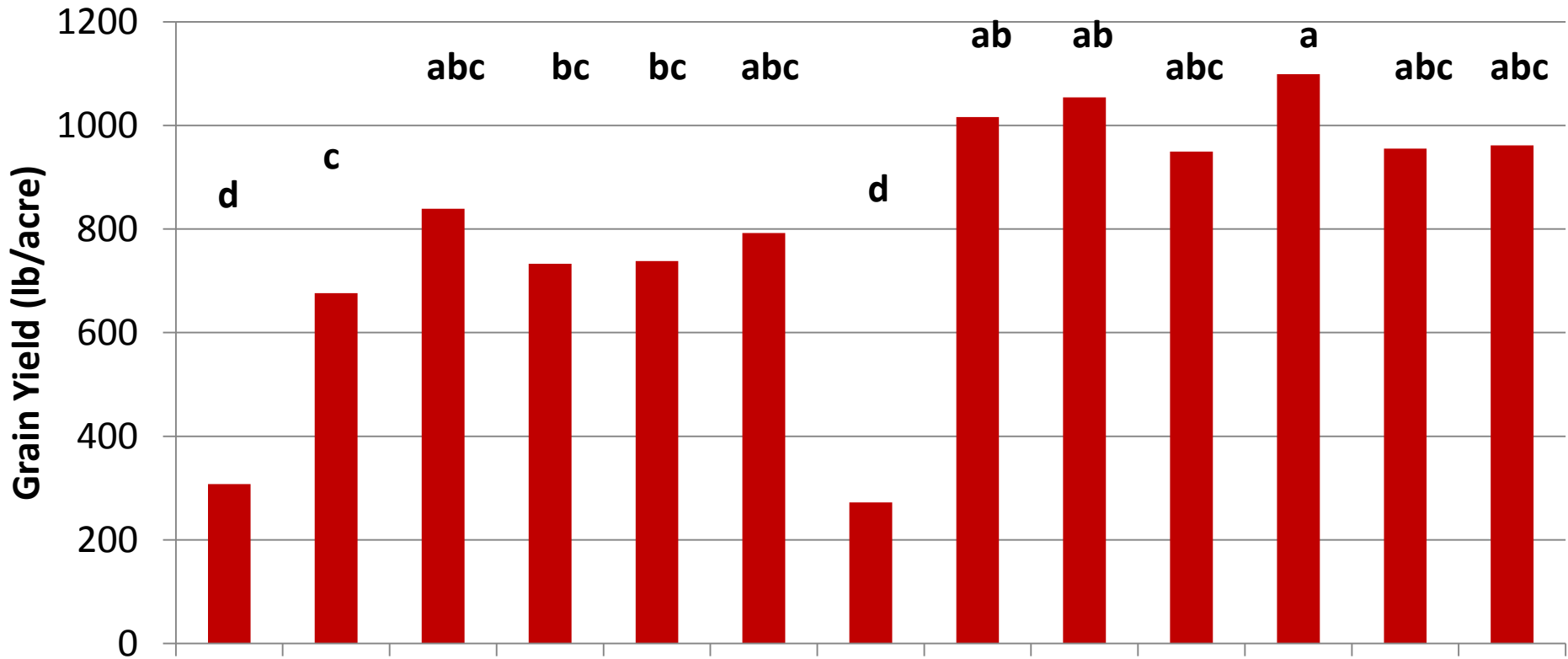


# Swift Current - 2017



N	0	15	30	30	30	60	60	60	60	60	90	60	60
P	0	0	0	30	30	30	30	30	30	30	30	30	30
CL		18	18	18	18	18	0	18	18	18	18	KCl	CaCl
S					15	15	15	15	15	15	15	15	15
Cu								3					
Zinc									3				
Cu, Z, Mn, B										Yes	Yes		

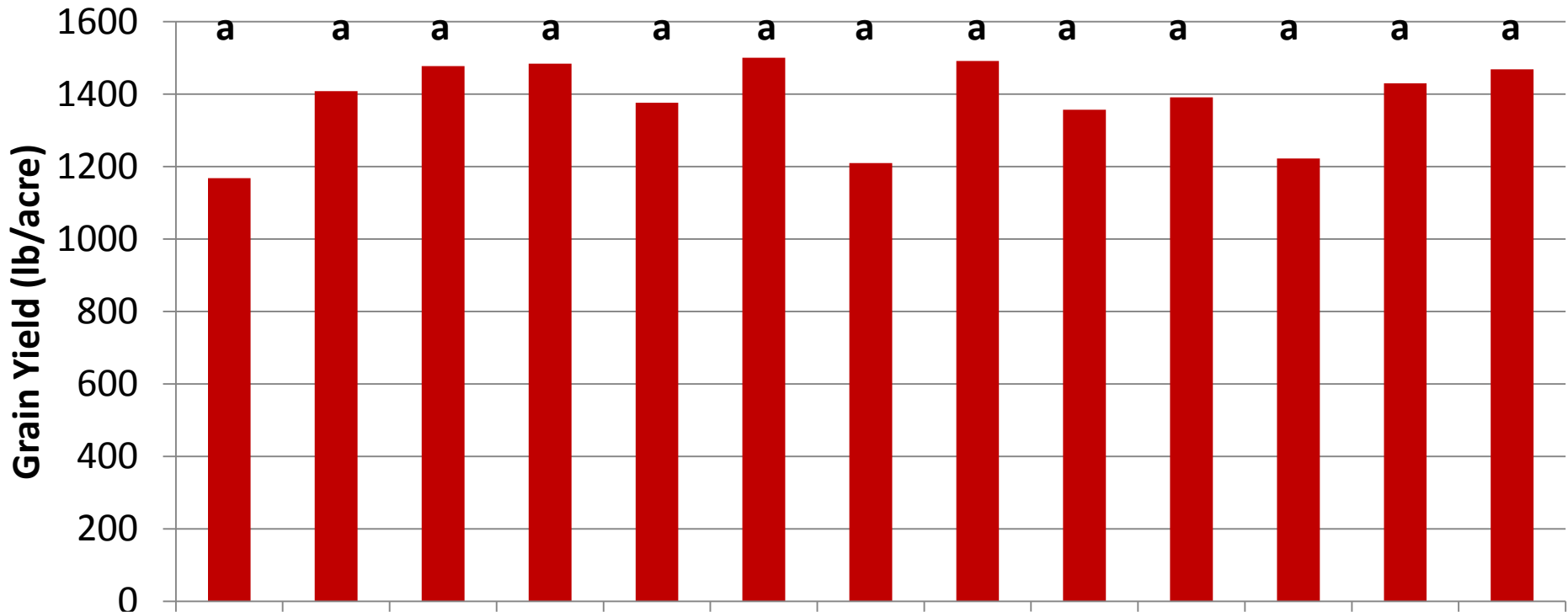
# Melfort - 2017



N	0	15	30	30	30	60	60	60	60	60	90	60	60
P	0	0	0	30	30	30	30	30	30	30	30	30	30
CL		18	18	18	18	18	0	18	18	18	18	KCl	CaCl
S					15	15	15	15	15	15	15	15	15
Cu								3					
Zinc									3				
Cu, Z, Mn, B										Yes	Yes		

