

Western Applied Research Corporation

From Policy to Practice: Assessing the Real-World Impact of Fertilizer Reduction (30% and 15%) on Oat Yields

P O G A C o n f e r e n c e 2 0 2 4

presented by:



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Changes in Agriculture

“In December 2020, we set an ambitious national target to reduce greenhouse gas (GHG) emissions associated with fertilizer application by 30% below 2020 levels by 2030.”

– Prime Minister Justin Trudeau

- ❖ Can we still meet **global demands** with reduced inputs?
- ❖ How does this national target affect local oat **production**?
- ❖ Can we reduce our fertilizer rates without impacting **profitability**?



OAT AGM
2025



Study 1: 2023

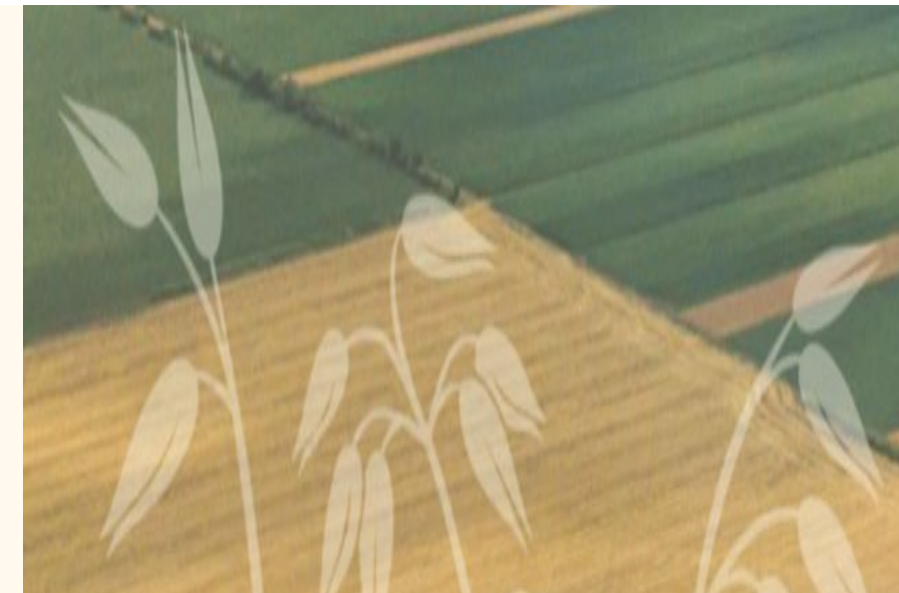
Determining the yield and test weight response of oats to 15% and 30% reductions in recommended nitrogen rates

