

# N Management for High Protein Wheat, Milling Oats, Feed Barley and Malt



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

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# 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	
Chloride	0-24"	56 lb/ac	*****				P <sub>2</sub> O <sub>5</sub>	31	Band *	P <sub>2</sub> O <sub>5</sub>	31	Band *
	0-6"	34 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.

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

Adopt and SaskBarley funded

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



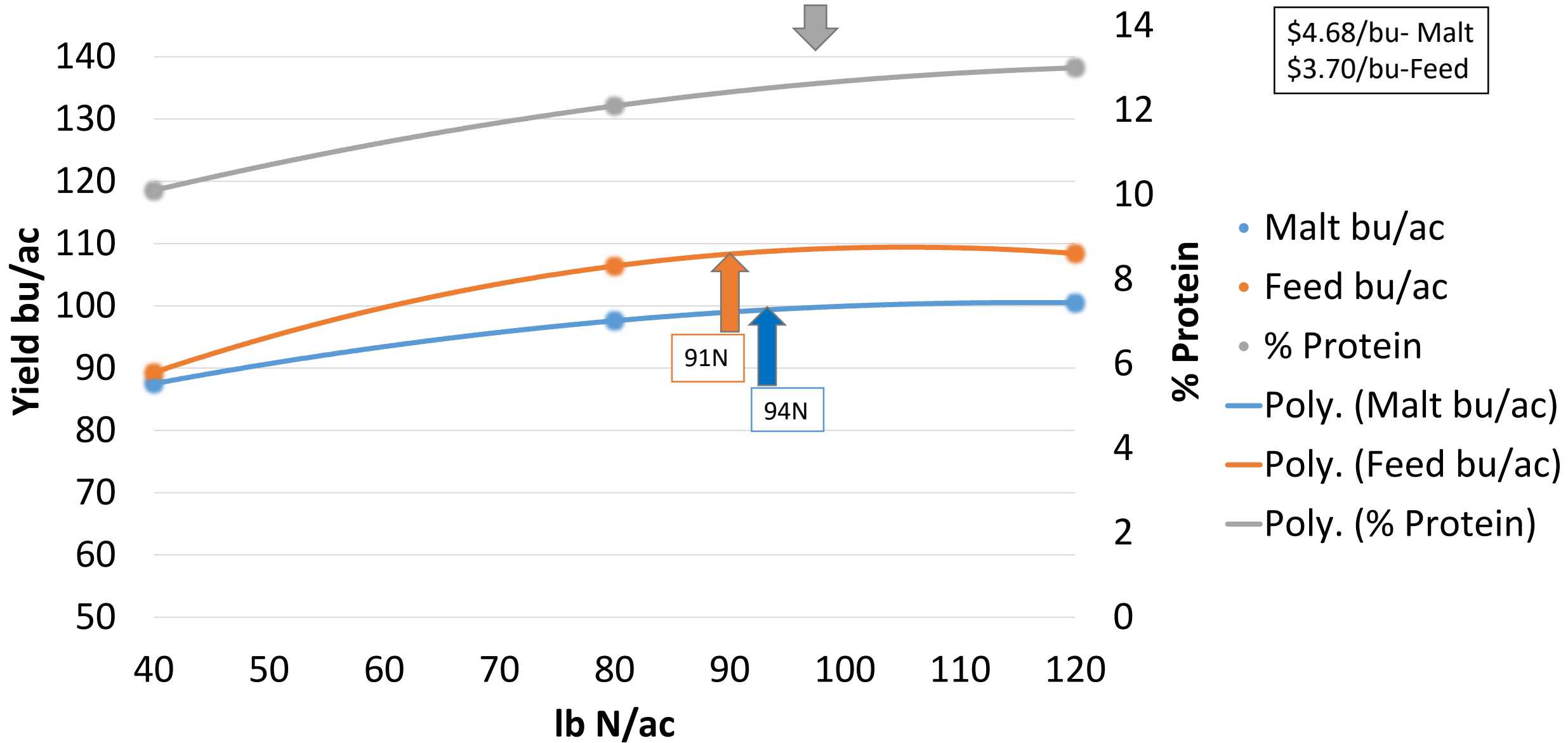
# Malt vs Feed Barley responses to Added N

- 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

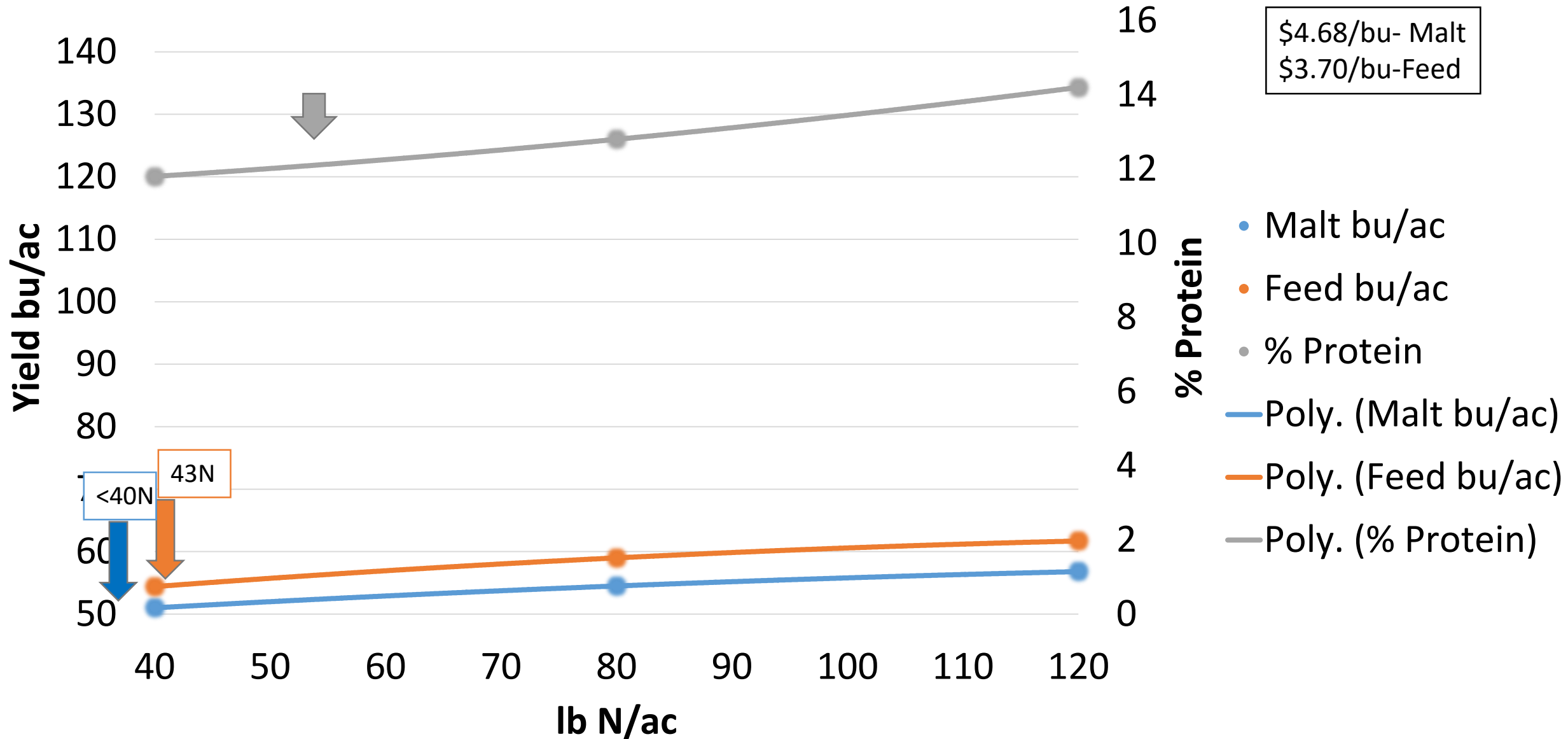
Sites were excluded on the basis of “wonky” yield responses or yield responses that were unresponsive to added N

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

## Austenson 2017



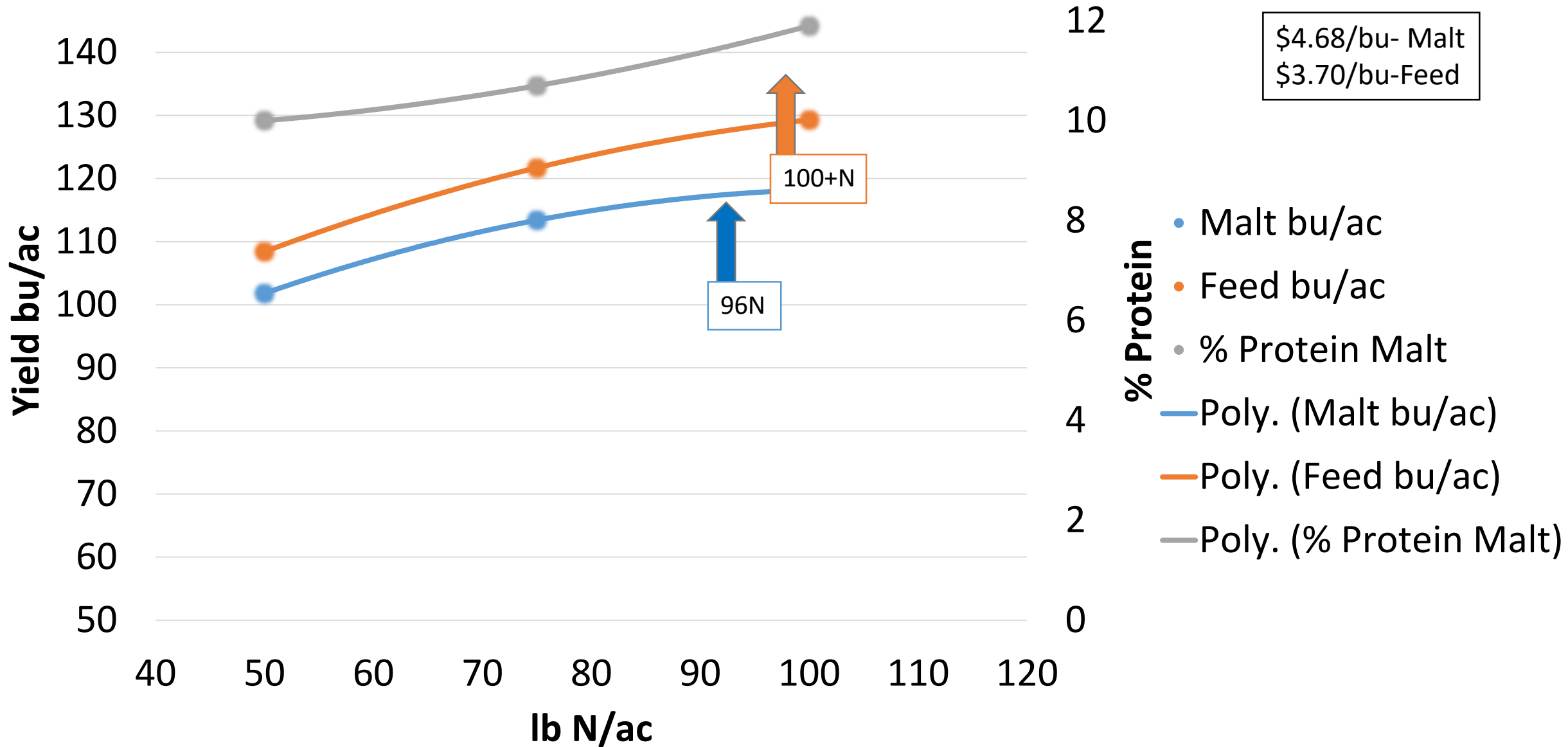
# Scott-Yield/Protein of AC Metcalfe vs Yield of CDC Austenson 2017





