PODF
PRAIRIE ORGANIC DEVELOPMENT FUND

MODULE 2
January 6, 2023

CROP ESTABLISHMENT, SEEDING & TILLAGE

The Prairie Organic Development Fund

- Investment platform established to develop organic agriculture and marketing in the Canadian Prairies
- Builds resilience in the sector by investing in
  - organic provincial associations (Capacity Fund); and
  - high impact programs (Innovation Fund) related to marketing, research, policy, education and capacity development that have broad public benefit to the organic sector.

www.organicdevelopmentfund.org

The Prairie Organic Development Fund is grateful for the support of:

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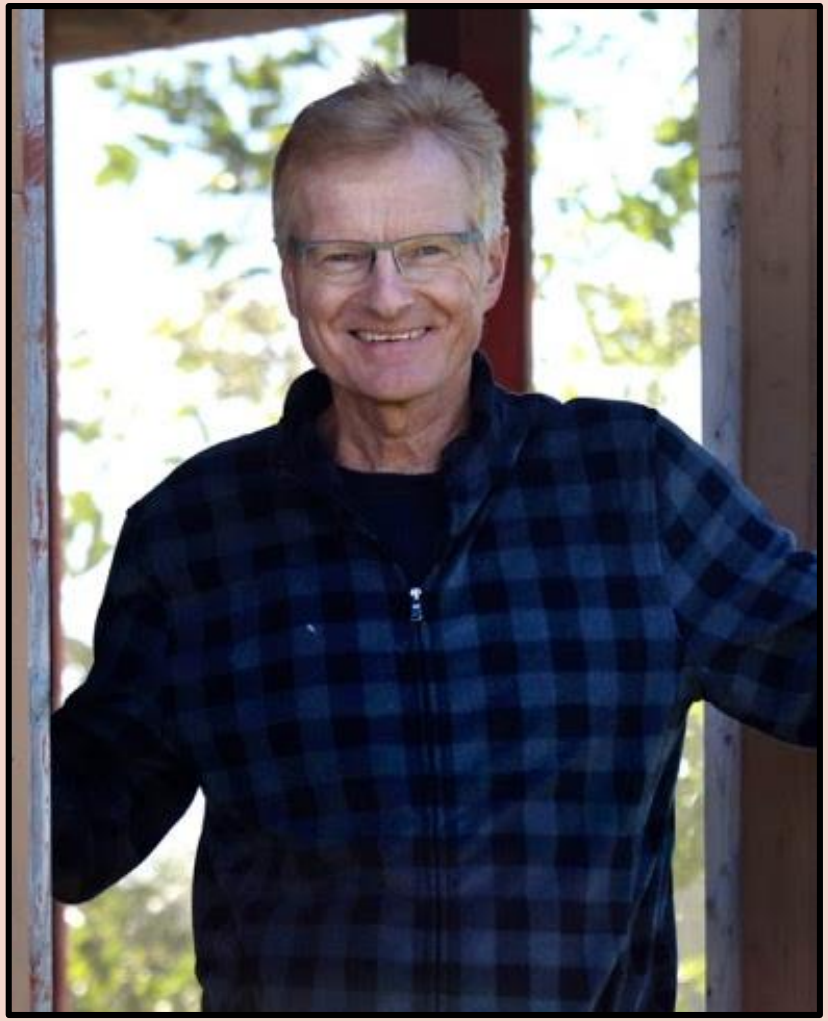
Silver Sponsors: Nature's Path, The Bauta Family Initiative on Canadian Seed Security & PHS Organics
Friend: F.W. Cobs Company

We gratefully acknowledge funding from the Canadian Agricultural Partnership.

www.organicdevelopmentfund.org

Martin Entz, Ph.D.
Department of Plant Science
Natural Systems Agriculture Lab
University of Manitoba

umanitoba.ca/outreach/naturalagriculture/



Lesson 2. Part 1. Seeds and seeding

- Crop cultivar selection
- Seed testing
- Seeding rates
- Seeding depth
- Seed size
- Intercrop options
- Forages and cover crops

Variety Descriptions

Variety[1]	Site Years Tested	Yield bu/acre	Maturity +/- 96 days	Height +/- 84 cm	Test Wt +/- 39.3 lb/bu	Hull %	Hull Colour	Resistance to: Lodging	Smut	Crown Rust	Stem[2] Rust	BYD[3]
AAC Justice	37	154	0	5	0.5	22.8	White	G	R	I	I	I
AAC Kongsore	4	145	1	20	1.0	24.5	White/Light Grey	G	R	MS	I	R
AC Morgan	36	144	-1	15	-1.0	25.2	White	G	I	S	S	MS
CDC Arborg	25	155	-2	19	0.2	20.5	White	VG	R	I	S	S
CDC Big Brown	42	142	-1	3	0	20.4	Tan	G	R	R	MS	MS
CDC Dancer	40	137	-3	13	0.5	19.6	White	G	R	I	I	MS
CDC Endure	14	157	-1	13	-1.1	20.9	White	VG	R	MR	S	I
CDC Haymaker (F)	37	125	2	25	-1.0	22.0	White	G	MR	S	S	—
CDC Minstrel	46	146	0	8	-0.2	22.3	White	VG	R	MS	I	MS
CDC Morrison	13	134	-2	-3	-1.0	24.4	White	VG	R	MS	I	I
CDC Norseman	31	149	-3	5	-1.0	20.5	White	G	MS	MR	S	I
CDC Ruffian	39	150	0	0	-0.8	20.5	White	G	R	I	S	S
CDC Skye	6	138	-2	11	0.5	19.6	White	G	R	R	S	—
CS Camden	34	157	2	0	-1.5	21.1	White	VG	I	MS	S	S
Furlong	72	136	-1	20	0.5	20.3	Tan	G	R	S	I	MR
HiFi	62	144	-3	15	0	24.7	White	G	MS	I	I	MR
Jordan	52	146	2	8	-2.0	23.6	White	VG	R	I	I	MR
Leggett	144	142	0	0	0	23.0	White	G	R	R	I	MS
ORe3541M	25	141	-2	-2	0.6	23.3	White	VG	R	R	S	MS
ORe3542M	25	143	-1	-2	-1.1	24.4	White	VG	R	R	S	S
Pinnacle	50	153	3	10	-1.2	23.7	White	G	R	S	I	MS
Ronald	45	135	0	3	0	22.1	White	VG	R	S	I	MR
Souris	60	141	-4	0	0.5	20.9	White	G	R	MS	MR	MS
Stride	39	141	-2	13	0.6	23.7	White	VG	R	R	I	I
Summit	62	148	0	-3	0.5	20.8	White	G	R	I	I	I
Triactor	43	160	-1	8	-1.5	22.1	White	VG	I	MR	S	MS
Varieties being tested for adaptability in Western Canada												
Akina	41	155	-4	0	0.8	25.6	White	G	R	R	—	—
Bradley	30	140	2	8	—	21.7	White	G	R	MS	MS	MS
Kara	41	154	-3	-3	1.6	26.3	White	G	MR	MR	—	—
Kyron	14	153	-3	3	0.9	26.6	White	G	—	—	—	—
Varieties supported for registration												
CFA1502	14	157	1	1	1.0	28.0	White	G	—	MR	—	MR
OT2122	6	155	-2	11	-1.0	25.9	—	G	R	I	I	I
GRAND MEAN (bu/acre)		146										
LSD (bu/acre) (0.05)		8										

What to look for:

- **Market class**
- **Yield and quality**
- **Days to maturity**

Plus

- **Disease resistance**
- **Height**

Source: Seed Manitoba, 2021

Smut in wheat

Seed borne diseases a problem in organic

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Kara	41	154	-3	-3	1.6	26.3	White	G	MR	MR	—	—
Kyron	14	153	-3	3	0.9	26.6	White	G	—	—	—	—