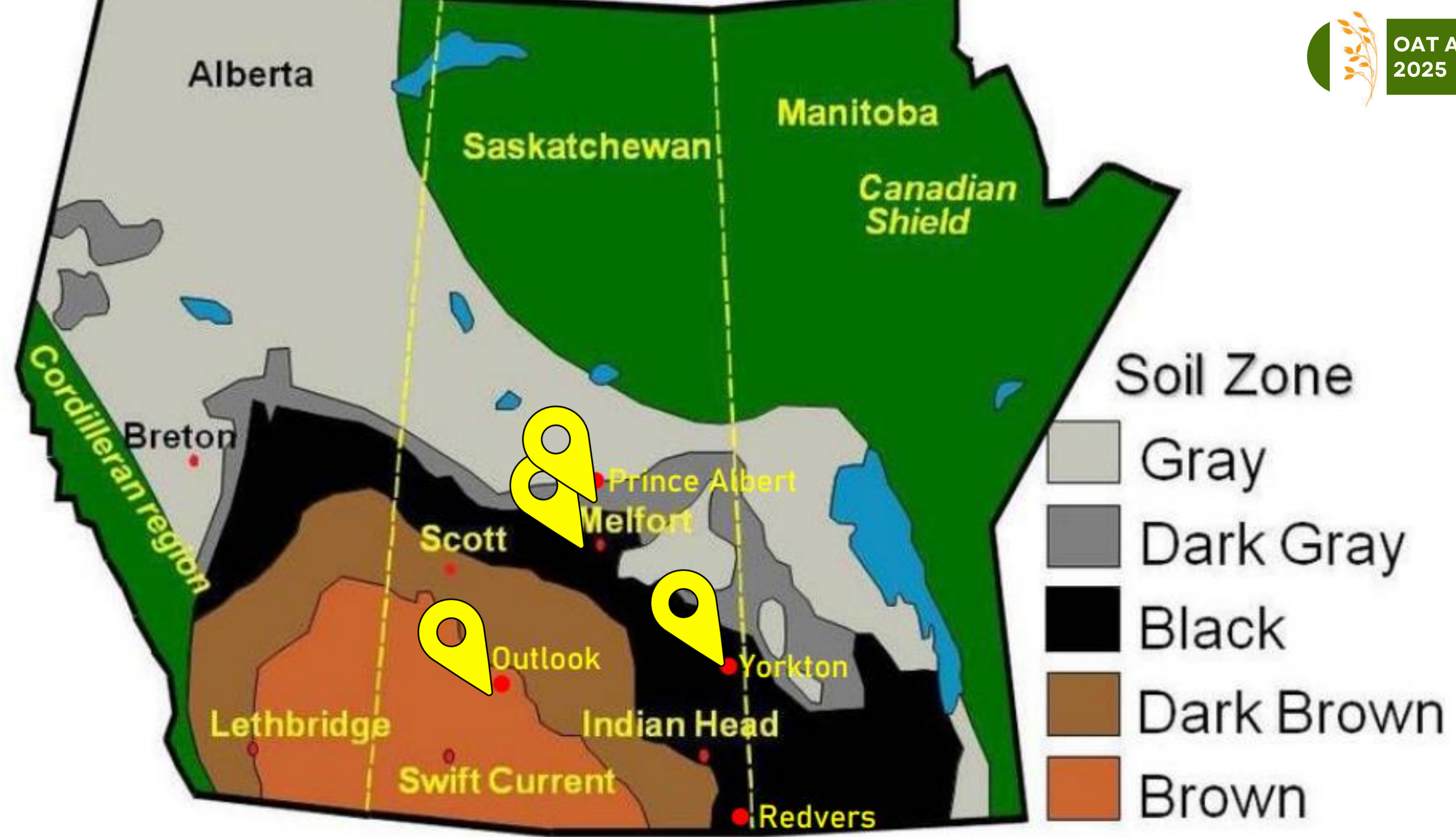


Objective: Assess the performance of CS Camden & CDC Arborg at 125lb/ac, 106lb/ac, and 88lb/ac of N (soil + fertilizer N)

• **Principal Investigators:**

- Mike Hall¹, Ahsan Rajper¹, Gursahib Singh², Brianne McInnes³, and Robin Lokken⁴
 - ¹East Central Research Foundation, Yorkton, SK.
 - ²Irrigation Saskatchewan, Outlook, SK.
 - ³Northeast Agricultural Research Foundation, Melfort, SK.
 - ⁴Conservation Learning Centre, Prince Albert, SK.