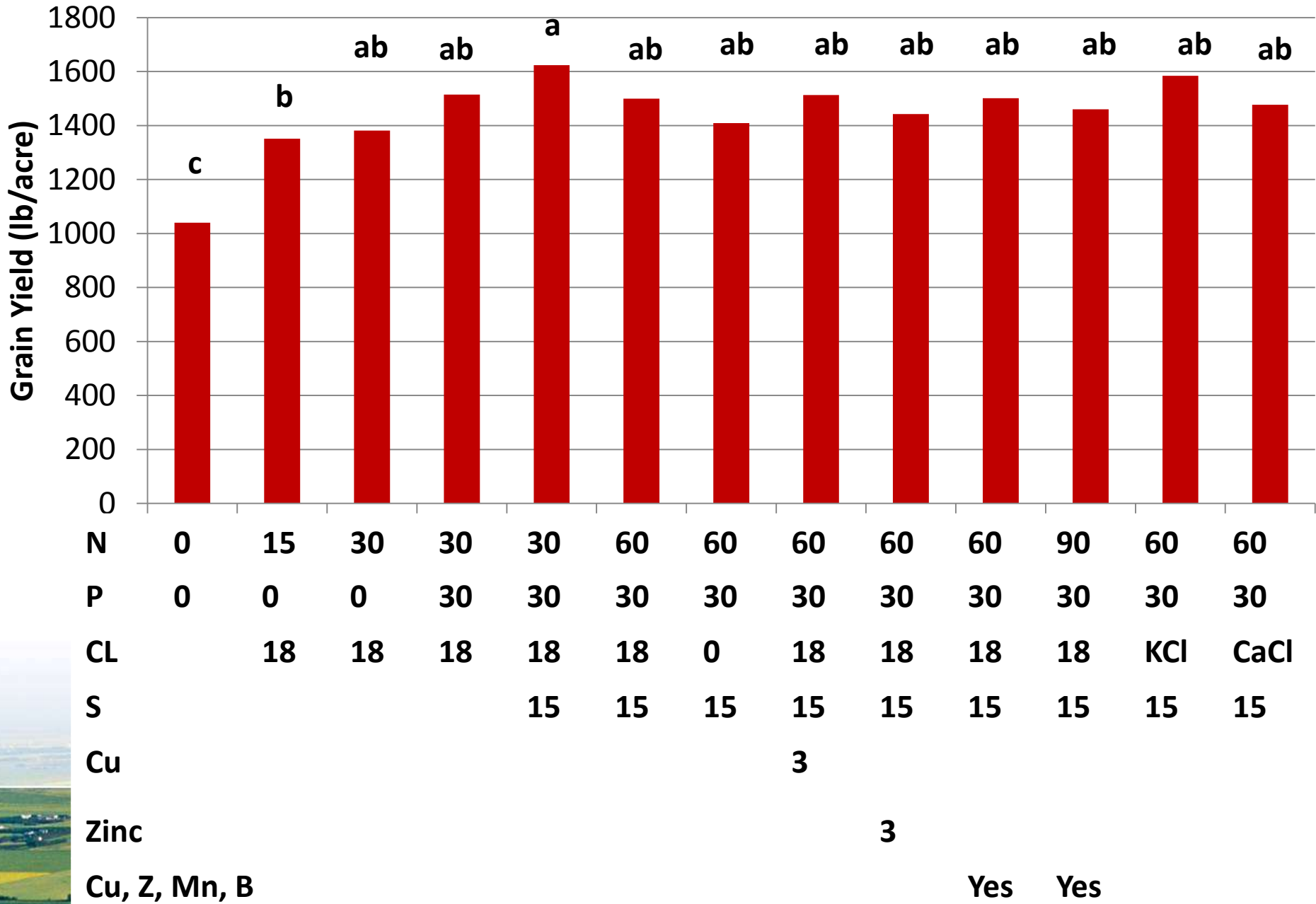


# Scott - 2017

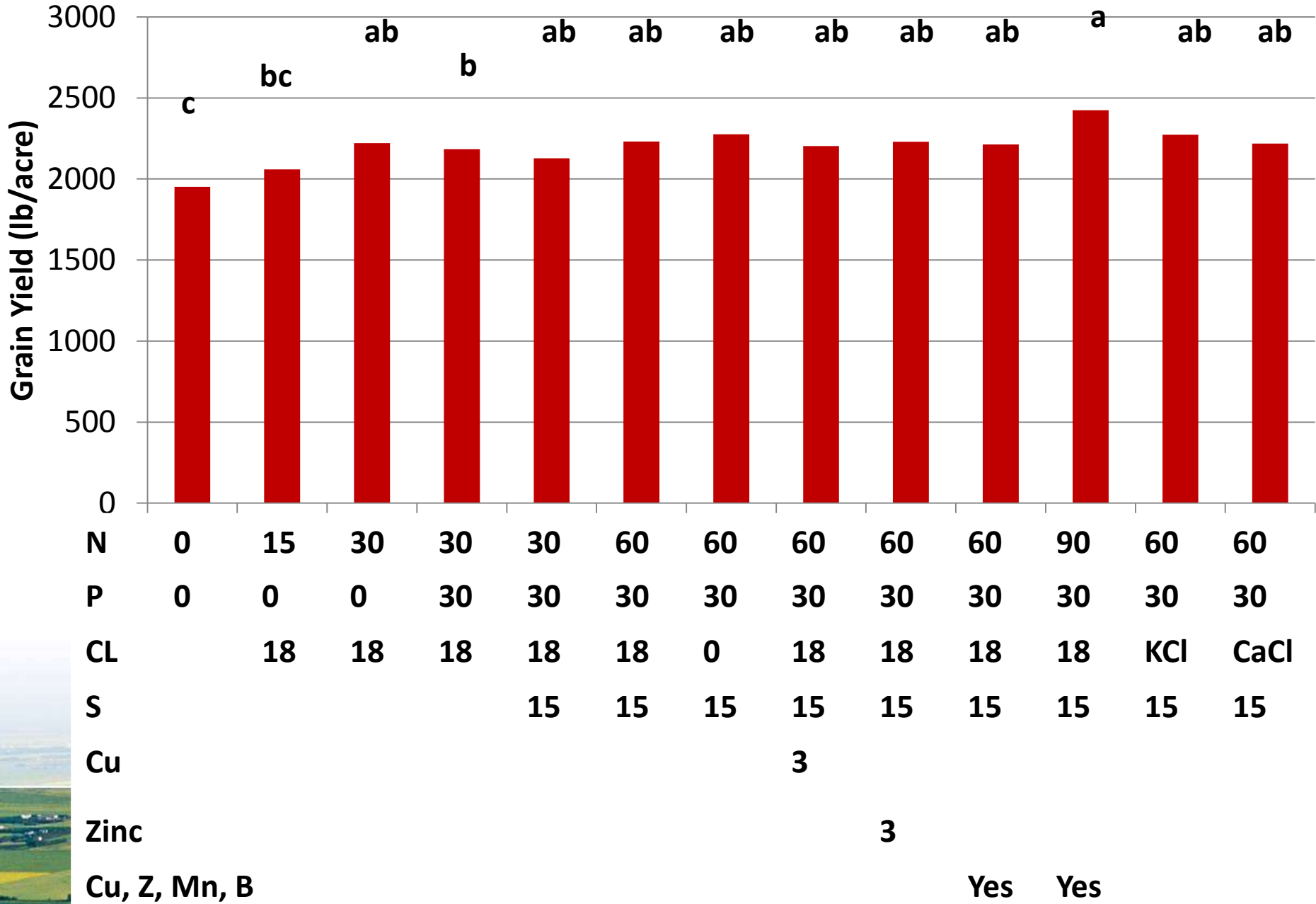


N	0	15	30	30	30	60	60	60	60	60	90	60	60
P	0	0	0	30	30	30	30	30	30	30	30	30	30
CL		18	18	18	18	18	0	18	18	18	18	KCl	CaCl
S					15	15	15	15	15	15	15	15	15
Cu								3					
Zinc									3				
Cu, Z, Mn, B										Yes	Yes		

# Yorkton - 2016



# Redvers - 2017





# Overall Results

- N Fertilizer: response at 18 out of 19 site-years  
Optimum amount (eyeing the trend)
  - 15 kg/ha – 3 out of 19
  - 30 kg/ha – 8 out of 19
  - 60 kg/ha – 4 out of 19
  - 90 kg/ha – 4 out of 19



# Overall Results

- Chloride: response at 7 out of 19
- Phosphate: response at 1 or 2 out of 19
- Zinc: response at 1 out of 19 locations



# Septoria Leaf Mottle

To spray or not to spray that is the question



**W.E. May**

Agriculture and Agri-food Canada



# Septoria Leaf Mottle

## Plot Size (ft)

- 13 x 35
- 26 x 35
- 39 x 35
- 13 x 70
- 26 x 70
- 39 x 70

Test is conducted in Two fields one with no canaryseed and the other with the rest of the field seeded to canaryseed

