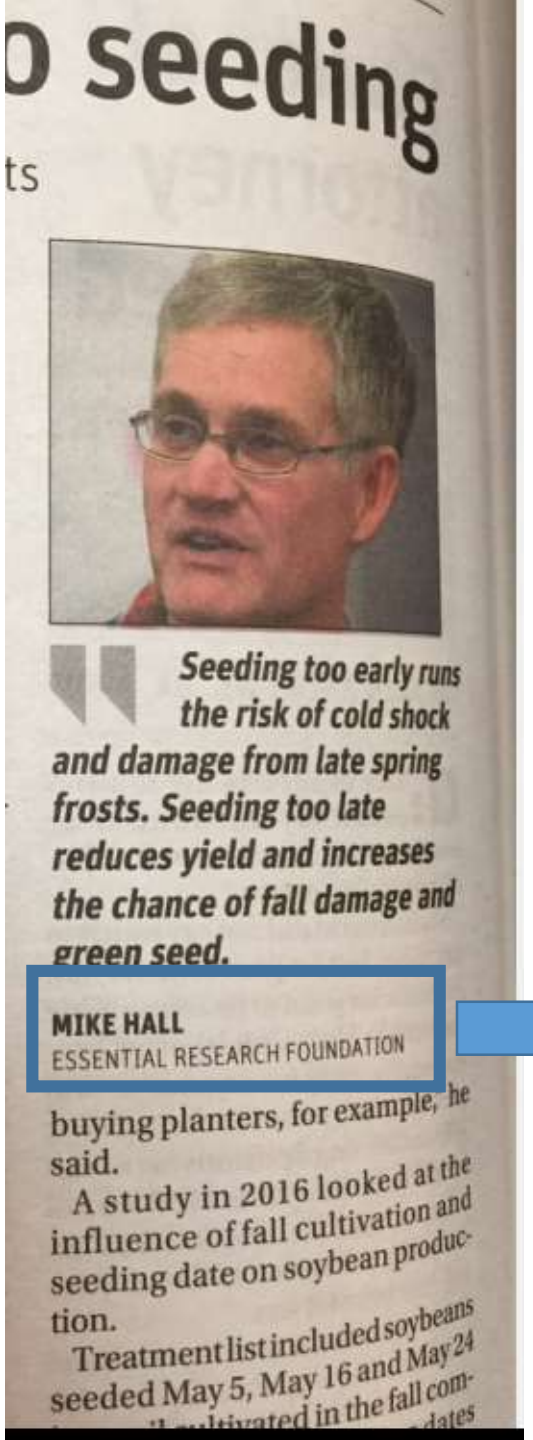
Is Your Nitrogen Disappearing Into Thin Air?

PARKLAND COLLEGE

www.ecrf.ca

EAST CENTRAL RESEARCH FOUNDATION
ECRF

Mike Hall – Research Coordinator
Heather Sorestad – Research Assistant (graph expert)


o seeding

ts

Seeding too early runs the risk of cold shock and damage from late spring frosts. Seeding too late reduces yield and increases the chance of fall damage and green seed.

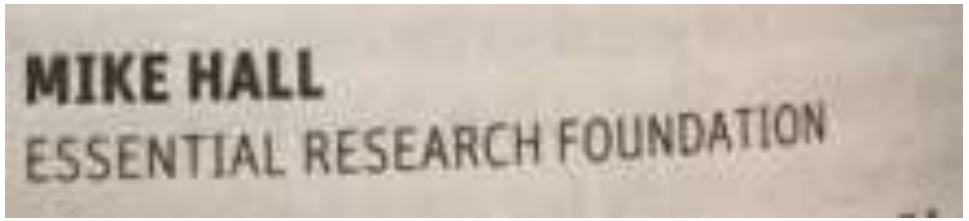
MIKE HALL
ESSENTIAL RESEARCH FOUNDATION

buying planters, for example, he said.

A study in 2016 looked at the influence of fall cultivation and seeding date on soybean production.

Treatment list included soybeans seeded May 5, May 16 and May 24

"East Central"
not
"Essential"


MIKE HALL
ESSENTIAL RESEARCH FOUNDATION

Not

"East Coast"

