

# Oat and Barley: Are we managing N properly?



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Mike Hall – Research Coordinator  
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# Maintaining Test Weight Stability of Milling Oats



Discounted <math>< 245 \text{ g}/0.5\text{l}</math>  
Rejected <math>< 230 \text{ g}/0.5\text{l}</math>

Mike Hall – Research Coordinator  
Heather Sorestad – Research Assistant



- Studies conducted Indian Head, Melfort, Canora SK and Brandon MB (1998-2000)
- Trial Design
  - Oat varieties (CDC Pacer and AC Assiniboia)
  - Seeded early May, mid May and early June
  - N rates 15, 40, 80 and 120 kg/ha = 13, 38, 71 and 107 lb N/ac
- Conclusions
  - Oats should be seeded mid-May with a N rate between 38 and 71 lb/ac when residual nitrate levels range between 18 and 45 lb/ac
  - When seeding was delayed to early June, 38 lb N/ac should be applied to maintain oat quality
  - Higher N resulted in lower test weight

*May, W., Mohr, R., Lafond, G., Johnston, A. and C. Stevenson. 2004b. Effect of nitrogen, seeding date and cultivar on oat quality and yield in the eastern Canadian Prairies. Can. J. Plant Sci. 84: 1025-1036.*

## *May, W. The Test Weight Stability and Yield Response of New and Established Oat Cultivars to Fertilizer N. Prairie Oat Growers Adopt 20150418 (2014-2016)*

(44 comparisons): 4 varietal comparisons at 3 sites for 3 years and 1 site for two years. Every site year had stride for a check.

- 22 instances where oat yield responded up to 107 lb N/ac
- 6 instances up to 71 lb N/ac
- 16 instances up to only 53 lb N/ac
- 18 instances where 107 lb N/ac would result in a discount
- 2 instances where 107 lb N/ac would result in rejection
- Relative to Stride, Summit had good test weights but the test weight of CS Camden was poorer.

*Saskatchewan Publication “Varieties of Grain Crops 2019” lists test weights as follows:*

- CS Camden 242 g/0.5l
- Summit 256 g/0.5l

# CS Camden vs Summit

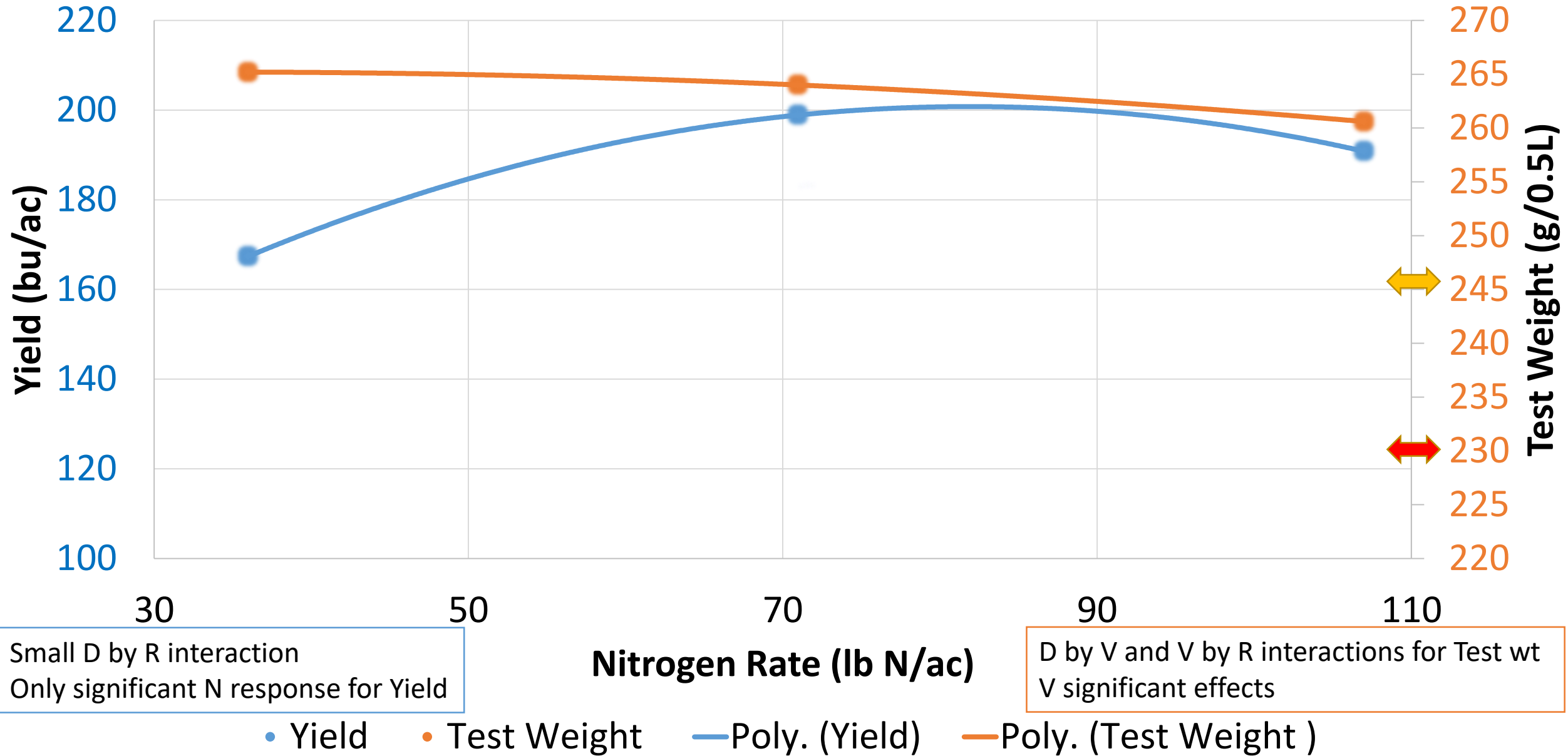
N rates:

- 40 kg N/ha = 37 lb N/ac
- 80 kg N/ha = 71 lb N/ac
- 120 kg N/ha = 107 lb N/ac

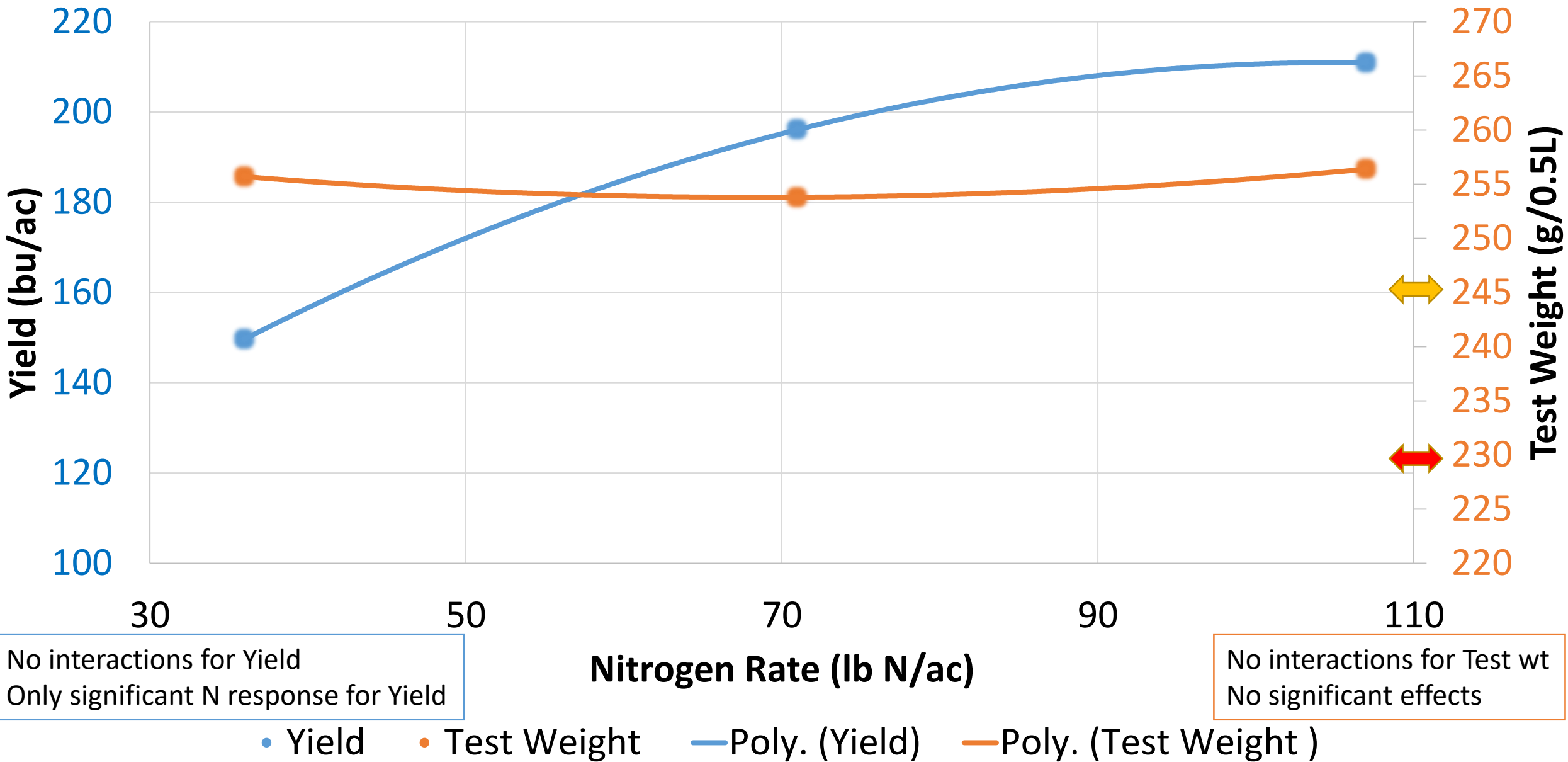
# Dates of Early and Late Seeding

Seeding Date	Indian Head	Melfort	Yorkton
<b>Early</b>	May 3	May 14	May 10
<b>Late</b>	May 29	June 12	May 31