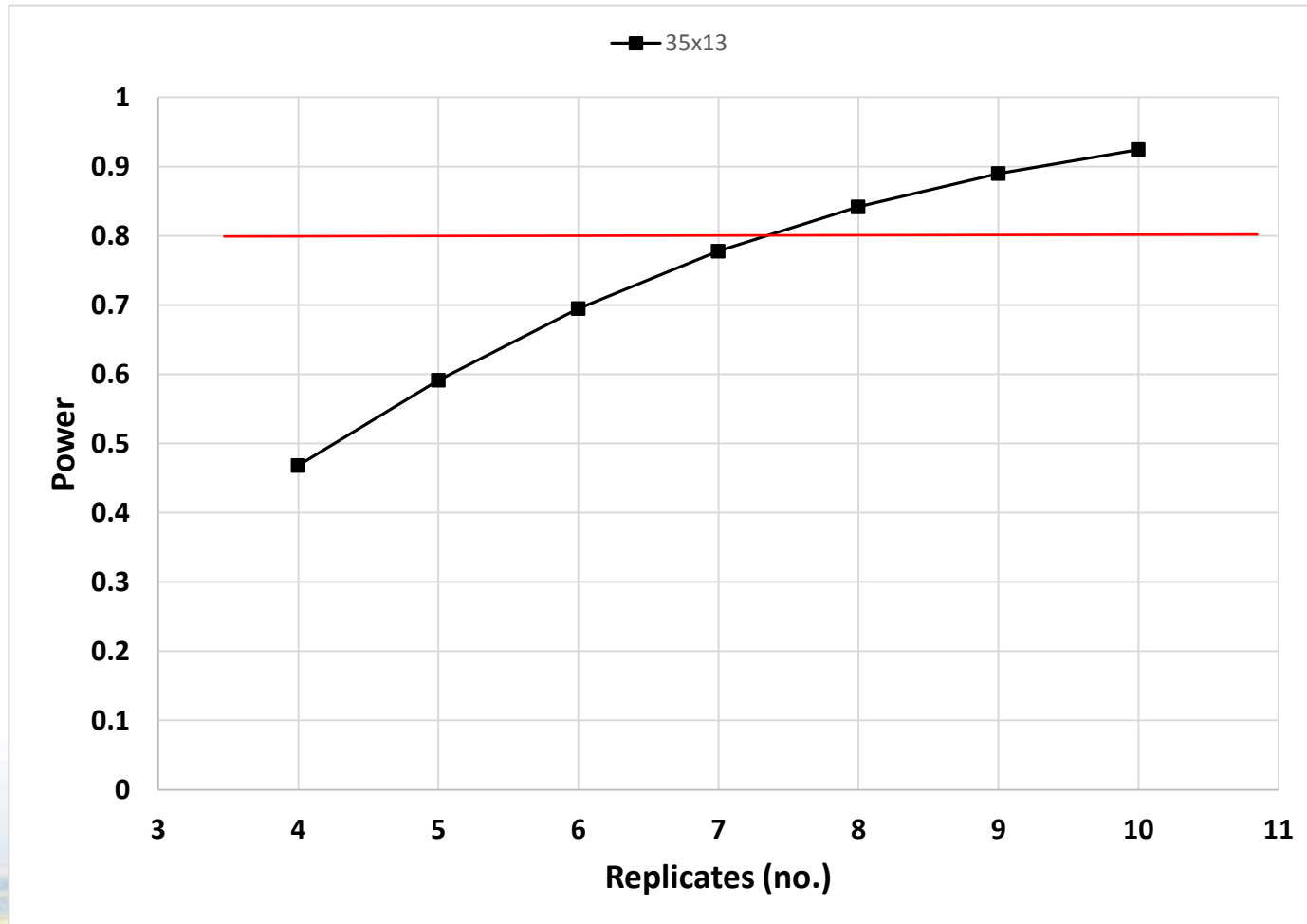


# Fungicide Treatments

- **Check**
- **Tilt**
- **Twinline**
- **Prosaro**
- **Prosaro late**



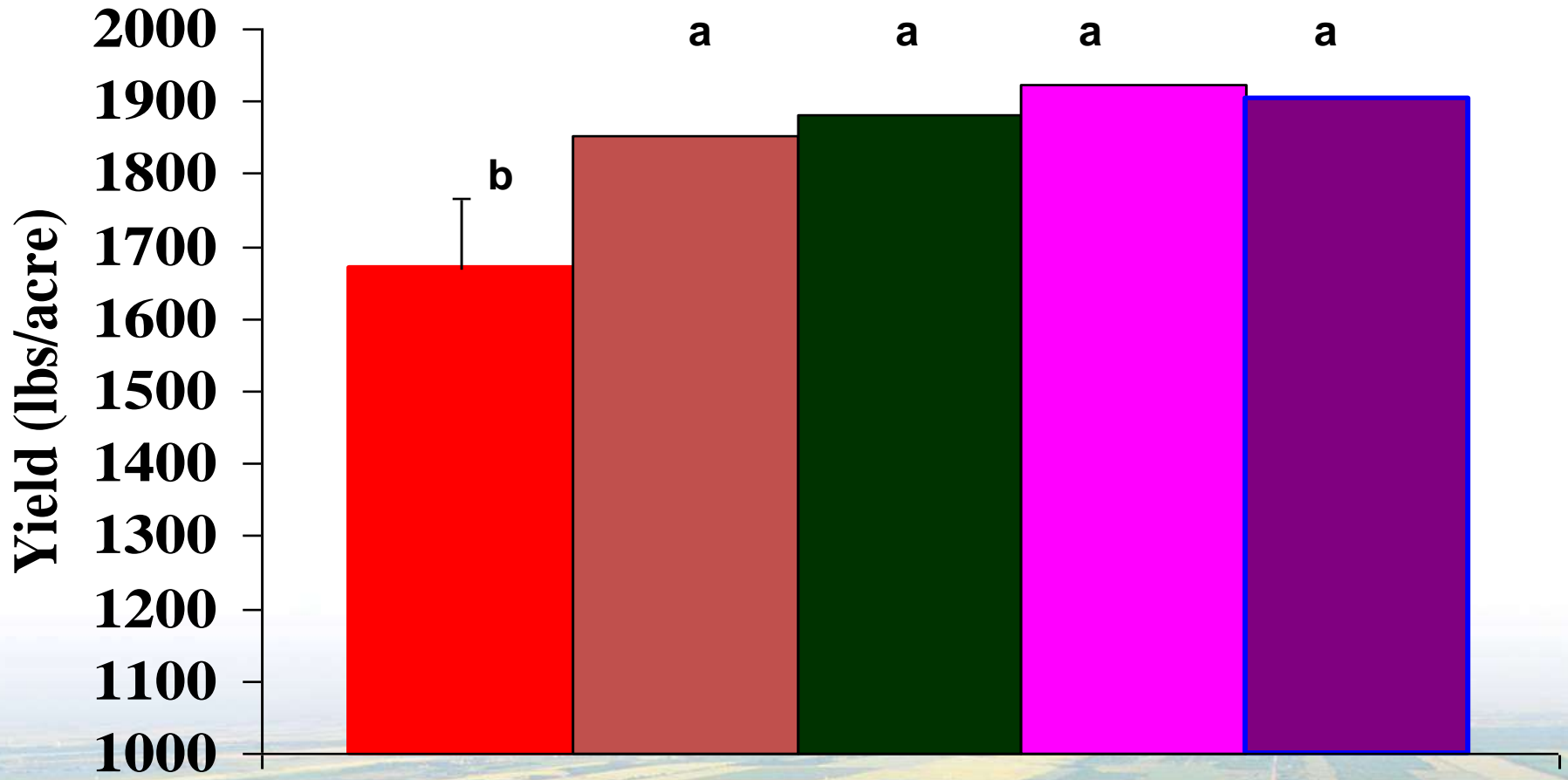
# Plot Size and Septoria Leaf Mottle





# Septoria Leaf Mottle and Yield

■ Check ■ Tilt ■ Twinline ■ Prosaro ■ Prosaro late





# Canaryseed and cereal aphids

Tyler Wist and Bill May

AAFC

Saskatoon and Indian Head



Agriculture and  
Agri-Food Canada

Agriculture et  
Agroalimentaire Canada

Canada

# The trouble with aphids

- Live birth, born pregnant, all female



Honeydew=mould

Viral vectors



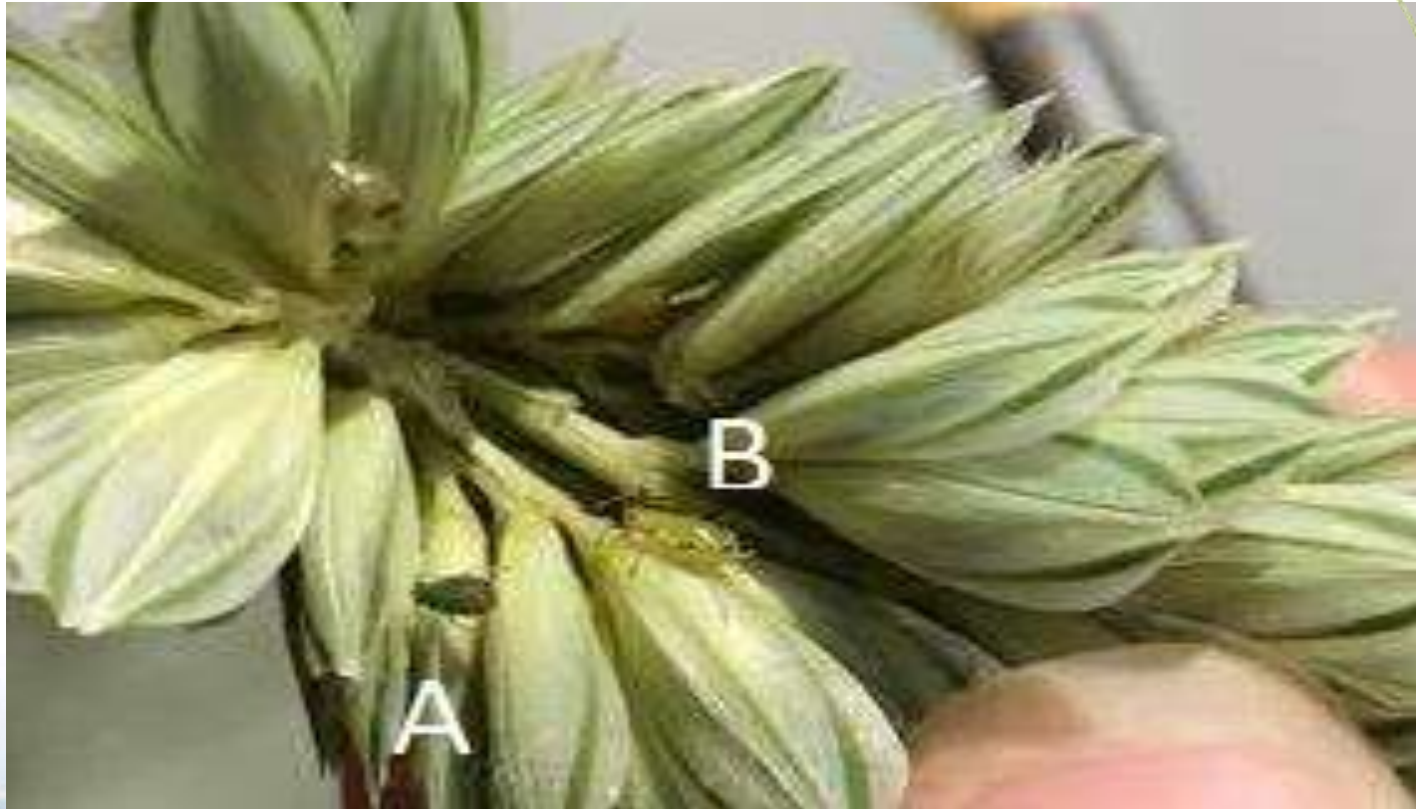


Birdcherry-oat

# Aphid species



English grain

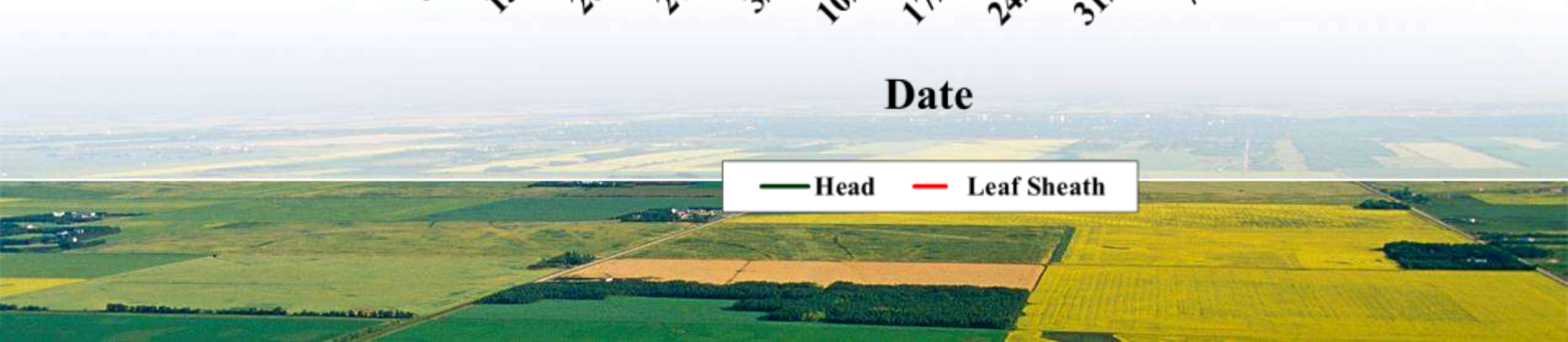
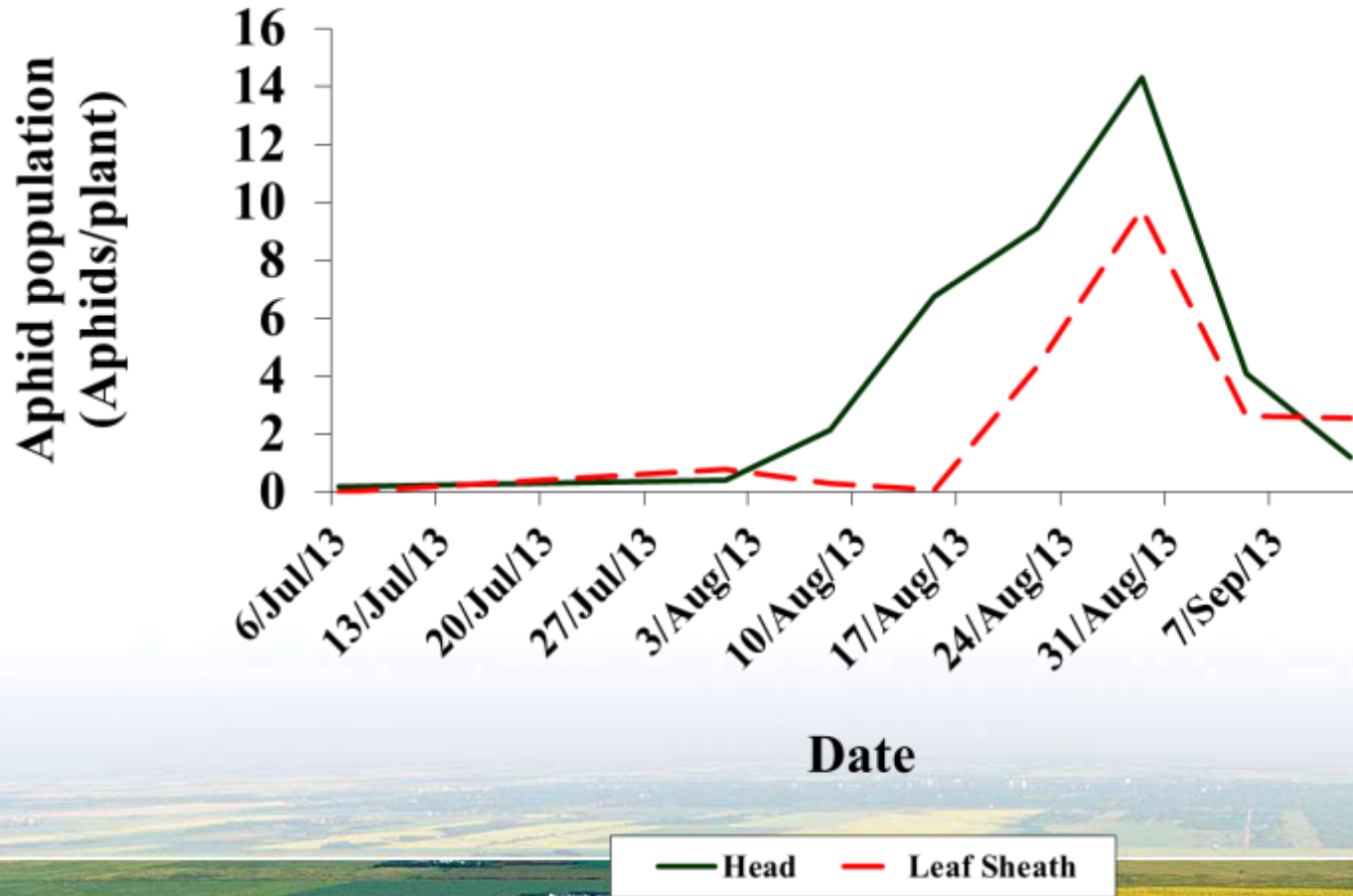