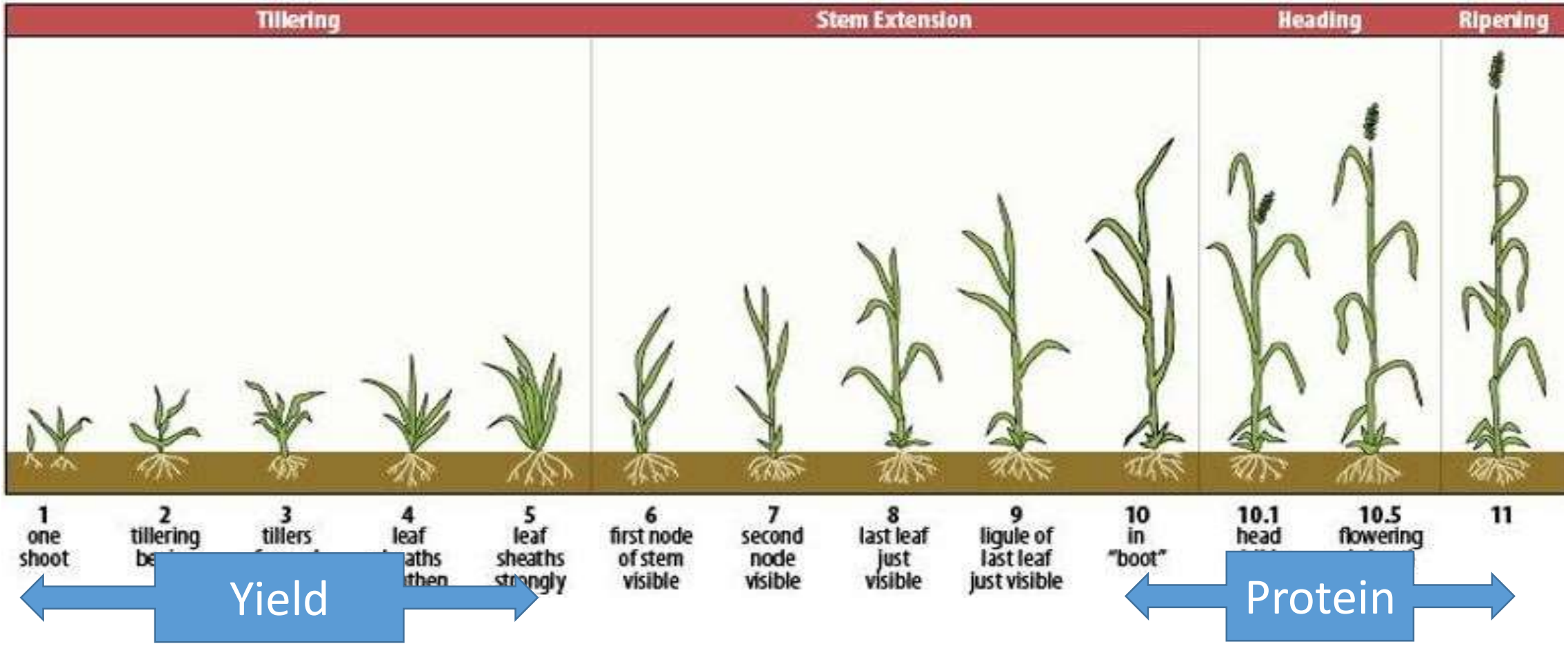
Main Avenues of Nitrogen Loss

- Volatilization: $NH_4^+ \rightarrow NH_3 + H^+ \uparrow$
- Denitrification: $NO_3^- \rightarrow N_2 + H_20 \uparrow$
- Leaching: $NO_3^- \downarrow$

4Rs of Nitrogen Management

- Right Rate
- Right Time
- Right Place
- Right Form
  - SUPERU
  - Agrotain

- **Post seeding applications?**
  - Applications of N prior to 5 leaf stage mostly go towards yield (needs rain)
  - Application of N at boot or after flowering go most towards protein (needs rain)



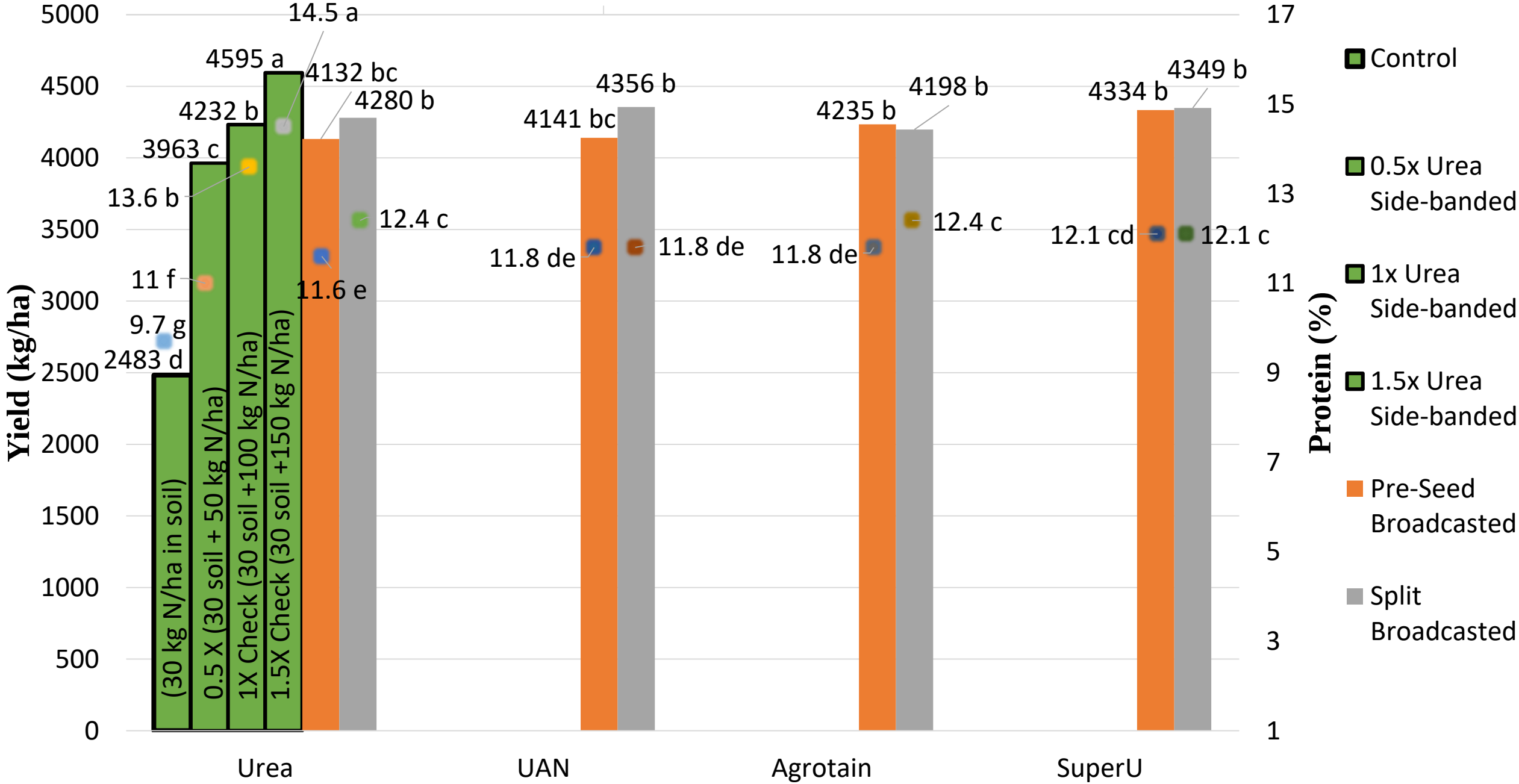
Demonstrating 4R Nitrogen Principle in Wheat and Canola