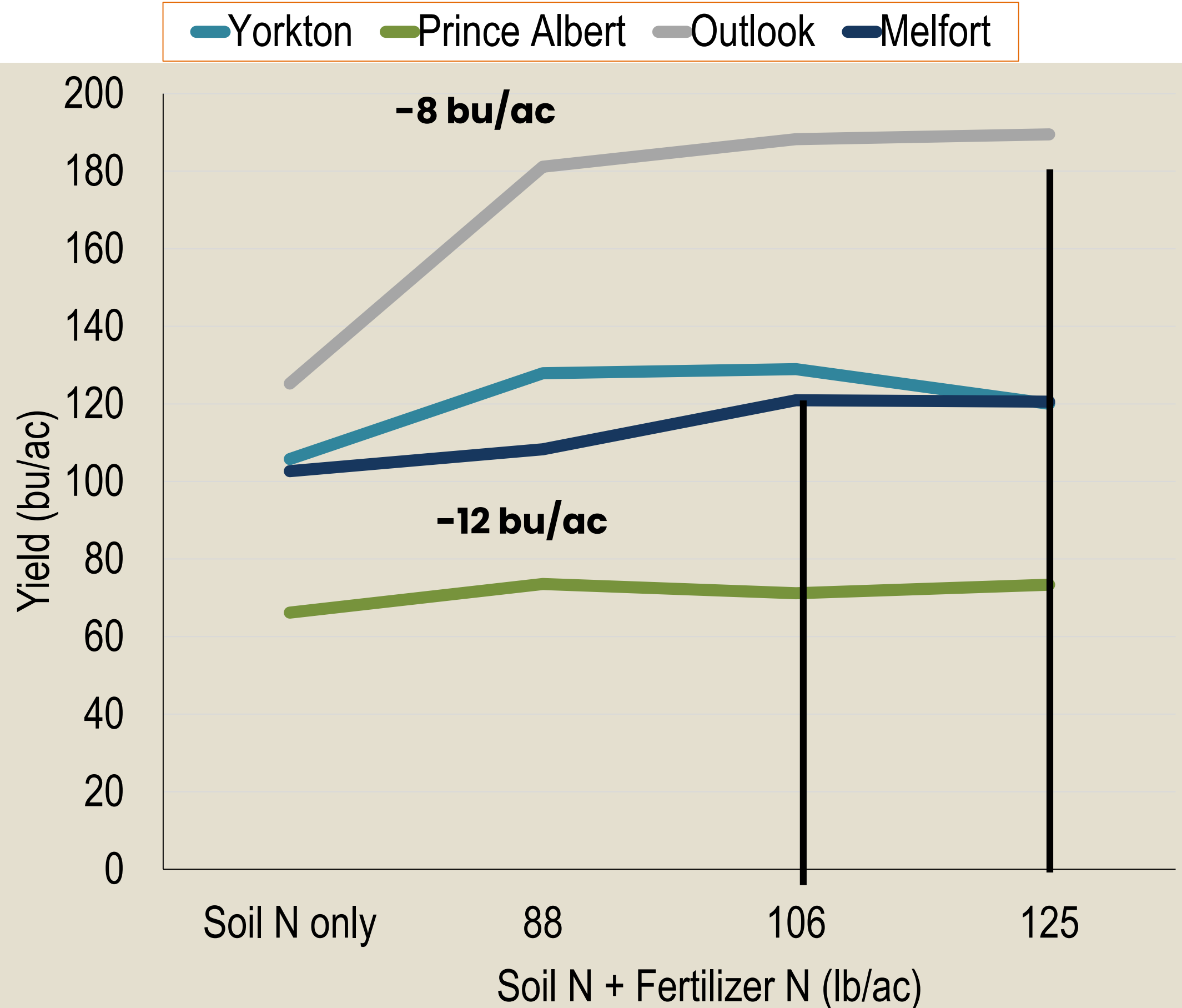
Our Results: Yield

Summary:

- ❖ Outlook & Melfort had greatest response
- ❖ Yorkton & Prince Albert minor response
- Yorkton: -8 bu/ac @ 100% N
 - ❖ PA: 30%, 15% and 100% relatively the same
- ❖ All sites combined: 15% Reduced N > 100%
 - ❖ 4.5 bu/ac yield gain compared to 30%

Implications:

- ❖ Drought conditions = minor response to 100% N
- ❖ Average & above rainfall = substantial loss at 30% reduction
 - ❖ 15% reduction = 100%



2023 30% vs. 15% Economics

Effect of Incremental decreases in N fertility on Net Revenue¹.

	Net Revenue (\$/ac)	
<u>N Fertility Decrease</u>	Outlook	Melfort
125 lb N/ac to 106 lb N/ac	9.00	17.56
106 lb N/ac to 88 lb N/ac	-22.70	-51.6
	Net Revenue (\$/ac)	
<u>N Fertility Decrease</u>	Yorkton	Prince Albert
125 lb N/ac to 106 lb N/ac	62.5	3.95
106 lb N/ac to 88 lb N/ac	9.4	27.4

¹Net Revenue based on 0.82/lb N and \$5.25/bu oat. Values taken from 2024 Saskatchewan Crop Planning Guide.