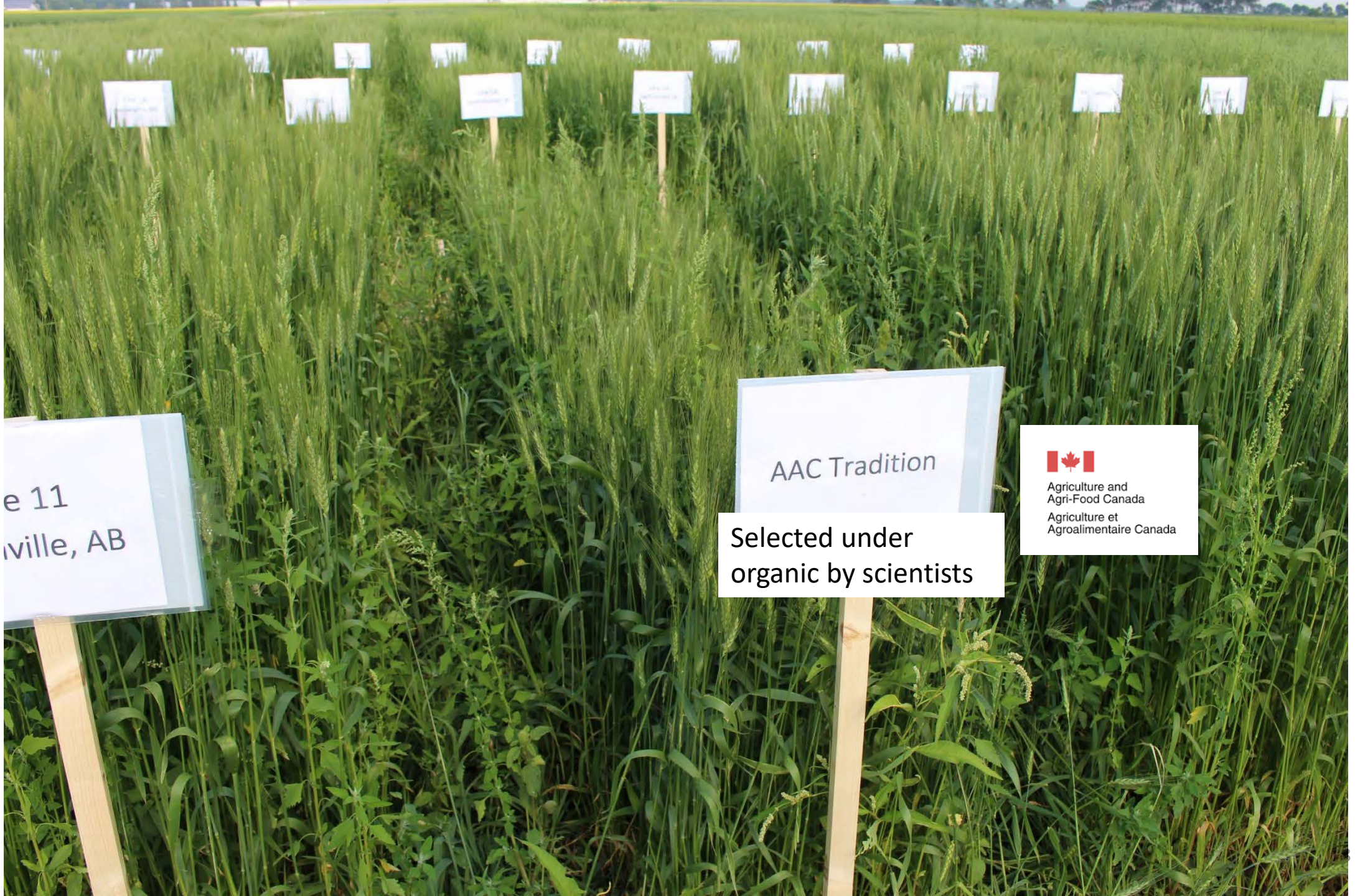
CANADA WESTERN RED SPRING WHEAT

Variety	Most Recent Year of Testing	Overall Station Years of Testing	Overall Yield	Yield Category (% AAC Brandon) Low < 77 (bu/ac)	Yield Category (% AAC Brandon) High ≥ 77 (bu/ac)	Agronomic Characteristics: Maturity Rating (Days +/- AAC Brandon)	Protein (%)	Test Weight (lb/bu)	TKW (g)	Height (cm)	Awns (Y/N)	Resistance: Lodging	Resistance: Sprouting	Disease Tolerance: Bunt	Disease Tolerance: Stripe Rust	Disease Tolerance: Loose Smut
Yield and agronomic data only directly comparable to AAC Brandon																
AAC Brandon (bu/ac)			**75**	**59**	**95**											
AAC Brandon - check	**2022**	**101**	**100**	**100**	**100**	**104**	**14.0**	**63**	**39**	**84**	**Y**	**G**	**P**	**S**	**M**	
AAC Alida VB †	2019	37	94	97	93	0	-0.2	63	41	91	Y	G	VG	I	M	
AAC Broadacres VB	2021	30	105	103	106	0	-0.7	63	40	86	Y	VG	F	R	M	
AAC Connery	2016	24	97	93	106	-1	0.2	62	40	88	N	VG	G	I	R	
AAC Elie	2020	15	103	105	100	0	-0.5	64	39	84	Y	G	F	I	M	
AAC Hockley*	2022	19	100	95	105	1	0.1	64	34	82	Y	VG	G	R	R	
AAC Hodge VB*	2022	31	103	101	105	-1	-0.3	63	37	91	Y	G	F	R	R	
AAC LeRoy VB	2021	29	100	101	99	0	-0.2	63	39	88	Y	G	G	I	MR	MR
AAC Magnet	2020	36	93	94	93	-2	0.0	63	40	90	Y	VG	F	S	I	MR
AAC Redberry	2017	37	94	94	94	-3	-0.3	63	41	90	Y	F	G	I	R	I
AAC Redstar*	2022	31	96	92	101	-2	0.0	63	36	90						
AAC Russell VB	2021	30	104	103	104	-1	-0.2	63	39	87						
AAC Starbuck VB	2020	36	103	104	102	0	-0.2	63	39	87						
AAC Tisdale †	2017	37	94	94	94	-1	0.6	63	42	93						
AAC Viewfield	2022	50	103	99	106	0	-0.3	63	37	81						
AAC Warman VB †	2020	36	94	93	94	-1	-0.4	63	38	99						
AAC Wheatland VB	2020	36	104	104	104	0	-0.5	63	40	86						
Carberry	2021	59	94	92	95	0	0.1	63	39	84						
CDC Abound	2010	88	101	100	105	-1	-0.1	63	40	87						
CDC Adamant VB	2018	37	98	98	97	-1	-0.2	63	39	88						
CDC Go	2019	60	95	93	96	-1	0.0	62	44	92						
CDC Hughes VB	2018	37	96	96	96	-1	-0.2	63	44	87						
CDC Landmark VB	2019	50	99	98	100	-1	-0.2	63	43	88						
CDC Ortona	2020	36	99	98	100	-1	-0.4	63	35	93						
CDC Pilar CLPlus*	2021	30	98	98	98	-1	-0.5	62	38	78						
CDC Plentiful †	2014	41	92	XX	XX	-2	-0.2	64	35	94						
CDC Silas*	2022	31	99	97	101	0	-0.2	62	36	87						
CDC SKRush*	2022	31	100	97	104	-1	-0.1	63	33	93						
CDC Stanley	2013	76	98	100	101	-1	-0.1	63	34	97						

Source: Alberta Agriculture

Have the varieties been tested in organic production?

Popular conventionally-bred


e 11
ville, AB
AAC Tradition
Selected under organic by scientists
Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada


Line 12
Wood Mountain, SK
Selected under organic by farmers

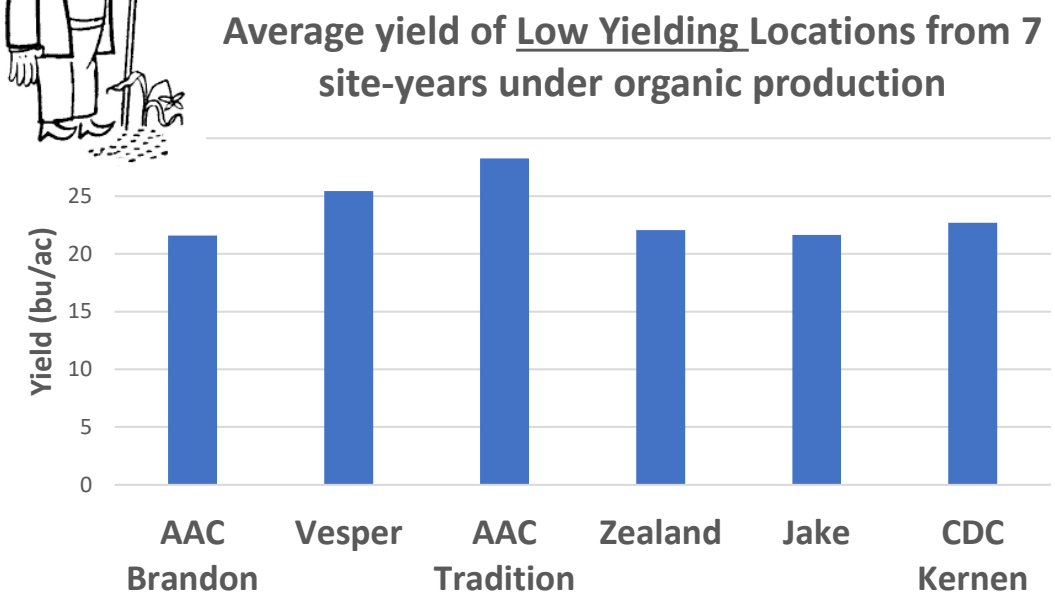

CDC Dancer

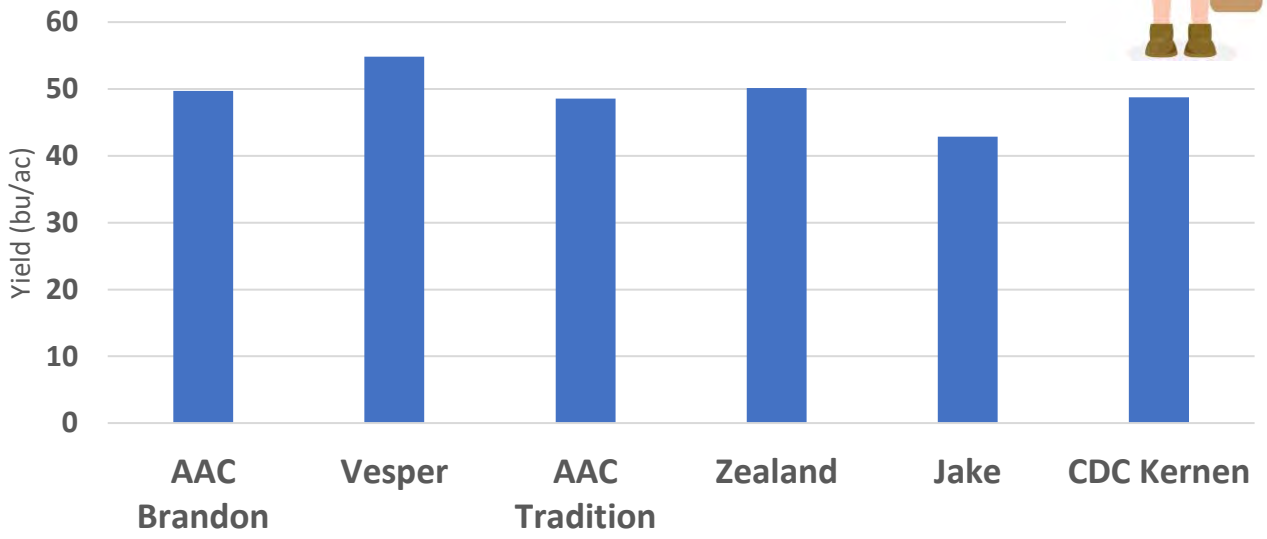

Souris
CDC Dancer


Line 7
Valleyview, AB
Tall Boy
Jordan


uris
Summit
Popular conventionally-bred
Agriculture and
Agri-Food Canada
Agriculture et
Agroalimentaire Canada