Funded by:

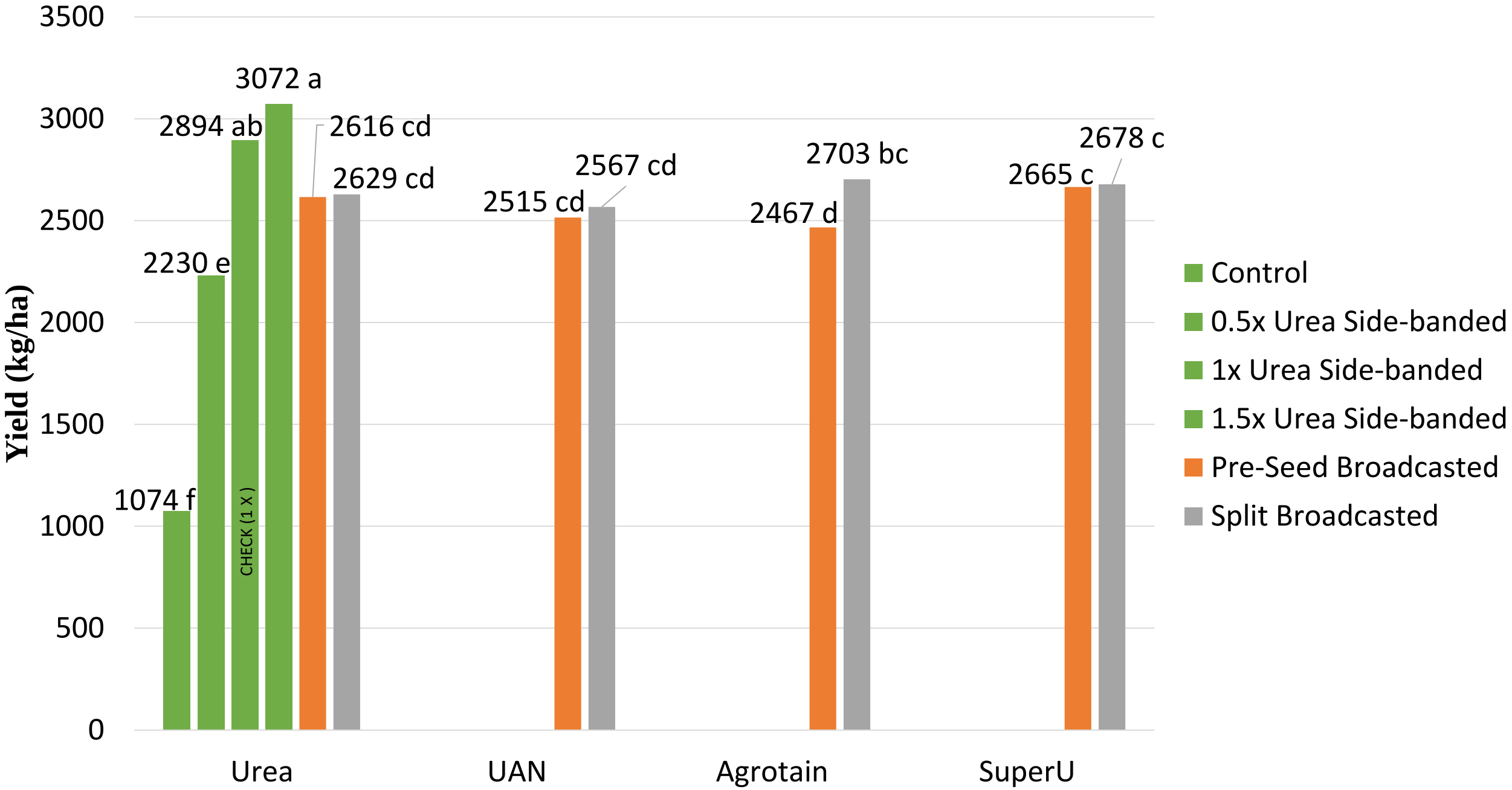
FERTILIZER CANADA
FERTILISANTS CANADA

Agriculture Demonstration of Practices and Technologies

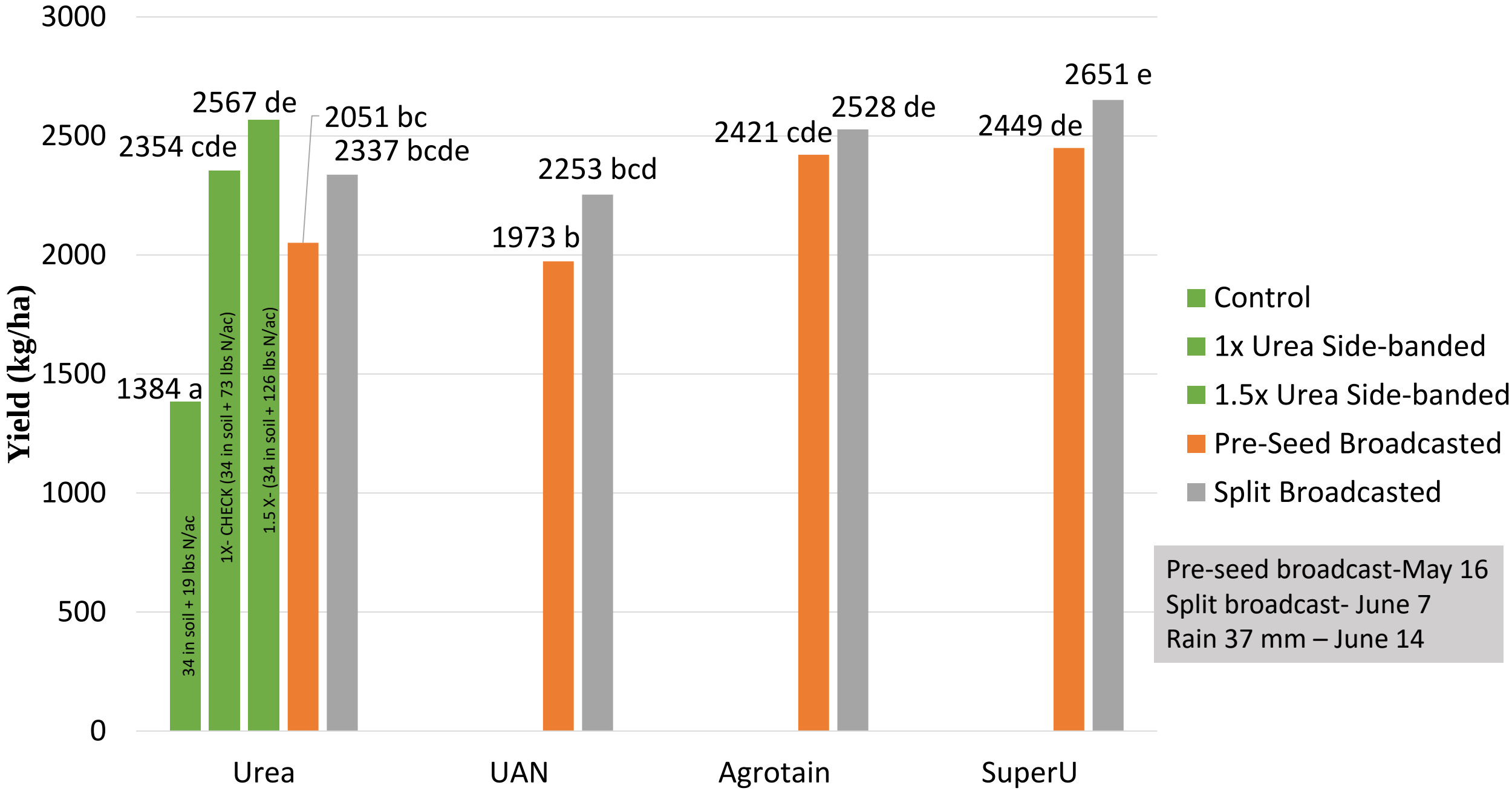