Study 2: 2024**preliminary*

Evaluating the fertility package of newly available oat milling varieties in Saskatchewan

- **Principal Investigators:**

- Brianne McInnes¹, Ishita Patel¹, Mike Hall², Ahsan Rajper², and Chris Holzapfel³, Jessica Enns⁴

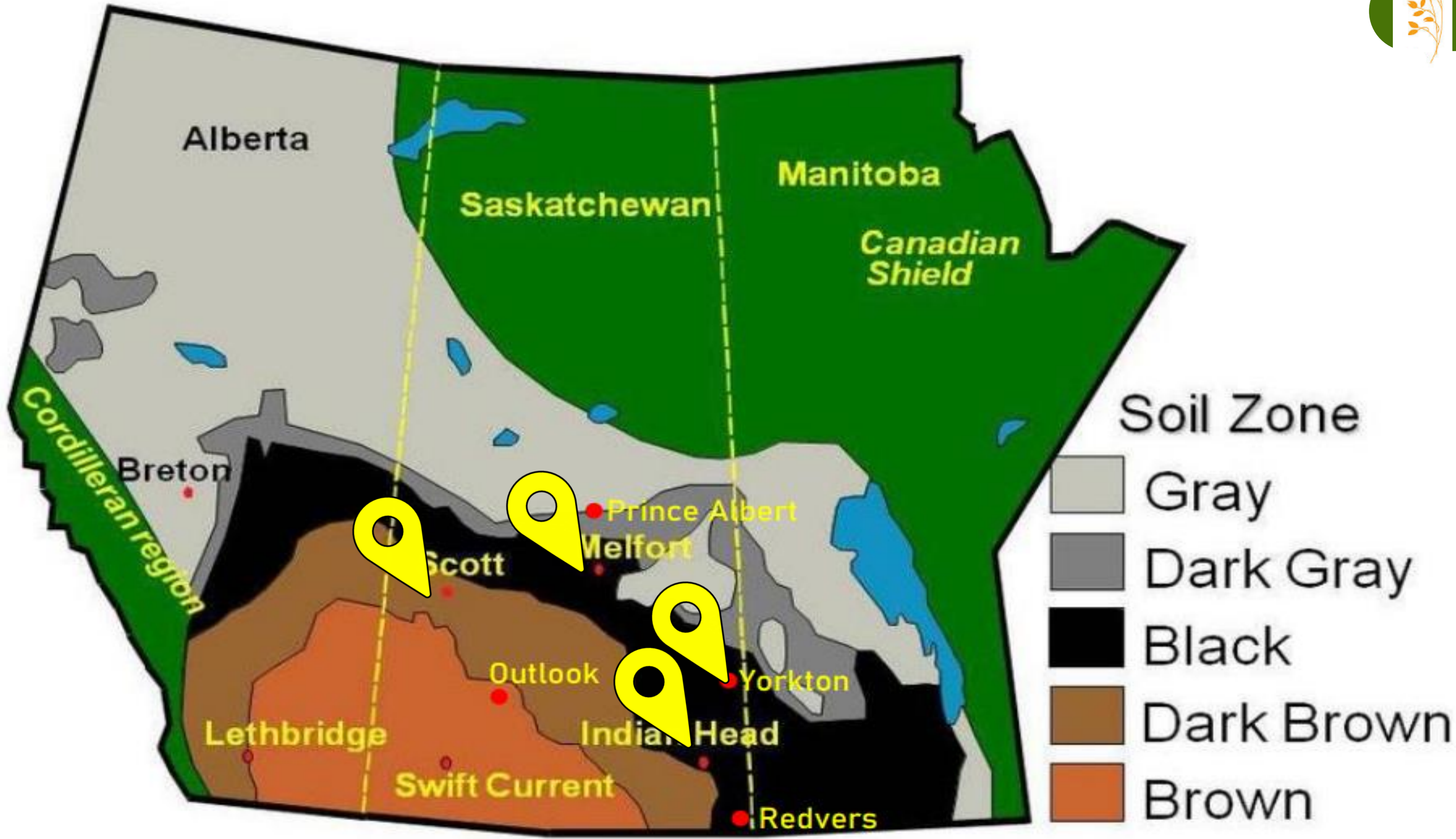
- ¹Northeast Agricultural Research Foundation, Melfort