Greenbug

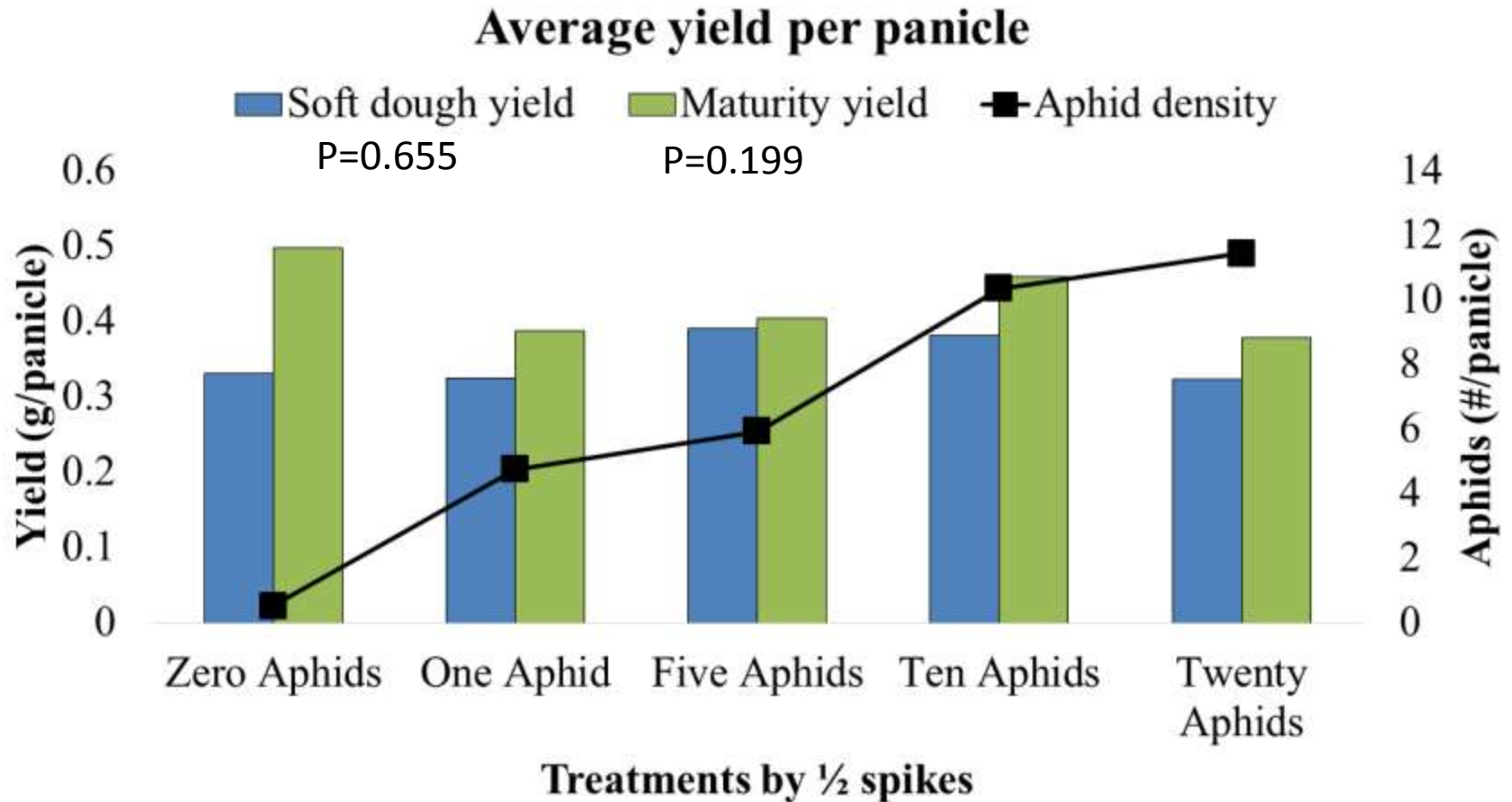




# Aphid population in Canaryseed 2013



# Cage experiment



# Plot experiment

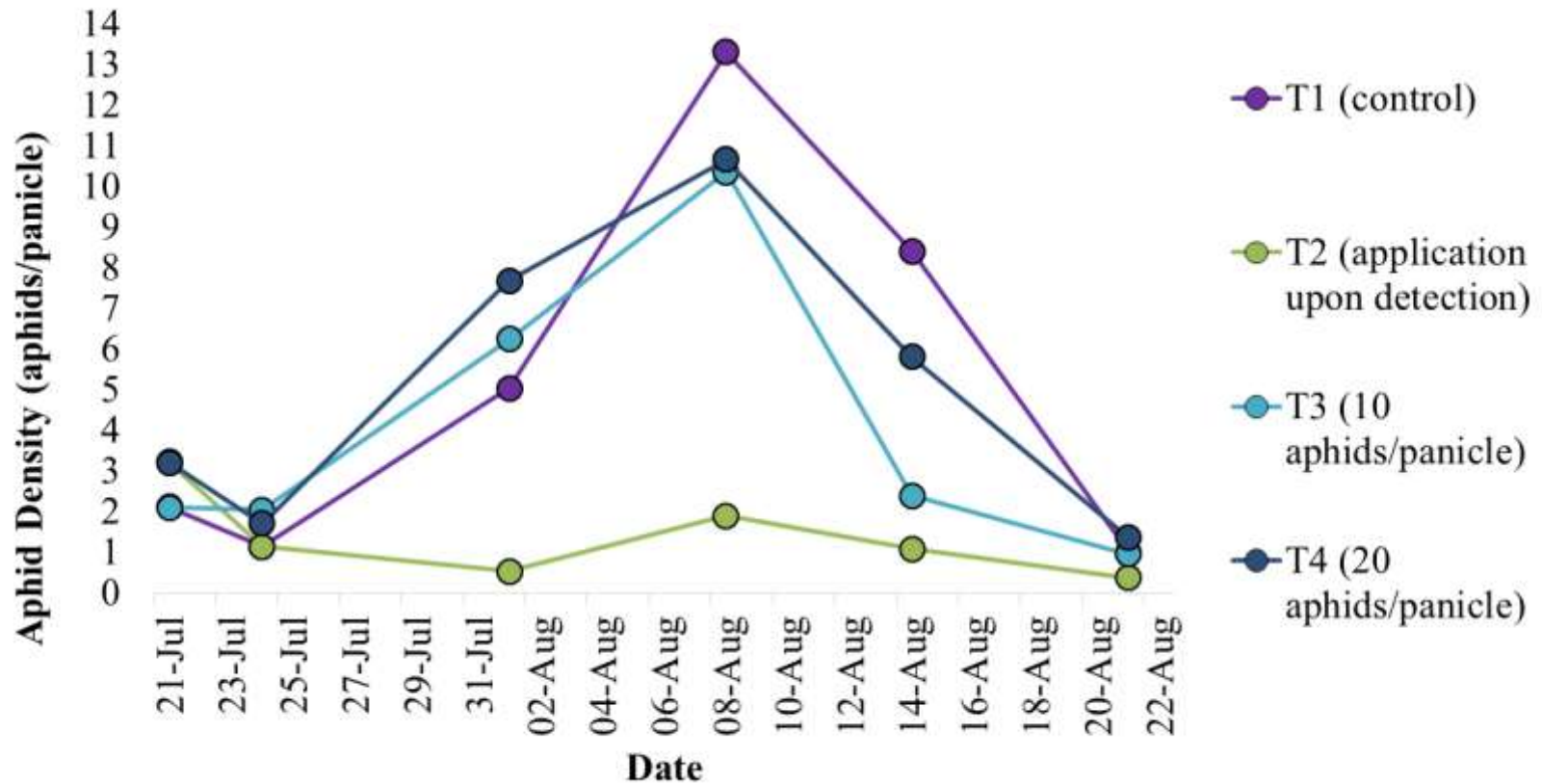
- Four treatments.
  1. Control (no spray)
  2. Zero aphids (spray all aphids...3x in 2017)
  3. 10/aphids per  $\frac{1}{2}$  tillers (one spray needed)
  4. 20 aphids per  $\frac{1}{2}$  tillers (not reached in 2017)





# Number of aphids per plot

Aphid per head (2017) in plot trials

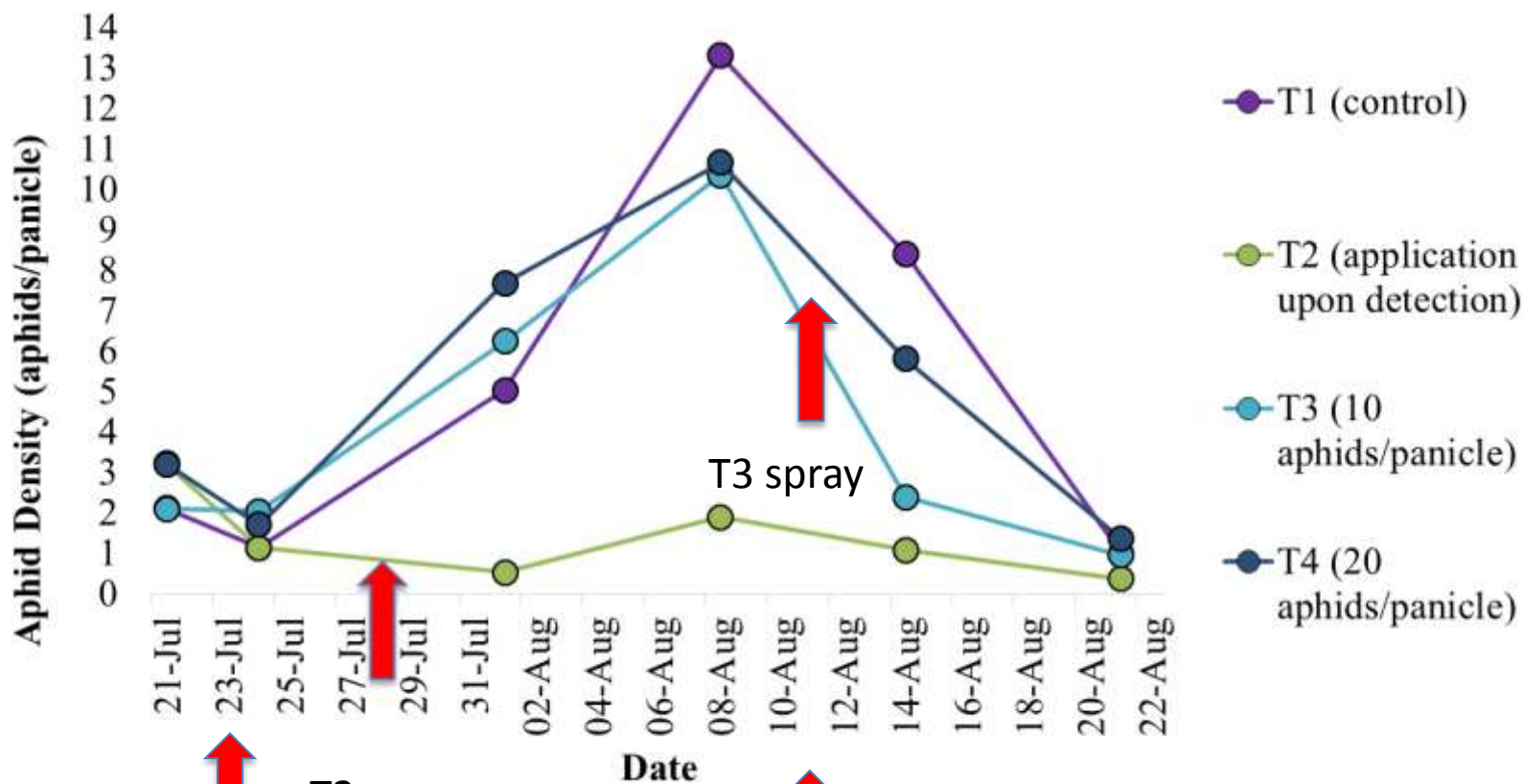




# Number of aphids per plot



Aphid per head (2017) in plot trials

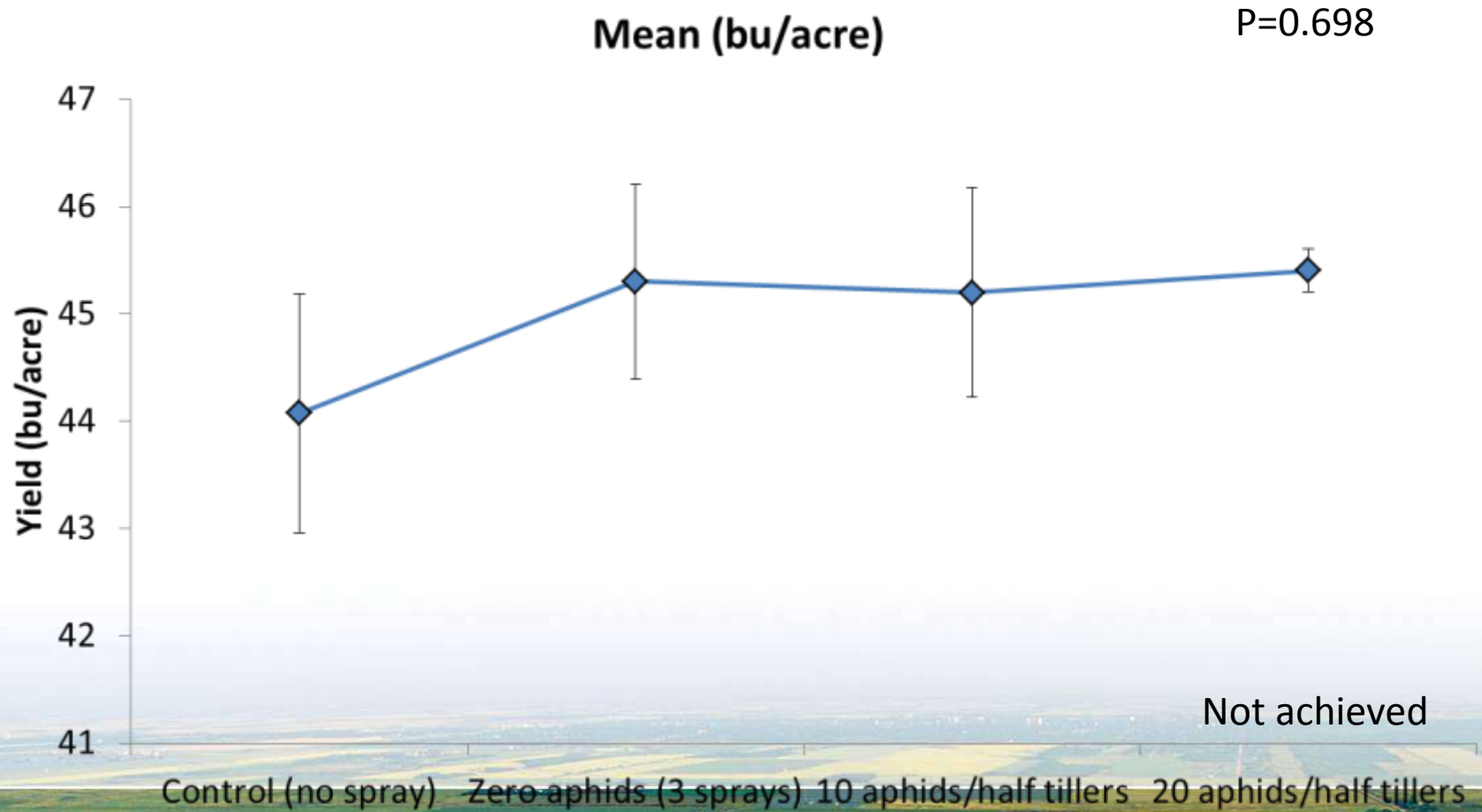


T2 spray

T2 spray



# Yield per plot



# 2018 experiments

- Replicate 2017 Expts x 2 sites (add Saskatoon)
- Cages
  - Aphids on heads for 21 days in cages
  - 2 aphid species (from Saskatoon colonies) to be tested in cages



# Parasitoids: aphid biocontrol



# Beneficial insects: lady beetles





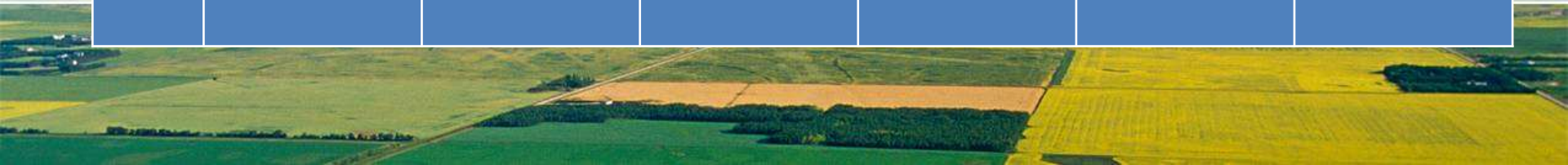
# Beneficial insects: hoverflies





# Pulse Intensity in Rotation

Rotations All phases of the rotation are grown in each year 24 treatments 4 reps						
	1	2	3	4	5	6
A	Wheat	Wheat	Wheat	Wheat	Wheat	Wheat
B	Canola	Pea	Pea	Pea	Lentil	Canola
C	oat	oat	Canola	Lentil	oat	Pea
D	Pea	Pea	Pea	Pea	Pea	Canola
Justifica tion	Cereal-oilseed- pulse in a rotation	Intensified pea- based rotation with cereal as a break crop	Intensified broadleaf crop with 1 cereal as a break crop	Intensified pulse- based rotation, 2 species with 1 cereal as a break crop	Intensified pulse- based rotation, 2 species with cereal as a break crop	Intensified canola- based rotation with cereal and pulse between