IHARF Nitrogen Product and Placement Effects on Wheat Yield[1](2017)



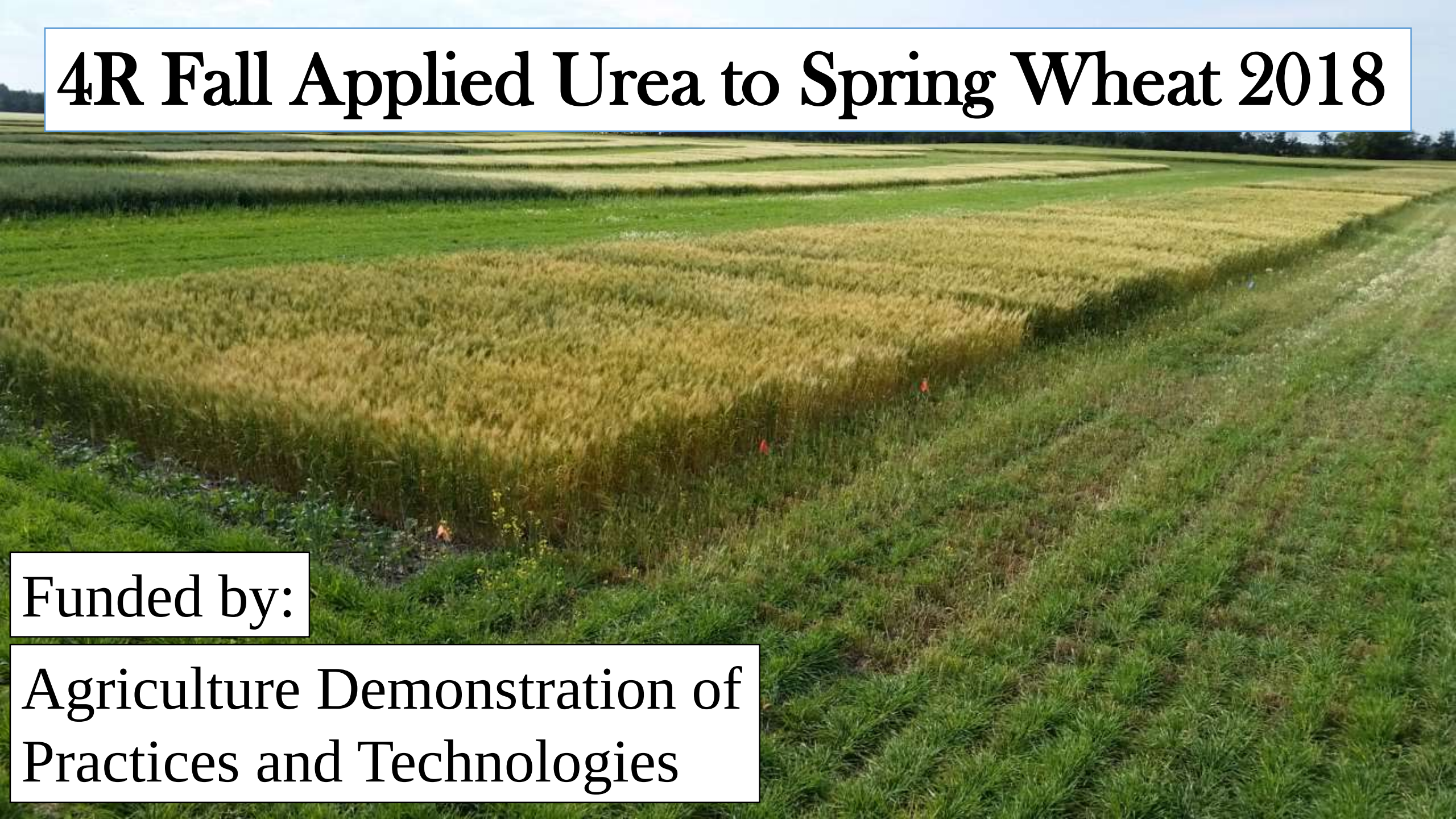
IHARF Nitrogen Product and Placements Effects on Canola Yield (2017)