# Melfort 2019: Early Seeded Summit Oat Yield and Test Weight Response to Added Nitrogen

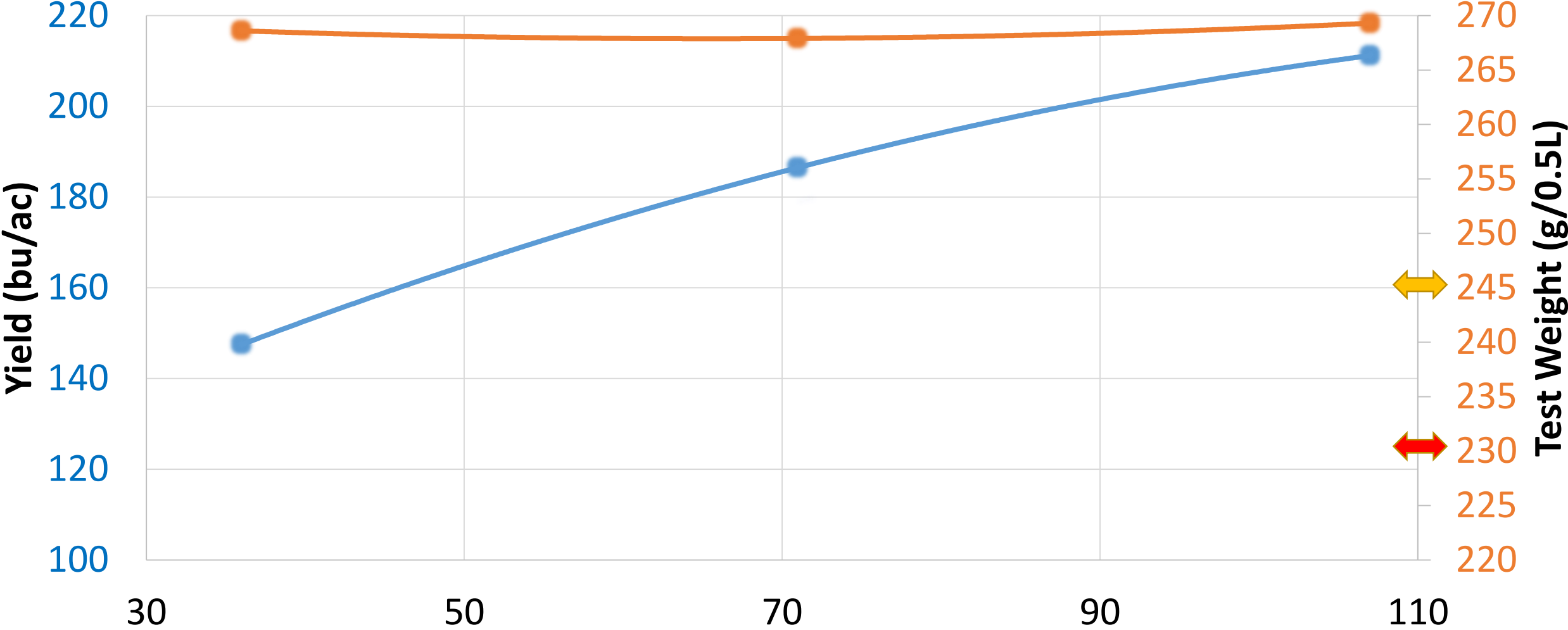


# Melfort 2019: Early Seeded Camden Oat Yield and Test Weight Response to Added Nitrogen





# Melfort 2019: Late Seeded Summit Oat Yield and Test Weight Response to Added Nitrogen

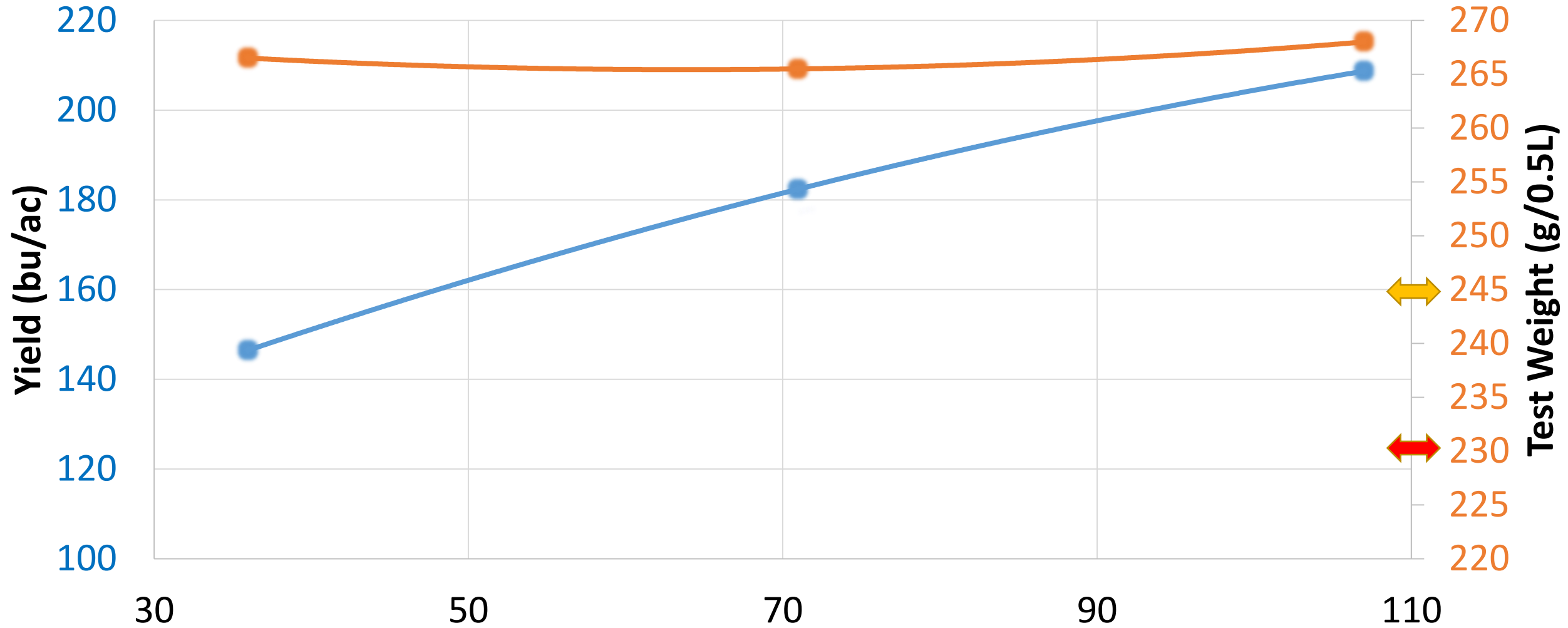


No interactions for Yield  
Only significant N response for Yield

No interactions for Test wt  
No significant effects

• Yield • Test Weight — Poly. (Yield) — Poly. (Test Weight)

# Melfort 2019: Late Seeded Camden Oat Yield and Test Weight Response to Added Nitrogen



No interactions for Yield  
Only significant N response for Yield

No interactions for Test wt  
No significant effects

• Yield • Test Weight — Poly. (Yield) — Poly. (Test Weight)

# Oat Economics for Melfort 2019 - Averaged over seeding date and variety

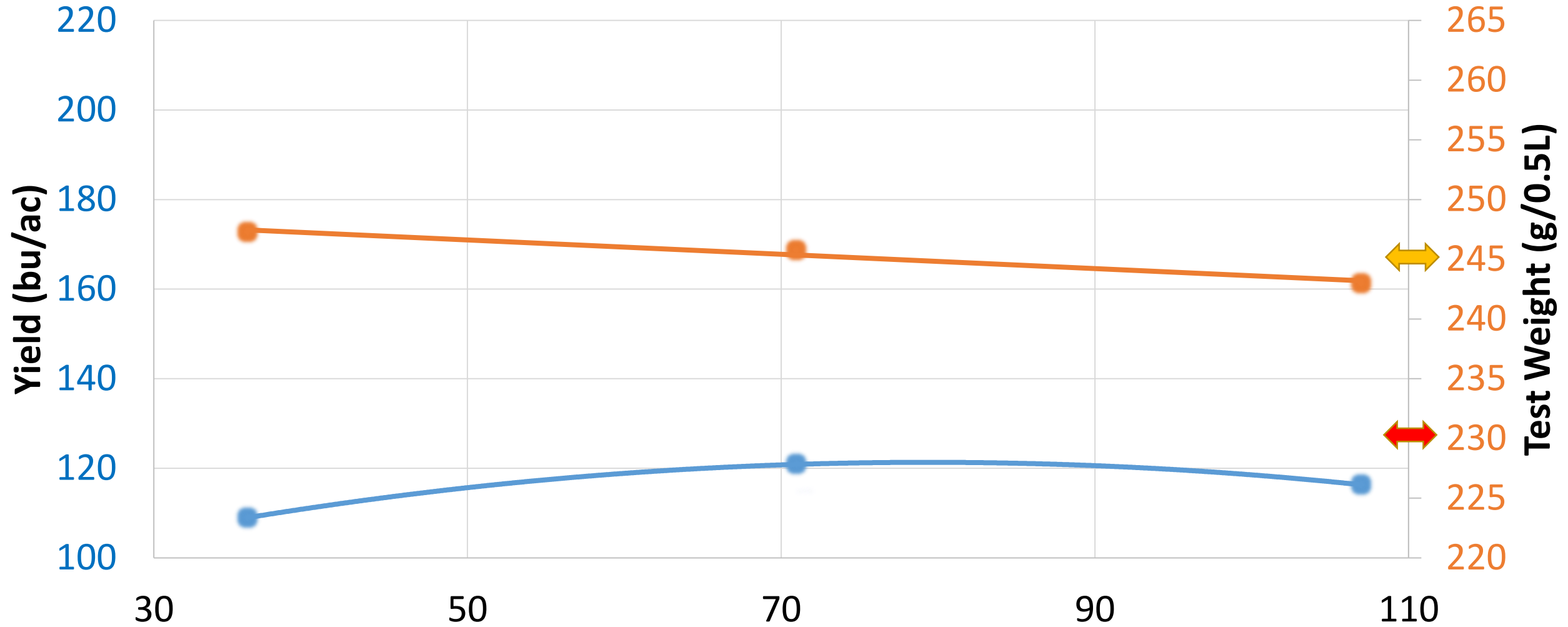
Lb N/ac	Bu/ac	Test wt. (g/0.5 l)	\$ N/ac (@ \$0.5/lb N)	\$Gross/ac (@ \$3.23/bu)	\$Discount/ac	\$Gross/ac-(\$N/ac+\$Discount/ac)
36	153	264.0	18	494	0.00	476
71	191	262.8	35.5	617	0.00	582
107	205	263.6	53.5	662	0.00	609

Economic Analysis based on:

- \$3.23/bu
- \$0.5/lb of N
- \$0.02/bu 245 -240 g/0.5l
- \$0.04/bu 240-235 g/0.5l
- \$0.08/bu 235-230 g/0.5l
- Reject below 230 g/0.5l