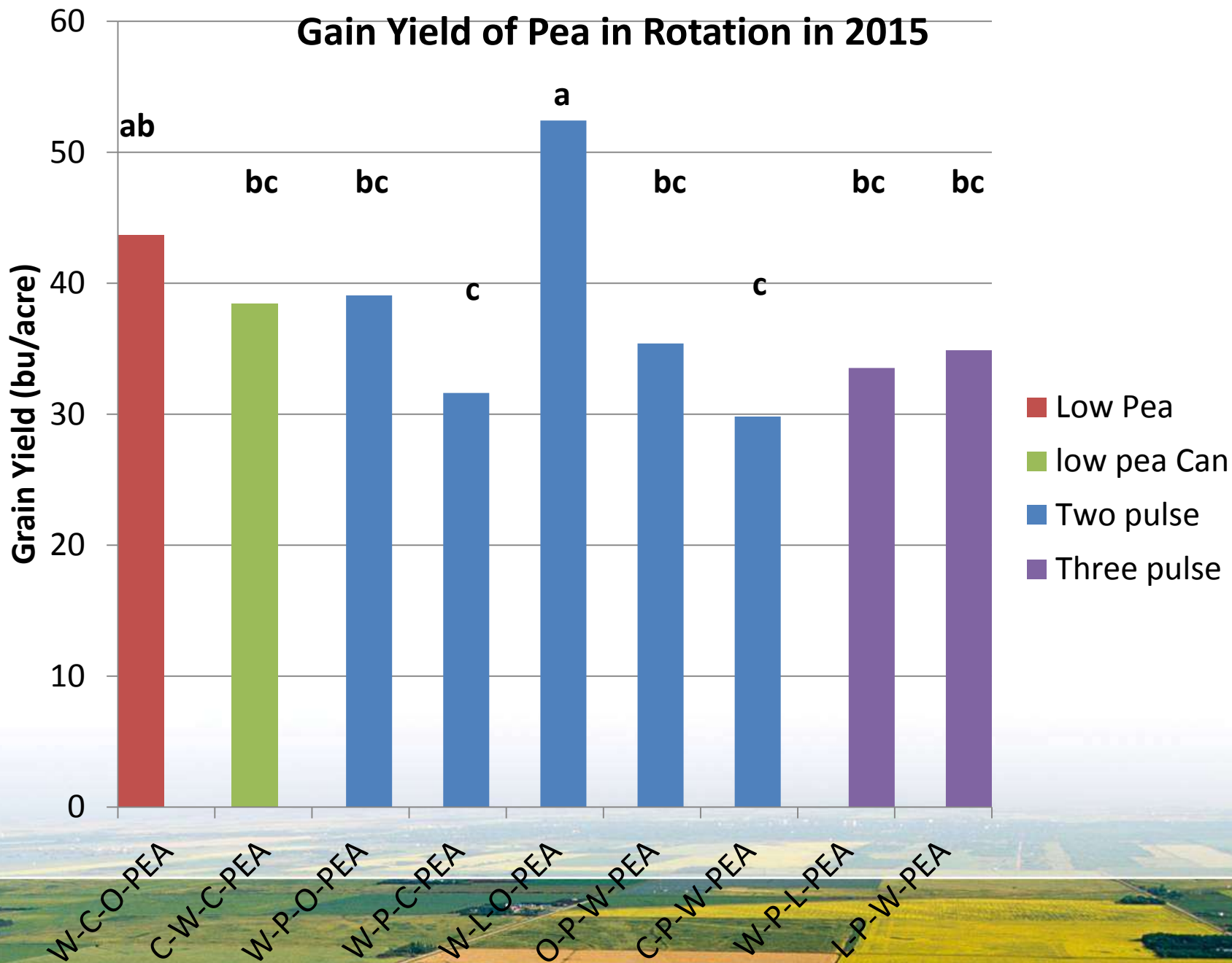


# Funding

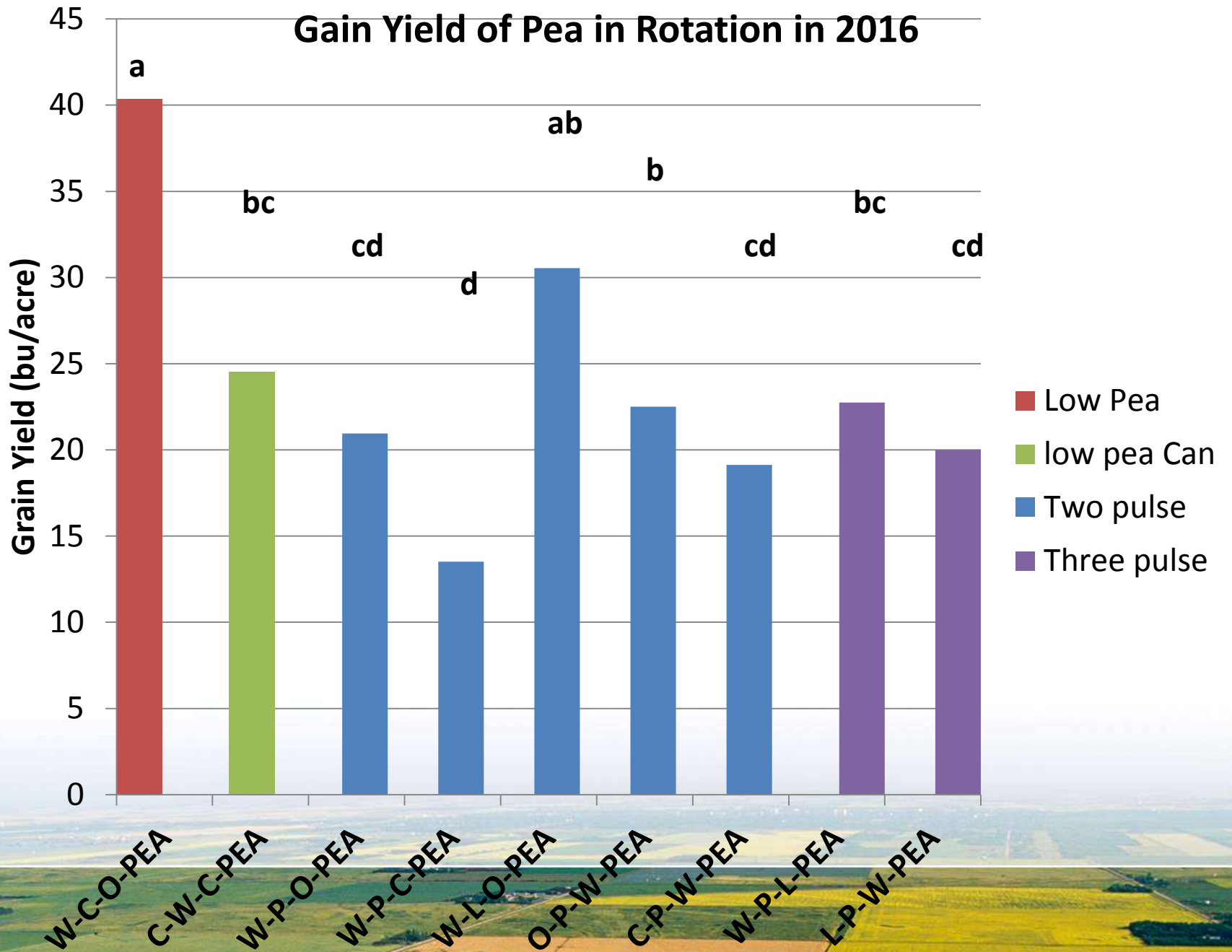
## Saskatchewan Pulse Growers



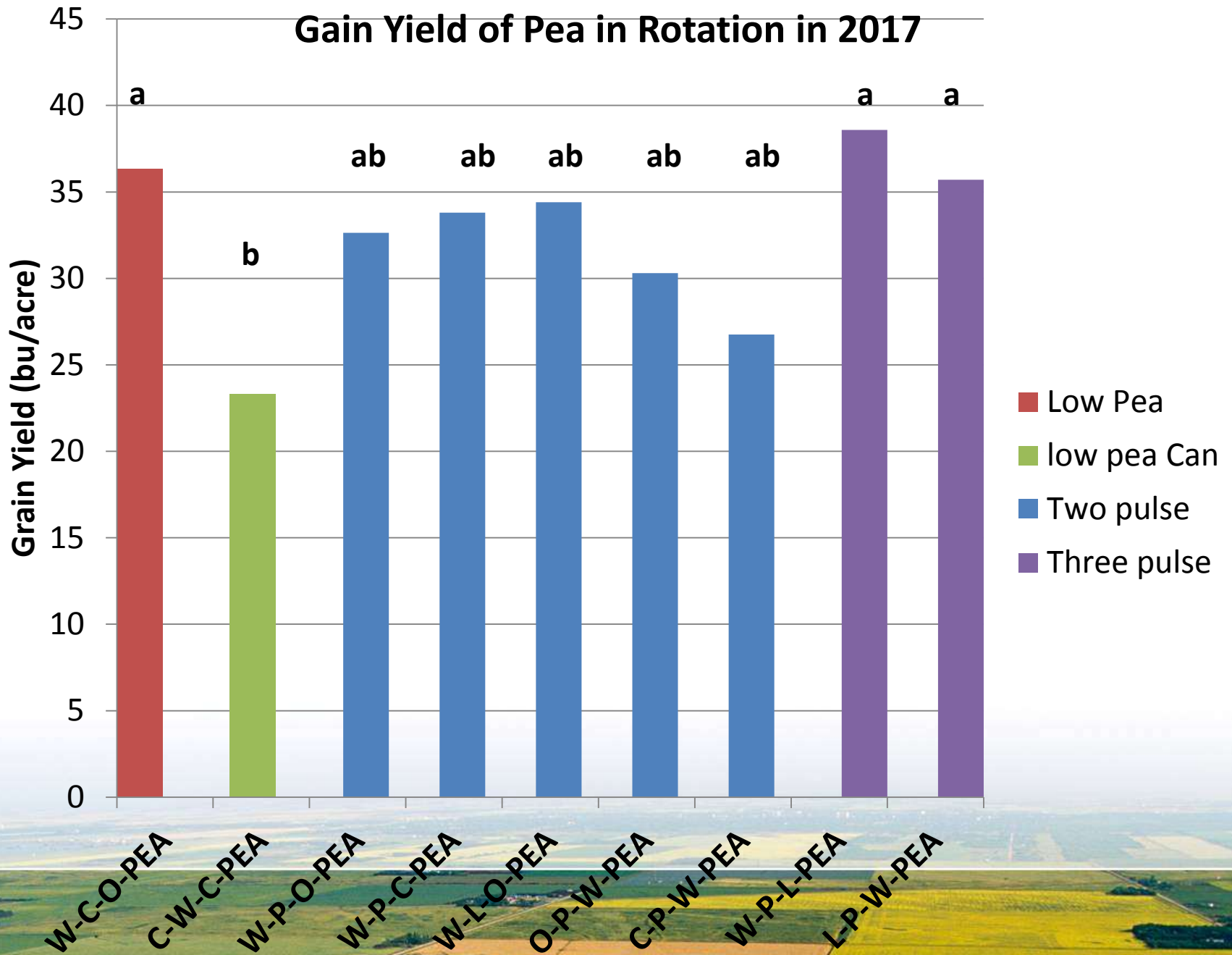
# Gain Yield of Pea in Rotation in 2015



# Gain Yield of Pea in Rotation in 2016

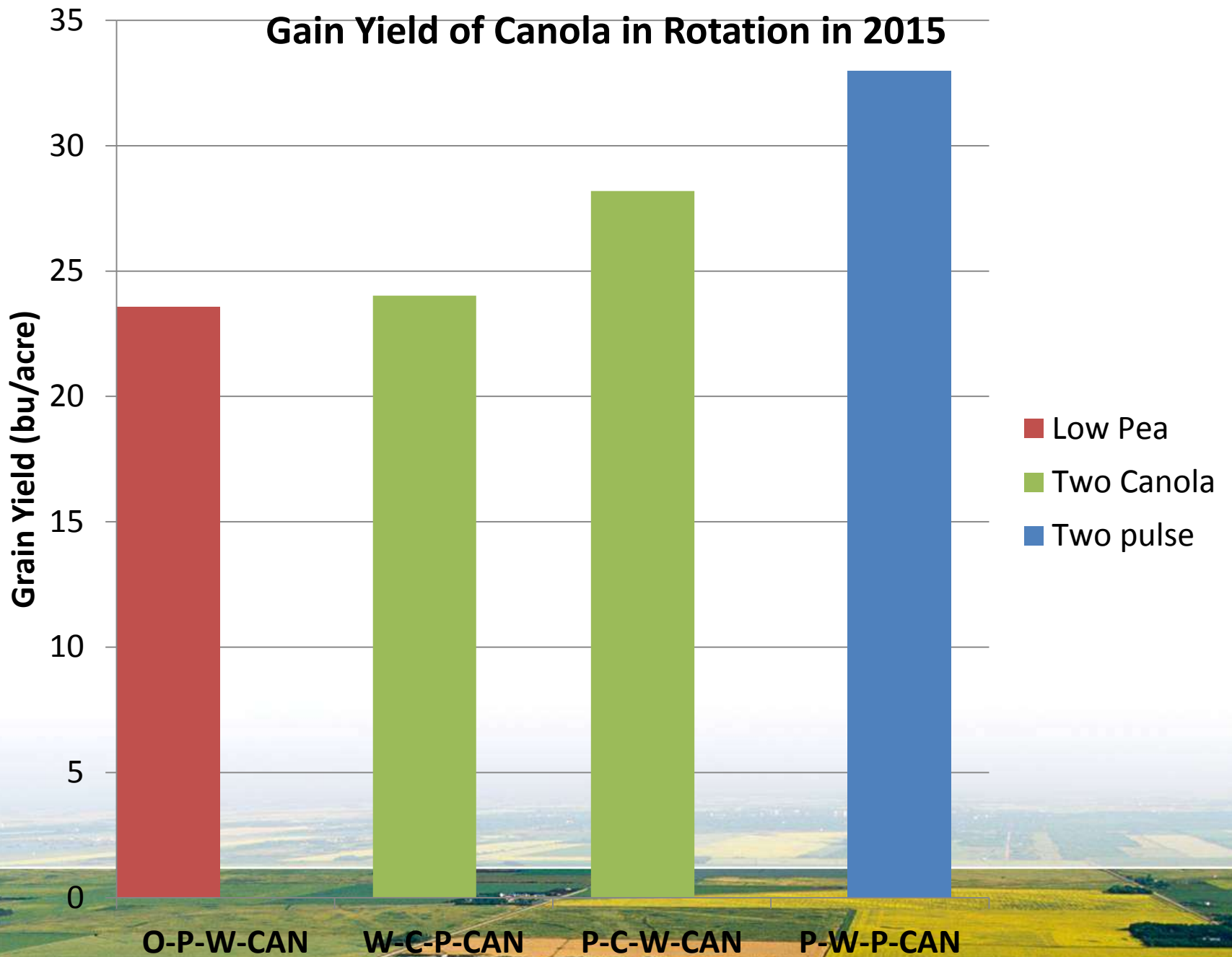