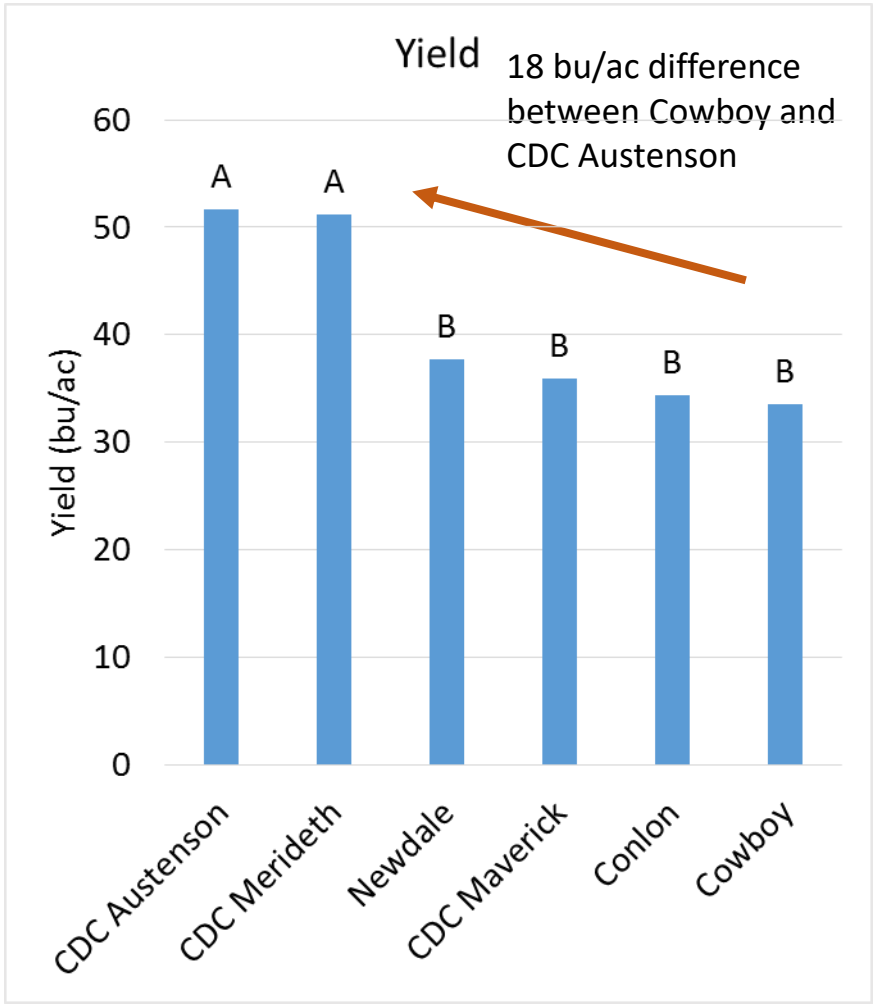

Line 9A
Fort Vermillion, AB
Selected under organic by farmers

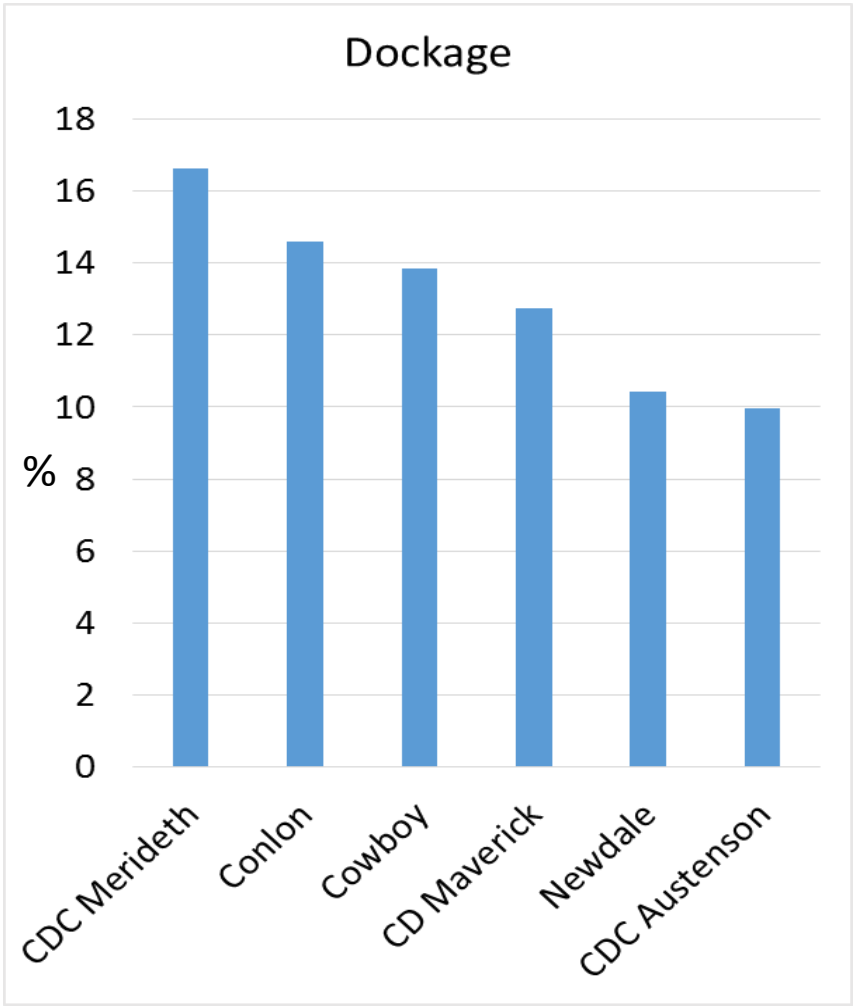


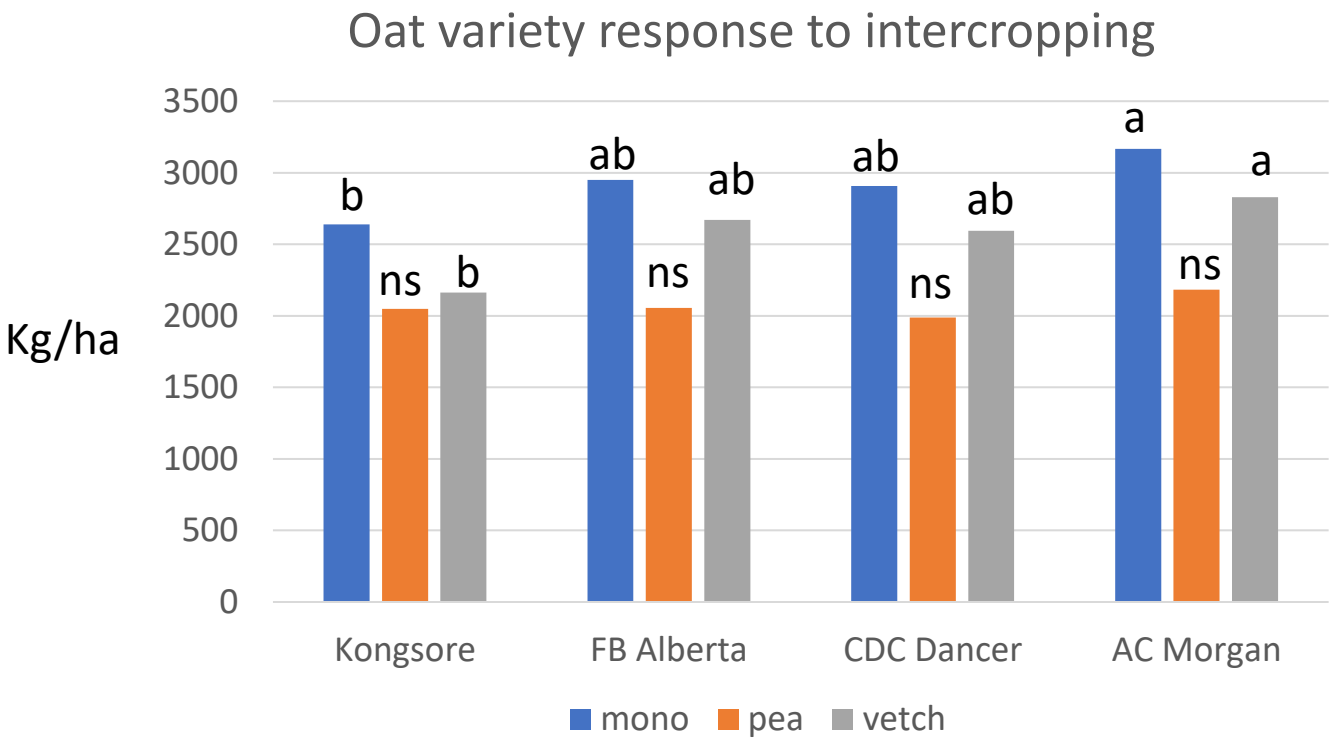


Source: M. Carkner

Barley – by variety



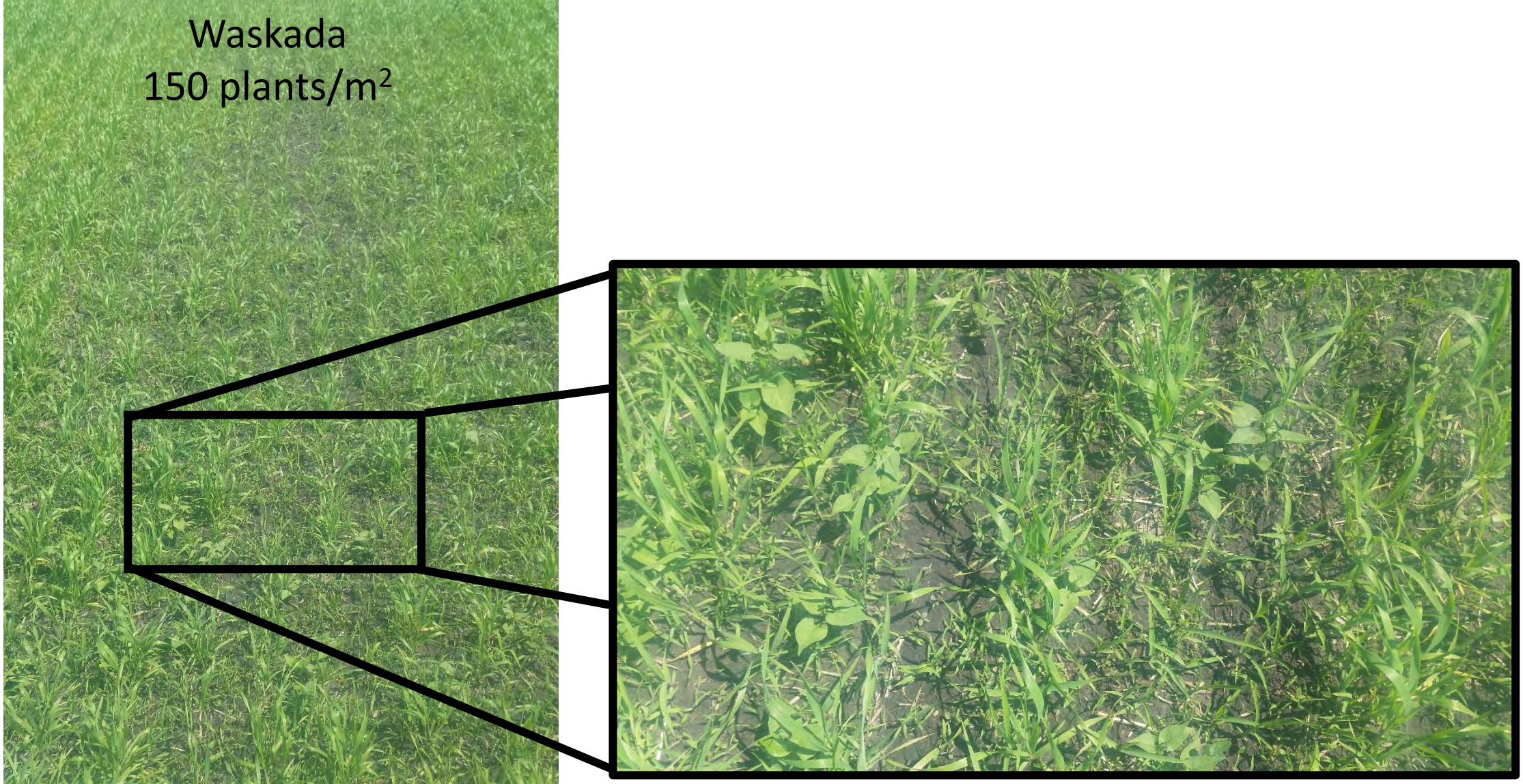