30 lb N/ac in 0-12 inches = 45 lb N/ac in 0-24 inches

# Indian Head 2019: Early Seeded (May 3) Summit Oat Yield and Test Weight with Increasing Nitrogen Rate

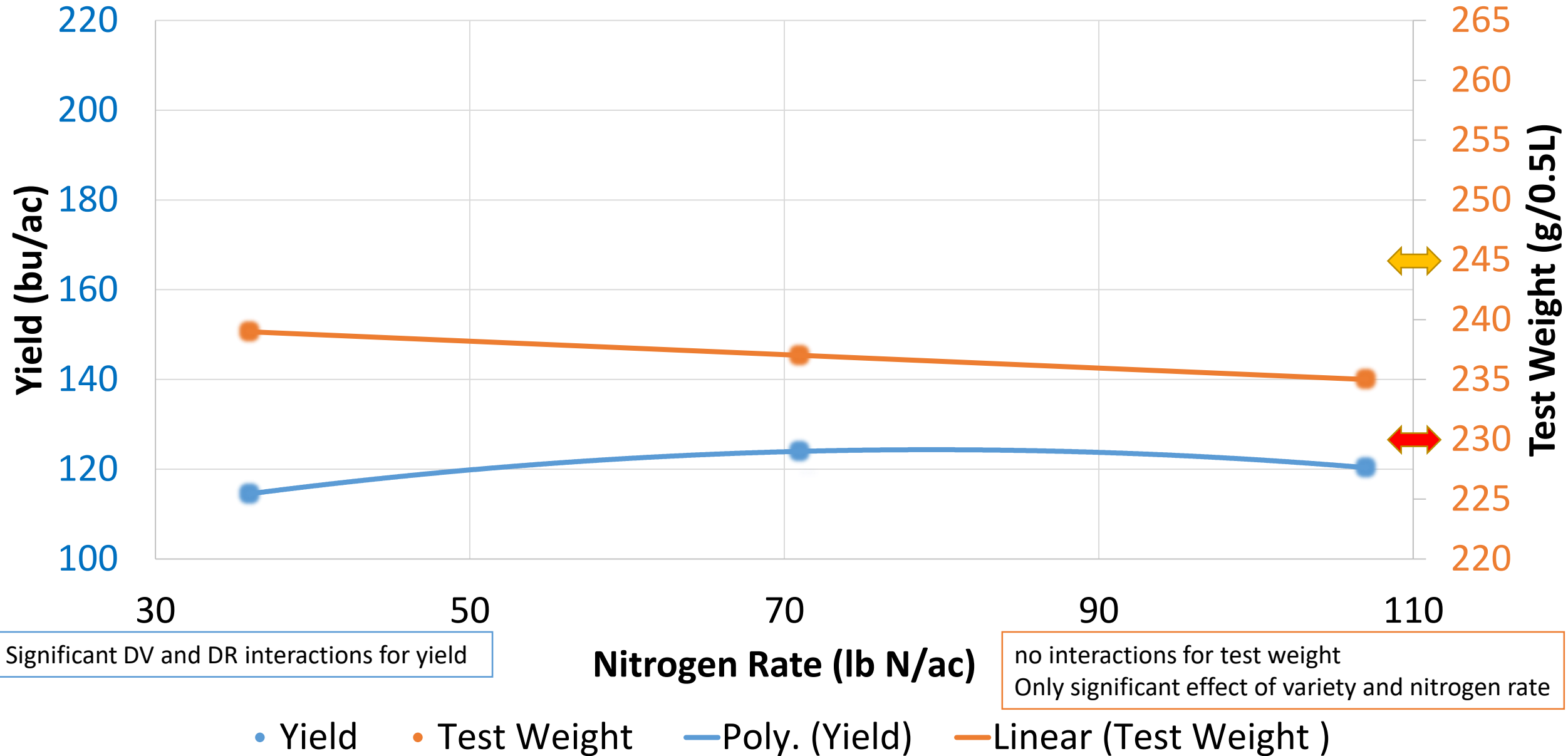


Significant DV and DR interactions for yield

no interactions for test weight  
significant effect of date variety and nitrogen rate

- Yield
- Test Weight
- Poly. (Yield)
- Linear (Test Weight)

# Indian Head 2019: Early Seeded (May 3) CS Camden Oat Yield and Test Weight with Increasing Nitrogen Rate



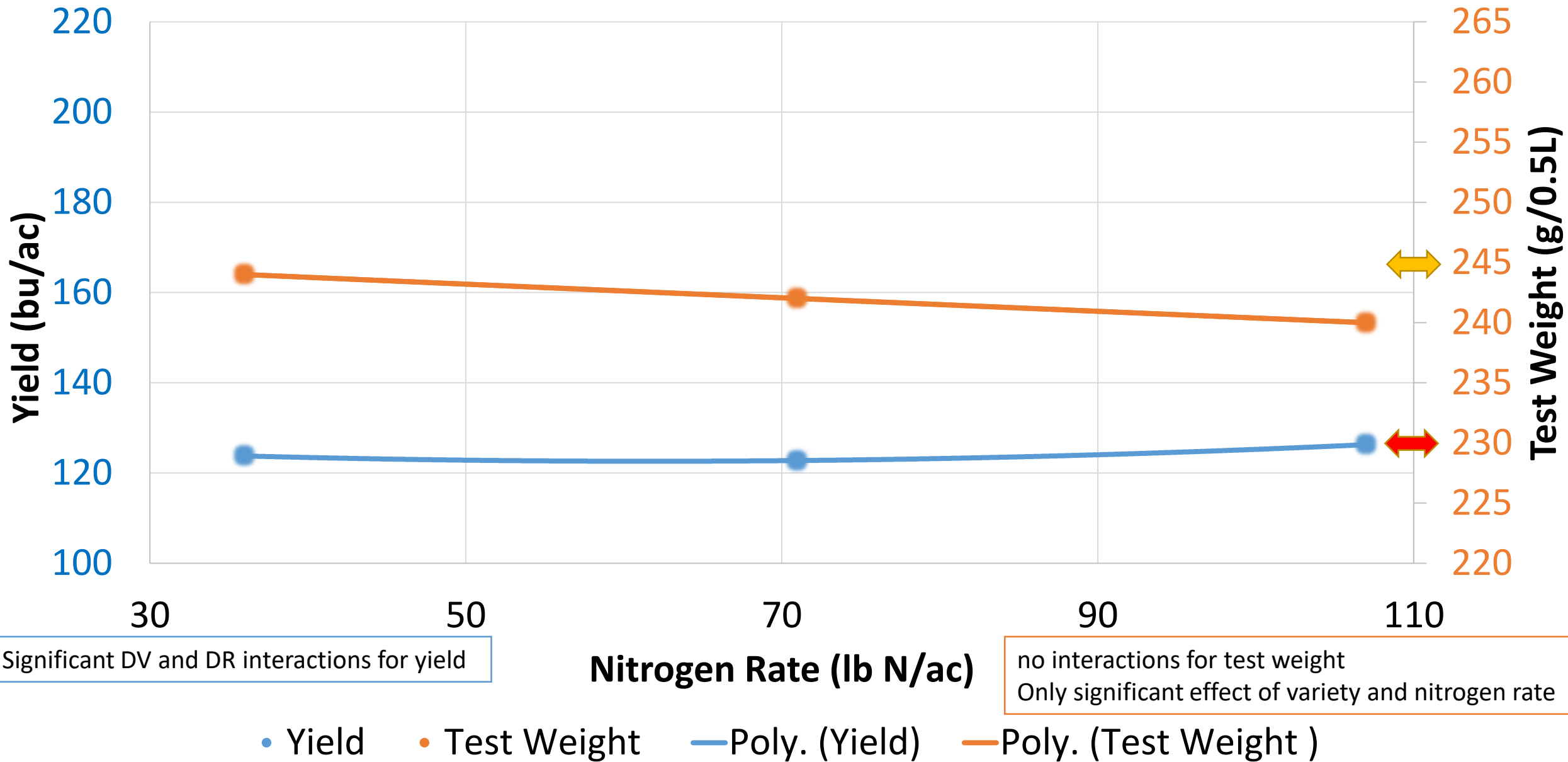
## Summit Oat Economics for Indian Head 2019 - Seeded Early

Lb N/ac	Bu/ac	Test wt.	\$ N/ac (@ \$0.5/lb N)	\$Gross/ac (@ \$3.23/bu)	\$Discount/ac	\$Gross/ac-(\$N/ac+\$Discount/ac)
36	109	247.5	18	352	0	334
71	121	245.4	35.5	390	0	354
107	116	243.2	53.5	375	2.32	319

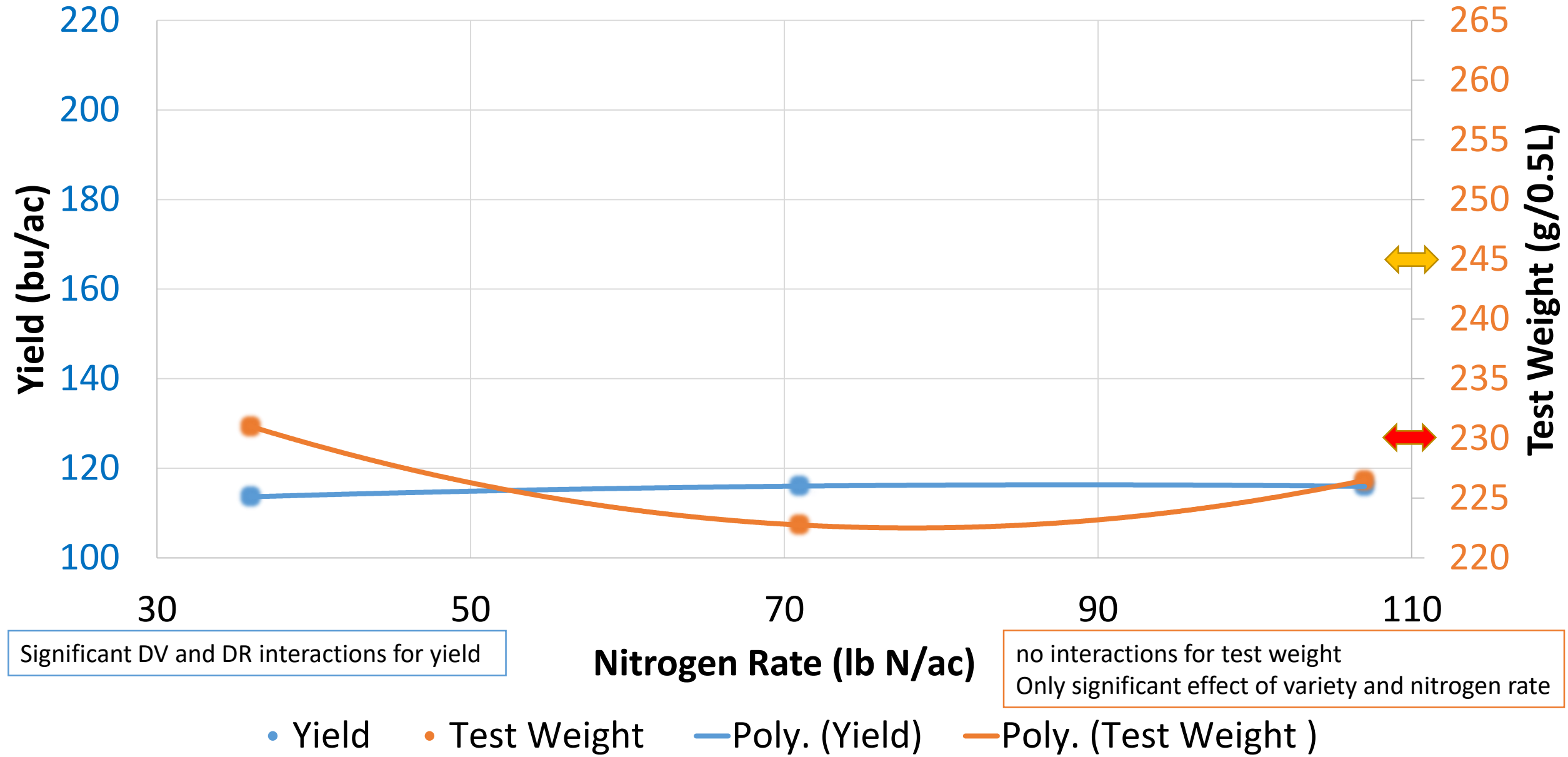
## CS Camden Oat Economics for Indian Head 2019 - Seeded Early

Lb N/ac	Bu/ac	Test wt.	\$ N/ac (@ \$0.5/lb N)	\$Gross/ac (@ \$3.23/bu)	\$Discount/ac	\$Gross/ac-(\$N/ac+\$Discount/ac)
36	115	239.0	18	370	4.58	347
71	124	237.0	35.5	401	4.96	360
107	121	235.0	53.5	390	4.83	331