# Gain Yield of Pea in Rotation in 2017

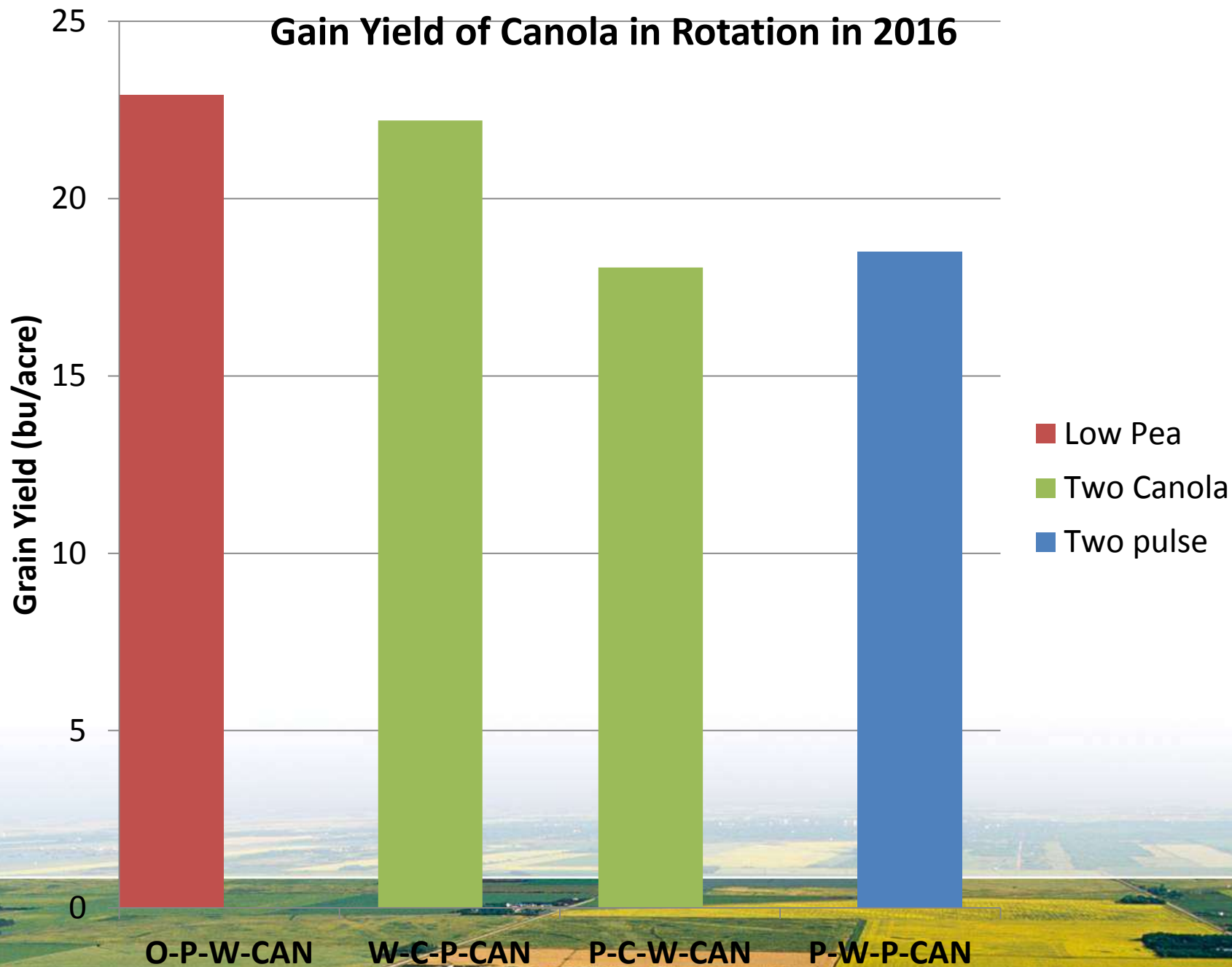




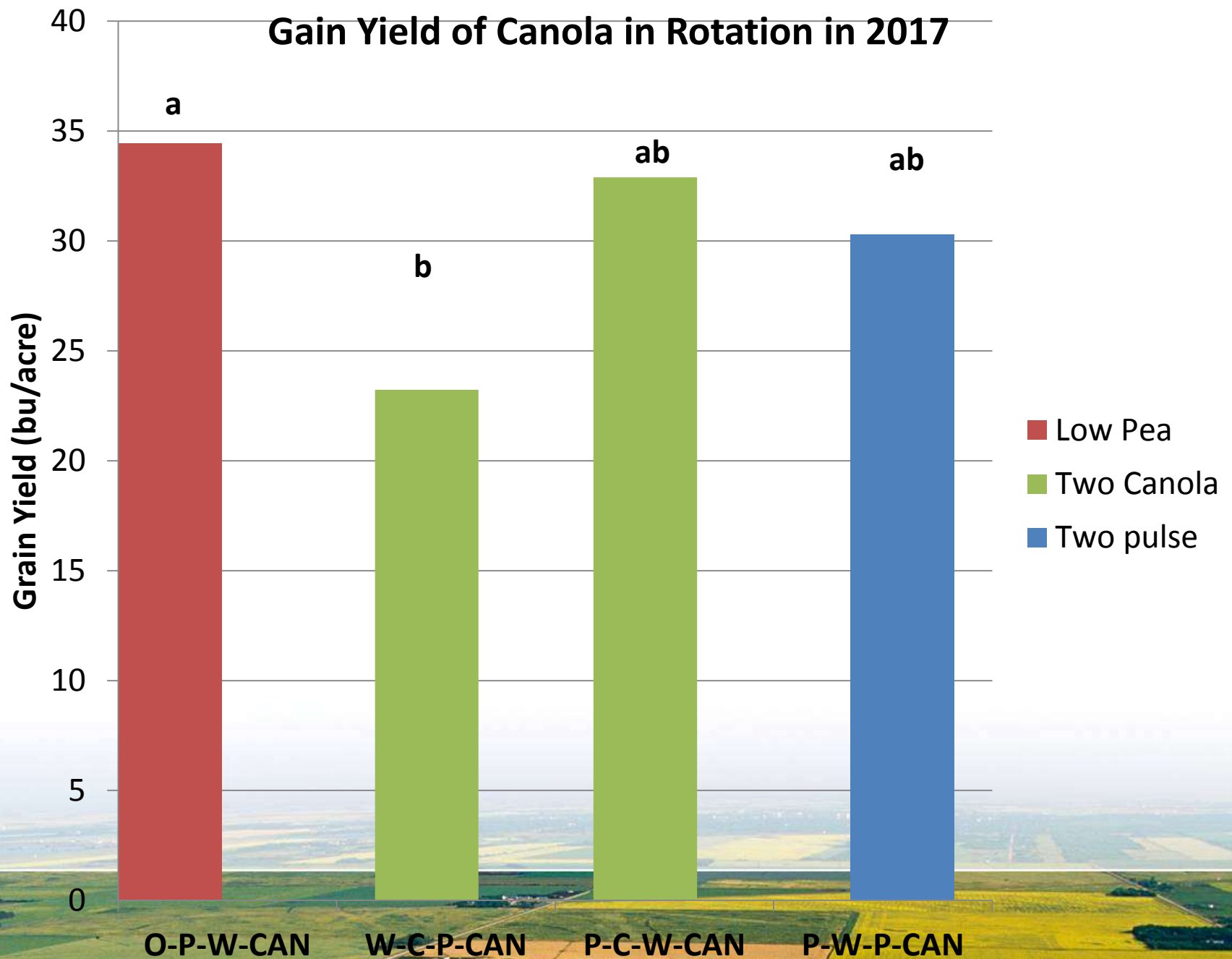
# Gain Yield of Canola in Rotation in 2015



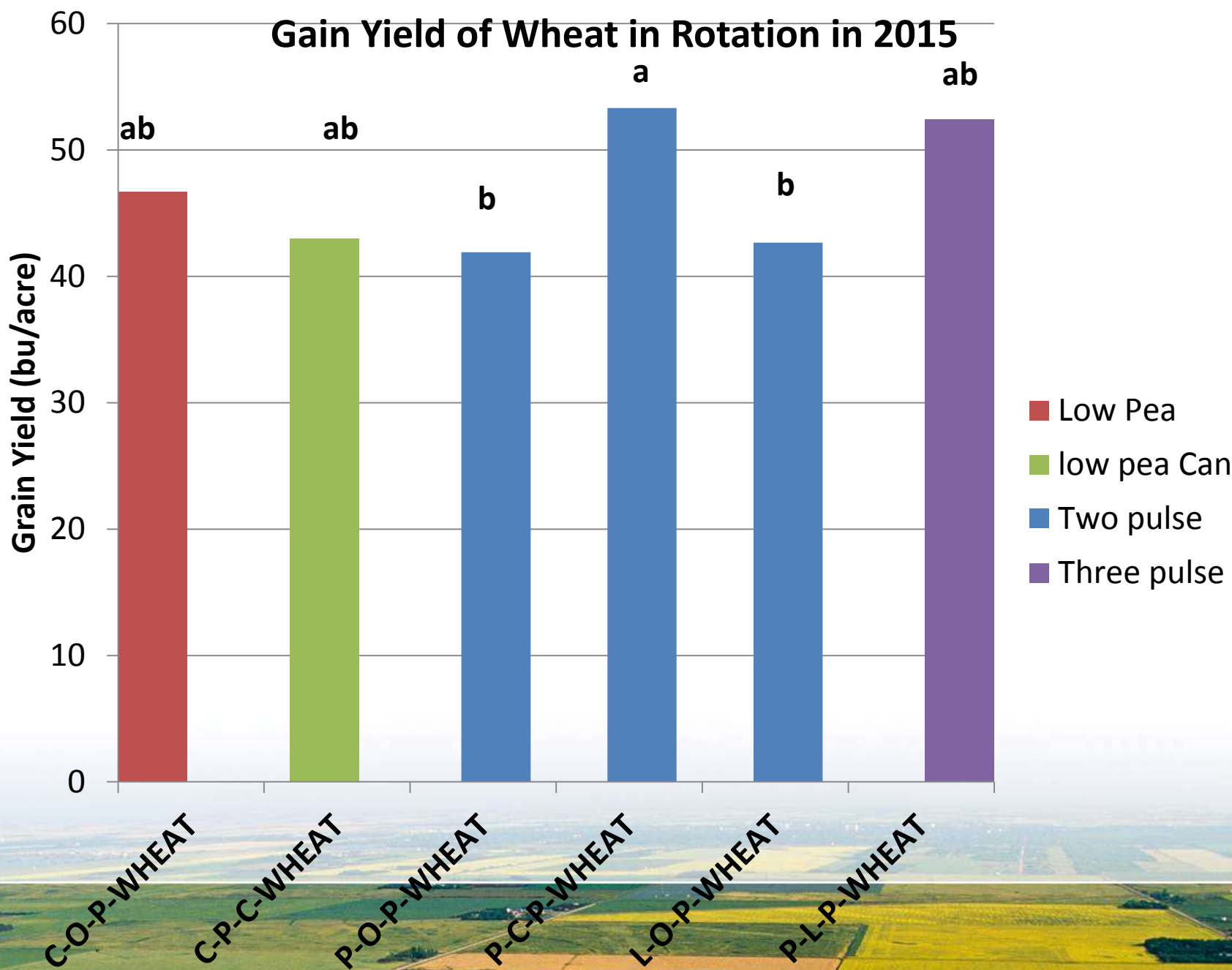
# Gain Yield of Canola in Rotation in 2016