ECRF Nitrogen Product and Placements Effects on Canola Yield (2017)



4R Fall Applied Urea to Spring Wheat 2018



Funded by:

Agriculture Demonstration of Practices and Technologies

Broadcast Urea and SUPERU

- Early Fall (Oct. 2)
- Late Fall (Oct. 27)
- Early Winter on 10 cm of snow (Nov. 5)

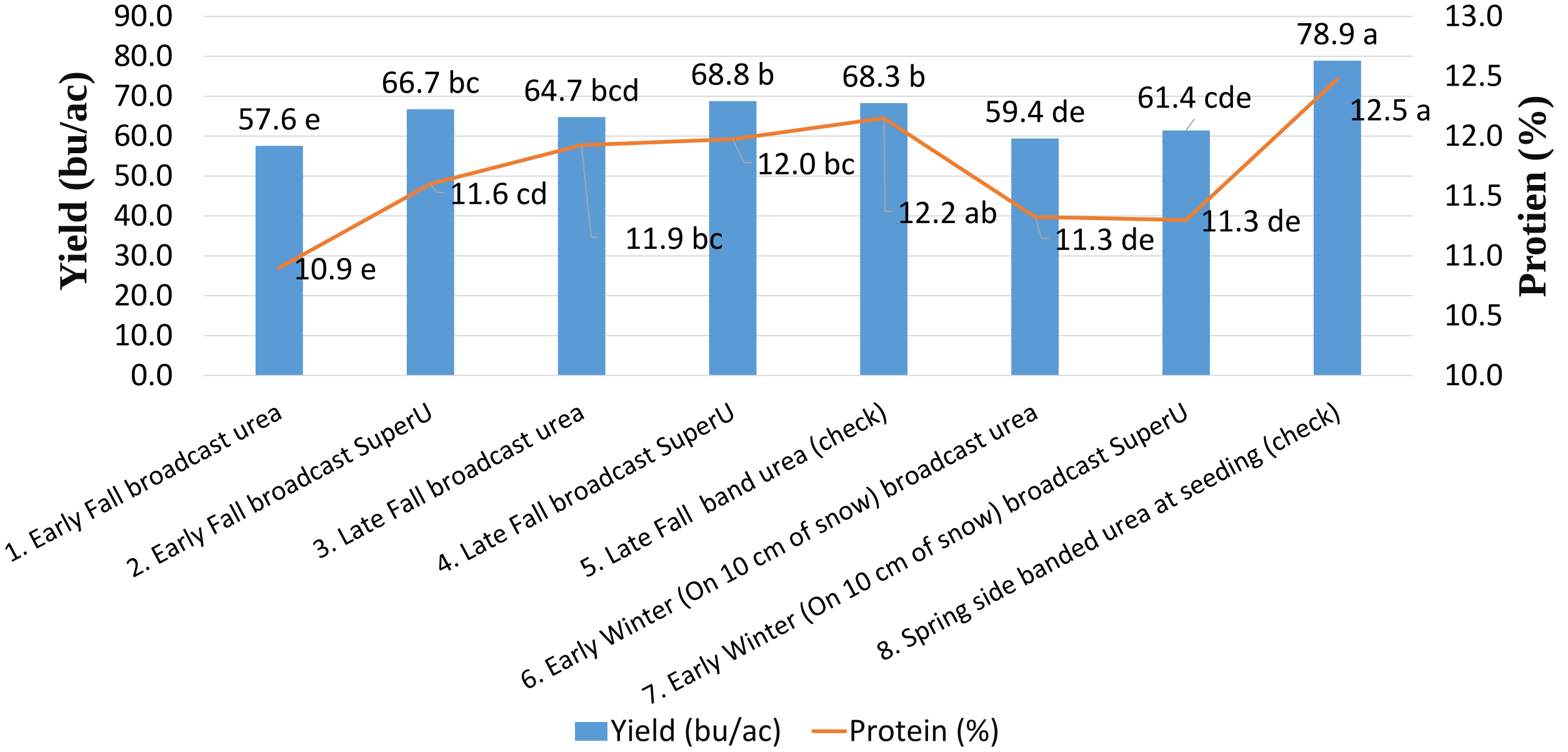
VERSUS

Banded Urea Checks

- Late Fall (Oct. 27)
- Side banded at seeding


Spring Side-Banded Urea at Seeding
Early Winter Broadcast Urea

Effect of Urea (174 lbs/ac) Source and Timing on Yield and Protein of Wheat[1]