# Indian Head 2019: Late Seeded (May 29) Summit Oat Yield and Test Weight with Increasing Nitrogen Rate



# Indian Head 2019: Late Seeded (May 29) CS Camden Oat Yield and Test Weight with Increasing Nitrogen Rate





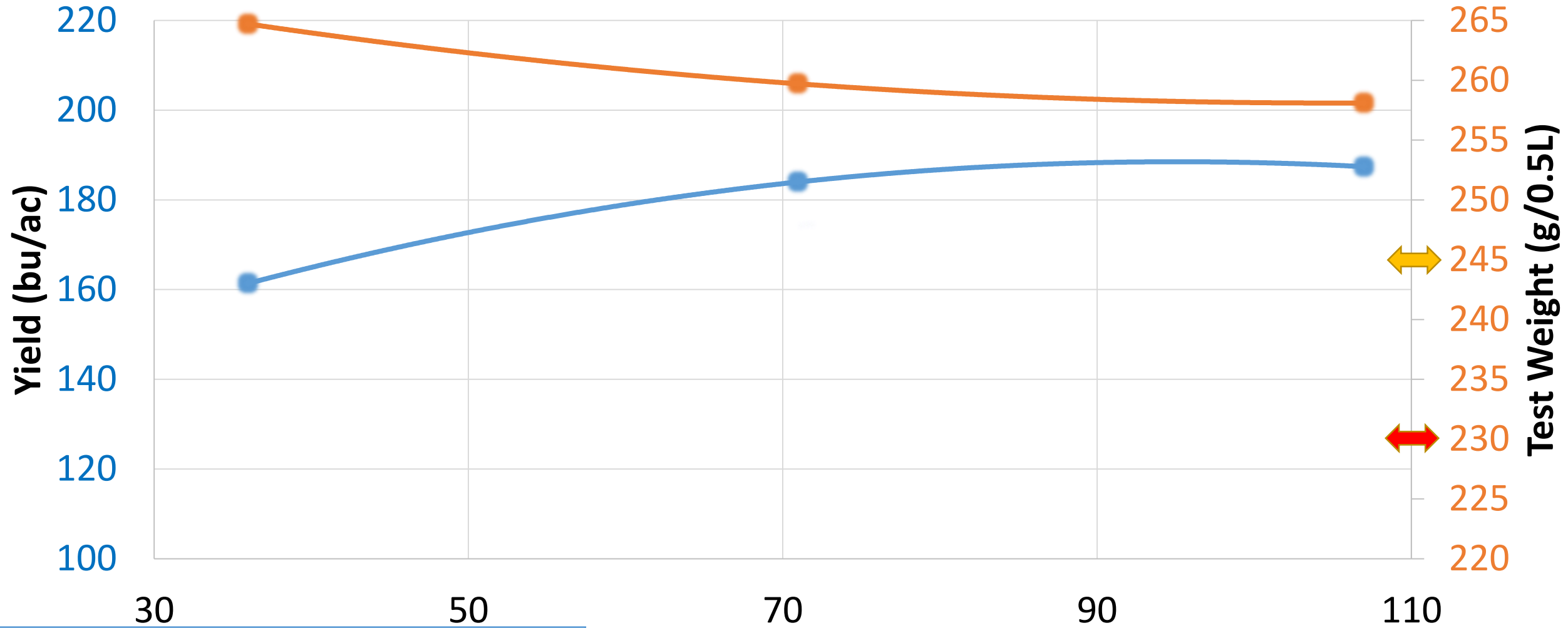
## Summit Oat Economics for Indian Head 2019 - Seeded Late

Lb N/ac	Bu/ac	Test wt.	\$ N/ac (@ \$0.5/lb N)	\$Gross/ac (@ \$3.23/bu)	\$Discount/ac	\$Gross/ac-(\$N/ac+\$Discount/ac)
36	124	244.0	18	400	2.47	379
71	123	242.0	35.5	397	2.46	359
107	126	240.0	53.5	408	2.53	352

## CS Camden Oat Economics for Indian Head 2019 - Seeded Late

Lb N/ac	Bu/ac	Test wt.	\$ N/ac (@ \$0.5/lb N)	\$Gross/ac (@ \$3.23/bu)	\$Discount/ac	\$Gross/ac-(\$N/ac+\$Discount/ac)
36	114	231.0	18	367	9.09	340
71	116	222.8	35.5	374	reject	?
107	116	226.6	53.5	374	reject	?

# Yorkton 2019: Summit Oat Yield and Test Weight with Increasing Nitrogen Rate, Averaged over Seeding Date

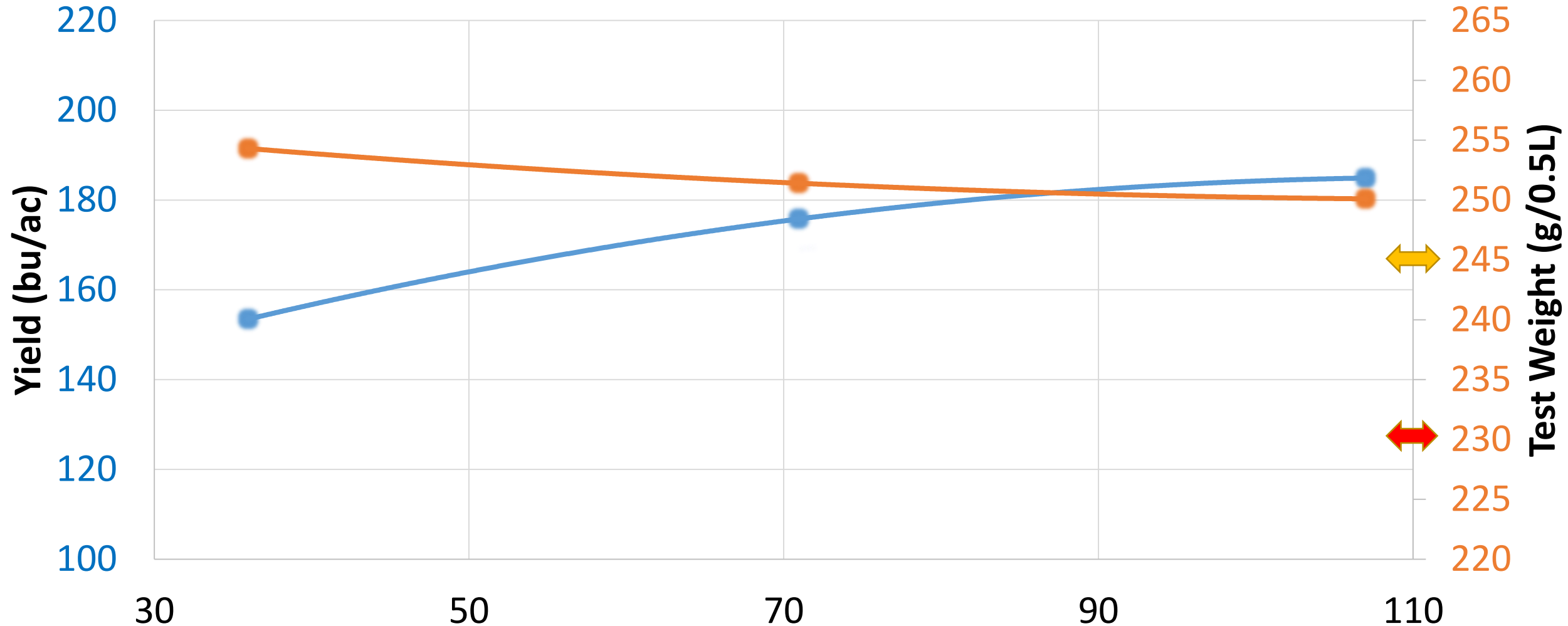


no interactions for yield  
Only significant effect of variety and increasing N rate

no interactions for test weight  
Only significant effect of variety and nitrogen rate

- Yield
- Test Weight
- Poly. (Yield)
- Poly. (Test Weight)

# Yorkton 2019: CS Camden Oat Yield and Test Weight with Increasing Nitrogen, Averaged over Seeding Date



no interactions for yield  
Only significant effect of variety and increasing N rate

no interactions for test weight  
Only significant effect of variety and nitrogen rate

• Yield • Test Weight — Poly. (Yield) — Poly. (Test Weight)

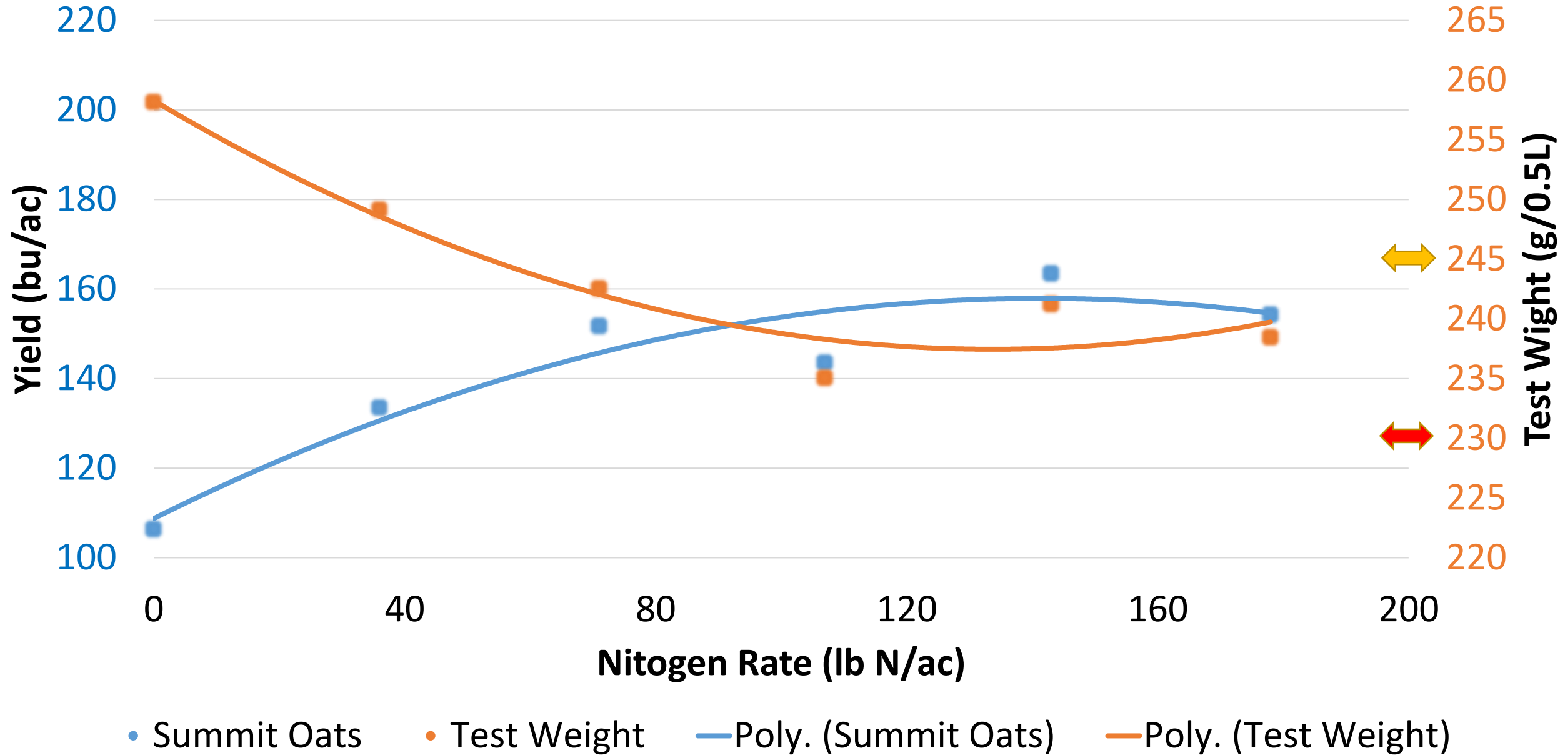
## Summit Oat Economics for Yorkton 2019 - Averaged over Seeding Date