# Gain Yield of Canola in Rotation in 2017

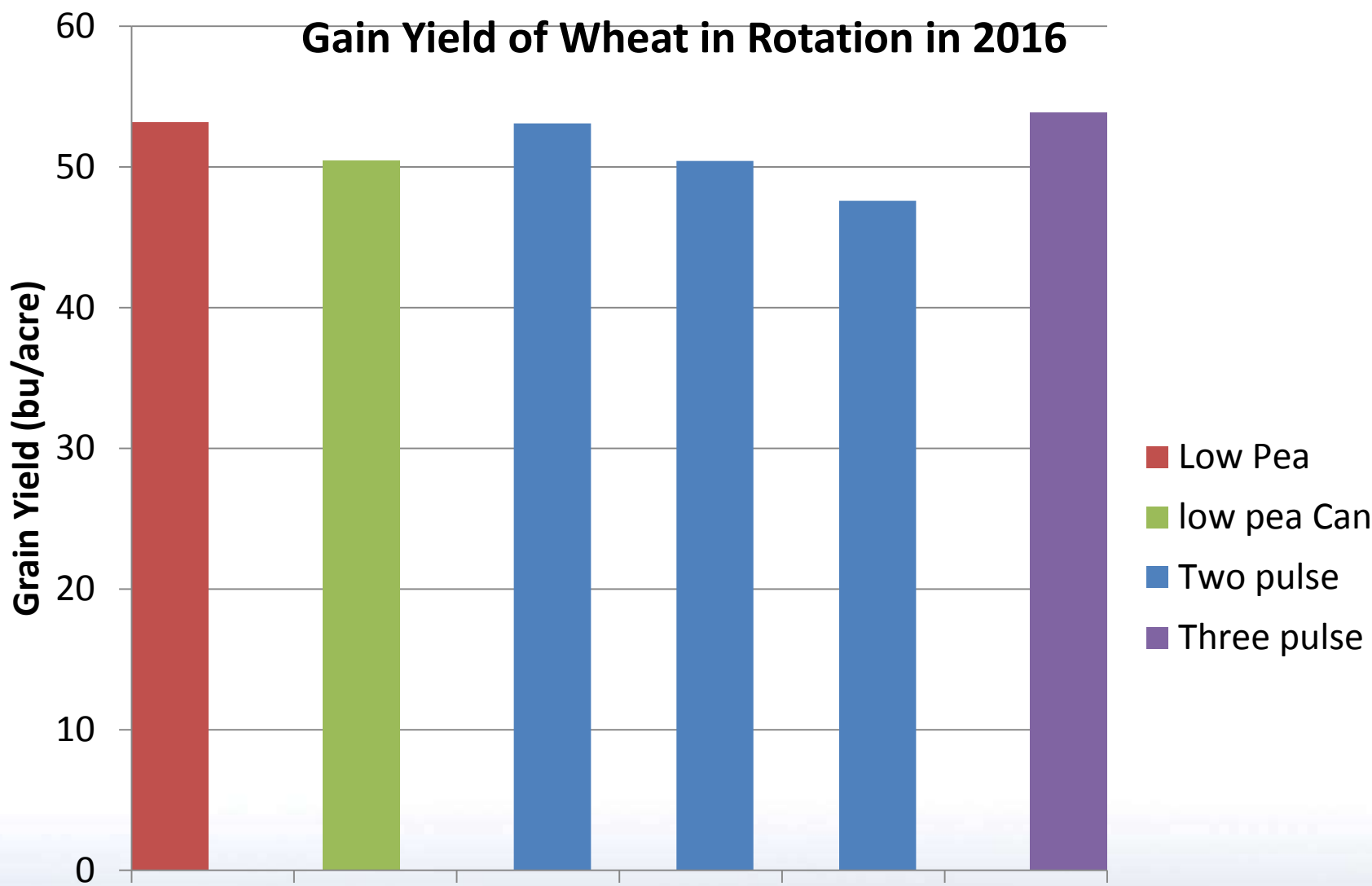


# Gain Yield of Wheat in Rotation in 2015





# Gain Yield of Wheat in Rotation in 2016



C-O-P-WHEAT

C-P-C-WHEAT

P-O-P-WHEAT

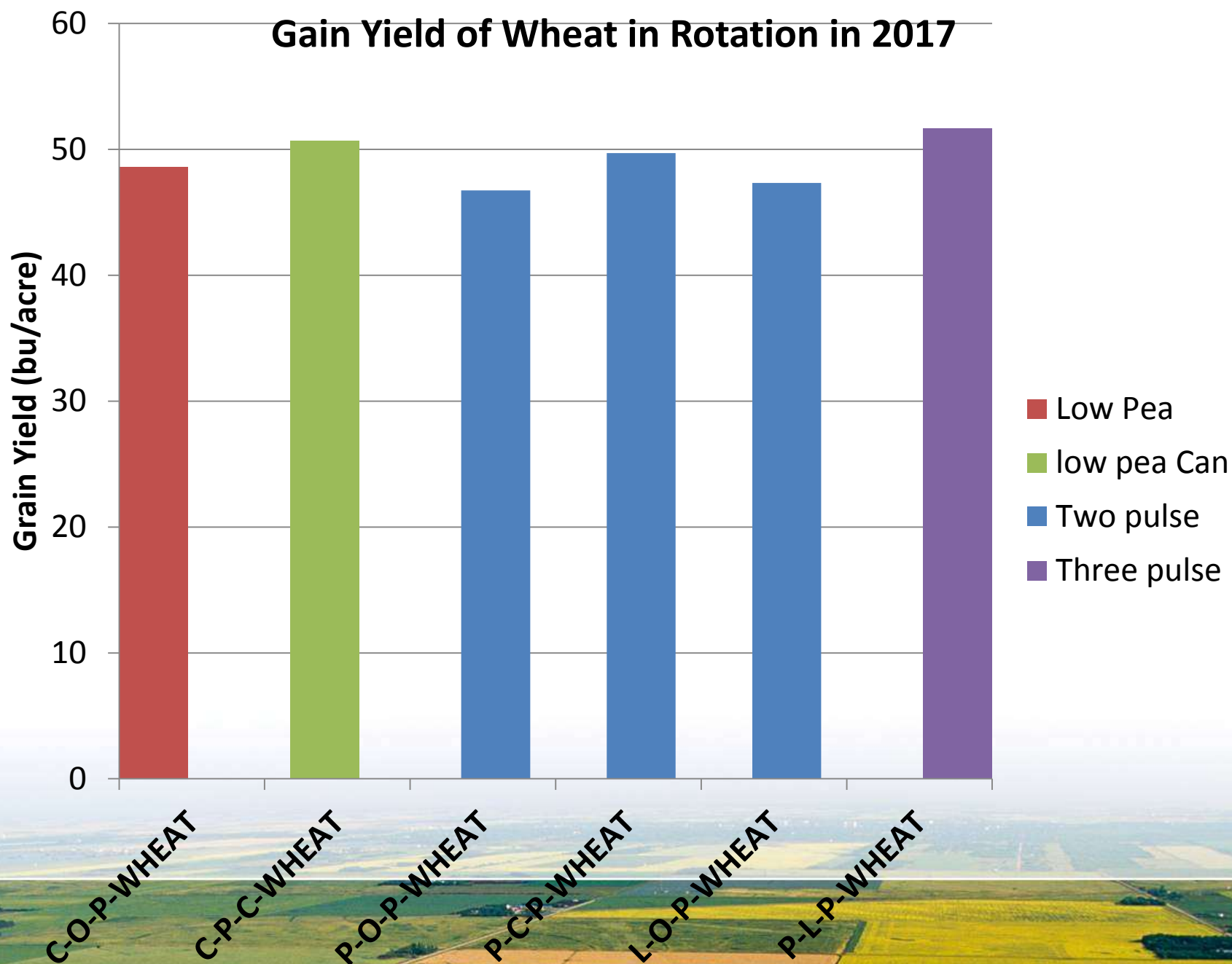
P-C-P-WHEAT

L-O-P-WHEAT

P-L-P-WHEAT

- Low Pea
- low pea Can
- Two pulse
- Three pulse

# Gain Yield of Wheat in Rotation in 2017



# Crop Sequences

William May, Yantai Gan and Steve Shirtliffe

Agriculture and Agri-food Canada  
Indian Head, Saskatchewan, Canada



# Crop Sequencing of Large acreage crops and special crops

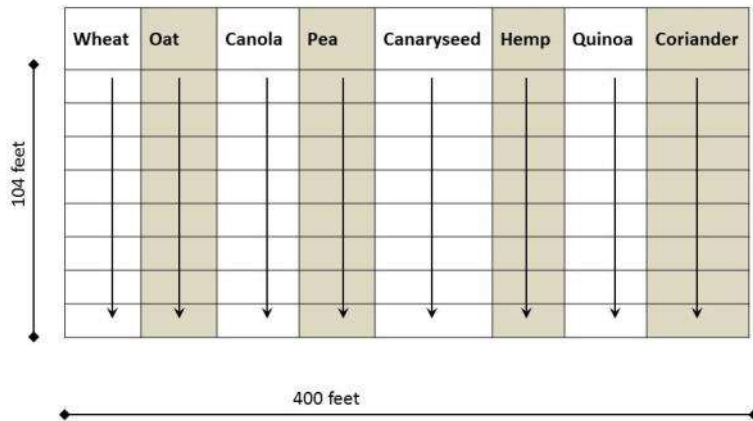
- **First year** – all eight crops are seeded in strips
- **Second year** – all eight crops are seeded across the strips set up in the first year
- **Crops:**
  - 1) Hemp
  - 2) Wheat
  - 3) Oat
  - 4) Canola
  - 5) Pea
  - 6) **Canaryseed**
  - 7) Quinoa
  - 8) Coriander



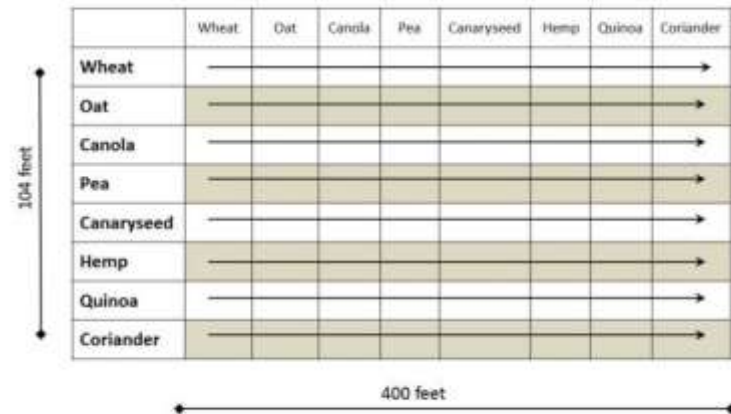


# Crop Sequencing of Large acreage crops and special crops

Year A Replicate 1



Year B Replicate 1









Canaryseed

19/07/2017





19/07/2017



# Crop Sequencing of Large acreage crops and special crops

- **First year** – 2015, 2016, 2017
- **Second year** – 2016, 2017, 2018
- **Locations:**
  - 1) Swift Current
  - 2) Saskatoon
  - 3) Indian Head
  - 4) Melfort