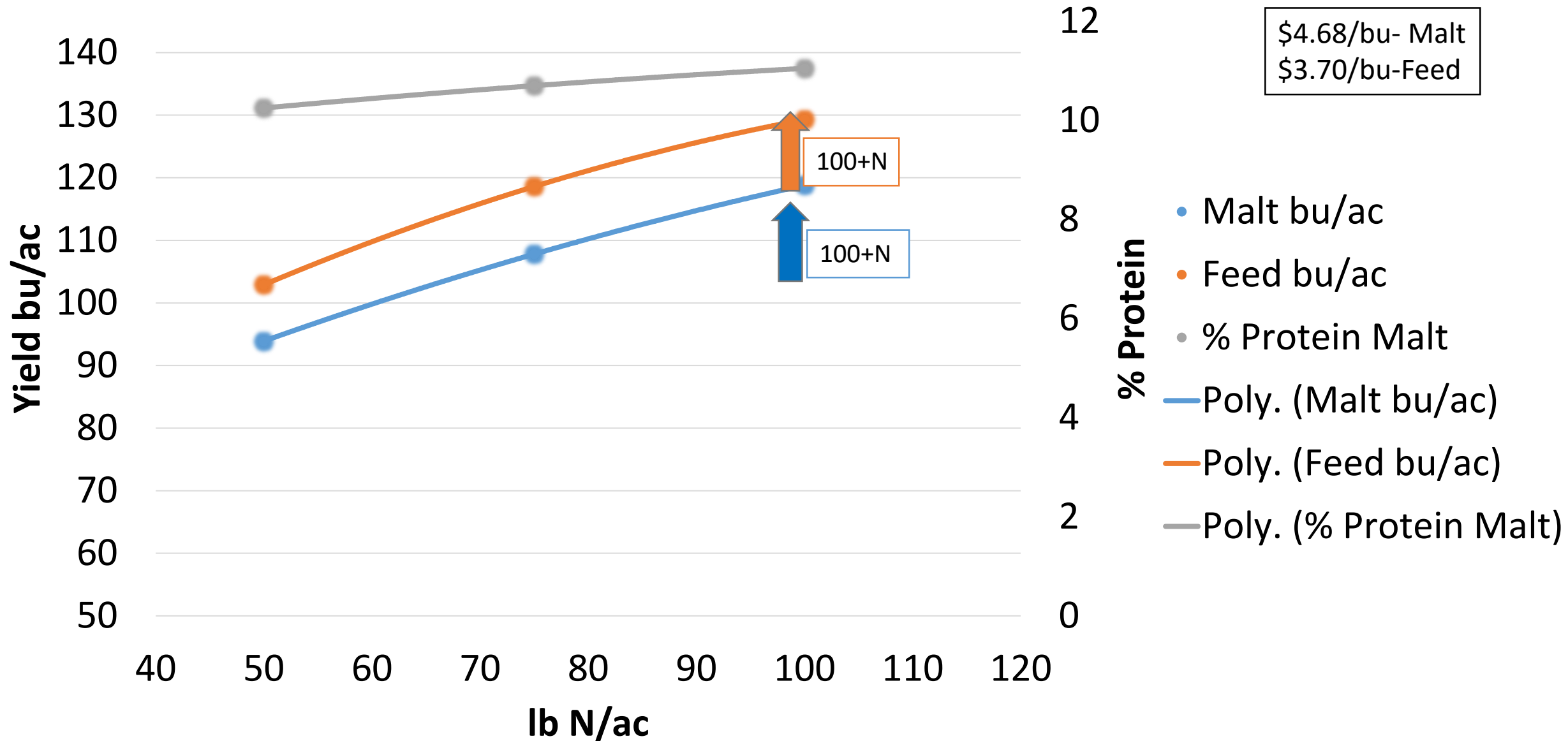
# Yorkton- Yield/Protein of **CDC Bow** vs Yield of CDC Austenson

## 2018

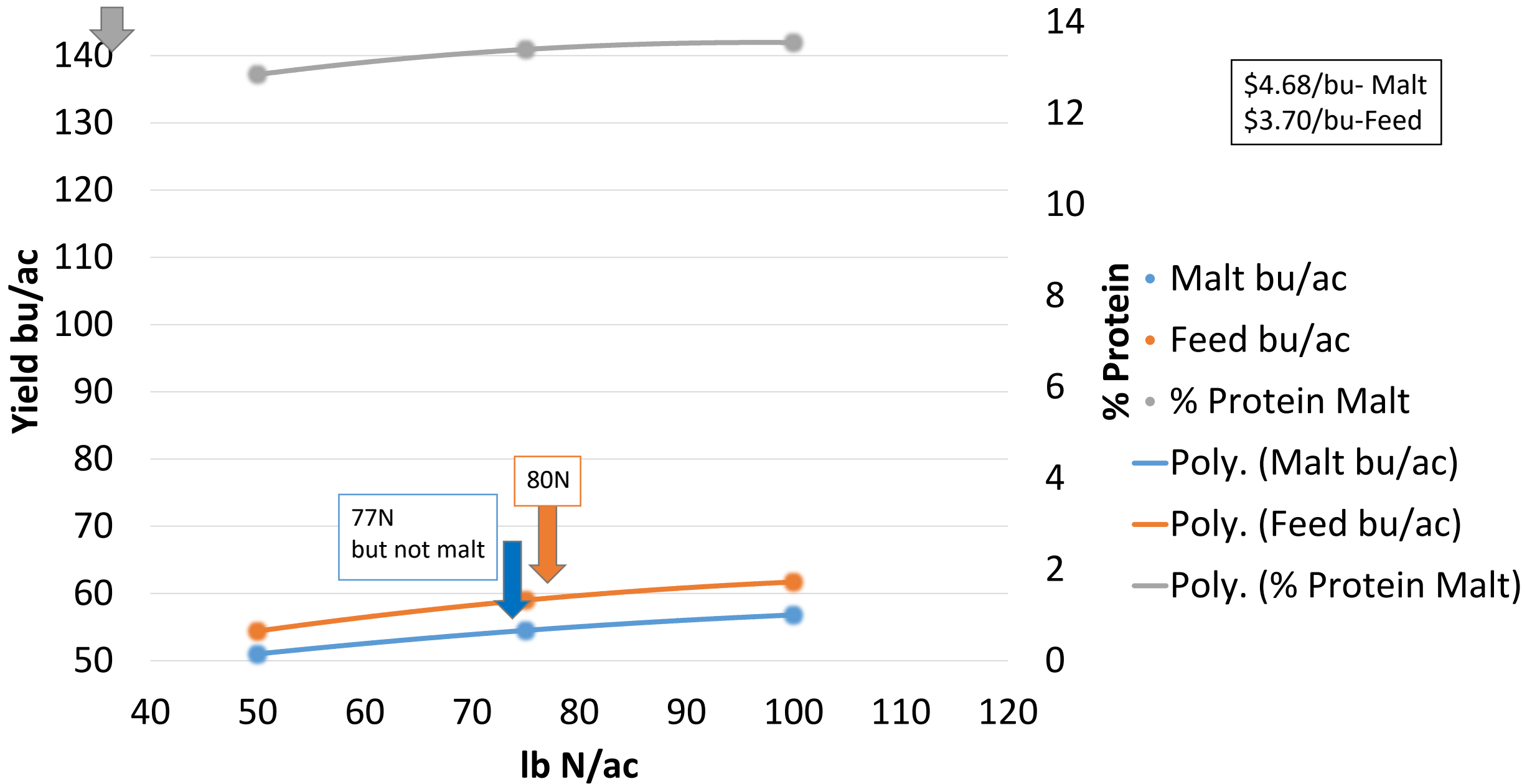


# Melfort- Yield/Protein of CDC Bow vs Yield of CDC Austenson

## 2018

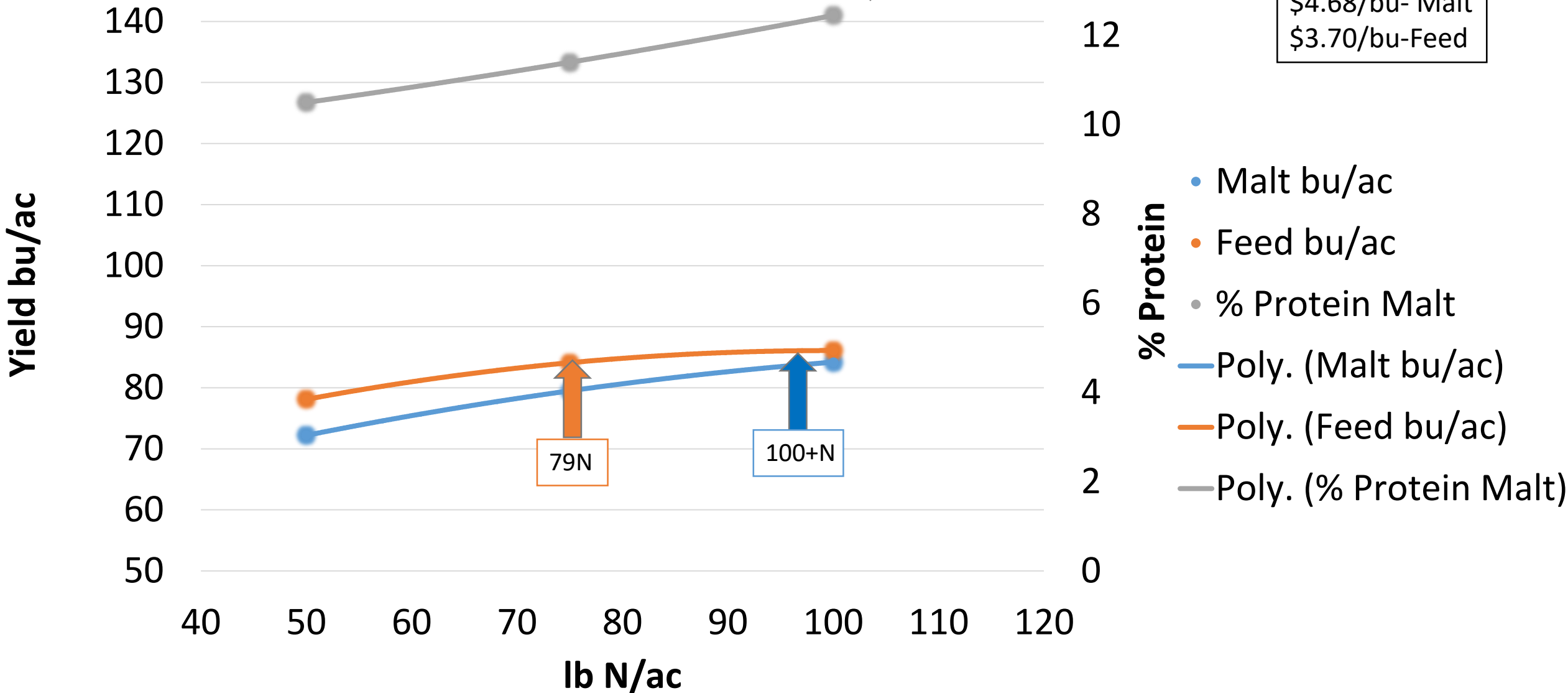


# Scott- Yield/Protein of CDC Bow vs Yield of CDC Austenson 2018



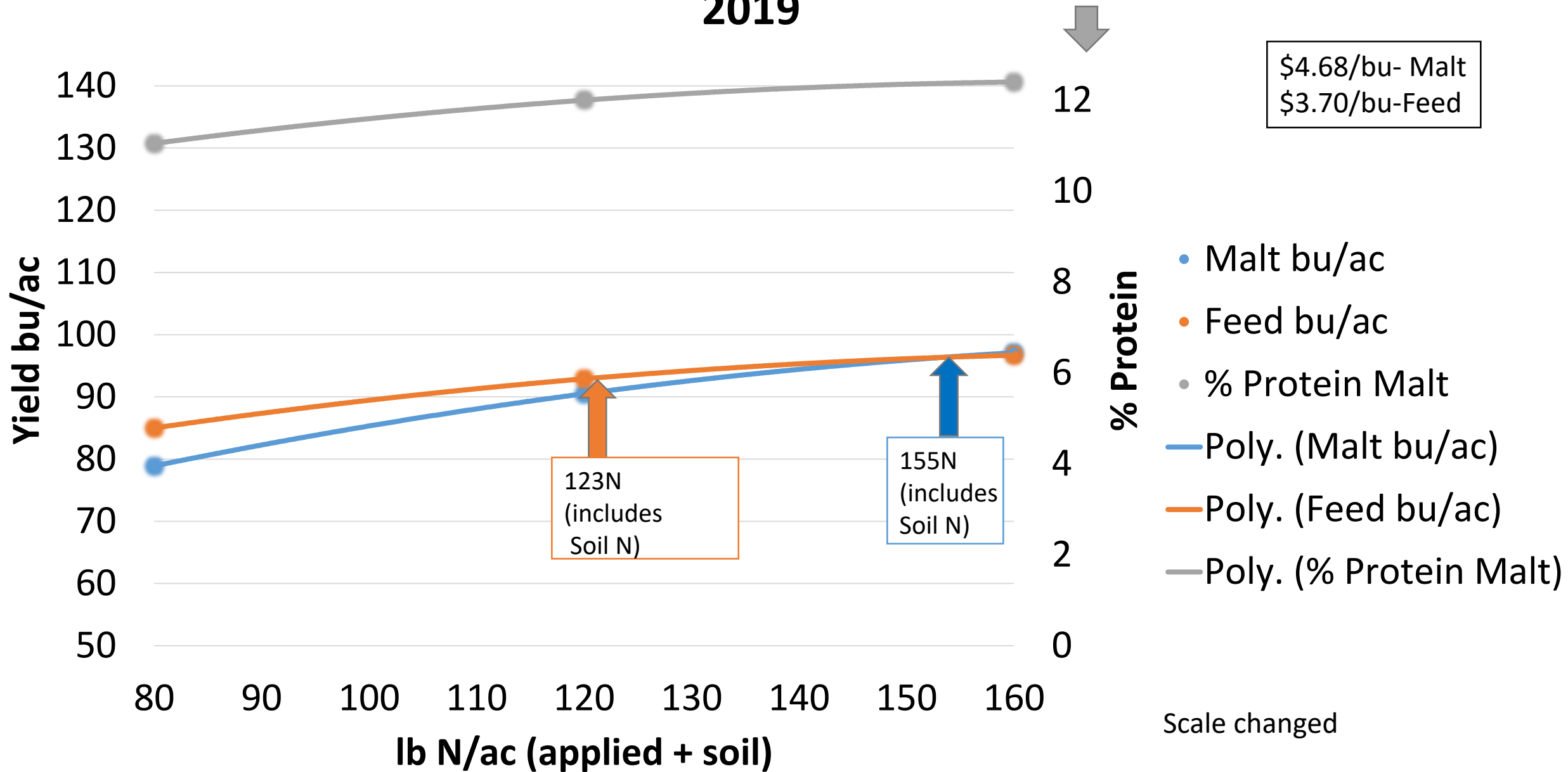
# Indian Head- Yield/Protein of CDC Bow vs Yield of CDC Austenson 2018