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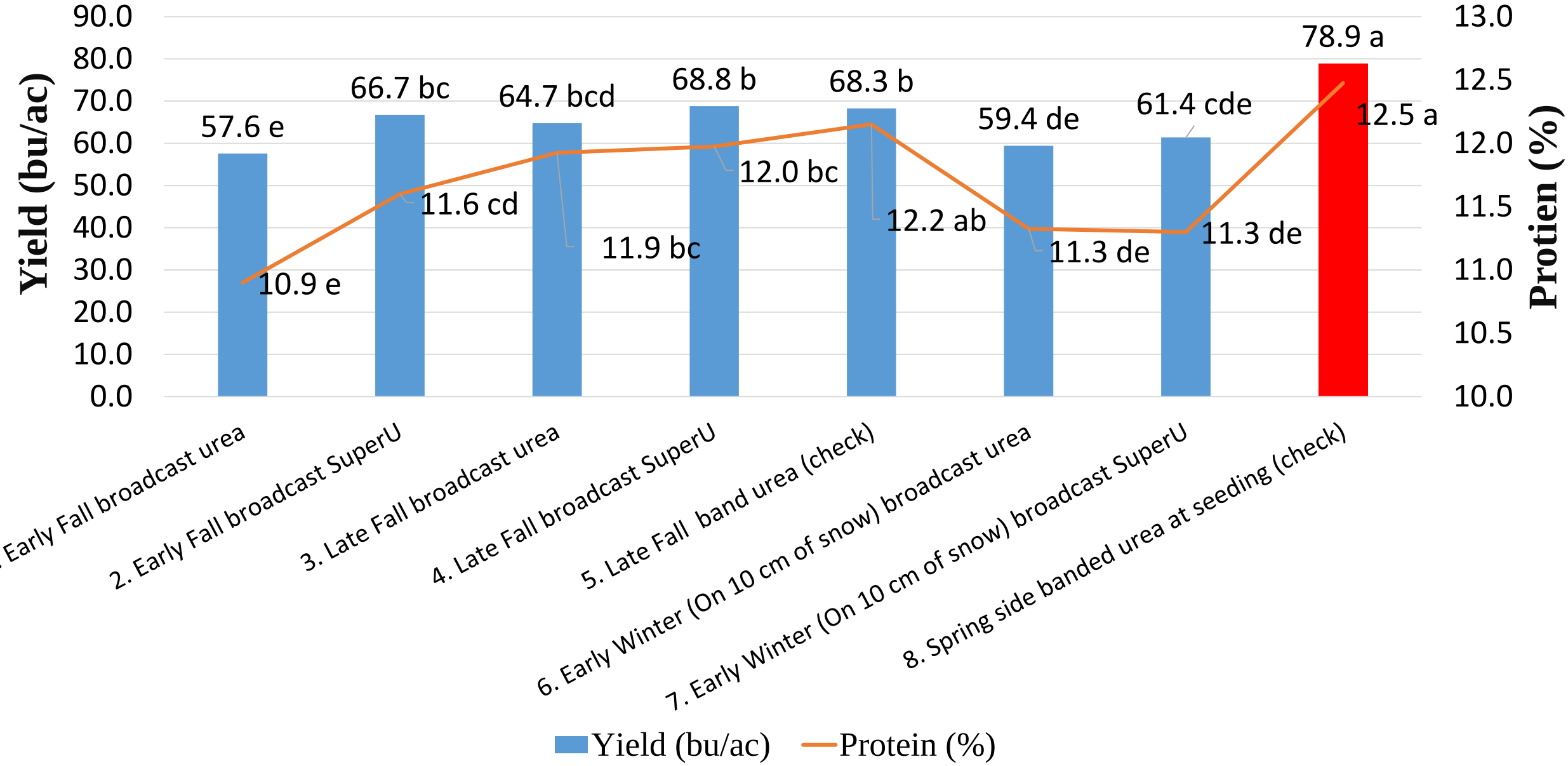

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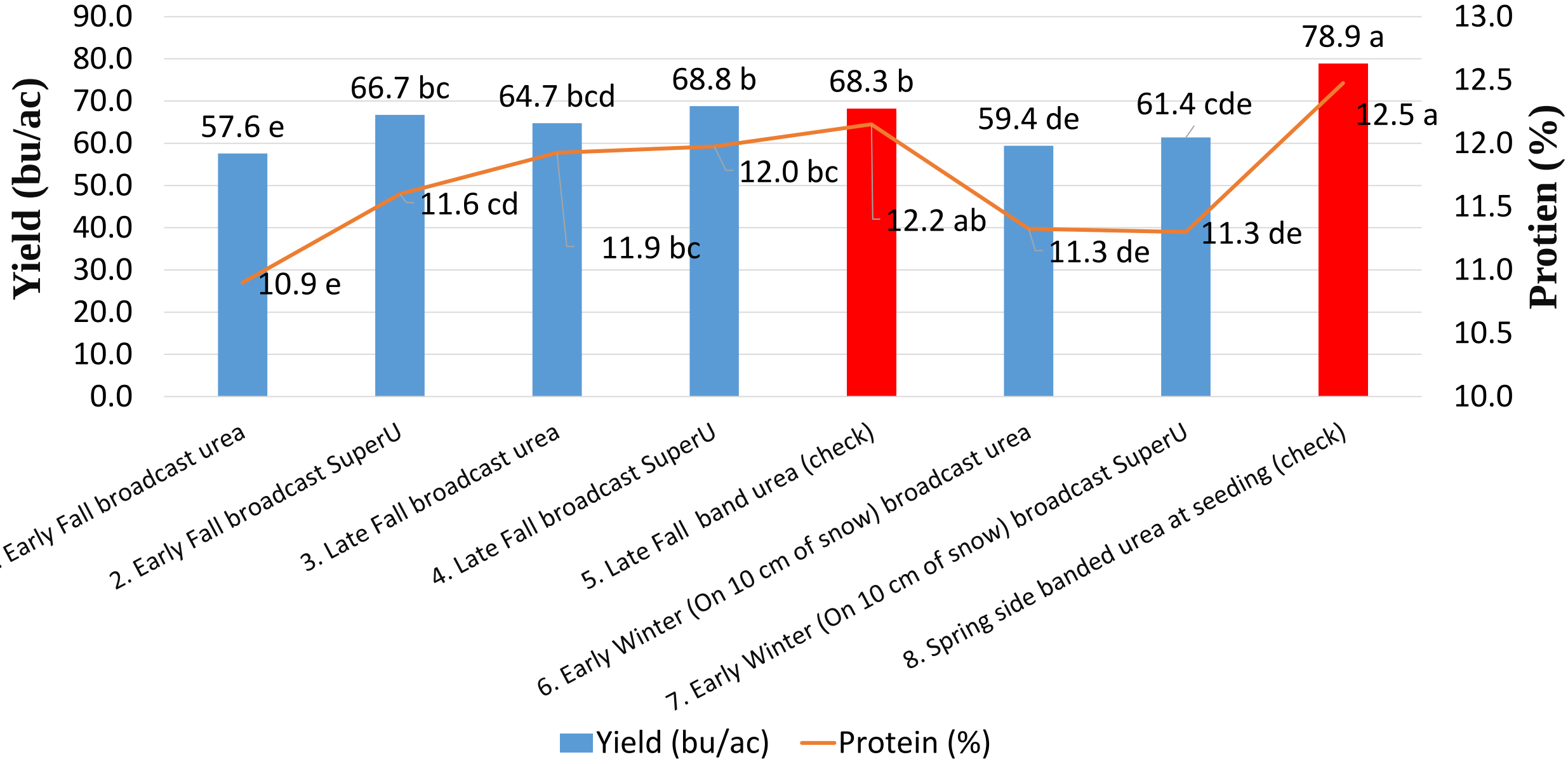