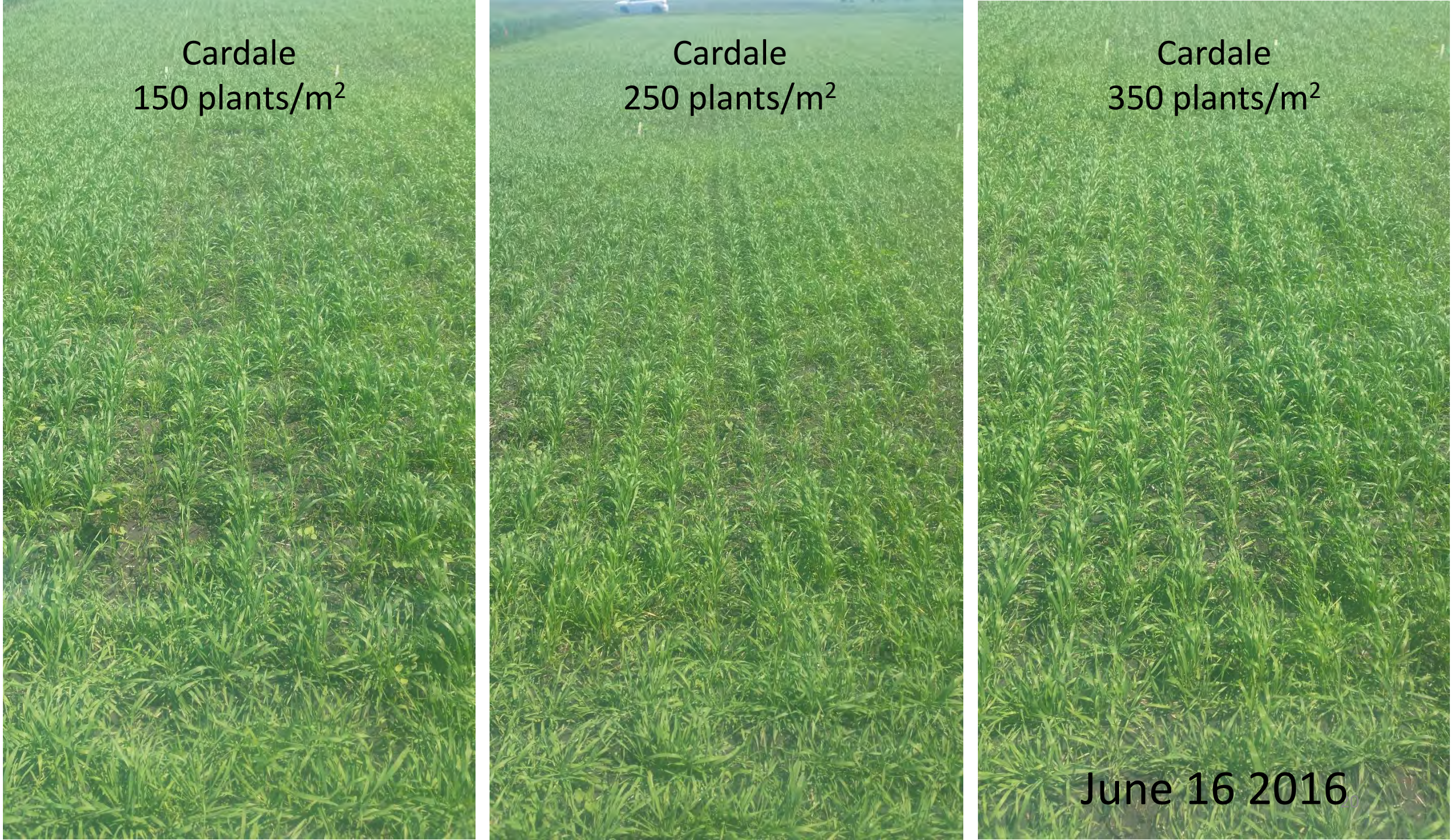


← 2500 kg/ha = 71 bushels/acre

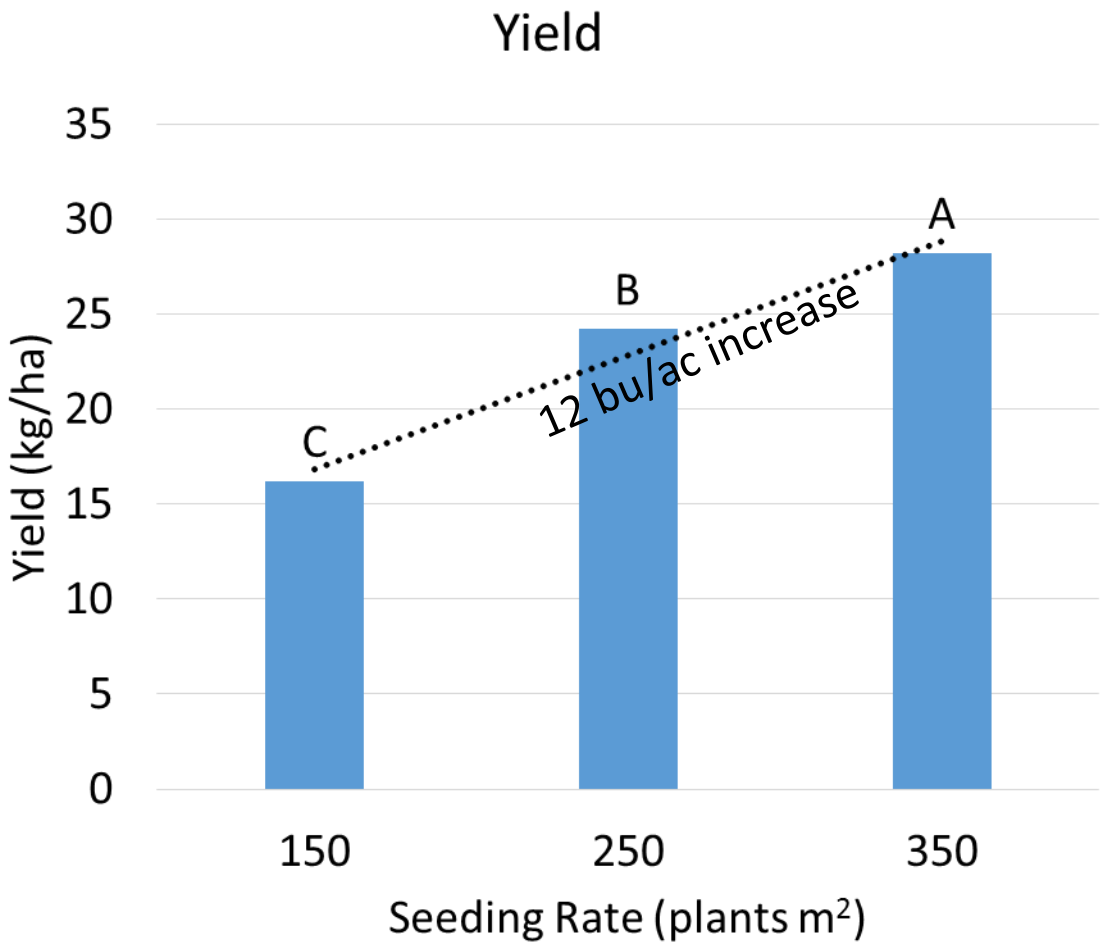
Oat varieties grown alone and as intercrops with pea and hairy vetch, Glenlea, Manitoba, 2021. Flood and Entz, unpublished