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

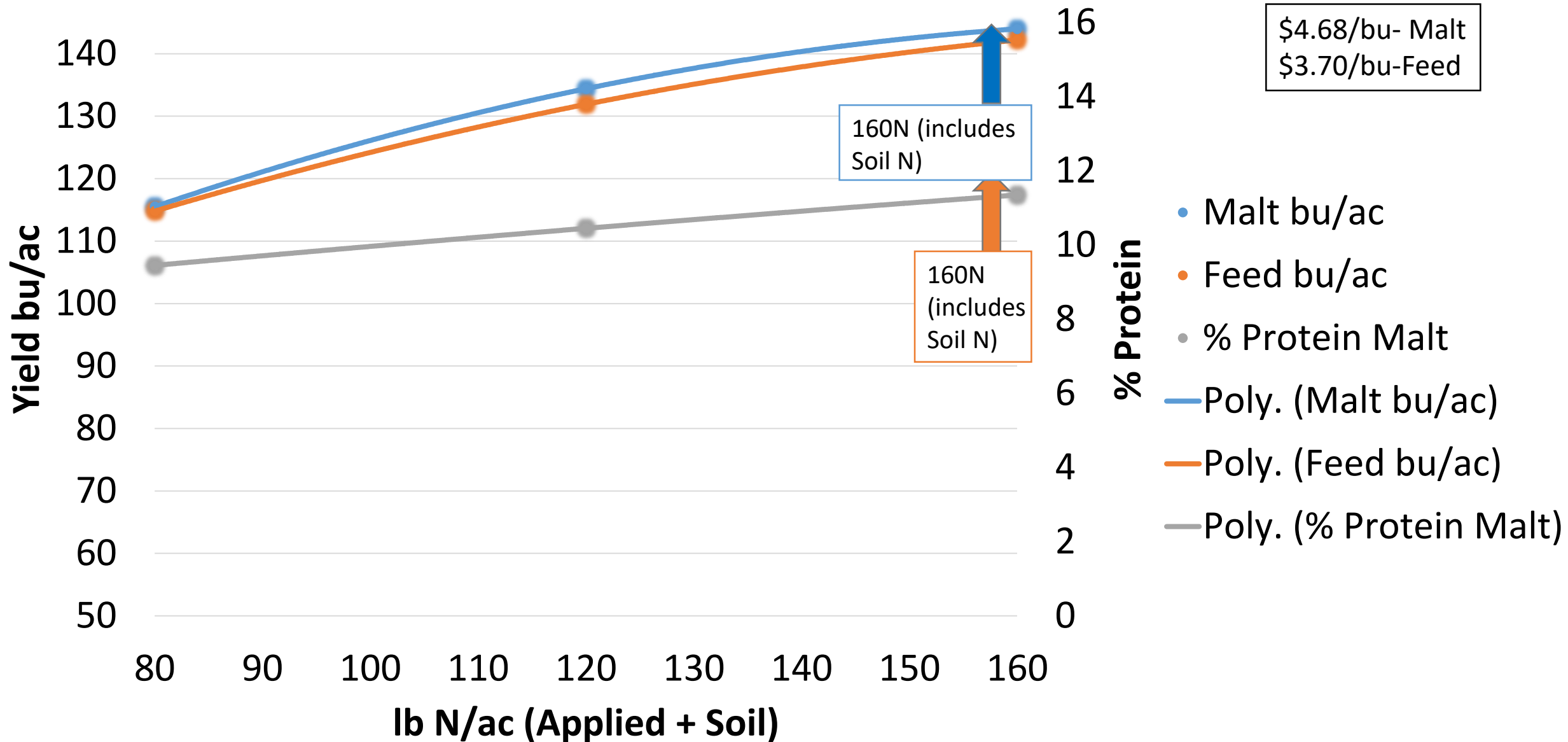


# Scott- Yield/Protein of AAC Synergy vs Yield of CDC Austenson

## 2019



# 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)



# 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>



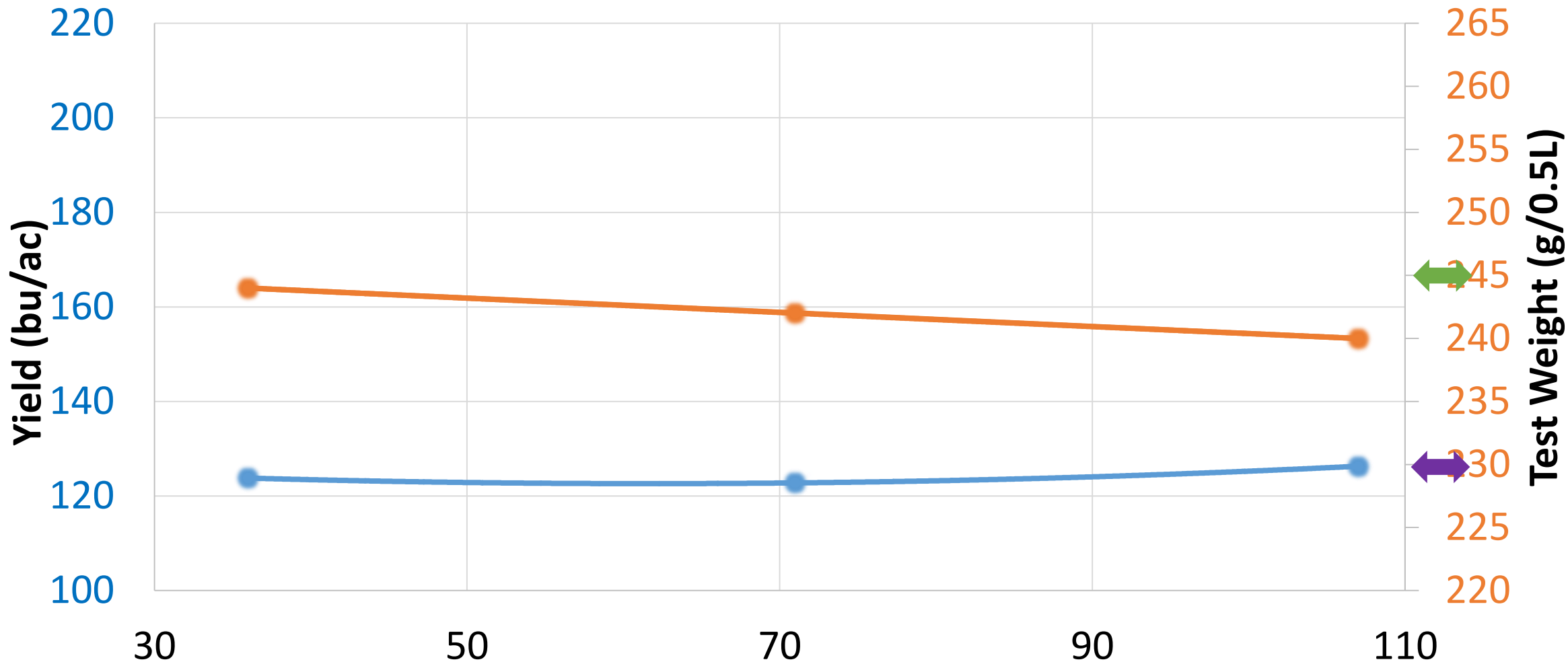
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# CS Camden vs Summit

## Nitrogen 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

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

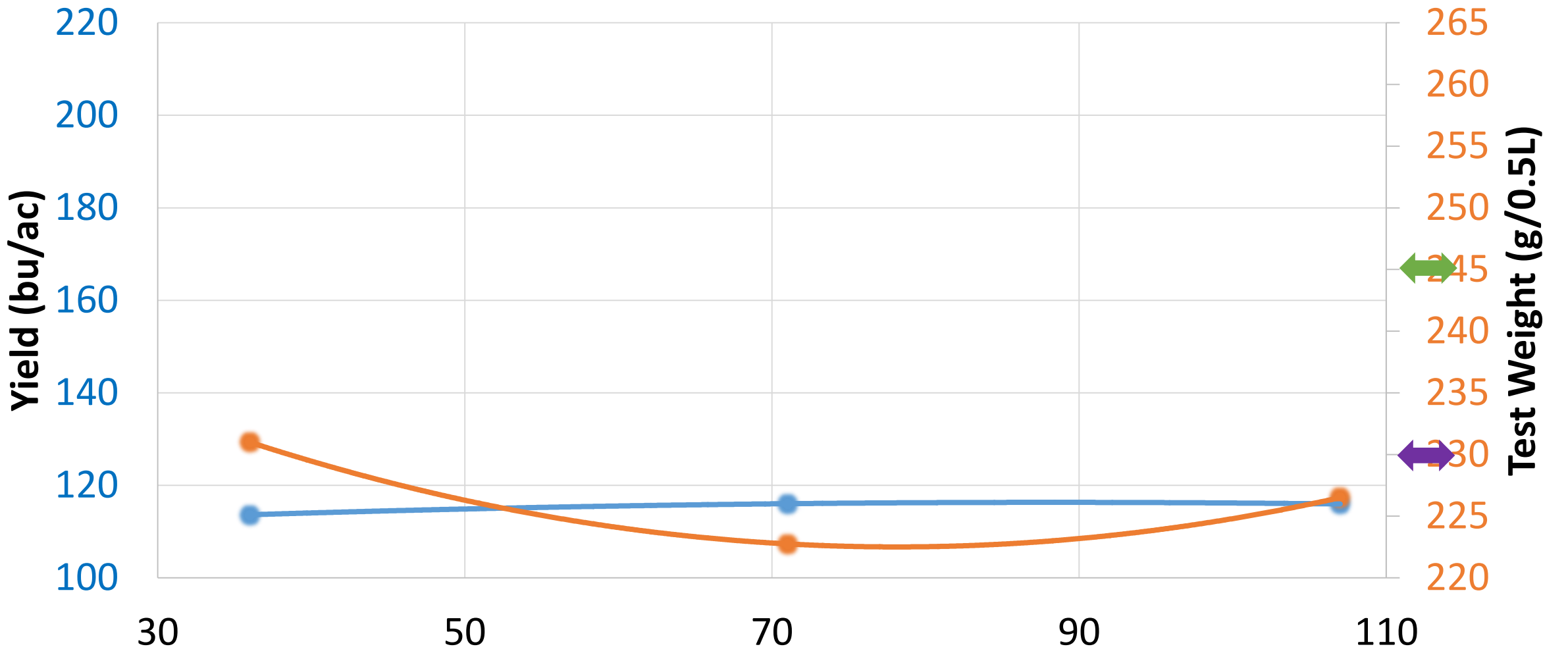


Significant DV and DR interactions for yield

Only significant effect of variety and nitrogen rate

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

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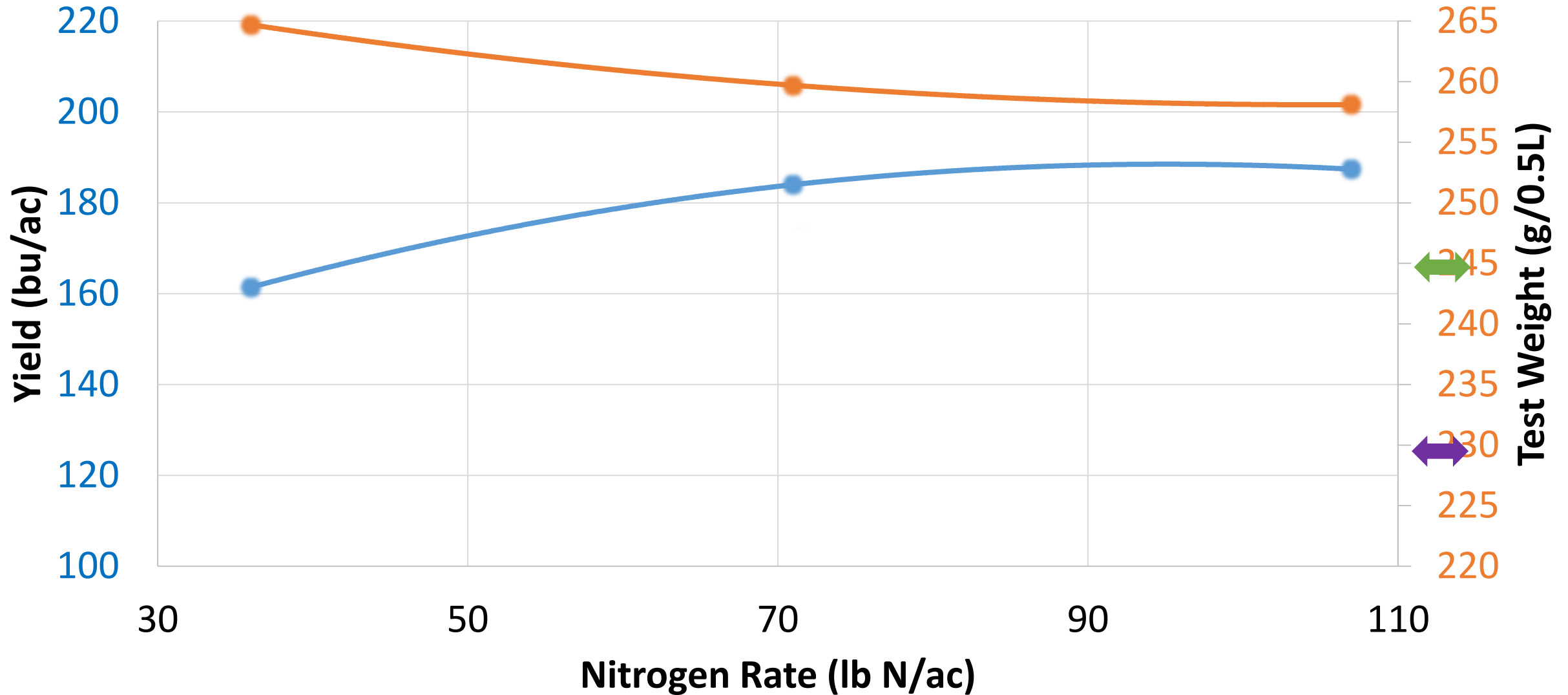
# Summit Oat Economics for Indian Head 2019 – Seeded Late