- ²East Central Research Foundation, Yorkton

- ³Indian Head Agriculture Research Foundation, Indian Head

- ⁴Western Applied Research Corporation, Scott



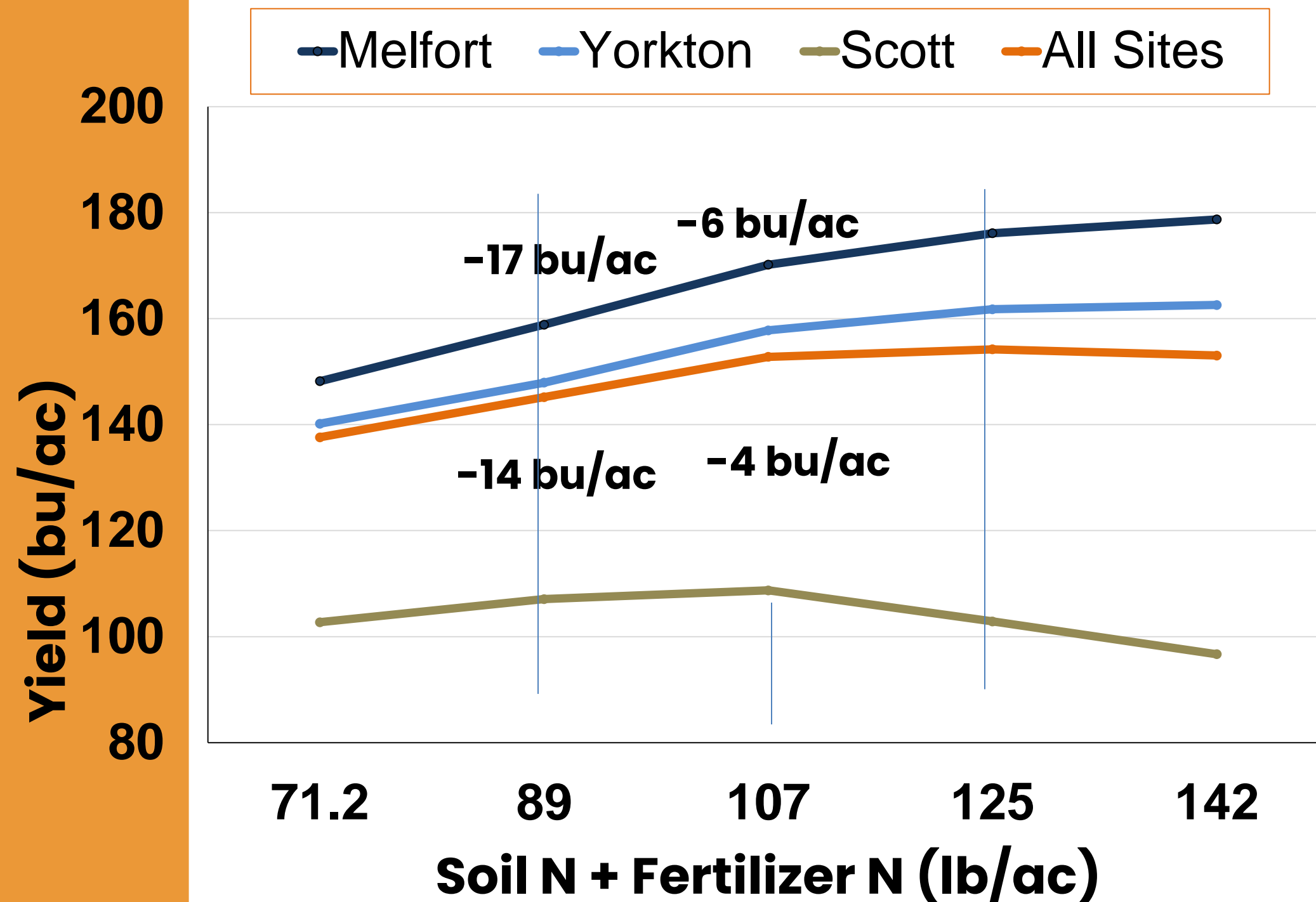


Our Results

Objective: Assess the performance of CS Camden, CDC Anson & AAC Neville



at 142lb/ac, 125lb/ac, 107lb/ac, 89lb/ac and 71lb/ac of N (soil + fertilizer N)