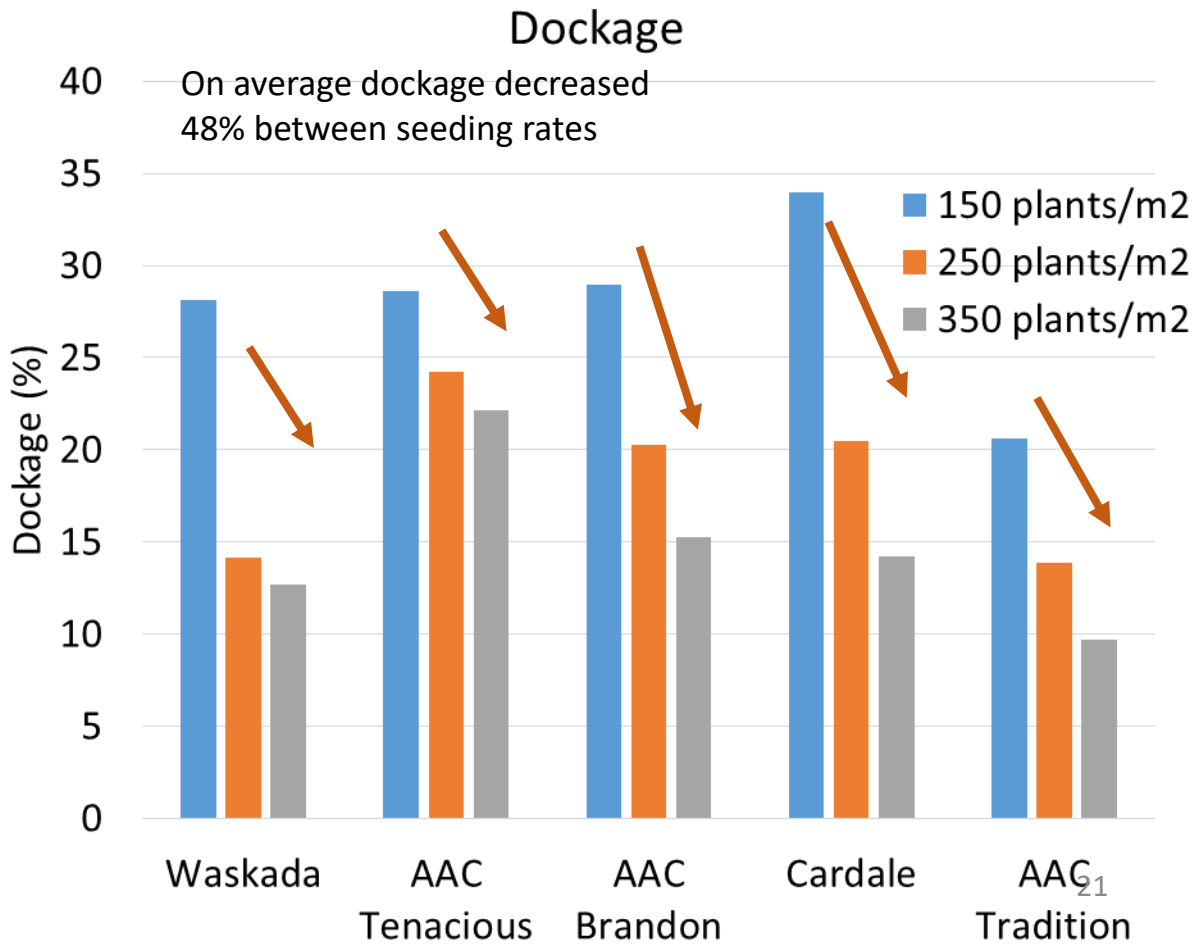
Seeding rate


Waskada
150 plants/m²


Cardale
150 plants/m2
Cardale
250 plants/m2
Cardale
350 plants/m2
June 16 2016

Wheat – by seeding rate – yield





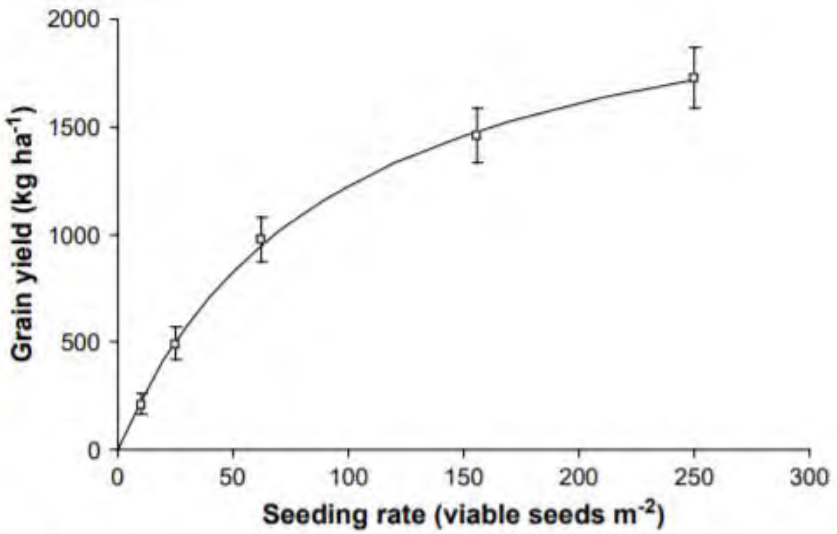


Fig. 3. The effect of seeding rate on grain yield of organically grown field pea. Points represent the mean of 4 site-years. Bars indicate standard error of the means.

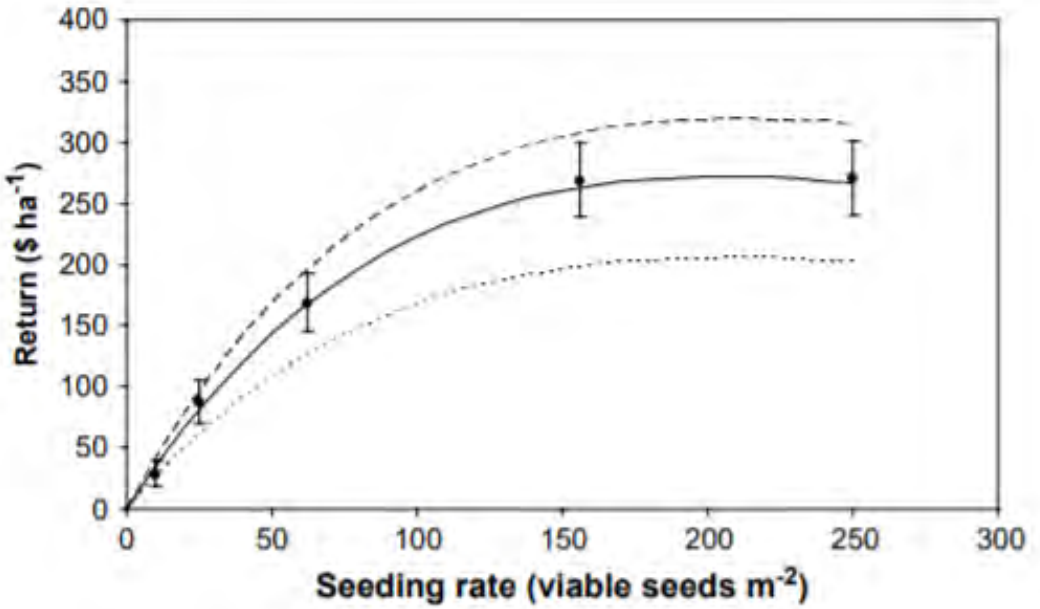
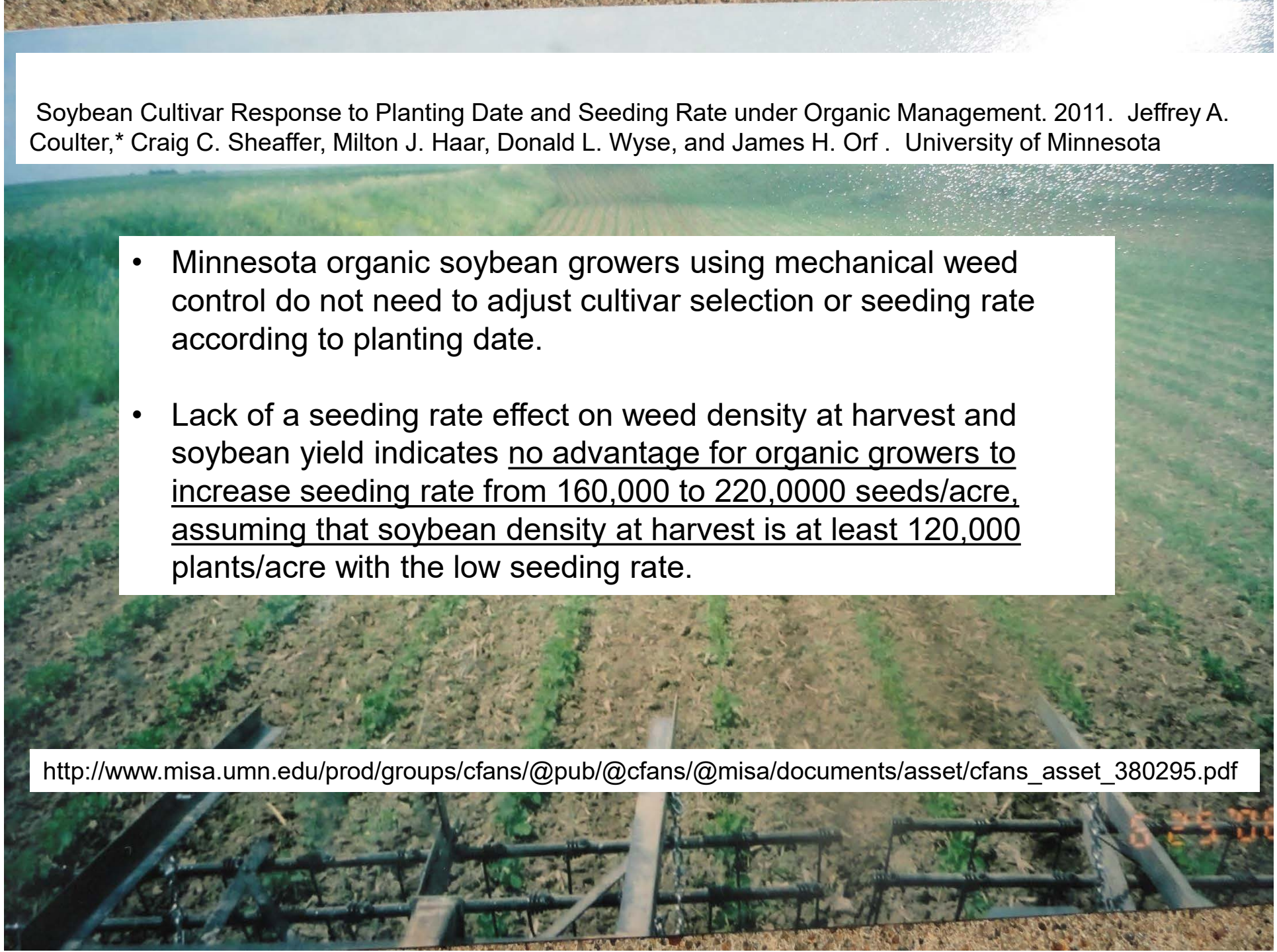


Fig. 4. Return for organic field pea combined for 4 site-years. Bars indicate standard error of the means. Regression lines indicate average price received (*), 2005 selling price (---), and 2006 selling price (...).

Baird, J.M., Walley, F.L. and Shirtliffe, S.J., 2009. Optimal seeding rate for organic production of field pea in the northern Great Plains. *Canadian journal of plant science*, *89*(3), pp.455-464.



Soybean Cultivar Response to Planting Date and Seeding Rate under Organic Management. 2011. Jeffrey A. Coulter,* Craig C. Sheaffer, Milton J. Haar, Donald L. Wyse, and James H. Orf . University of Minnesota

- Minnesota organic soybean growers using mechanical weed control do not need to adjust cultivar selection or seeding rate according to planting date.