Lb N/ac	Bu/ac	Test wt.	\$ N/ac (@ \$0.5/lb N)	\$Gross/ac (@ \$3.23/bu)	\$Discount/a c	\$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

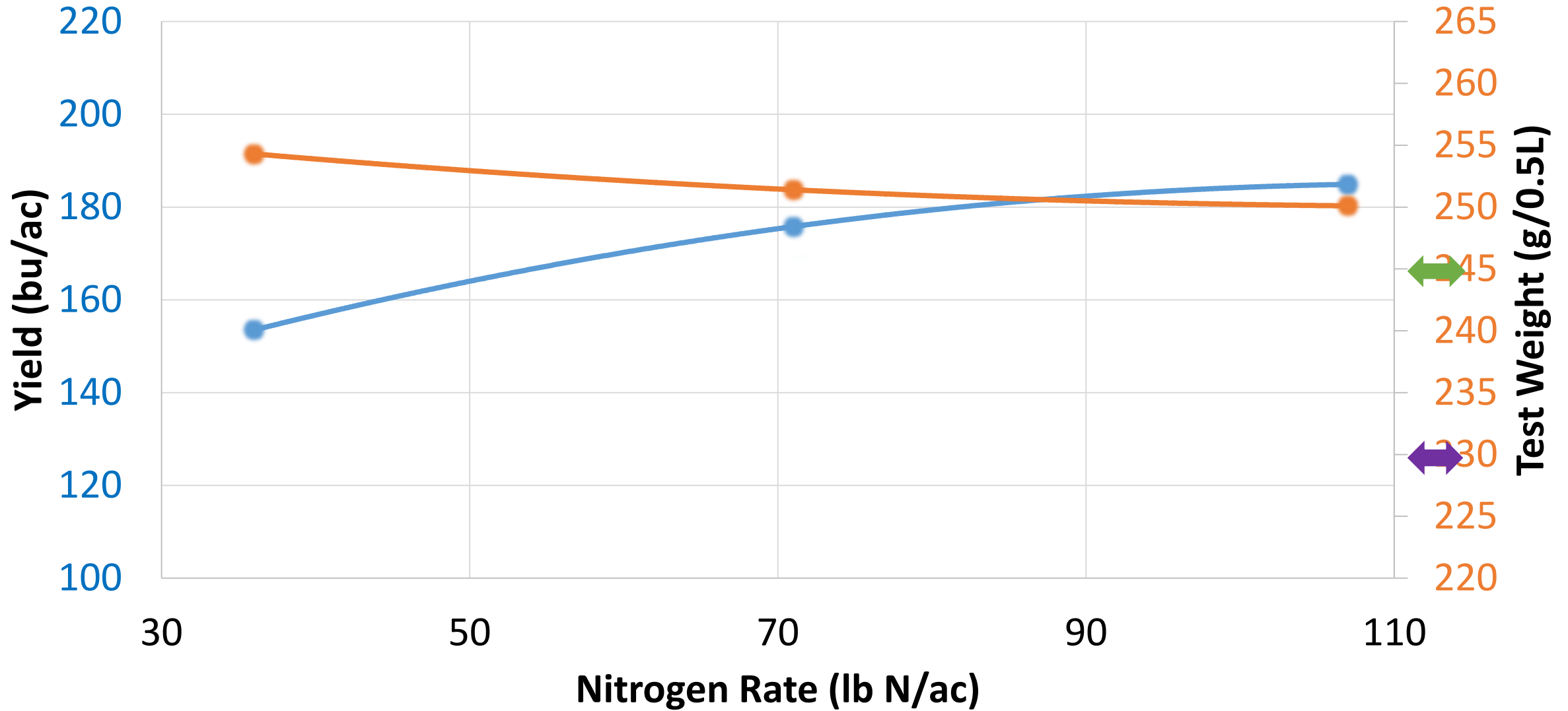
Lb N/ac	Bu/ac	Test wt.	\$ N/ac (@ \$0.5/lb N)	\$Gross/ac (@ \$3.23/bu)	\$Discount/a c	\$Gross/ac- (\$N/ac+\$Discount/ac)
36	114	231.0	18	367	9.09	340
71	116	222.8	35.5	374	reject	?
107	116	226.6	53.5	374	reject	?

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



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

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



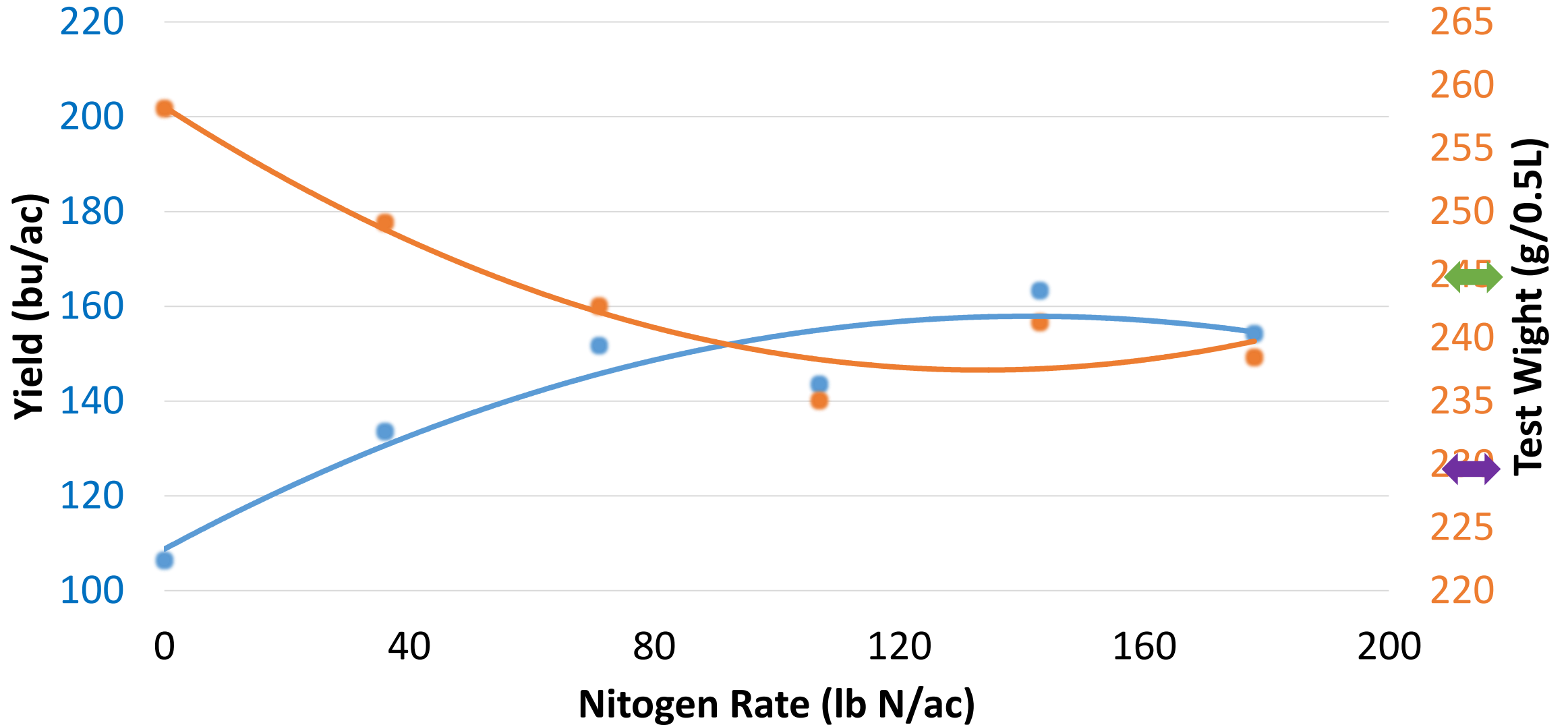
# Summit Oat Economics for Yorkton 2019 – Averaged over Seeding Date

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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

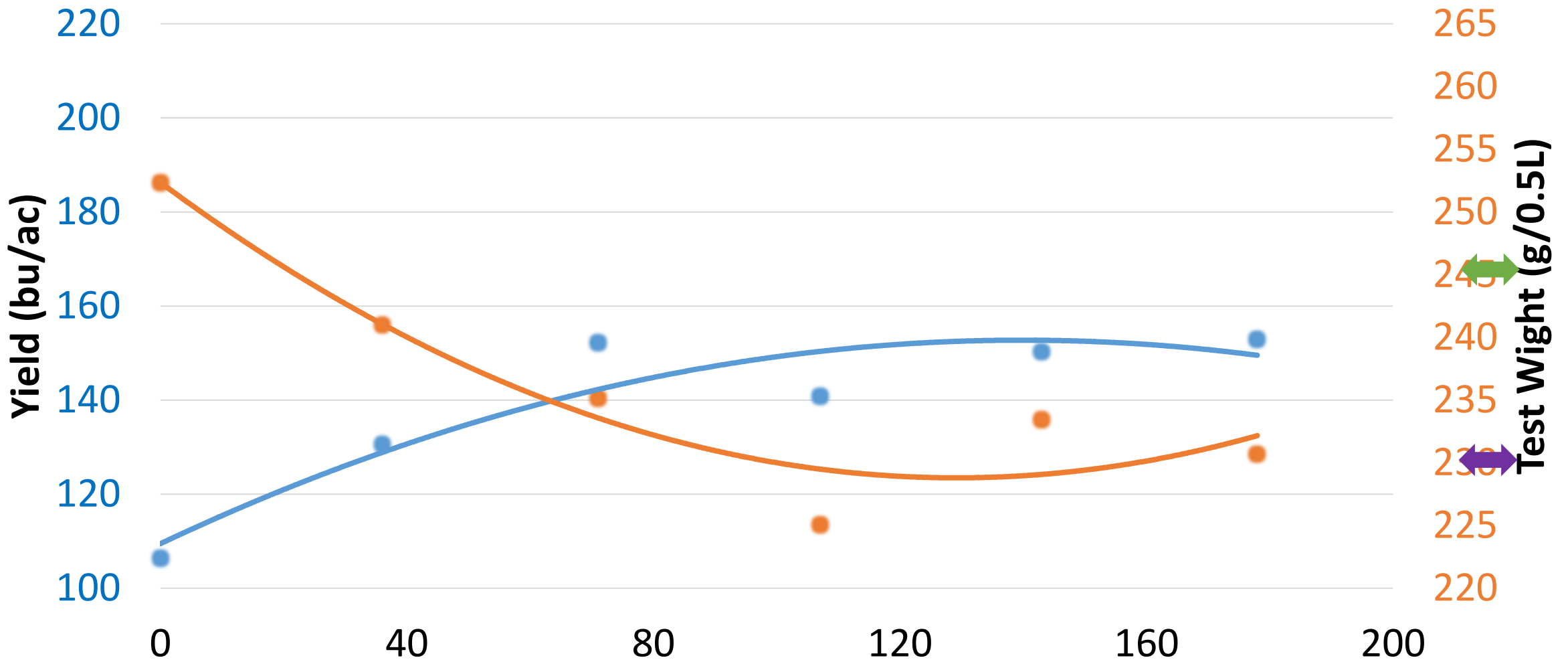
Lb N/ac	Bu/ac	Test wt.	\$ N/ac (@ \$0.5/lb N)	\$Gross/ac (@ \$3.23/bu)	\$Discount/a c	\$Gross/ac- (\$N/ac+\$Discount/ac)
36	154	254.4	18	496	0	478
71	176	251.6	35.5	568	0	533
107	185	250.6	53.5	598	0	544

# Yorkton 2019 another trial: Test Weight and Yield of Summit Oats with Increasing Nitrogen Rate



• Summit Oats    • Test Weight    — Poly. (Summit Oats)    — Poly. (Test Weight)

# Yorkton 2019 another trial: Test Weight and Yield of Camden Oats with Increasing Nitrogen Rate



• CS Camden Oats   
 • Test Weight   
 — Poly. (CS Camden Oats)   
 — Poly. (Test Weight)

Summit Oat Economics Yorkton 2019 (Trial 151)

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)
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)

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)
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

# Different Results from nearby trials!

- Two Yorkton sites
  - 3 miles apart
  - Seeded within 10 days
  - Similar background nitrogen and organic matter
  - 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 is adequate because it comes close to maximizing returns with a reduced risk of rejection based on low test weight.
- Summit is less likely to be rejected than Camden based on low test weights. In other words, you can push the N more with Summit provided it doesn't lodge.