# Funding

- 1) Government of Saskatchewan
- 2) Saskatchewan Wheat Development Commission
- 3) Western Grains Research Foundation
- 4) Canaryseed Development Commission of SK
- 5) Prairie Oat Growers Association
- 6) Agriculture and Agri-Food Canada



# Agronomics

	Crop	Variety	Seeding Rate	Estimated field emergence (%)	N rate (kg/ha)
1	Wheat	Unity (2013)	250 plants/m <sup>2</sup>	90	80
2	Oat	AAC Justice	300 plants/m <sup>2</sup>	90	80
3	Canola	L252	75 plants/m <sup>2</sup>	60	80
4	Pea	Amarillo	80 plants/m <sup>2</sup>	80	10
5	Canaryseed	Bastia (Melfort- Calvi)	35 kg/ha	100	80
6	Hemp	Katani	110 plants/m <sup>2</sup>	70	80
7	Quinoa		11 kg/ha	100	80
8	Coriander		33 kg/ha	100	80



# Plant Density of Harvested Crop Indian Head 2016

		Harvested Crop							
		Wheat	Oat	Canola	Pea	Canary	Hemp	Quinoa	Coriander
Stubble	Plant Density (plants m <sup>-2</sup> )								
Wheat	170	129	79	50	179	38	35	77	
Oat	294	221	37	69	177	51	38	127	
Canola	214	244	38	63	204	82	41	136	
Pea	204	242	56	55	227	62	43	138	
Canary	208	230	37	65	183	59	43	138	
Hemp	210	246	32	64	239	46	20	130	
Quinoa	237	210	49	67	238	75	23	151	
Coriander	206	271	35	65	216	81	33	408	





# Indian Head 2017 Broadleaf stubble



19/07/2017



# Indian Head 2017 Cereal stubble



19/07/2017



# Plant Density of Harvested Crop Indian Head 2017

Stubble	Harvested Crop							
	Wheat	Oat	Canola	Pea	Canary	Hemp	Quinoa	Coriander
	Plant Density (plants m <sup>-2</sup> )							
Wheat	141	108	47	50	98	63	47	46
Oat	128	134	47	46	101	70	53	45
Canola	120	130	30	46	105	50	12	22
Pea	141	116	49	55	93	59	23	28
Canary	119	122	42	49	91	80	55	43
Hemp	123	115	28	46	75	37	10	11
Quinoa	142	129	46	48	87	45	9	20
Coriander	145	140	41	51	89	54	35	30



# Grain Yield of Harvested Crop Indian Head 2016

	Harvested Crop							
	Wheat	Oat	Canola	Pea	Canary	Hemp	Quinoa	Coriander
Stubble	Grain Yield (kg ha <sup>-1</sup> )							
Wheat	3216 c	5551 ab	2025 def	2120 de	1571 gh	627 lm		123 op
Oat	3283 c	5147 b	2100 de	2112 de	1328 hij	663 lm		97 p
Canola	3579 c	5562 ab	1891 efg	1904 d-g	1553 gh	699 l		253 n
Pea	3648 c	5727 ab	2274 de	1142 jk	1363 hij	897 kl		214 no
Canary	3581 c	5149 b	2148 de	1677 fgh	849 l	658 lm		124 op
Hemp	3647 c	6104 a	2136 de	1915 d-g	1224 ij	716 l		224 no
Quinoa	3639 c	6020 a	2288 d	2066 de	1454 hij	646 lm		129 op
Coriander	3453 c	5706 ab	1516 hi	2006 def	1427 hij	476 m		13 q





# Grain Yield of Harvested Crop Swift Current 2016

	Harvested Crop							
	Wheat	Oat	Canola	Pea	Canary	Hemp	Quinoa	Coriander
Stubble	Grain Yield (kg ha <sup>-1</sup> )							
Wheat	3838	6183 c	2844	4420	774	653	308	90
Oat	3809	5835 c	2767	4308	677	692	226	99
Canola	3556	6047 c	2625	4456	658	541	117	64
Pea	4147	7006 a	3202	3694	924	960	250	67
Canary	4014	6277 bc	2758	4162	646	788	397	95
Hemp	4167	7032 a	3096	4734	1146	548	165	162
Quinoa	3965	6980 a	2920	4679	1351	710	140	92
Coriander	3867	6760 ab	2957	3685	878	346	84	71



# Grain Yield of Harvested Crop Saskatoon 2016

	Harvested Crop							
	Wheat	Oat	Canola	Pea	Canary	Hemp	Quinoa	Coriander
Stubble	Grain Yield (kg ha <sup>-1</sup> )							
Wheat	4899	7873 ab	3985	6343	1731	2603		751
Oat	4706	6271 cd	4041	6421	1825	2007		688
Canola	4530	8356 a	3712	6288	1682	2495		791
Pea	4432	8319 a	4952	5021	1313	2619		741
Canary	4326	6850 bc	2731	4835	1134	2674		553
Hemp	4337	7096 bc	3380	5036	1302	2752		904
Quinoa	5316	8895 a	3646	6691	1702	3059		959
Coriander	4104	6478 cd	1921	6031	1612	2127		1336



# Grain Yield of Harvested Crop Indian Head 2017

## Harvested Crop

	Wheat	Oat	Canola	Pea	Canary	Hemp	Quinoa	Coriander
<b>Stubble</b>	<b>Grain Yield (kg ha<sup>-1</sup>)</b>							
Wheat	3656	4357	2248	2791	1373	974	18	1896
Oat	3713	4176	1983	2742	1417	904	18	1828
Canola	3322	4042	1596	2573	1295	724	0	1166
Pea	3948	4175	2135	2552	1111	872	11	1440
Canary	3915	4104	2067	2794	1378	1024	28	1781
Hemp	3376	3664	1336	2525	960	695	18	1267
Quinoa	3676	4297	2056	2588	883	593	14	1305
Coriander	3608	4306	2066	2777	1349	755	9	1366



# Problems

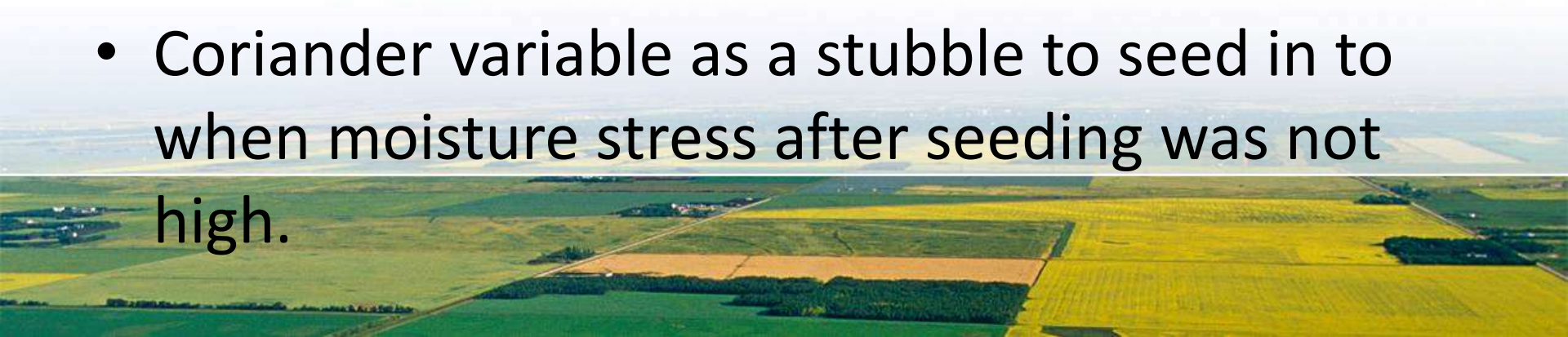
- Paper work to include hemp in trial is a large cost in time and effort
- Quinoa germination and insect pressure
- Coriander – did not spray in time for blossom blight control in 2016





# Conclusions so far

- Coriander did not seem to benefit from Pea stubble as extra N
- Dry conditions after seeding (2.5 inches in June) gave cereal stubbles an advantage over broadleaf stubbles
- Coriander is a significant problems as a volunteer weed
- Coriander variable as a stubble to seed in to when moisture stress after seeding was not high.



# Conclusions so far

- In reality this is just scraping the surface



# Intercropping Chickpea and Flax

## 1) Crop Placement (special arrangement)

Intermixed (both crops in same row)

Single alternate rows

## 2) Flax seed density

(seeds  $m^{-2}$ )

Approx. lbs/acre

a. 0	0
b. 150	10
c. 300	19
d. 600	38

## 3) Nitrogen Rate ( $kg\ ha^{-1}$ )

0

60



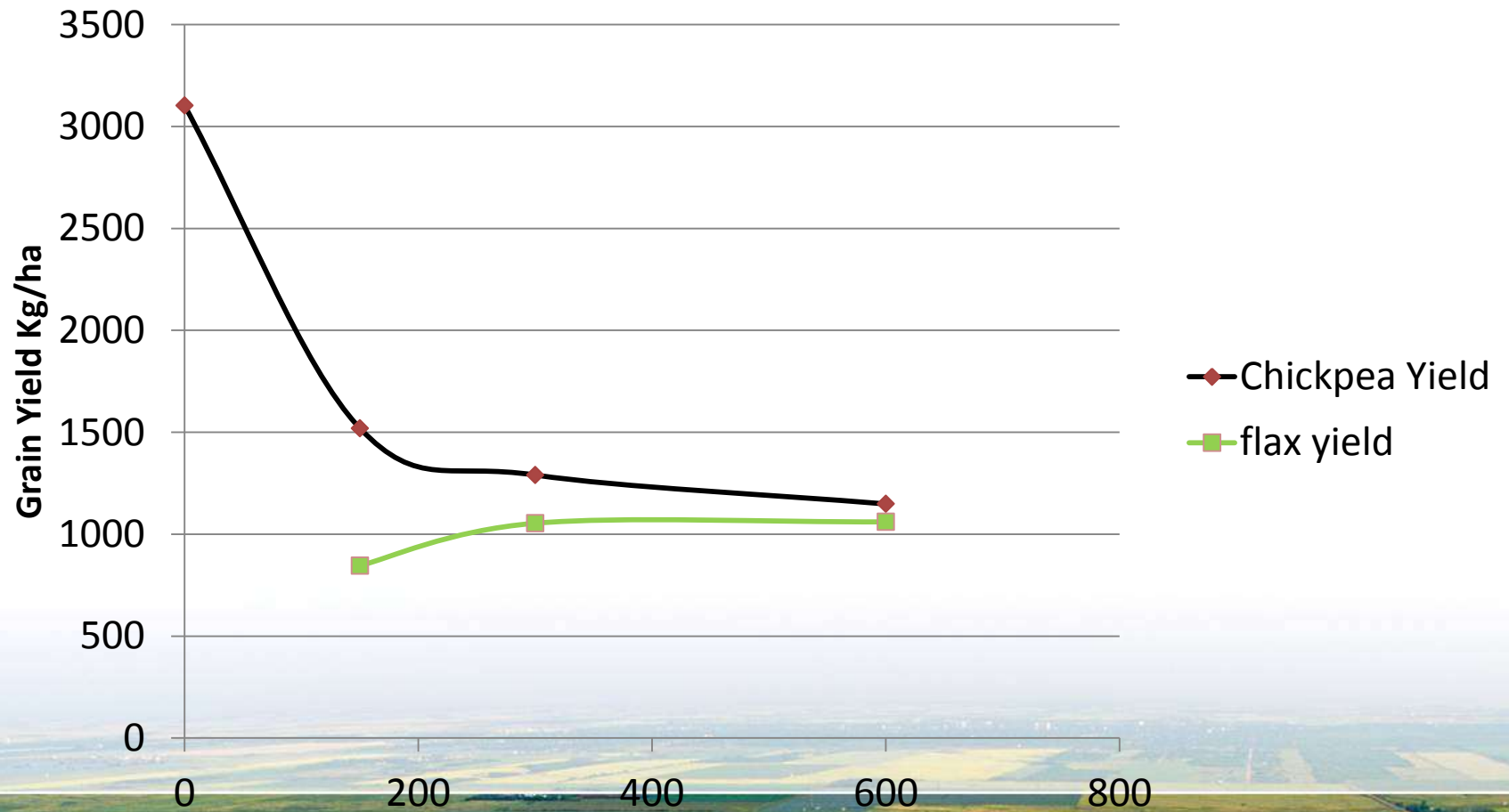
# Funding

## Saskatchewan Pulse Growers





# Grain Yield



# Gross Income