- Lack of a seeding rate effect on weed density at harvest and soybean yield indicates no advantage for organic growers to increase seeding rate from 160,000 to 220,0000 seeds/acre, assuming that soybean density at harvest is at least 120,000 plants/acre with the low seeding rate.

http://www.misa.umn.edu/prod/groups/cfans/@pub/@cfans/@misa/documents/asset/cfans_asset_380295.pdf

Seeding depth

1” (2.5 cm) Seeding Depth

2.5” (5 cm) Seeding Depth

June 16 2016

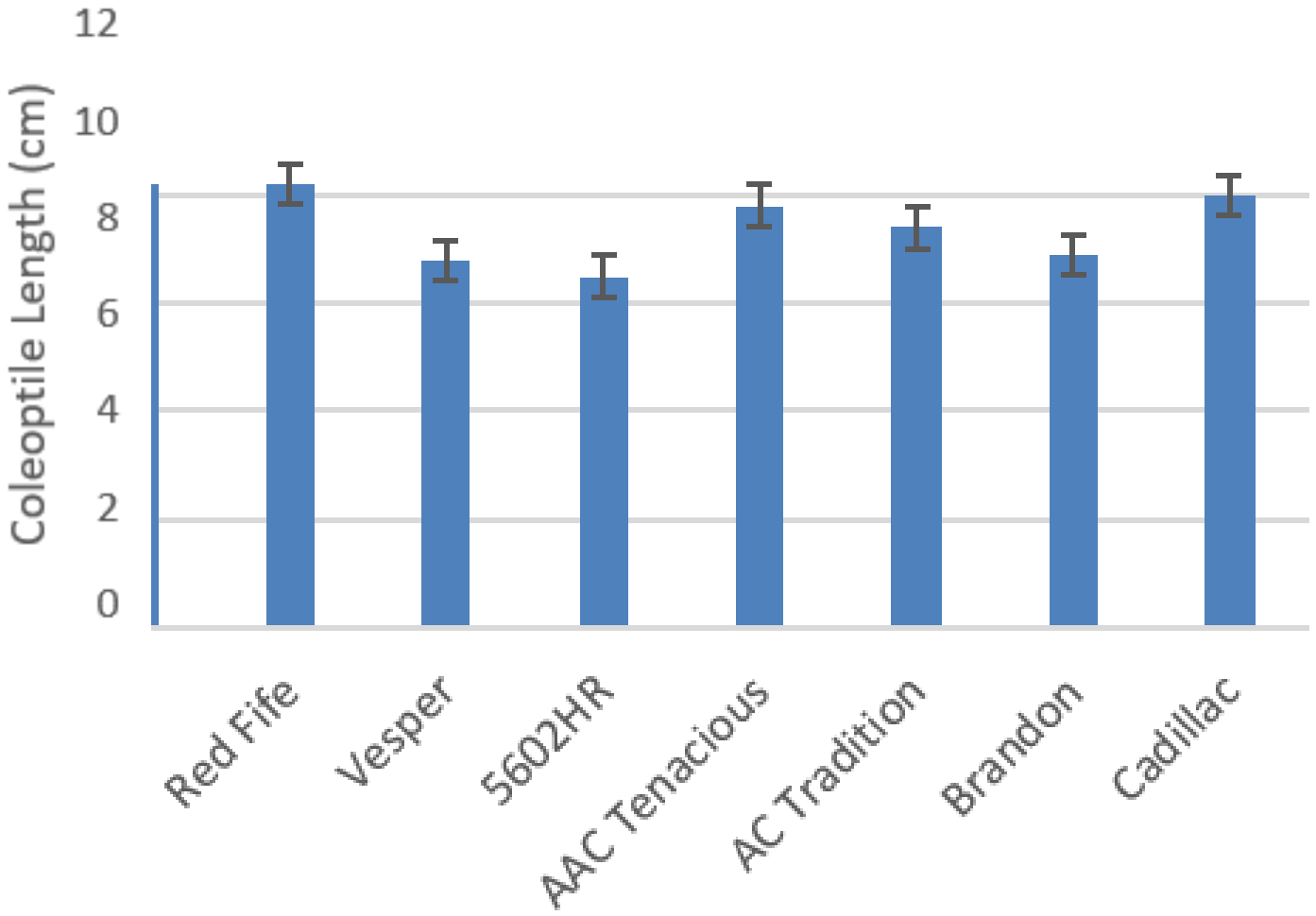
Deep seeding reduces yield potential

Location of crown (contains all the buds for future leaves and roots)

Seeding depth

Deep seeding challenges ability of coleoptile to protect first leaf in cereals.

Coleoptile measurements in wheat: UM, unpublished



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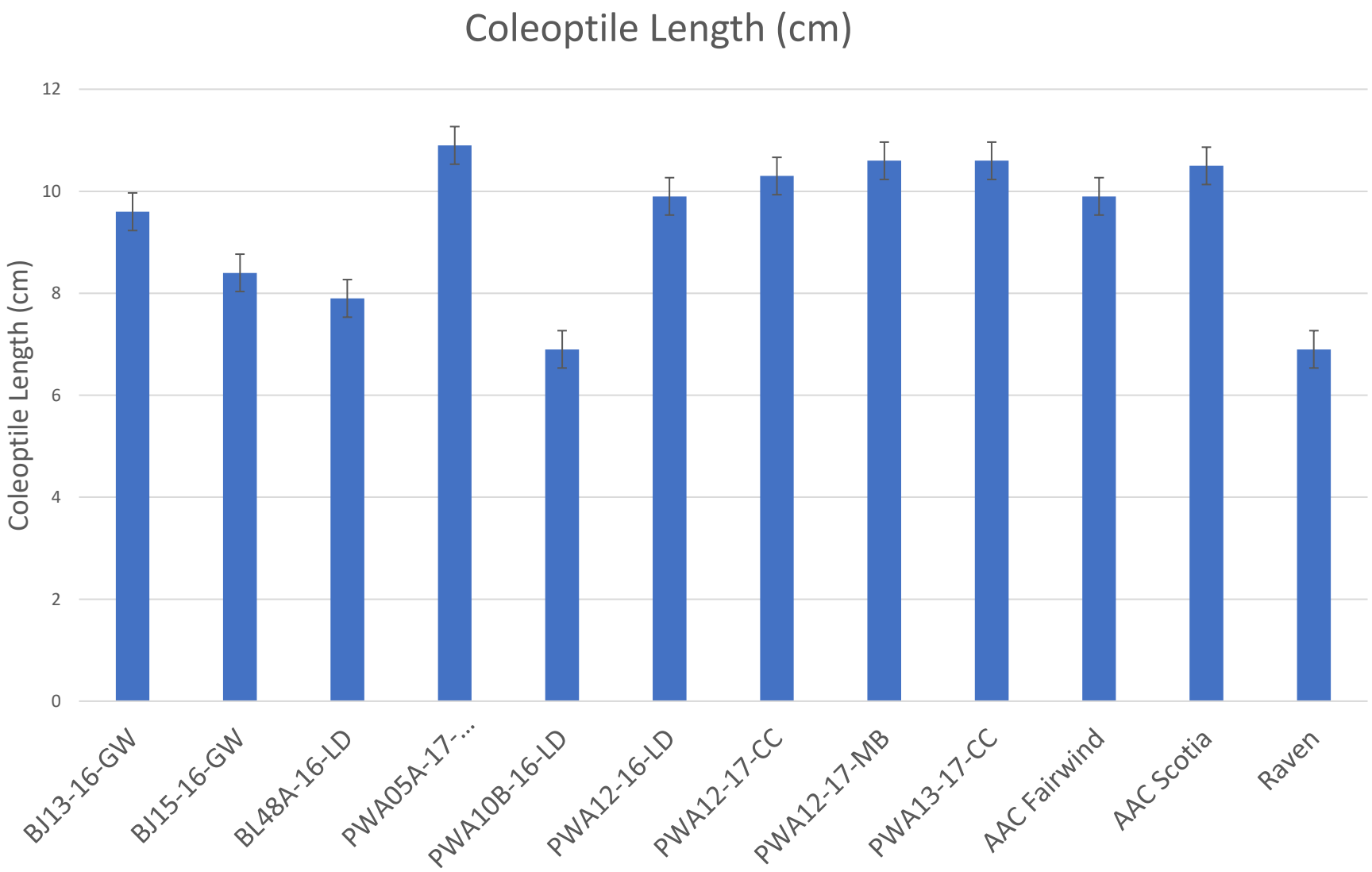
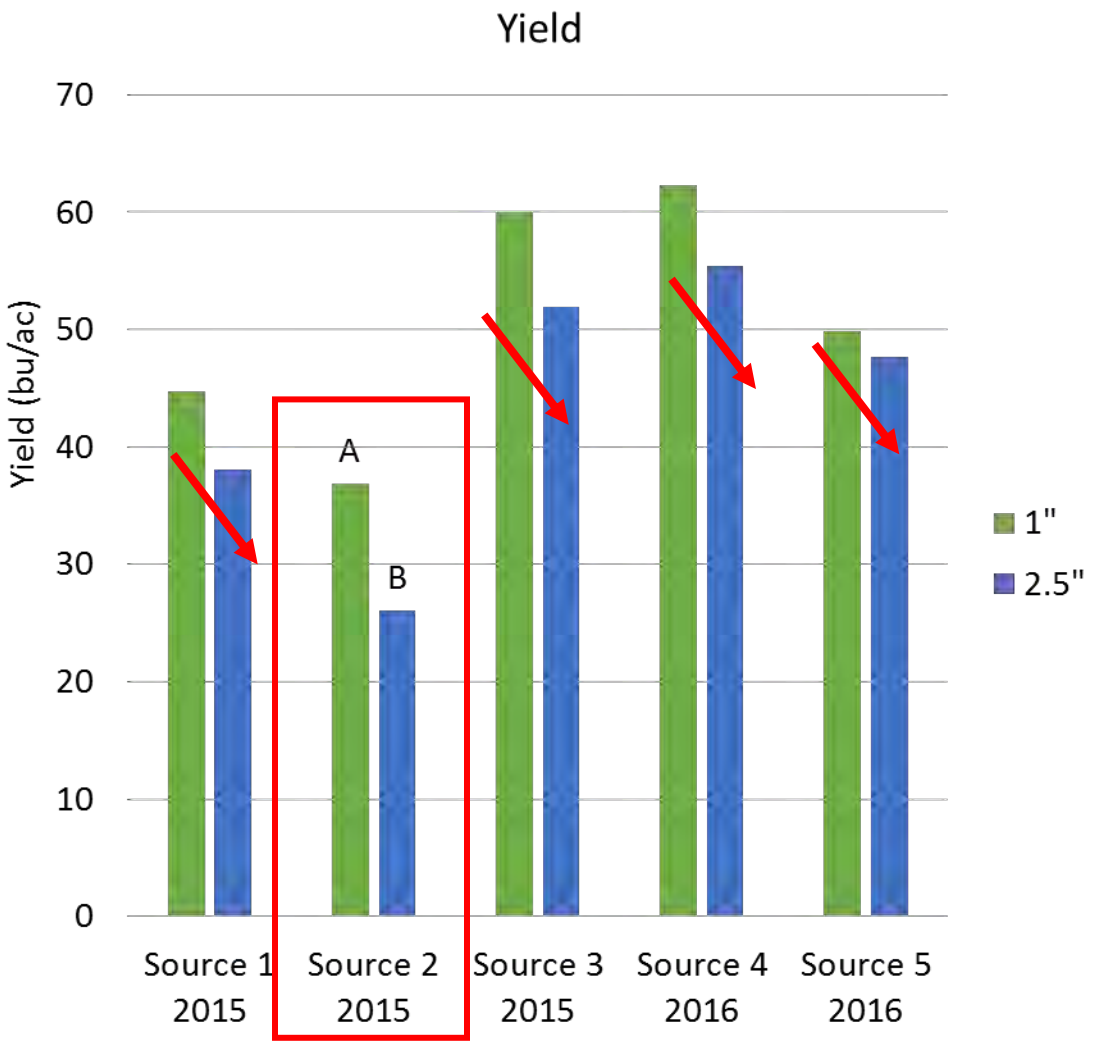