# Funding Provided by:



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

Supported by:



# Impact of Late Season Nitrogen on Wheat Yield and Protein (UAN vs Dissolved Urea)

Dissolving Urea is Endothermic  
Urea with >1% biuret will burn the crop

**Indian Head** – Indian Head Agricultural Research Foundation (IHARF)

**Melfort** – Northeast Agriculture Research Foundation (NARF)

**Redvers** – South East Research Farm (SERF)

**Outlook** – Irrigation Crop Diversification Corporation (ICDC)

**Prince Albert** – Conservation Learning Center (CLC)

**Scott** – Western Applied Research Corporation (WARC)

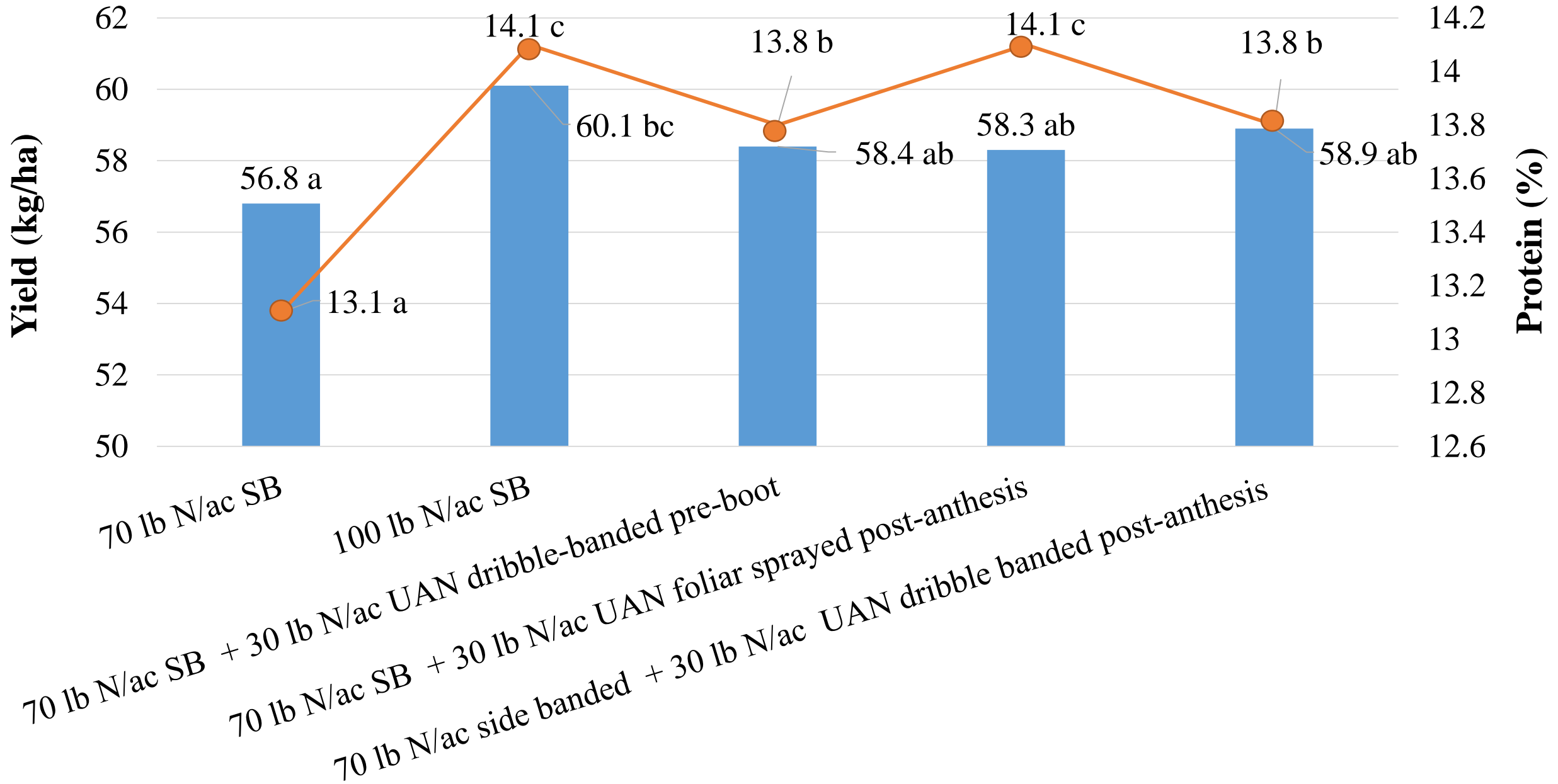
**Swift Current** – Wheatland Conservation Area Inc. (WCA)

**Yorkton** – East Central Research Foundation (ECRF)

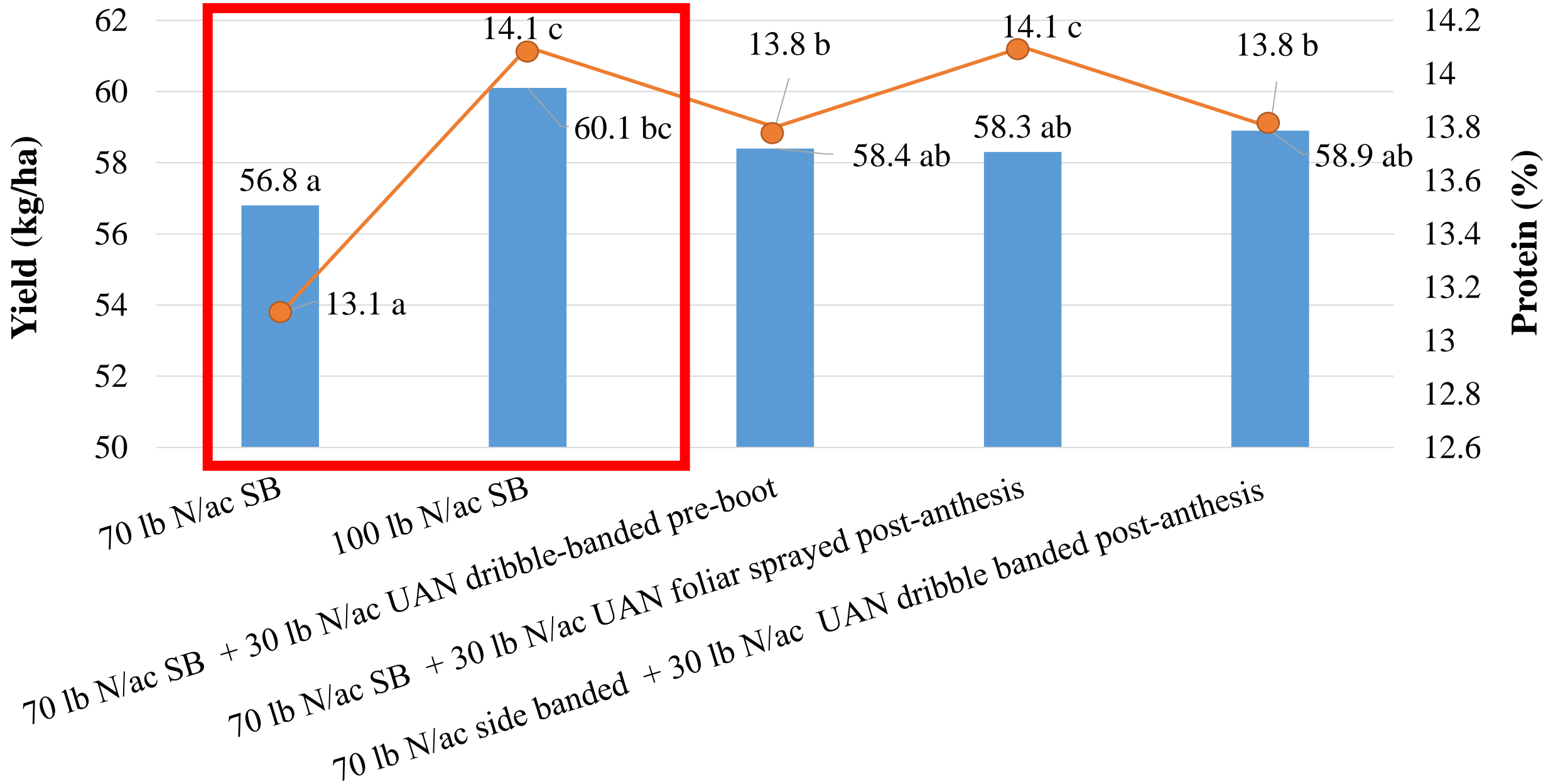




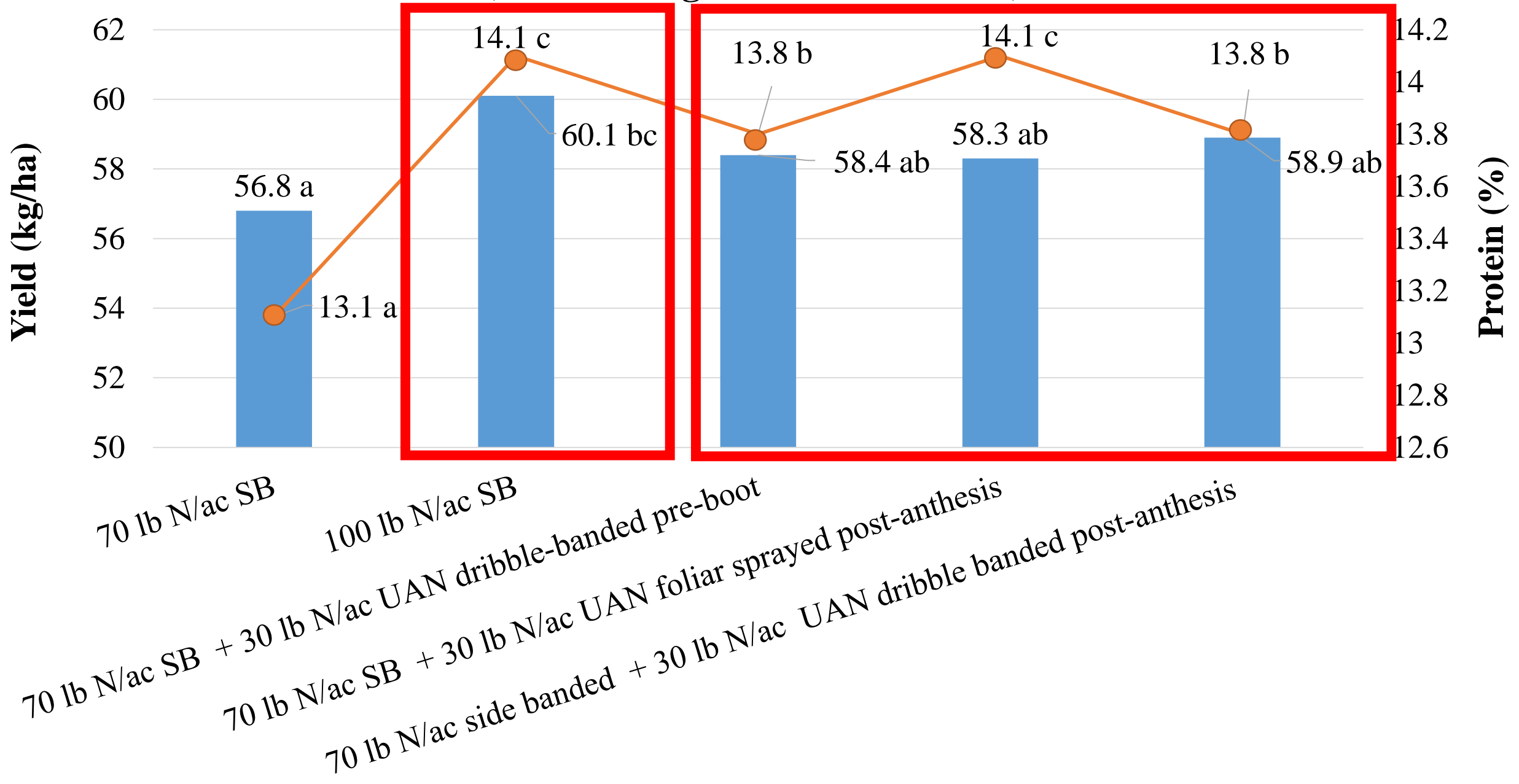
# Impact of Late Season Nitrogen on Wheat Yield and Protein (2018-averaged over 7 locations)