Lb N/ac	Bu/ac	Test wt.	\$ N/ac (@ \$0.5/lb N)	\$Gross/ac (@ \$3.23/bu)	\$Discount/ac	\$Gross/ac-(\$N/ac+\$Discount/ac)
36	161	264.7	18	521	0	503
71	184	259.8	35.5	594	0	558
107	187	258.3	53.5	604	0	550

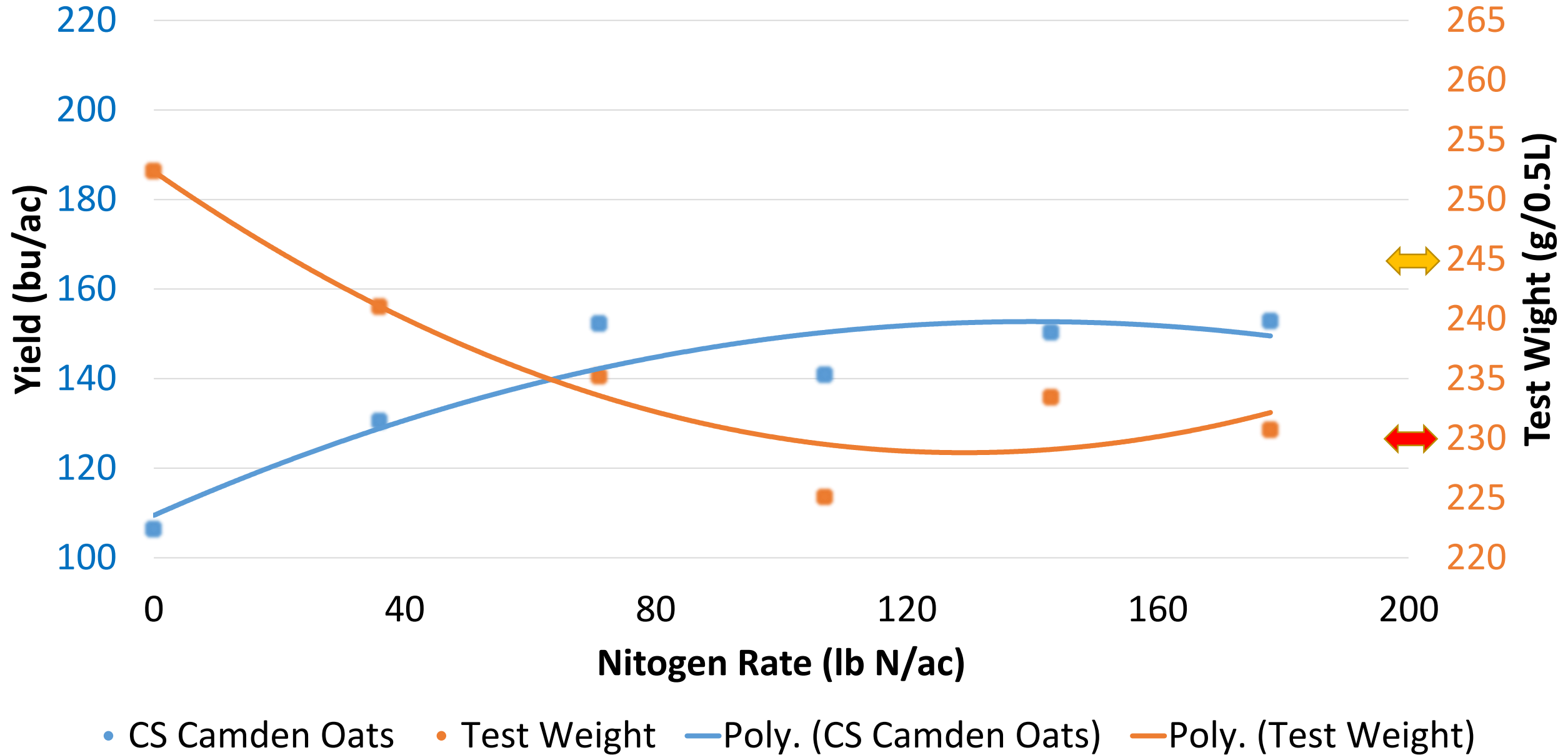
## CS Camden Oat Economics for Yorkton 2019 - Averaged over Seeding Date

Lb N/ac	Bu/ac	Test wt.	\$ N/ac (@ \$0.5/lb N)	\$Gross/ac (@ \$3.23/bu)	\$Discount/ac	\$Gross/ac-(\$N/ac+\$Discount/ac)
36	154	254.4	18	496	0	478
71	176	251.6	35.5	568	0	533
107	185	250.6	53.5	598	0	544

# Yorkton 2019 Trial 151: Test Weight and Yield of Summit Oats with Increasing Nitrogen Rate



# Yorkton 2019 Trial 151: Test Weight and Yield of Camden Oats with Increasing Nitrogen Rate



**Summit Oat Economics Yorkton 2019 (Trial 151)**

<b>Lb N/ac</b>	<b>Bu/ac</b>	<b>Test wt.</b>	<b>\$ N/ac (@ \$0.5/lb N)</b>	<b>\$Gross/ac (@ \$3.23/bu)</b>	<b>\$Discount/ac</b>	<b>\$Gross/ac-(\$N/ac+\$Discount/ac)</b>
0	109	258.3	351	0	0	351
36	131	248.6	422	18	0	404
71	146	242.2	470	35.5	2.91	432
107	155	238.7	499	53.5	6.18	440
143	157	238.3	508	71.5	6.29	430
178	153	240.9	495	89	6.14	400

**CS Camden Oat Economics Yorkton 2019 (Trial 151)**

<b>Lb N/ac</b>	<b>Bu/ac</b>	<b>Test wt.</b>	<b>\$ N/ac (@ \$0.5/lb N)</b>	<b>\$Gross/ac (@ \$3.23/bu)</b>	<b>\$Discount/ac</b>	<b>\$Gross/ac-(\$N/ac+\$Discount/ac)</b>
0	109	252.4	354	0	0	354
36	129	241.0	416	18	2.578	396
71	142	233.5	460	35.5	11.39	413
107	150	229.4	486	53.5	reject	Na
143	153	228.8	494	71.5	reject	Na
178	150	231.8	484	89	reject	Na

# Mike your results don't apply to my farm!

- Fair enough
- Two Yorkton sites
  - 3 miles apart
  - Seeded within 10 days
  - Site 1: no test weight discounts up to 107 lb/ac
  - Site 2: 107 lb/ac resulted in discounts for Summit and rejection for CS Camden
- The results from one side of our farm don't apply to the other!



# Conclusions

- For the most part 71 lb N/ac should be fairly safe and will come close to maximizing your returns. However, results can vary.
- Summit more likely to maintain adequate test weights as N rates are pushed.
- Seeding late only significantly reduced test weights at Indian Head. However, seeding early obviously has maturity and harvest benefits.

# Funding Provided by:



**Agricultural Demonstration of  
Practices and Technologies  
(ADOPT)**

Supported by:



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**GRAIN MILLERS**

# Should feed barley be fertilized with more N than malt?

11 to 12.5% protein

Mike Hall - Research Coordinator  
Heather Sorestad - Research Assistant



# Should feed barley be fertilized with more N than malt?

Western Applied Research Corporation- Scott

East Central Research Foundation- Yorkton

South East Research Farm- Redvers

Indian Head Agricultural Research Foundation- Indian Head

Northeast Agriculture Research Foundation- Melfort

Conservation Learning Centre- Prince Albert

Irrigation Crop Diversification Corporation- Outlook

Wheatland Conservation Area- Swift Current



# Should feed barley receive more or less N than malt barley?

## Saskatchewan Crop Planning Guide's Recommended lb N/ac

Barley	Brown Soil	Dark Brown Soil	Black Soil
Feed	85	90	99
Malt	69	74	81

Barley	Black lb N/ac	Bu/ac
Feed	99	93.2
Malt	81	76.2

Message?: Apply more N to feed barley and expect higher yields.

Nutrient In The Soil		Interpretation				1st Crop Choice			2nd Crop Choice		
		VLow	Low	Med	High	Barley-Feed ▼			Barley-Malting ▼		
Nitrate	0-6" 6-24"	18 lb/ac 21 lb/ac				YIELD GOAL			YIELD GOAL		
	0-24"	39 lb/ac				80	BU		80	BU	
		*****				SUGGESTED GUIDELINES			SUGGESTED GUIDELINES		
		*****				Band ▼			Band ▼		
Phosphorus	Olsen	9 ppm				LB/ACRE		APPLICATION	LB/ACRE		APPLICATION
Potassium		291 ppm				N	101		N	85	
		*****				P <sub>2</sub> O <sub>5</sub>	31	Band *	P <sub>2</sub> O <sub>5</sub>	31	Band *
Chloride	0-24"	56 lb/ac				K <sub>2</sub> O	10	Band (Starter)*	K <sub>2</sub> O	10	Band (Starter)*
		*****									

Message?: Fertilize feed barley more even if you are expecting the same yield.

- They are just giving a lower recommendation to ensure lower protein.