Summary:

- ❖ Melfort & Yorkton greatest response
 - Linear Response
- ❖ Scott at 15% had highest yield
 - Quadratic Response to N
 - 107lb/ac = 118 bu/ac**

Implications:

- ❖ No one size fits all for every location
- ❖ Scott – great growing conditions but lower yielding
- ❖ Melfort & Yorkton– greater potential returns

Our Economics

Effect of Incremental decreases in N fertility on Net Revenue ¹ .		
	Net Revenue (\$/ac)	
<u>N Fertility Decrease</u>	Melfort	Yorkton
125 lb N/ac to 107 lb N/ac	-16.4	-6.2
107 lb N/ac to 89 lb N/ac	-44.6	-37.0
	Net Revenue (\$/ac)	
<u>N Fertility Decrease</u>	Scott	All sites
125 lb N/ac to 107 lb N/ac	45.5	7.2
107 lb N/ac to 89 lb N/ac	6.15	-25.14

¹Net Revenue based on 0.82/lb N and \$5.25/bu oat. Values taken from 2024 Saskatchewan Crop Planning Guide.

What Does Our Past Research Tell Us?



<https://poga.ca/research/research-projects/>



<https://www.ecrf.ca>

Brown R. and L. Shaw. 2018. Managing Fertilizer Use to Optimize Yield and Quality of Oat.

D. Popsecul, S. Mathieson, M. Hall, H. Sorestad, C. Holzapfel, B. McInnes, L. Shaw. 2021 . Are Oats Responding to Higher Levels of Macronutrients?

McInnes B, and J. Enns. 2022 & 2023. 4R Management: Right rate and placement for fertilizer in oats.

M. Hall, J. Pratchler, C. Holzapfel. 2019. Maintaining Test Weight Stability of Milling Oats

B. May, M. Hall, S. Brandt, L. Shaw. 2016. The Test Weight Stability and Yield Response of New and Established Oat Cultivars to Fertilizer N.

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– Prime Minister Justin Trudeau

Can we still meet **global demands** with
reduced inputs?



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The Big Picture



31 Site Years in Saskatchewan	
Yield (bu/ac) Gain	Yield (bu/ac) Loss
3.1	- 9.1
(7 site years)	(24 site years)
23%	77%

% Gain in Market +3 Gain at 30%	
92.96	
bu/ac	213,807,162.50
MT 1	3,000,000
MT 2	3,103,410.96
% Differ	3%

% Gain in Market With - 9 bu/ac Gain at 30%	
80.73	
bu/ac	185,673,515.45
MT 1	3,000,000
MT 2	2,695,051.08
% Differ	-11%

2024: Increase in acreage of 15% compared to last year BUT 18% below 5 year average

- Oat production in Canada is up 26% from 2023 but 15% below 5-year average – AAFC, 2024

Note: These values are based on rough estimates and more information is required.

Estimates: Statistics Canada, 2024 & Agriculture and Agri-Food Canada, 2024

The Big Picture



Yield (bu/ac)- Loss or Gain at 30% Fertilizer Reduction	
2014	
Yorkton	10 Loss
Melfort	7.1 Loss
Indian Head	6.4 Loss
2015	
Yorkton	19.7 Loss
Melfort	16.4 Loss
Indian Head	1.2 Loss
Redvers	2.5 Loss
2016	
Yorkton	2.1 Gain
Melfort	6.4 Loss
Indian Head	17.2 Loss
Redvers	1.9 Loss
2018	
Prince Albert	18 Loss
Redvers	3 Gain

2019	
Indian Head	1.179 Gain
Melfort	14.4 Loss
Yorkton	6.3 Loss
2021	
Indian Head	4 Loss
Melfort	0
Redvers	2 Gain
Yorkton	1 Gain
2022	
Scott	0.2122 Loss
Melfort	2.2 Gain
2023	
Scott	8.2 Loss
Melfort	7.6 Loss
2023	
Prince Albert	2 Loss
Yorkton	9 Gain
Outlook	8.4 Loss
Melfort	12.3 Loss
2024	
Melfort	17 Loss
Yorkton	14 Loss
Scott	4 Gain

31 Sites- Years Across 2014 to 2024 -- Excluding 2017 & 2020



The Big Picture



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3.1	- 9.1
(7 site years)	(24 site years)
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Changes in Agriculture

How does this national target affect local
oat **production**?