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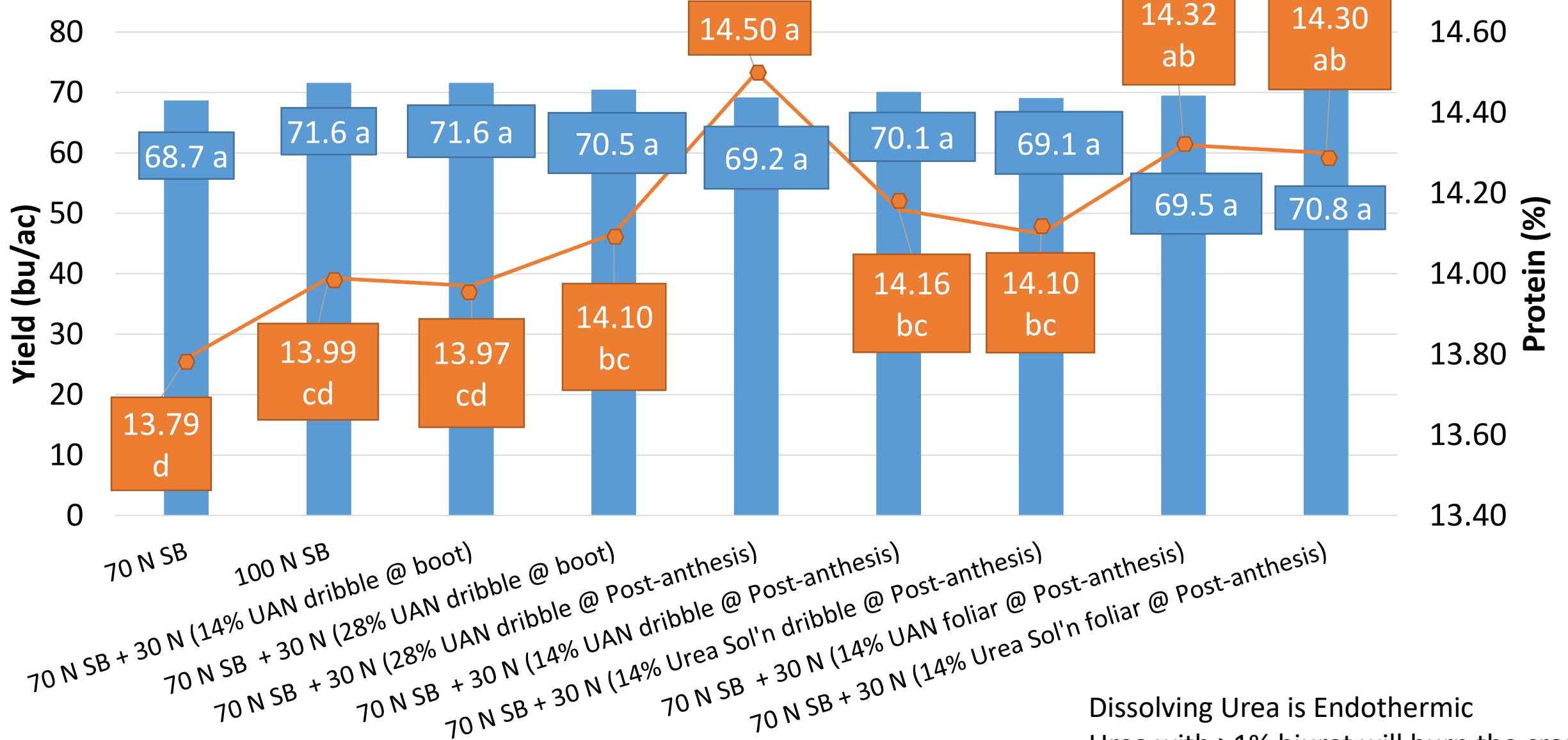


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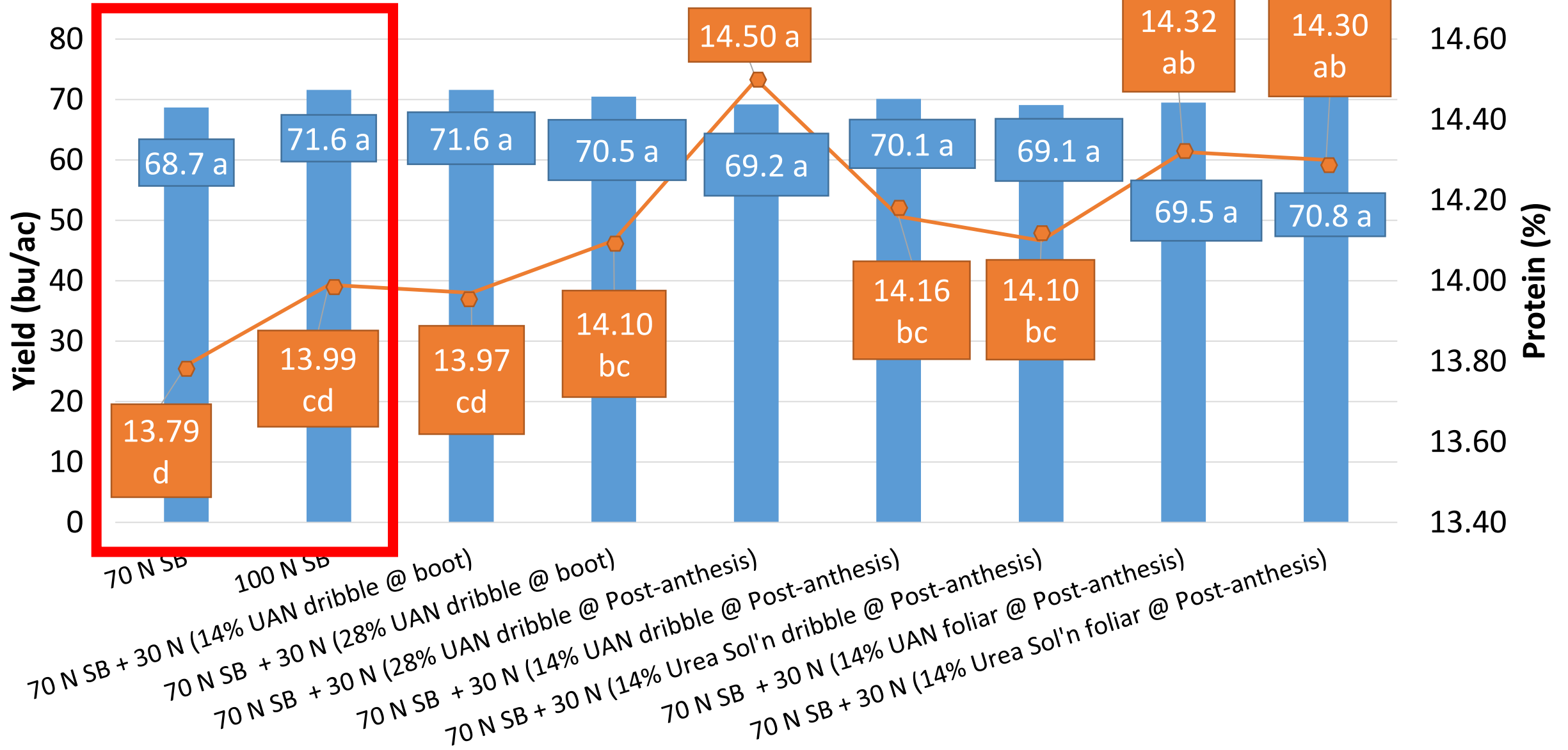
(2019 iharf, serf, icdc, ecrf, wca, warc, narf, clc)