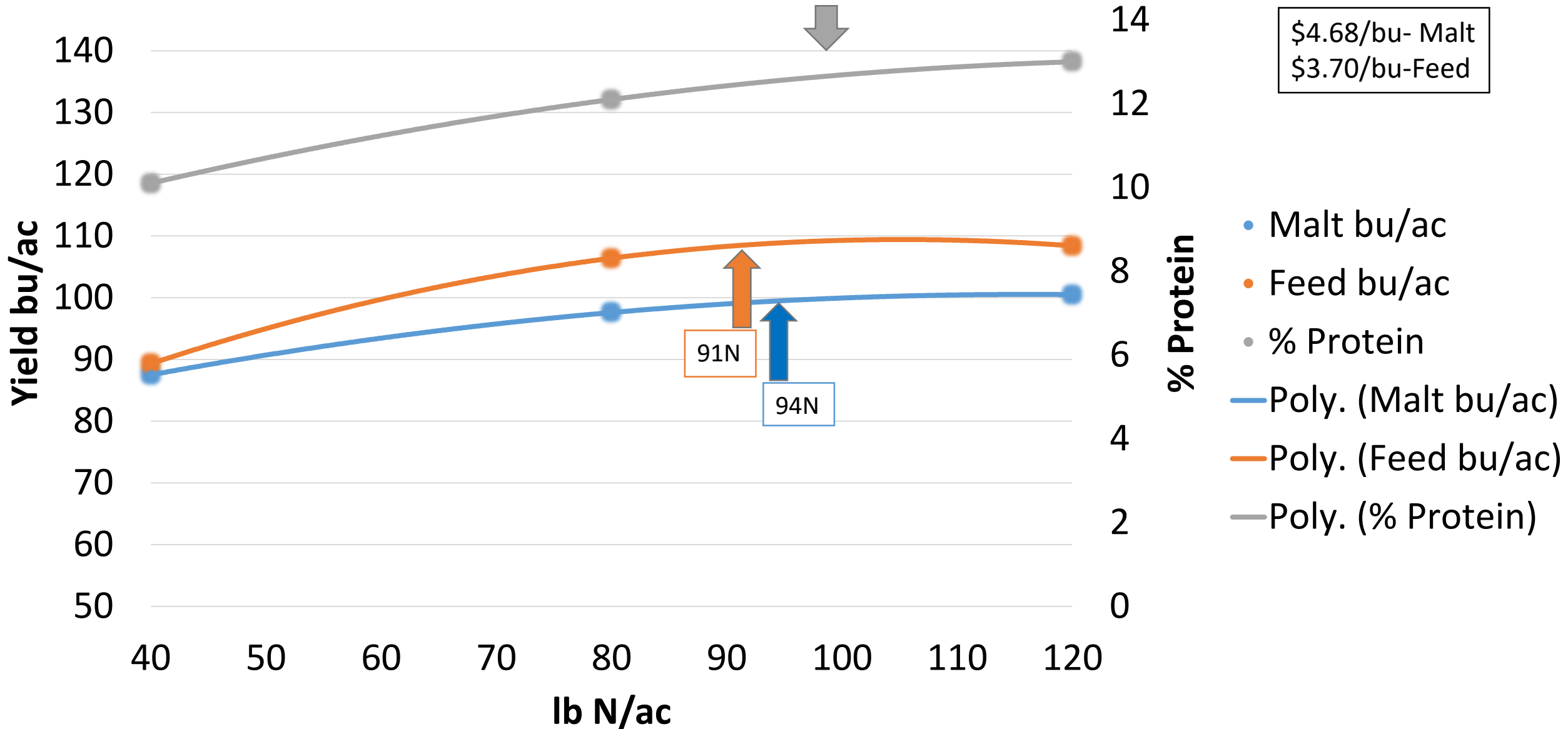
# Malt vs Feed Barley responses to Added N

- 2017 CDC Austenson vs AC Metcalfe
  - N rates 40, 80, 120 lb/ac
  - 3 locations, Reporting on 2
- 2018 CDC Austenson vs CDC Bow
  - N rates 50, 75, 100 lb/ac
  - 7 locations, Reporting on 4
- 2019 CDC Austenson vs AAC Synergy
  - N rates + Soil N 80, 120, 160 lb/ac
  - 8 locations, Reporting on 2

Sites were excluded on the basis of “wonky” yield responses or yield responses that were unresponsive to added N

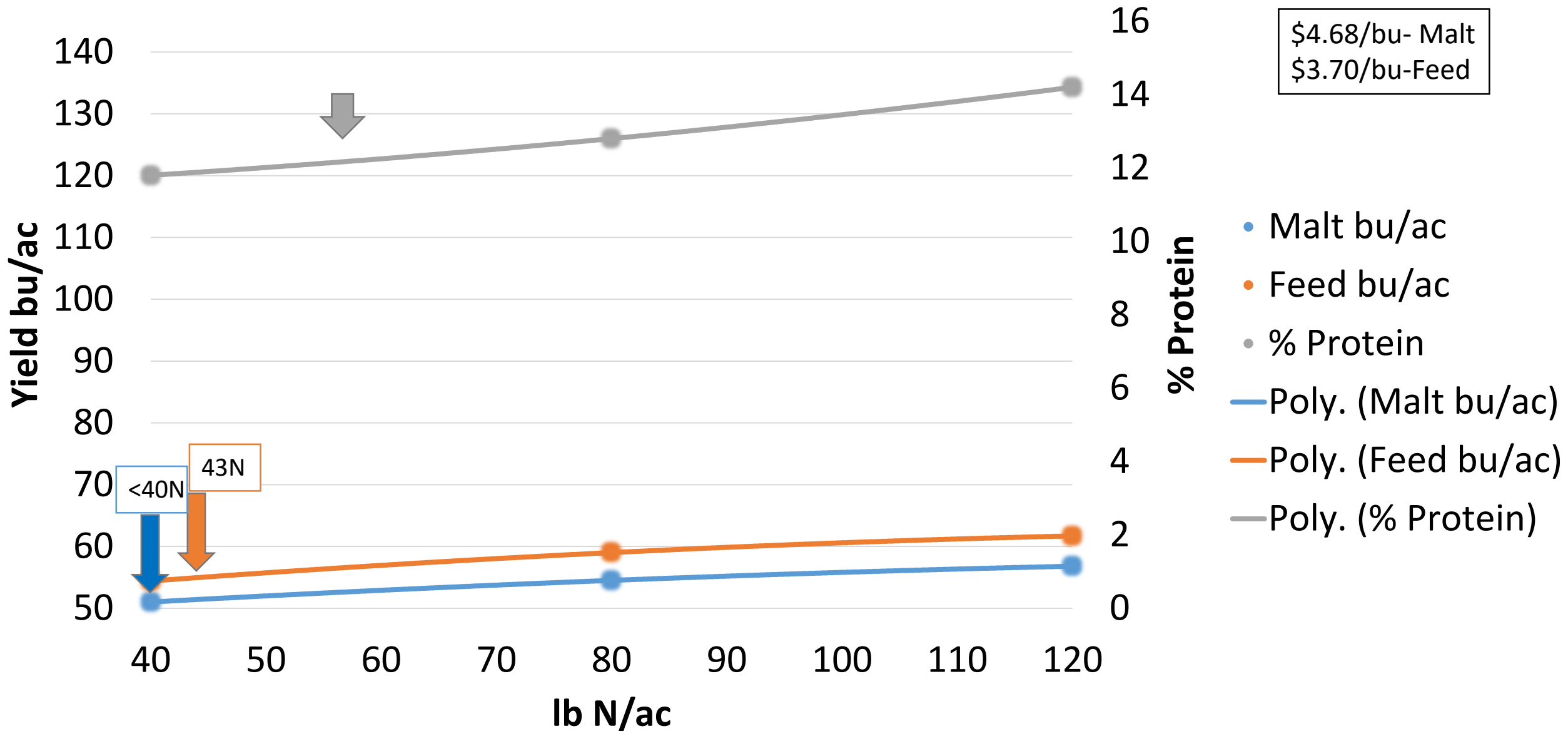
# Indian Head- Yield/Protein of **AC Metcalfe** vs Yield of CDC