Barley Seeded Depth Effect on Final Yield



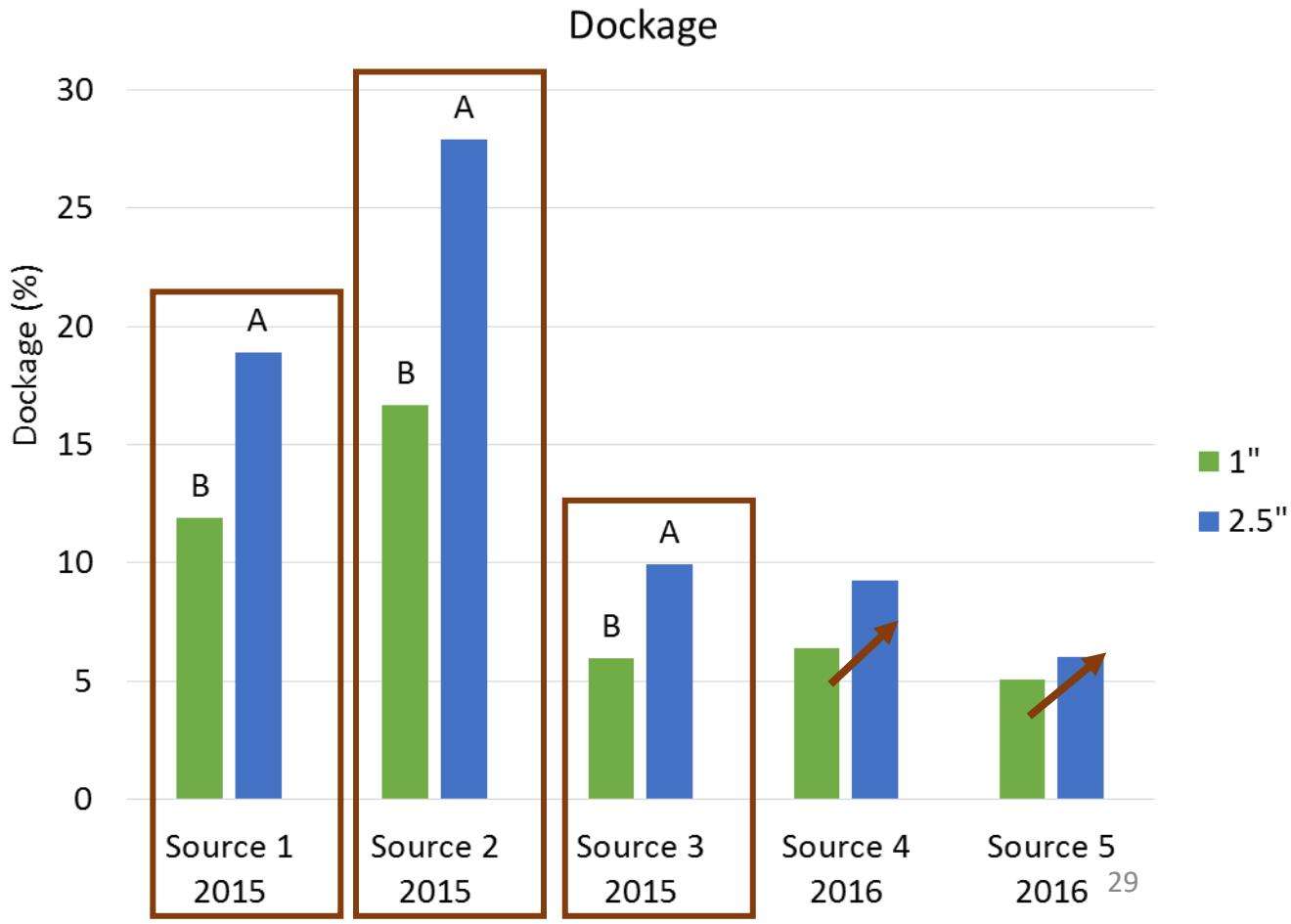


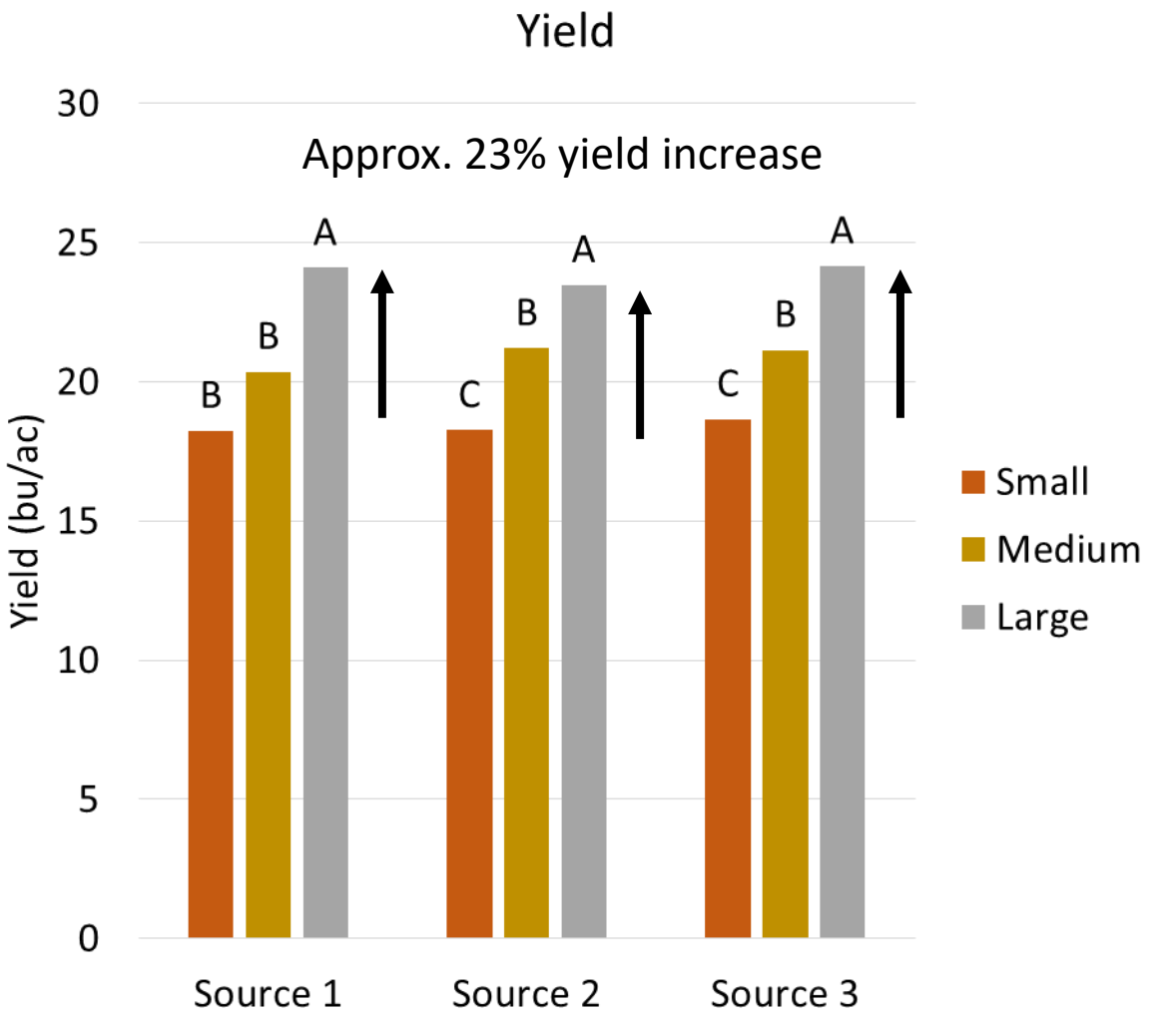
Photo: Scott Beaton, Rosser, Manitoba

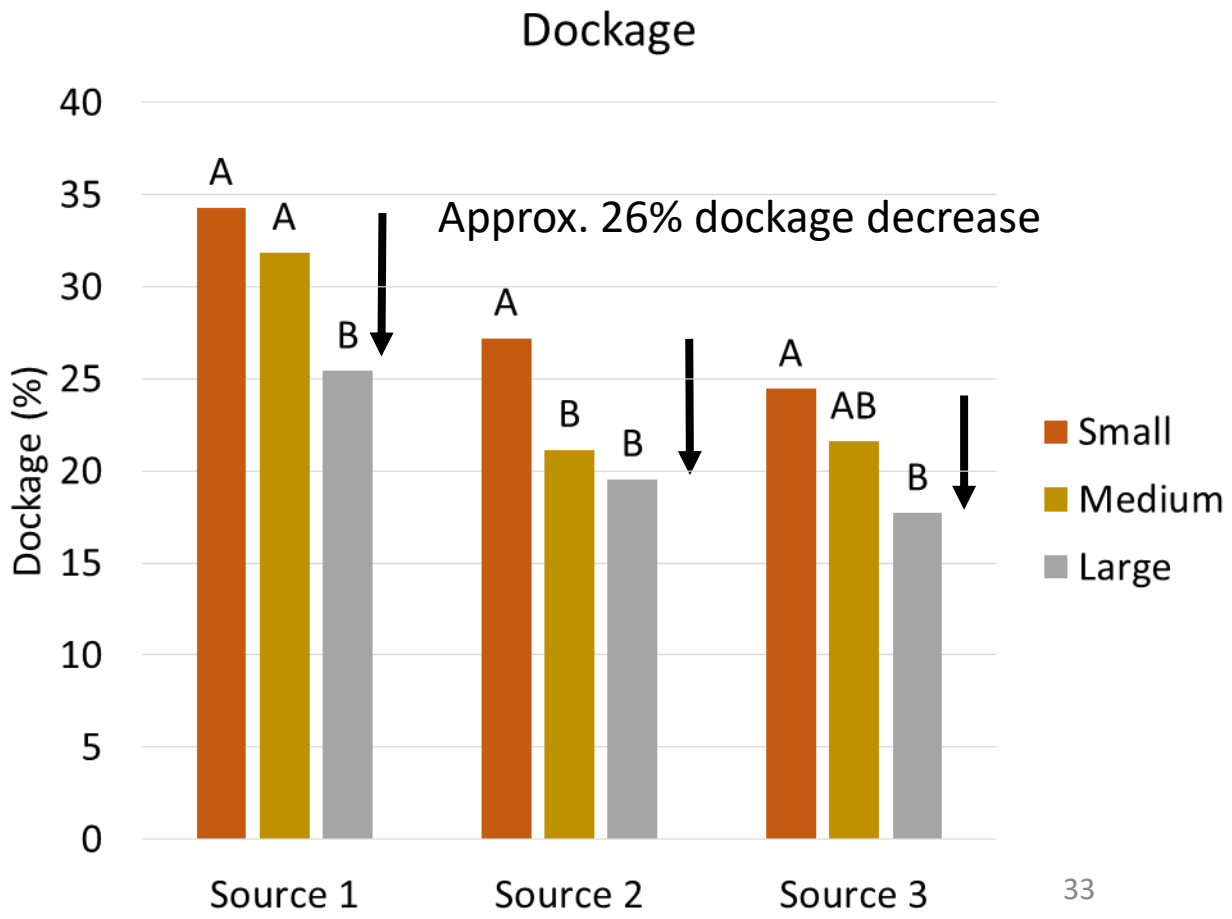
- Crop cultivar selection
- Seed testing
- Seeding rates
- Seeding depth
- Seed size
- Intercrop options
- Forages and cover crops