Can we reduce our fertilizer rates without
impacting **profitability**?



OAT AGM
2025



Economics 30% vs 15%



	lb/ac of N	Cost of N	Profit	Net	Difference
100%	125	102.5	471.78	369.28	
15%	107	87.74	454.16	366.42	-\$2.86
30%	88	72.16	423.82	351.66	-\$17.62

Assuming a Yield 89.86 bu/ac

- \$0.82 / lb of N
- \$5.25 /bu

Profit Gains & Losses at 30% Reduced N Fertilizer

Profit Gains & Losses at 15% Reduced N Fertilizer

Yield Gain (+3)	
lb/ac of N	Difference
125	\$46.6
88	

23%

Based on 31 site-years

Yield Loss (-9)	
lb/ac of N	Difference
125	-\$17.62
88	

77%

Yield Gain (+3.5)	
lb/ac of N	Difference
125	\$33.1
107	

55%

Based on 11 site-years

Yield Loss (-3.4)	
lb/ac of N	Difference
125	-\$2.86
107	

45%

Economics 30% vs 15%



	lb/ac of N	Cost of N	Profit	Net	Difference
100%	125	102.5	471.78	369.28	
15%	107	87.74	451.45	363.71	-\$5.57
30%	88	72.16	471.00	344.84	-\$24.44

Assuming a Yield 89.86 bu/ac

- \$0.82 / lb of N
- \$5.25 /bu

BLACK Soil Zone 30% Reduced N Fertilizer

Yield Gain (+2.5)	
lb/ac of N	Difference
125	\$43.54
88	

25%

Based on 21 site-years

Yield Loss (-10.4)	
lb/ac of N	Difference
125	-\$24.44
88	

75%

BLACK Soil Zone 15% Reduced N Fertilizer

Yield Gain (+3.4)	
lb/ac of N	Difference
125	\$32.42
107	

55%

Based on 7 site-years

Yield Loss (-3.9)	
lb/ac of N	Difference
125	-\$5.57
107	

45%

Economics 30% vs 15%



	lb/ac of N	Cost of N	Profit	Net	Difference
100%	125	102.5	471.78	369.28	
15%	107	87.74	471.78	384.04	\$14.76
30%	88	72.16	449.69	377.53	\$8.26

Assuming a Yield 89.86 bu/ac

- \$0.82 / lb of N
- \$5.25 /bu

DARK BROWN Soil Zone 30% Reduced N Fertilizer

DARK BROWN Soil Zone 15% Reduced N Fertilizer

Yield Gain (+4)	
lb/ac of N	Difference
125	\$51.34
88	

33%

ONLY Based on 3 site-years

Yield Loss (-4.2)	
lb/ac of N	Difference
125	\$8.26
88	

67%

Yield Gain (+3.6)	
lb/ac of N	Difference
125	\$33.77
107	

100%

ONLY Based on 3 site-years

Yield Loss (0)	
lb/ac of N	Difference
125	\$14.76
107	

0%

CAUTION

What does it all mean?



That a generic 30% reduction in fertilizer is not a realistic practice

- A **30% reduction** in fertilizer can be **beneficial** when:
 - High residual nitrogen levels
 - Going into drought years
 - Low to Moderate Yield Potential Zone
- **NOT** Beneficial:
 - Previous year yielded high
 - High rainfall growing season
 - High yield potential zones
 - Risk Adverse (potential 75% loss in revenue)

A Compromise: 15% Reduction in N Fertilizer
Black Soil Zone: 54% of (+\$30/ac) vs. 45% (-\$6.00) @ 106 lbN/ ac



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Thank You!



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