## Austenson 2017



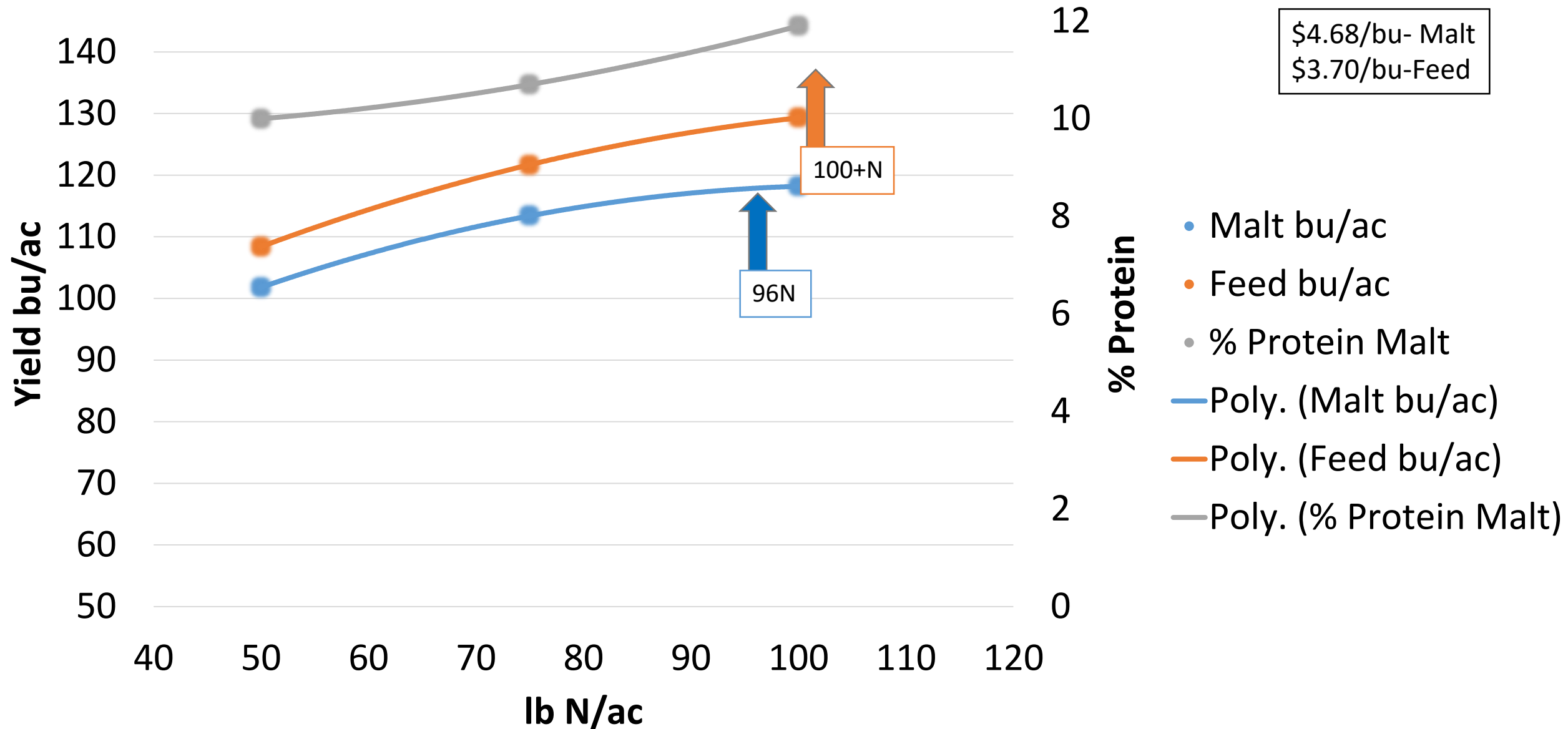


# Scott-Yield/Protein of AC Metcalfe vs Yield of CDC Austenson 2017



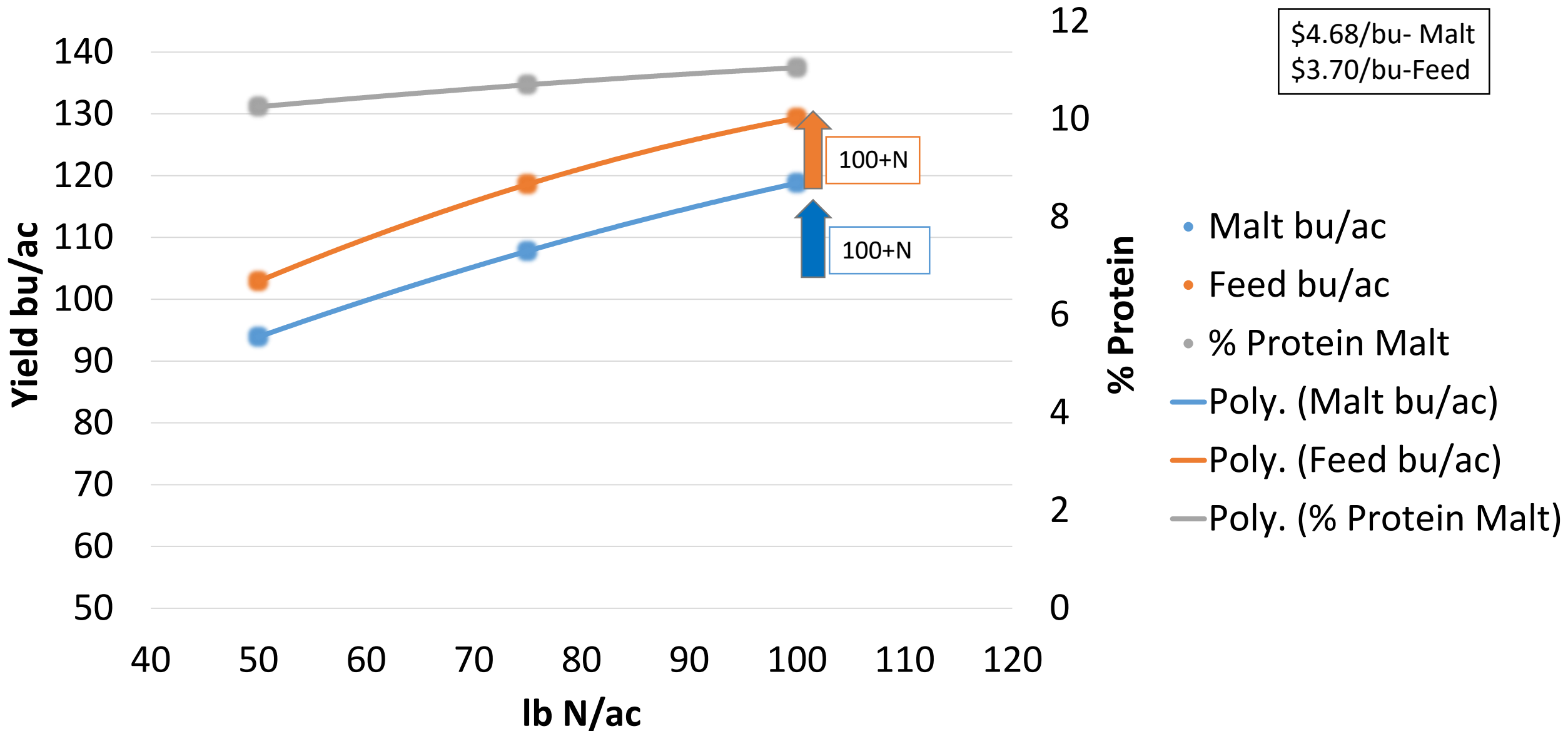
# Yorkton- Yield/Protein of **CDC Bow** vs Yield of CDC Austenson

## 2018

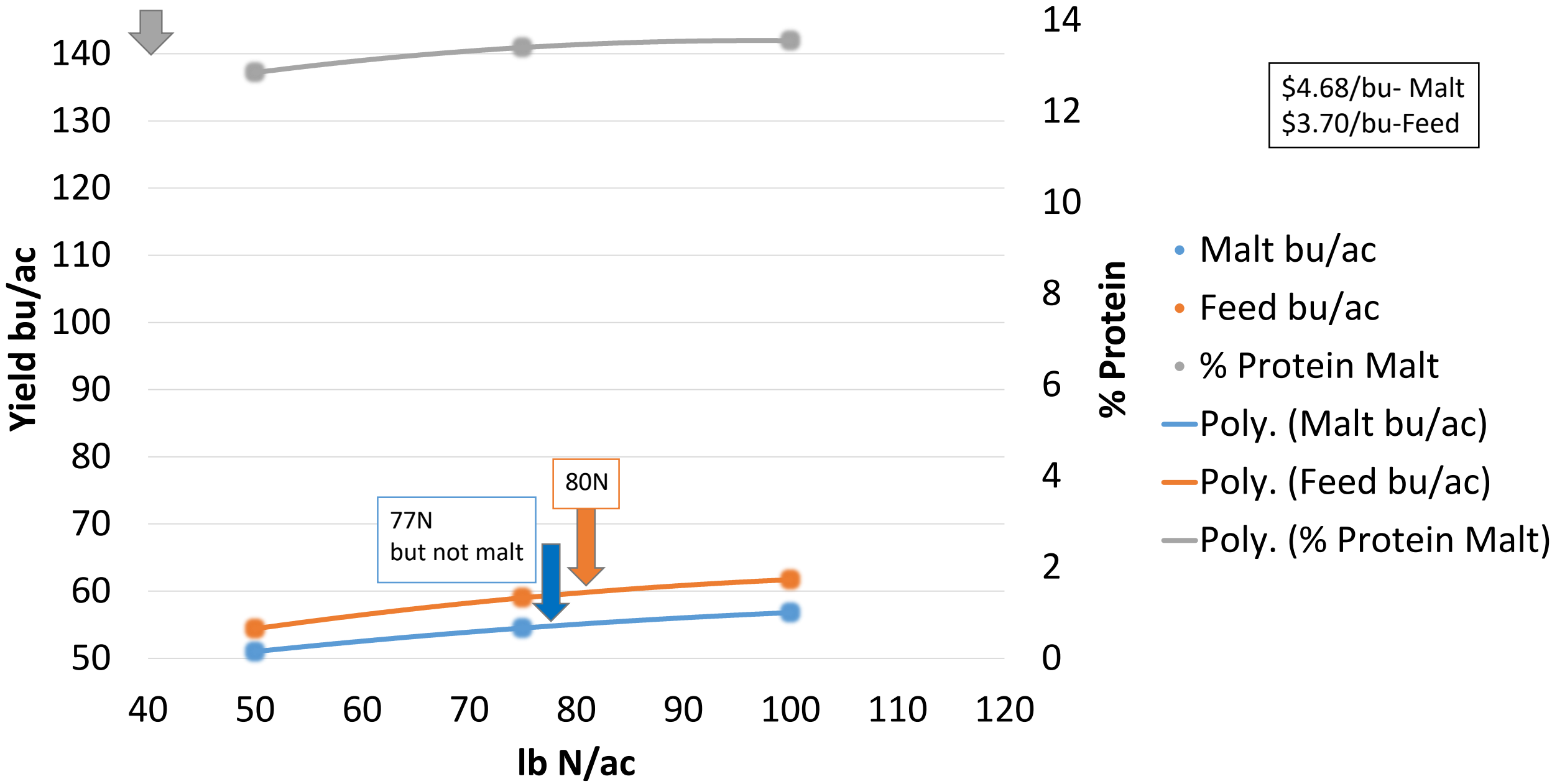


# Melfort- Yield/Protein of CDC Bow vs Yield of CDC Austenson

## 2018



# Scott- Yield/Protein of CDC Bow vs Yield of CDC Austenson 2018

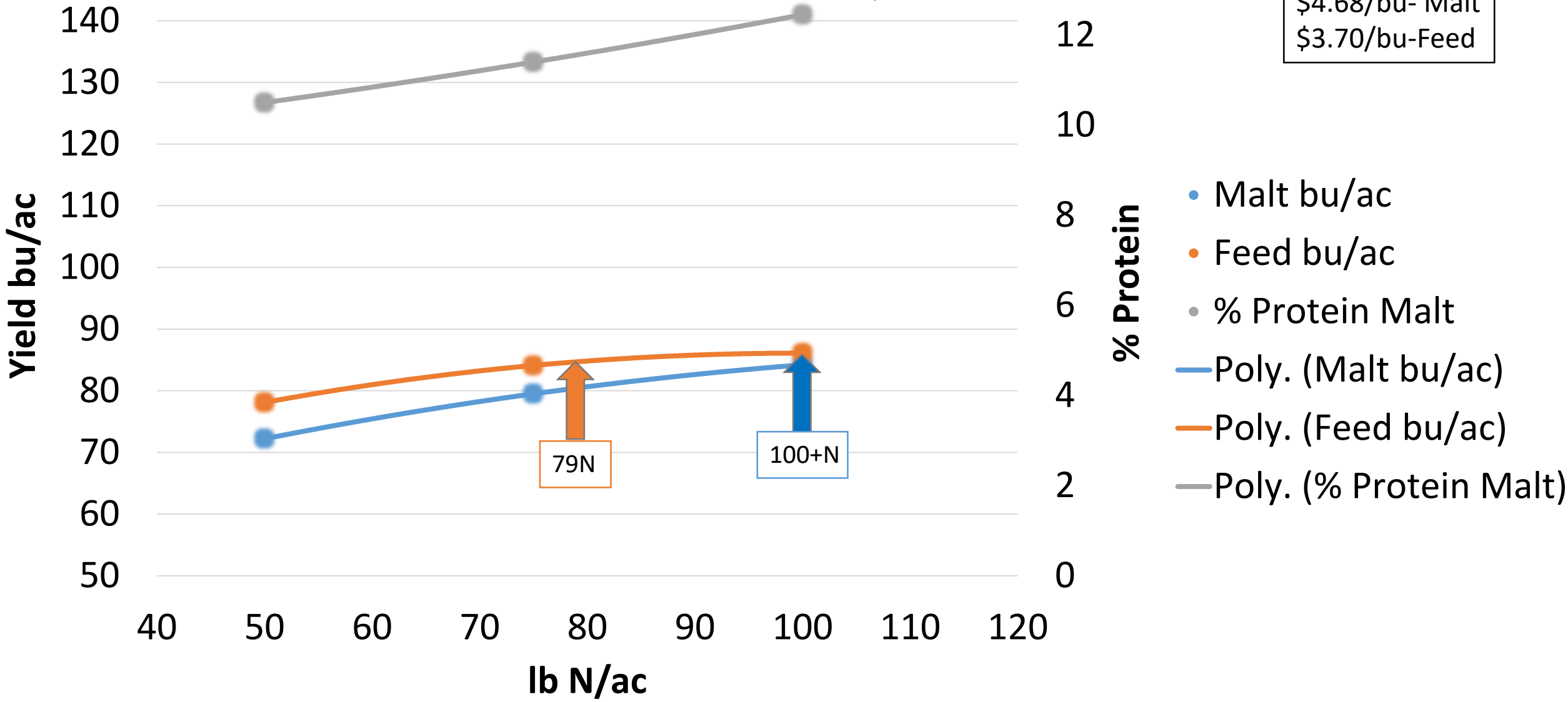


\$4.68/bu- Malt  
\$3.70/bu-Feed

- Malt bu/ac
- Feed bu/ac
- % Protein Malt
- Poly. (Malt bu/ac)
- Poly. (Feed bu/ac)
- Poly. (% Protein Malt)