Dissolving Urea is Endothermic  
 Urea with >1% biuret will burn the crop

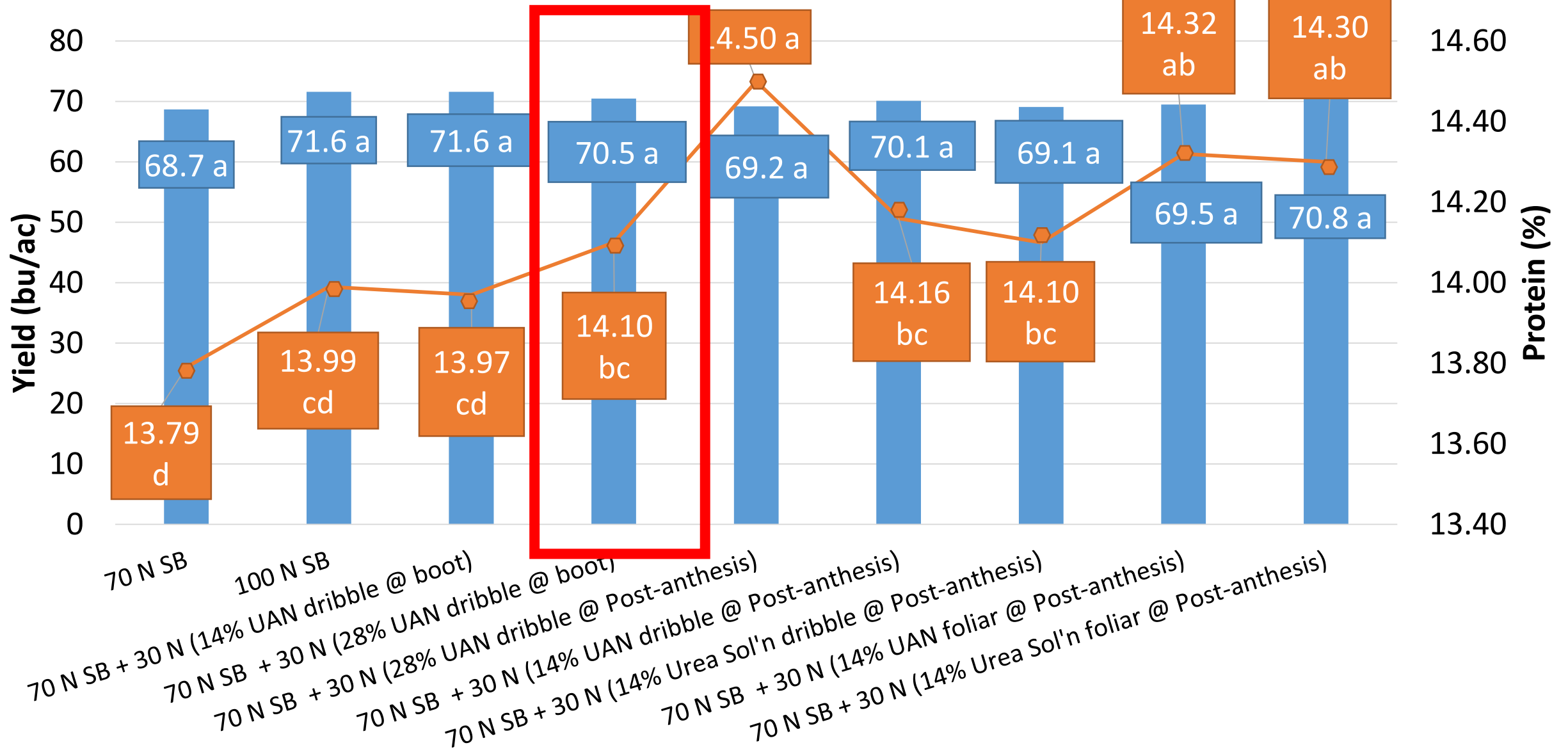
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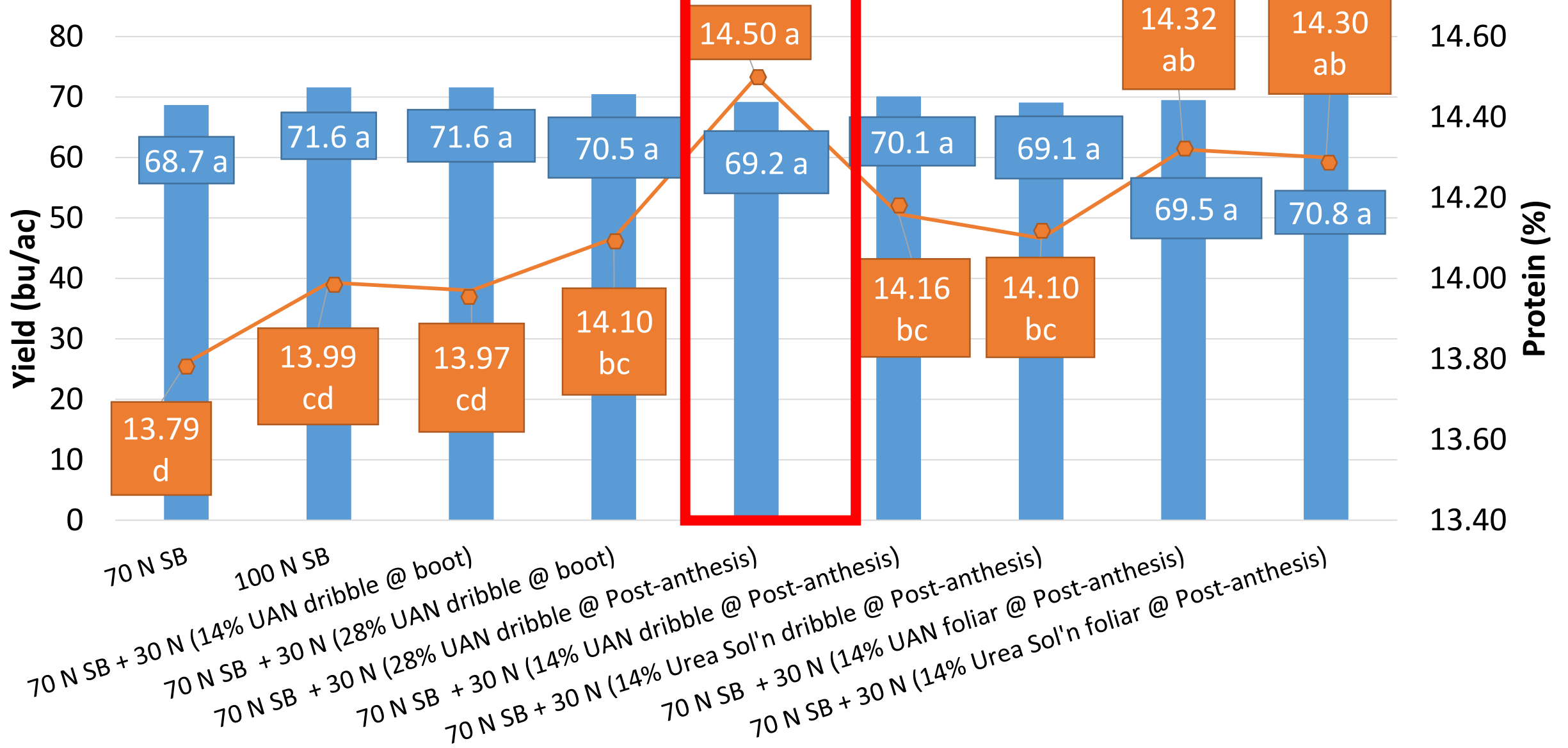
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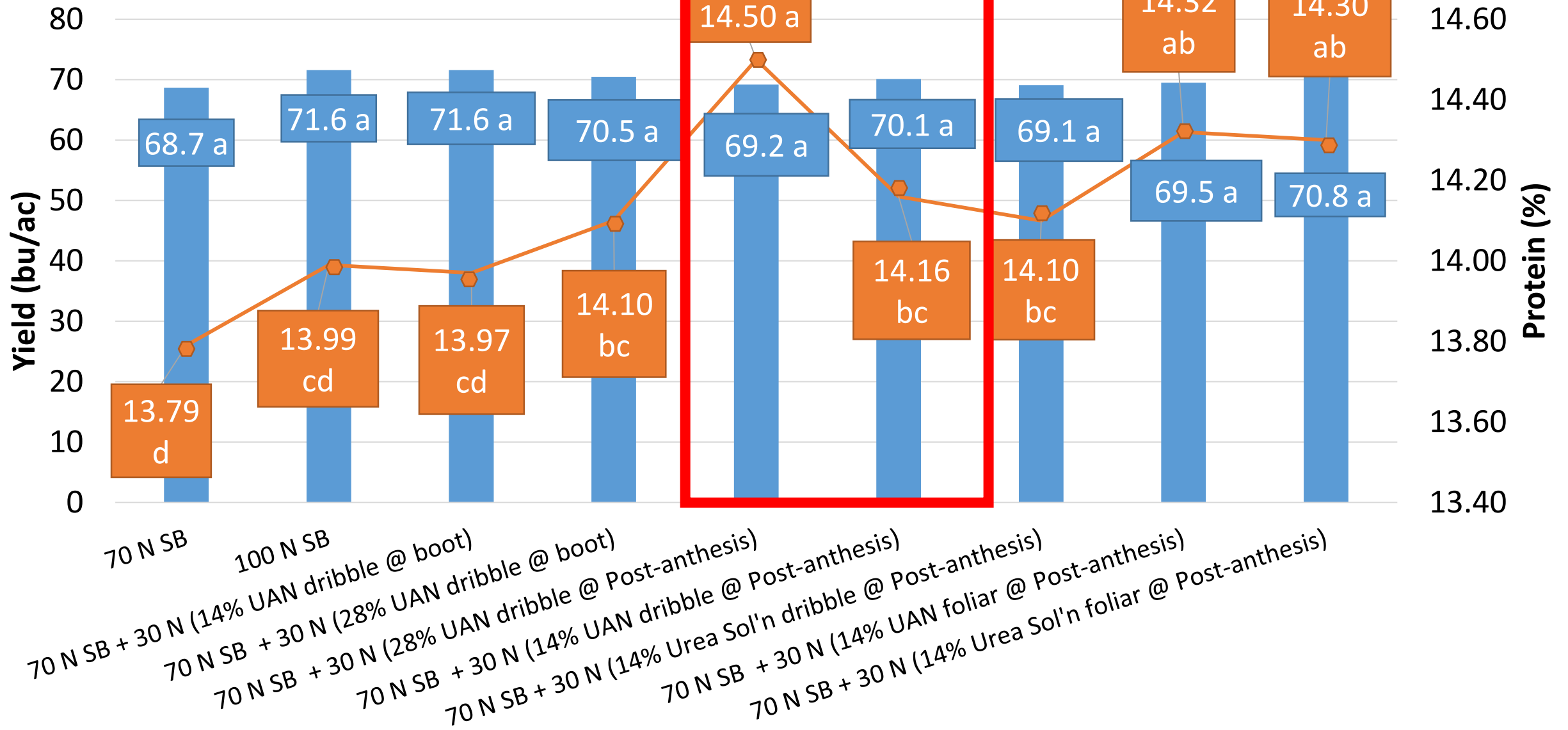
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(2019 iharf, serf, icde, cc f, wca, warc, narf, clc)



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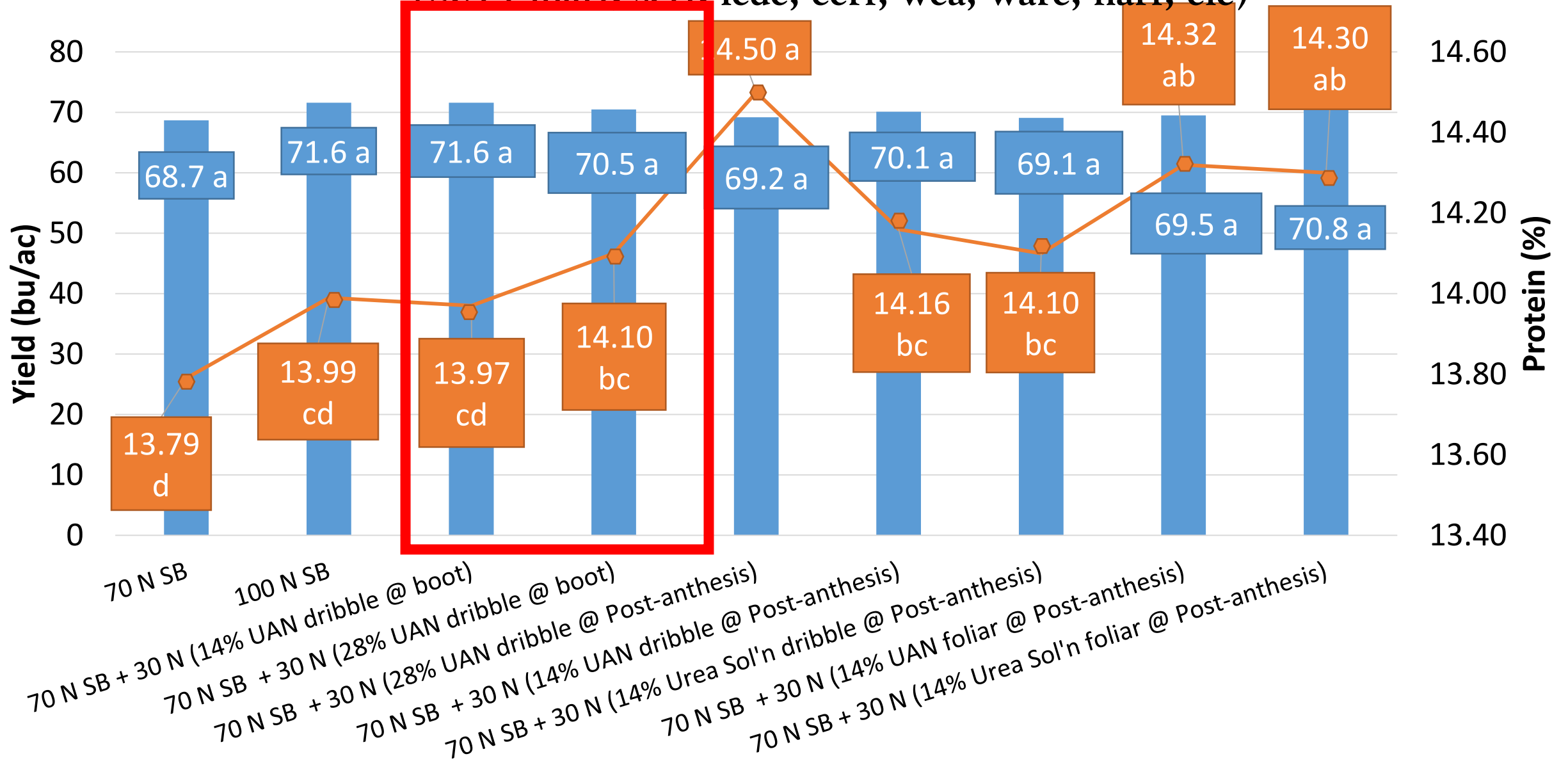
(2019 iharf, serf, icde, cerf, wea, warc, narf, clc)