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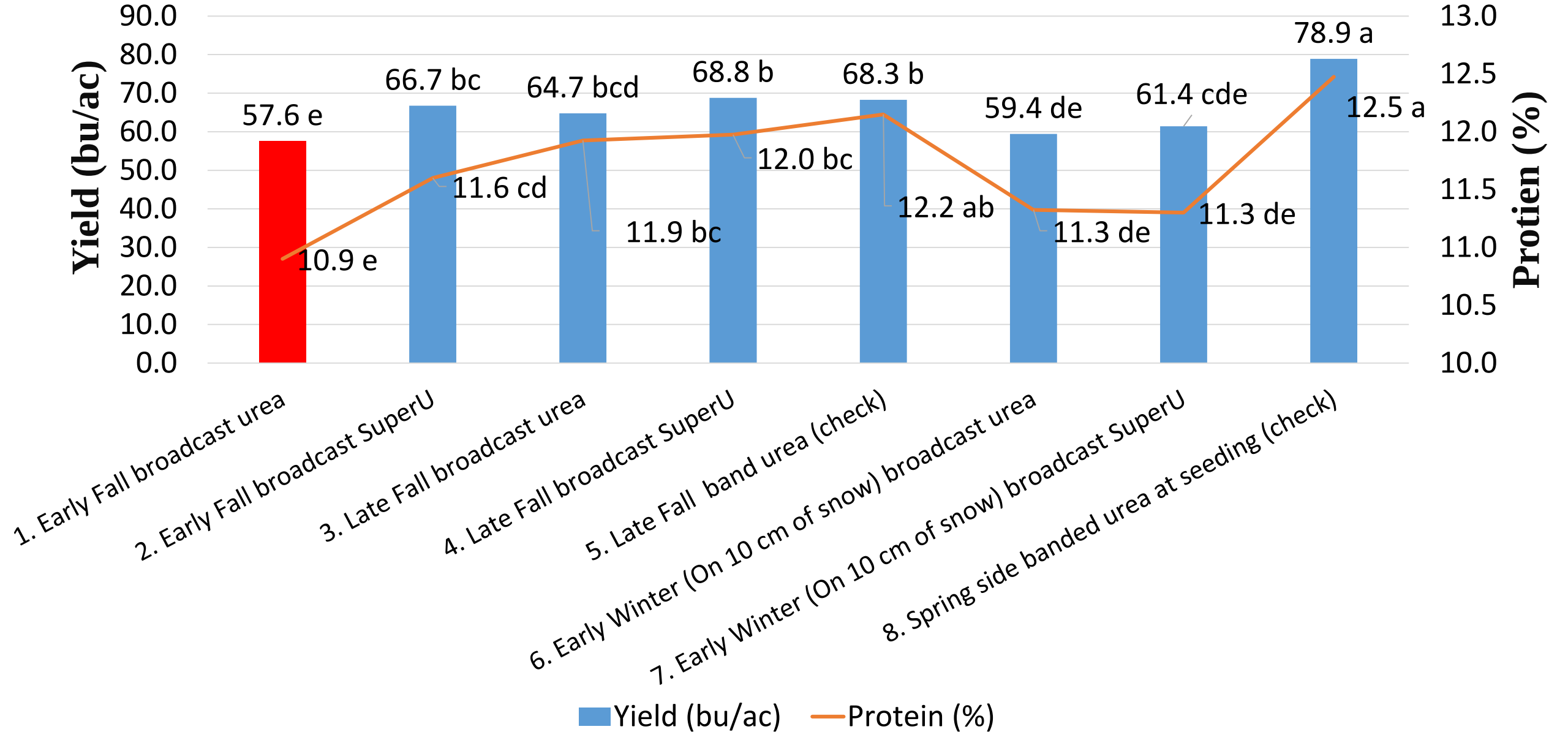