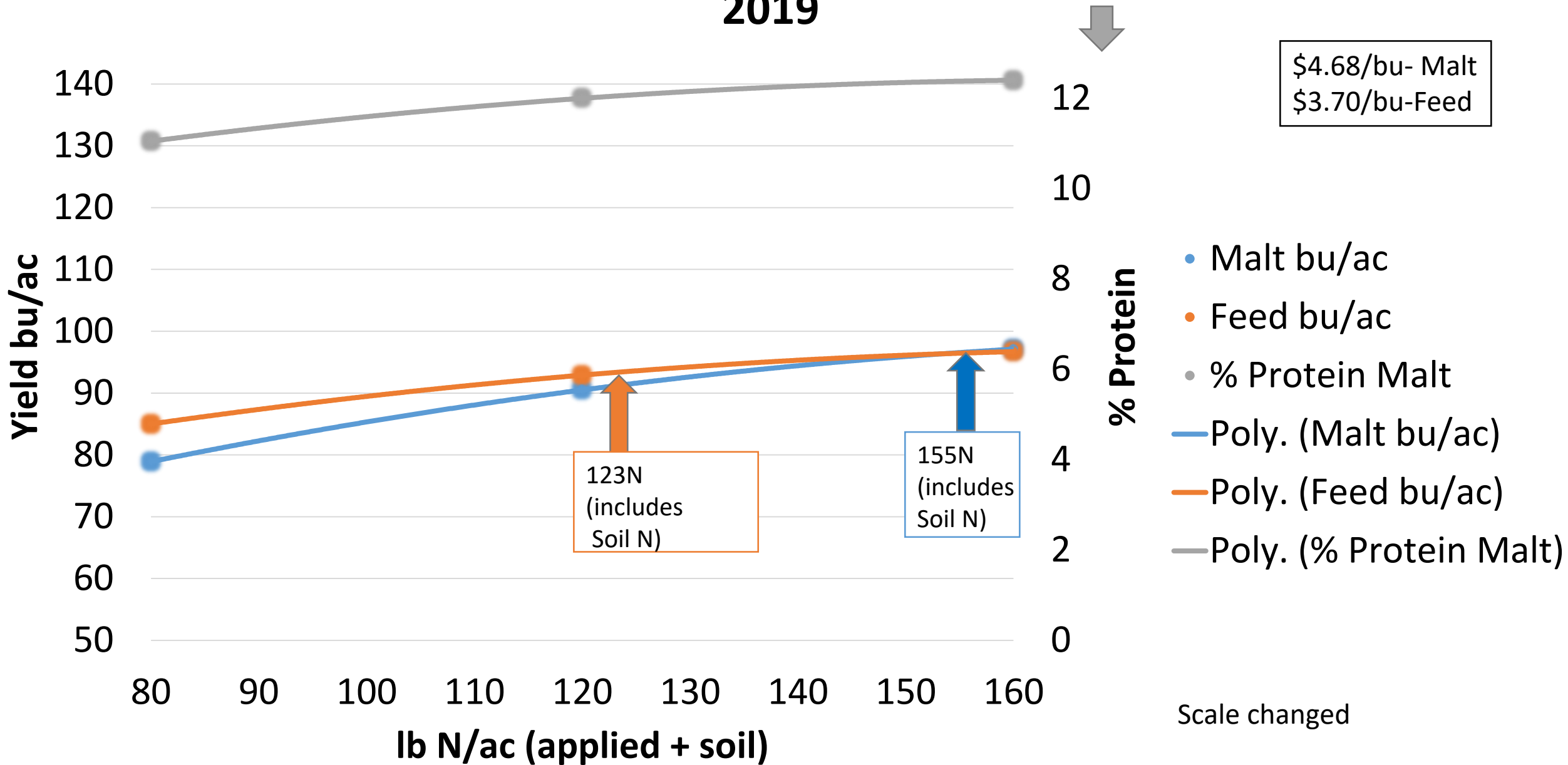
# Indian Head- Yield/Protein of CDC Bow vs Yield of CDC Austenson 2018

\$4.68/bu- Malt  
\$3.70/bu-Feed



# Scott- Yield/Protein of AAC Synergy vs Yield of CDC Austenson

## 2019

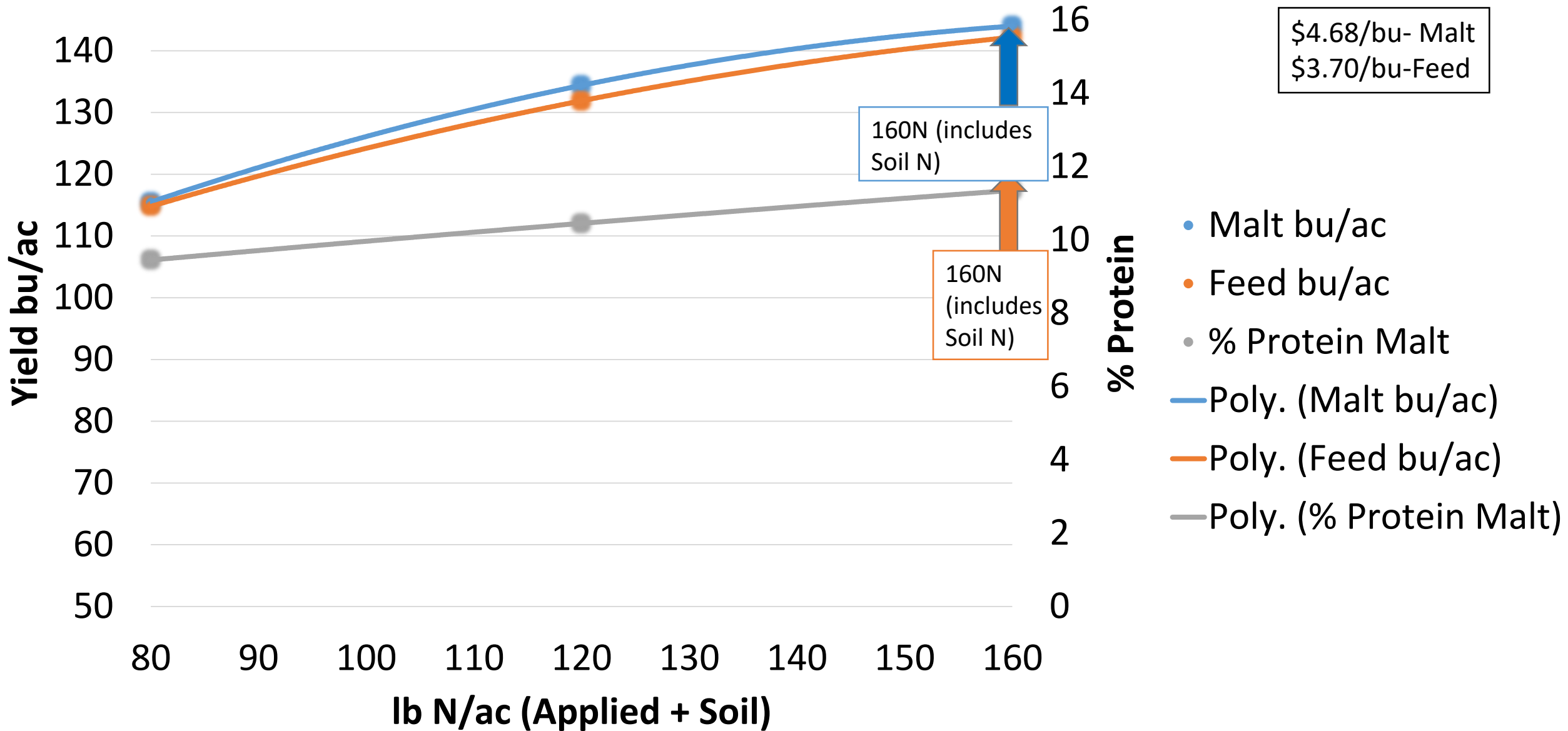


\$4.68/bu- Malt  
\$3.70/bu-Feed

- Malt bu/ac
- Feed bu/ac
- % Protein Malt
- Poly. (Malt bu/ac)
- Poly. (Feed bu/ac)
- Poly. (% Protein Malt)

Scale changed

# Yorkton- Yield/Protein of AAC Synergy vs Yield of CDC Austenson 2019



# Feed vs Malt: Most Economic Rates of N (lb/ac)

Feed Barley	Malt Barley	Difference
91	94	3
43	40	-3
100+	96	-4+
79	100+	21+
123 (+soil N)	155 (+soil N)	32
80	<50	-30+ (due to protein issue)
100+	100+	?
160+ (+soil N)	160+ (+soil N)	?



# Conclusions:

- Yield difference between CDC Austenson and the malt variety was:
  - Large with AC Metcalfe
  - Medium with CDC Bow
  - Small with AAC Synergy
- There may be little reason to grow a feed variety like CDC Austenson, when a malt variety like AAC Synergy (which is becoming more widely accepted by maltsters) can provide similar yields.
- There is little evidence to suggest more N is required for Feed barley
- I'm not going to suggest you fertilize your malt with more N.
- I will suggest it might be worth fertilizing your feed barley with rates similar to your malt if your malt proteins are typically near 12%.
- While there is more risk associated with applying too much N to malt barley, there is little evidence to suggest the most economic rate of N is higher for feed than malt.

# Funding Provided by:

## Agricultural Demonstration of Practices and Technologies (ADOPT)





Nitrogen Recommendation (lb/ac)		
MOIST		
80	85	90
75	95	120
55	75	100
35	55	80
15	35	60
0	15	40

Appendix Table 4. Nitrogen recommendations for feed barley (based on spring broadcast application)<sup>57</sup>.

Nitrogen Recommendation (lb/ac)										
SOIL MOISTURE CATEGORY		DRY			MOIST			IDEAL		
TARGET YIELD (bu/ac)		60	65	70	80	85	90	85	95	105
Fall Soil NO <sub>3</sub> -N										
lb/ac in 0-24"	Rating									
20	VL	45	70	100	75	95	120	95	130	180
30	L	25	50	80	55	75	100	75	110	160
40	M	5	30	60	35	55	80	55	90	140
50	M	0	10	40	15	35	60	35	70	120
60	H	0	0	20	0	15	40	15	50	100
70	H	0	0	0	0	0	20	0	30	80
90	VH	0	0	0	0	0	0	0	10	60
100	VH+	0	0	0	0	0	0	0	0	40

NITROGEN RECOMMENDATION (lb/ac)		
MOIST		
65	70	75
80	105	155
60	80	135
40	60	115
20	45	95
0	25	75
0	5	55
0	0	35
0	0	15
0	0	0

Appendix Table 5. Nitrogen recommendations for malting barley (based on spring broadcast application)<sup>58</sup>.

NITROGEN RECOMMENDATION (lb/ac)										
SOIL MOISTURE CATEGORY		DRY			MOIST			IDEAL		
TARGET YIELD (bu/ac)		55	60	65	65	70	75	75	80	85
Fall Soil NO <sub>3</sub> -N										
lb/ac in 0-24"	Rating									
20	VL	50	80	130	80	105	155	125	150	180
30	L	30	60	105	60	80	135	105	130	160
40	M	10	40	85	40	60	115	85	110	140
50	M	0	20	65	20	45	95	65	90	120
60	H	0	0	45	0	25	75	45	70	100
70	H	0	0	25	0	5	55	25	50	80
80	VH	0	0	0	0	0	35	5	30	60
90	VH	0	0	0	0	0	15	0	10	40
100	VH+	0	0	0	0	0	0	0	0	20

Appendix

Message?: Target fewer bushels of Malt and Apply more N to reach that goal. Did they switch the tables?

0	0	0
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