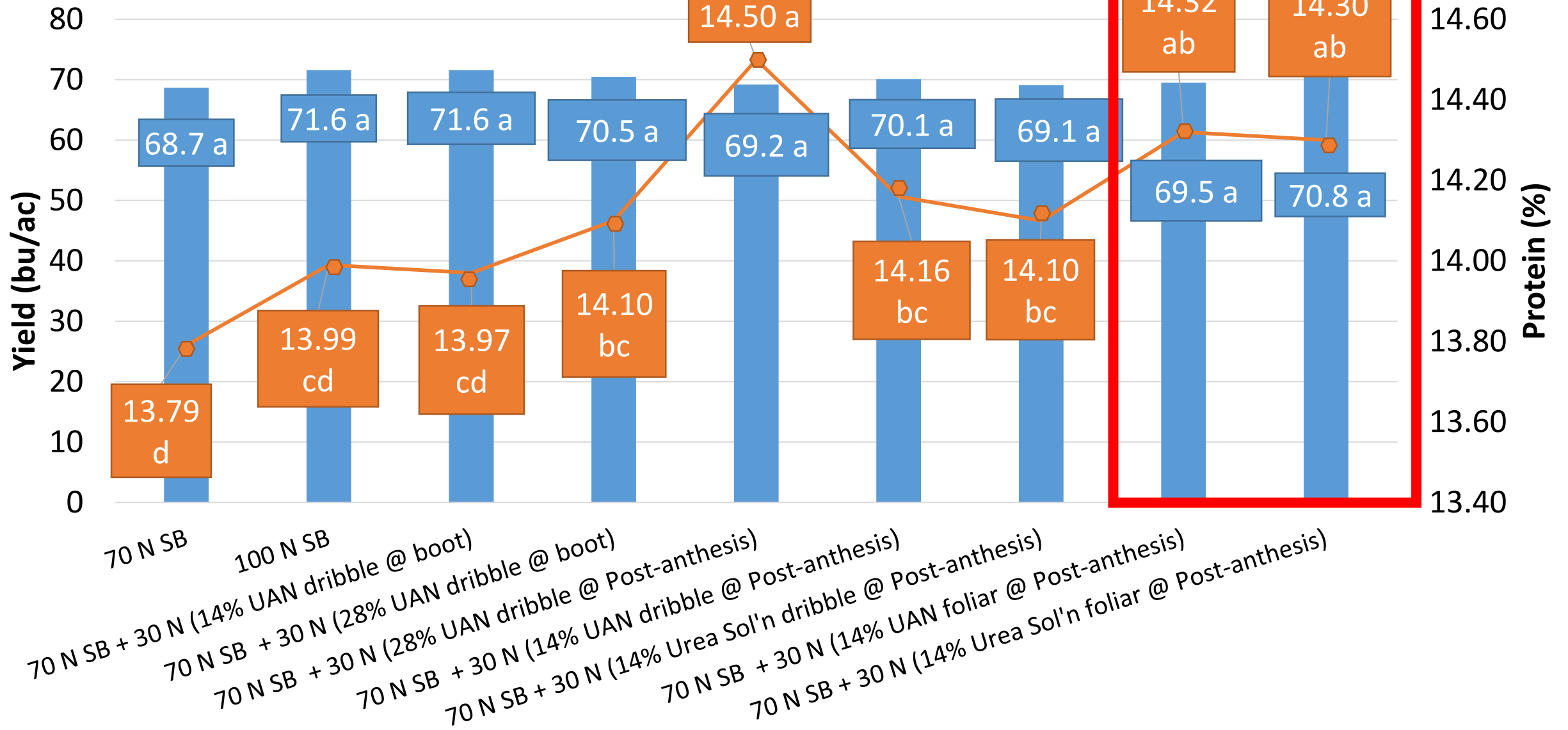
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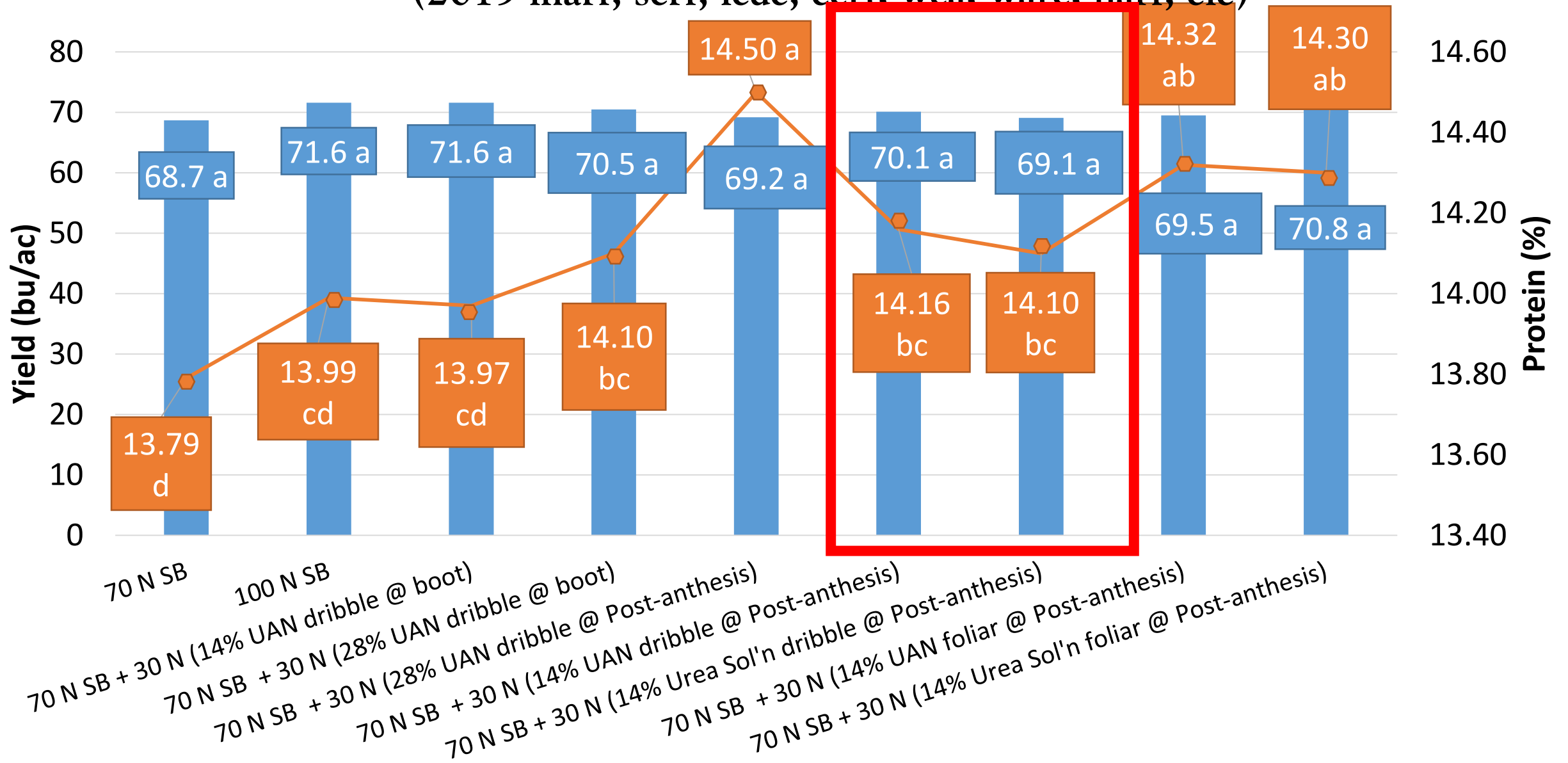
# Impact of Late Season Nitrogen on Wheat Yield and Protein

(2019 iharf, serf, icdc, ecrf, wca, warc, narf, etc)



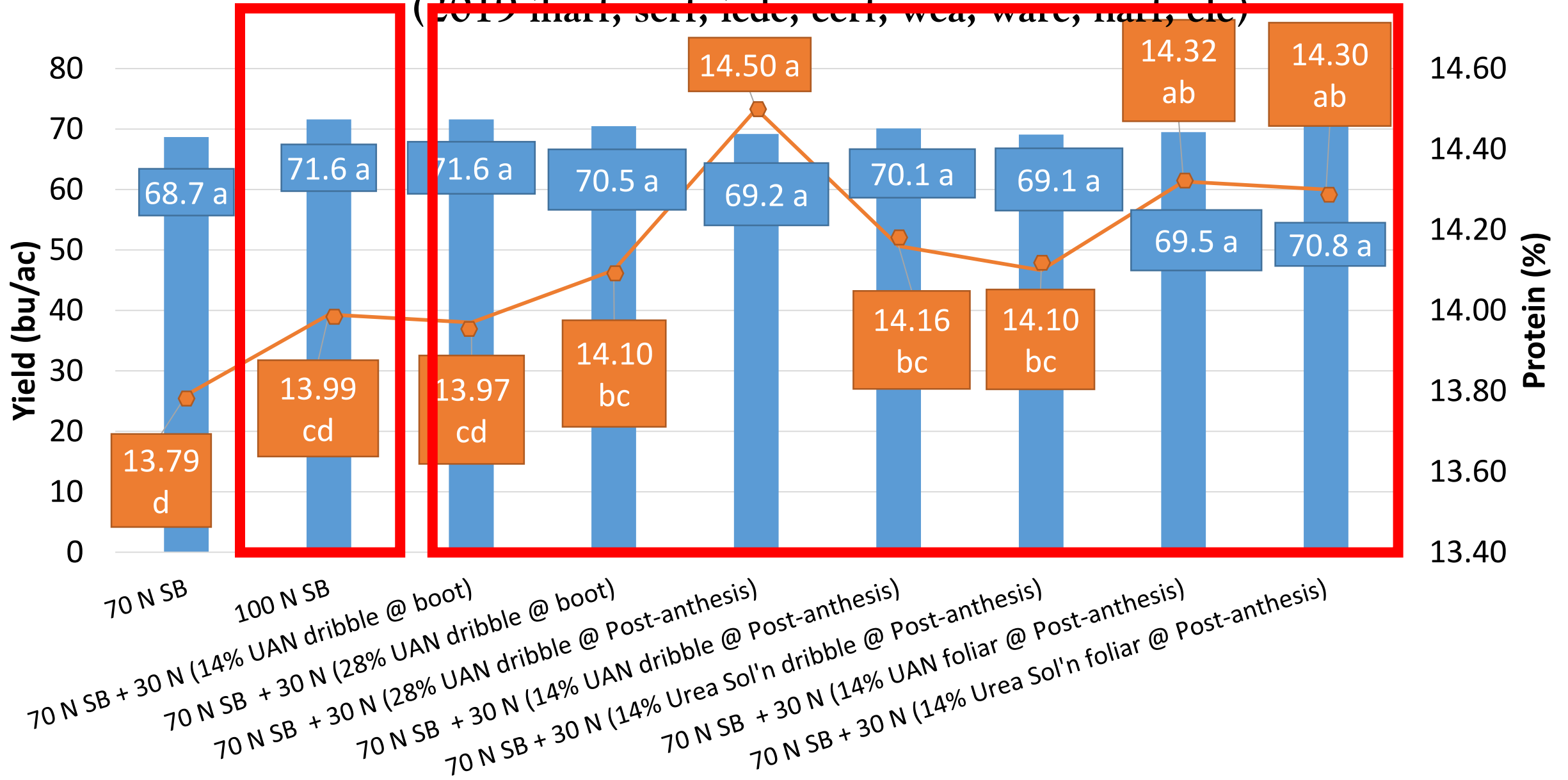
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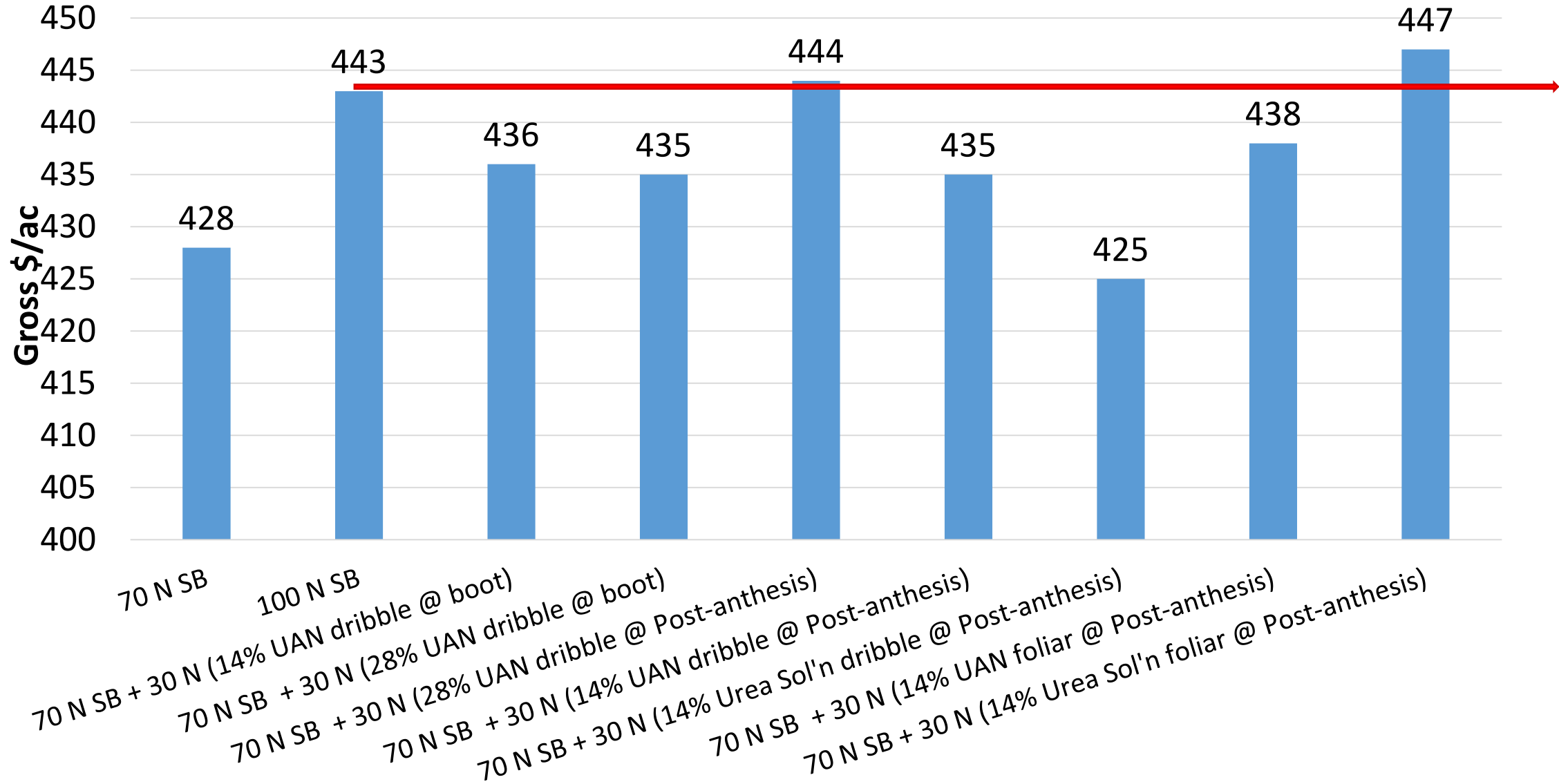


# Impact of Late Season Nitrogen on Wheat Yield and Protein

(2019 *harf, serf, icde, cerf, wea, ware, narf, etc*)



# Gross \$/ac (+ Protein Premium – Cost of N – Cost of Application) (2019-All Sites)



# Conclusions

- In 2018, Split applications of N did not result in higher protein or yield compared to side-banding all the N at seeding. Thus no economic gains from this practice.
- In 2019, Split applications of N often resulted in higher protein compared to applying all the N at seeding but it often resulted in lower yield as well.
- As a result, very few cases of split applying N were more economical than just side-banding all the N at seeding
- Leaf burn could be reduced by dribble banding instead of broadcast foliar sprays or using dissolved urea instead of UAN, however, this did not translate into any economic gains.

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Mike Hall

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Special Thanks to Adopt  
and Saskatchewan for funding.







Thomas Appéré

+ Follow

PRO



UAN (14% N)

- 30 lb N/ac
- Broadcast Foliar
- Post-anthesis



Urea Sol'n (14% N)

- 30 lb N/ac
- Broadcast Foliar
- Post-anthesis