Wheat sieved using industry sieve sizes

“x”/64 x ¾ inch

Wheat Seed Size Effect on Final Yield






1” Seeding Depth
Small Size


1” Seeding Depth
Medium Size
June 16 2016

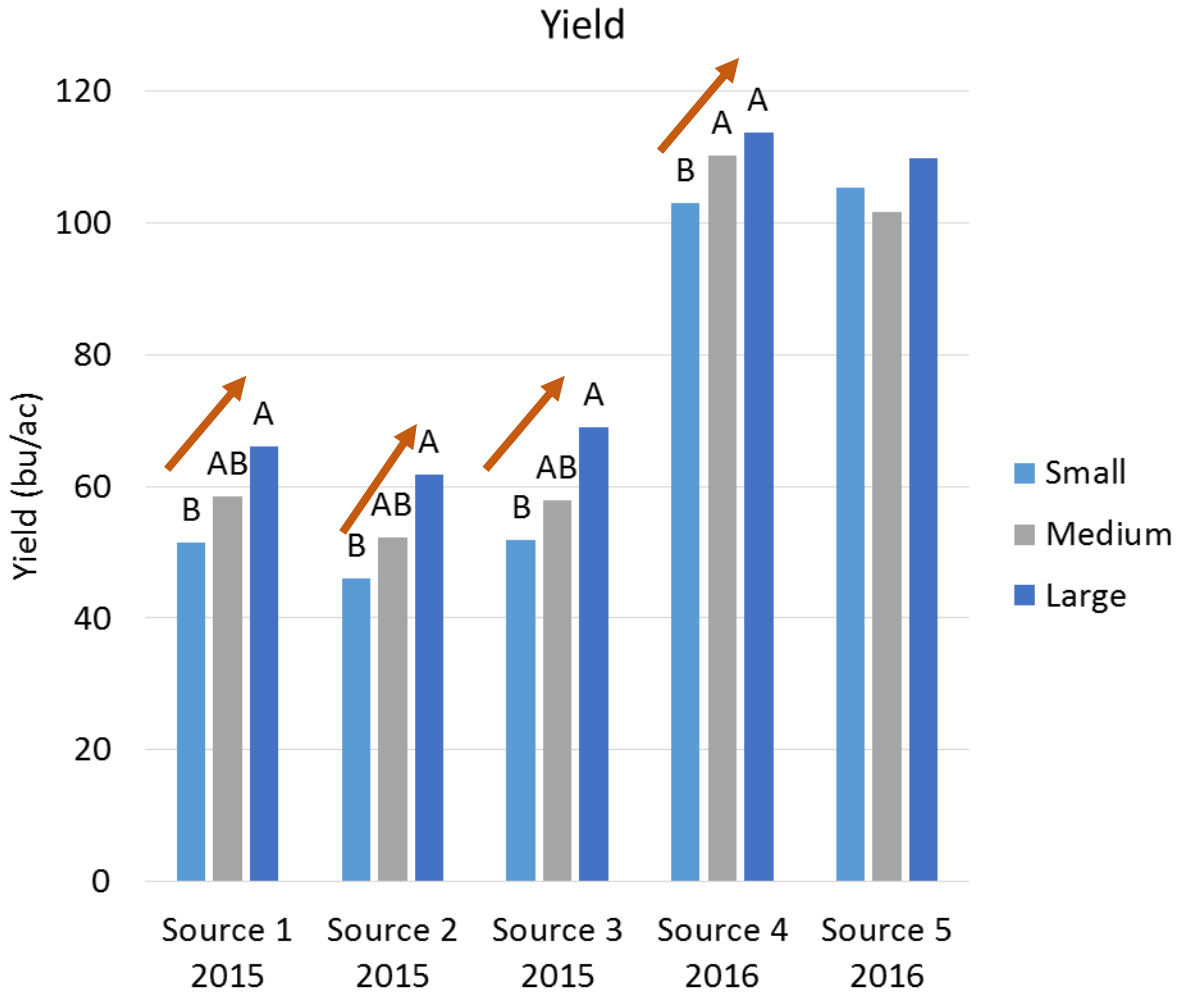

1” Seeding Depth
Large Size

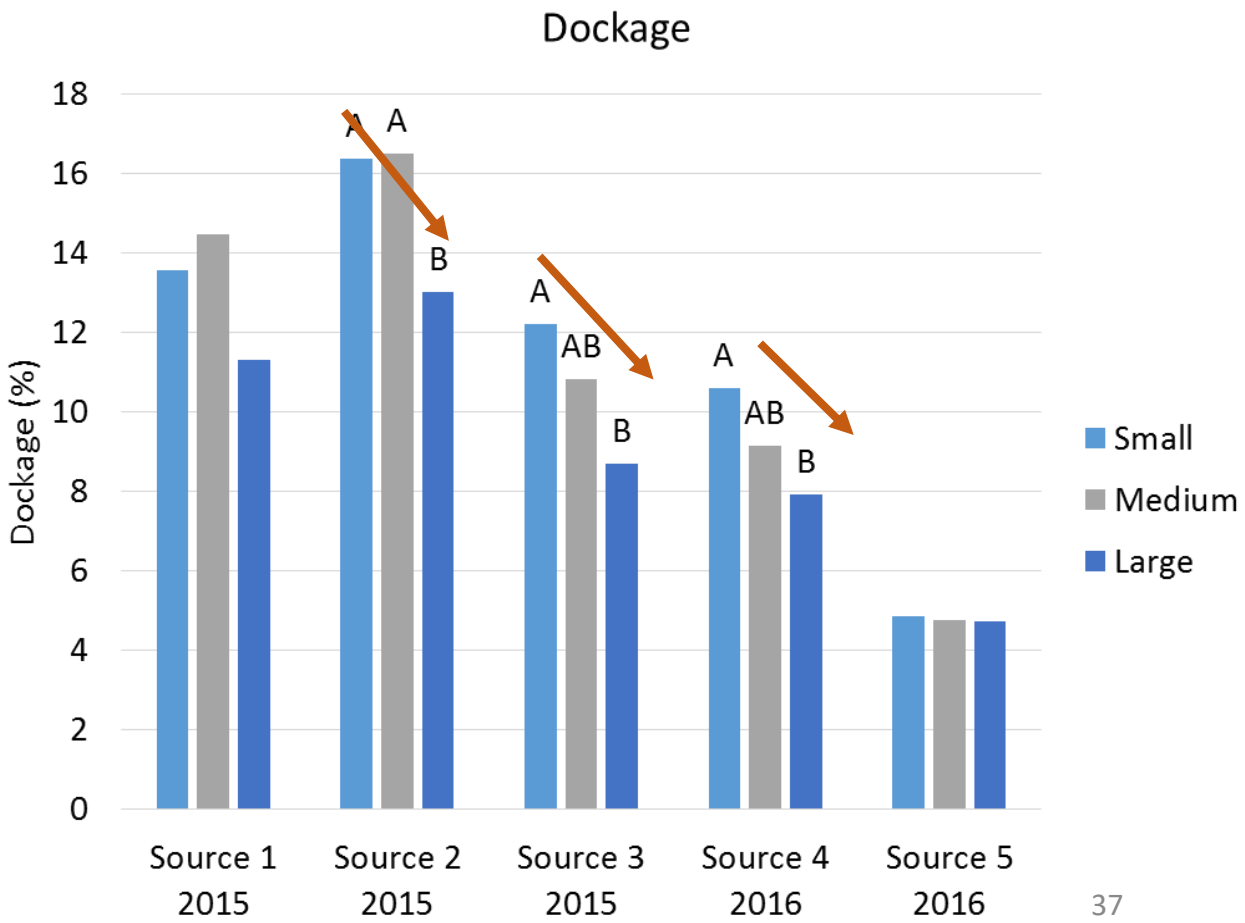

2.5” Seeding Depth
Small Size
2.5” Seeding Depth
Medium Size
2.5” Seeding Depth
Large Size
June 16 2016

Gold star goes to the combination of shallow seeding and large seed

Beneficial to sunlight capture and weed competition

Oat Seed Size Effect on Final Yield





Using larger seeds means using a larger volume of seed per unit area of land during planting. One question therefore regards the economics of planting a larger volume of seed compared with a smaller volume of seed. Results from our study could be used to test the economic implication of increasing seed volume per hectare through the use of larger seeds. For example with barley, an investment in an extra 65 or 43 kg ha^{-1} of seed (2015 and 2016, respectively) resulted in a grain yield increase of 871 and 339 kg ha^{-1} for the 2 years. For oat, an investment of an extra 56 and 47 kg ha of seed (2015 and 2016, respectively) resulted in grain yield increases of 607 and 277 kg ha^{-1} for the 2 years. Therefore, averaged across years and crops, our results show that for each 1 kg ha^{-1} invested in seed, the return was 10 kg ha^{-1} of grain; a 10 to 1 return on investment. This example

How best to get the extra seed mass

- Increased seeding rate?
- Increased seed mass/size?
- Combination?

Stanley, K.A. and Entz, M.H., 2019. Can large seed size compensate for deep seeding in organic barley (Hordeum vulgare) and oat (Avena sativa) production? An assessment of farm-saved seed. *Organic Agriculture*, *9*(4), pp.373-381.

Tine Weeder/
broadcast seeder

Seeding systems for forage and cover crop establishment

Forages and cover crops

The Prairie Organic Development Fund

- Investment platform established to develop organic agriculture and marketing in the Canadian Prairies
- Builds resilience in the sector by investing in
  - organic provincial associations (Capacity Fund); and
  - high impact programs (Innovation Fund) related to marketing, research, policy, education and capacity development that have broad public benefit to the organic sector.

www.organicdevelopmentfund.org

To learn more about PODF:
www.organicdevelopmentfund.org

For more organic production resources visit:
www.pivotandgrow.com