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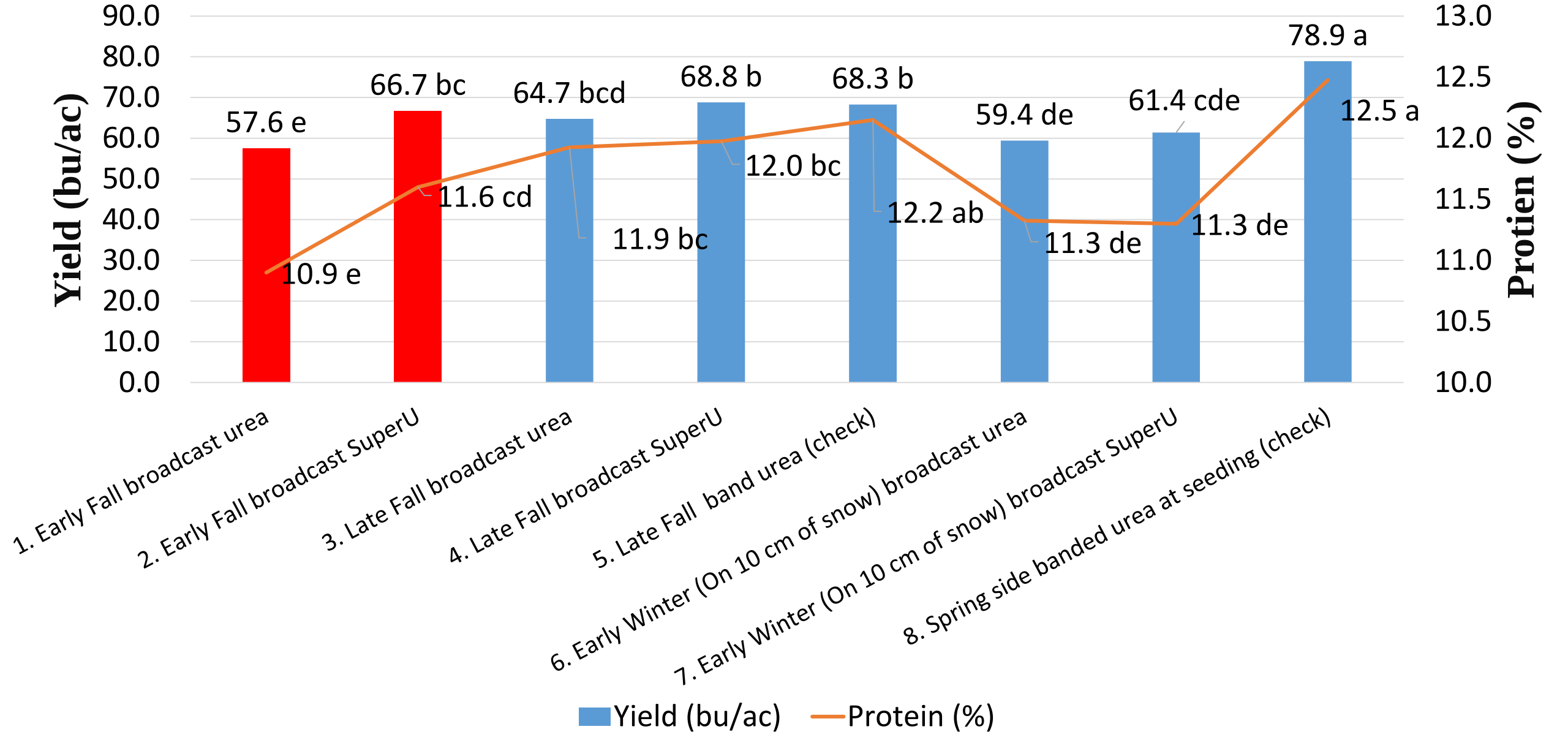

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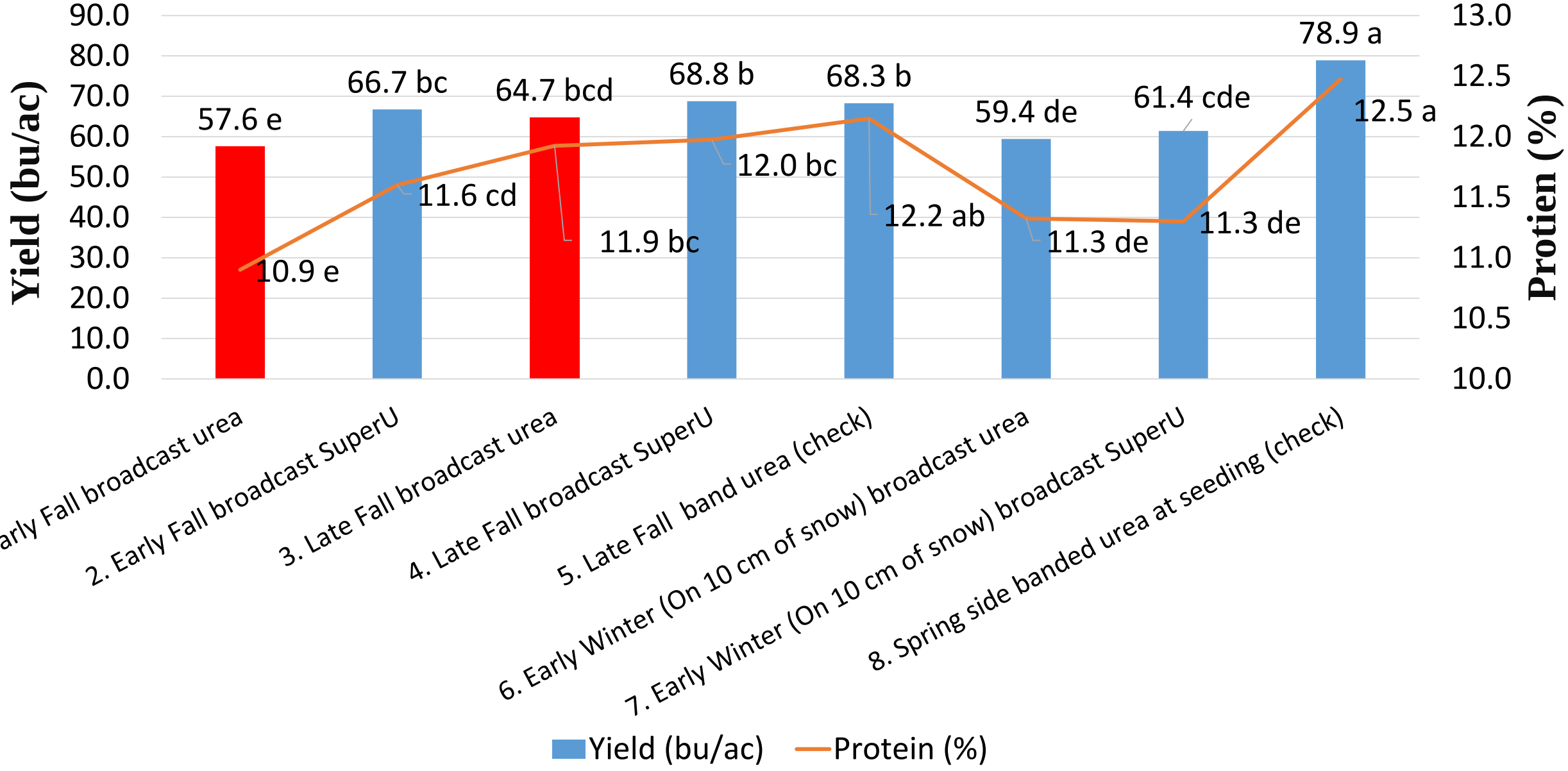

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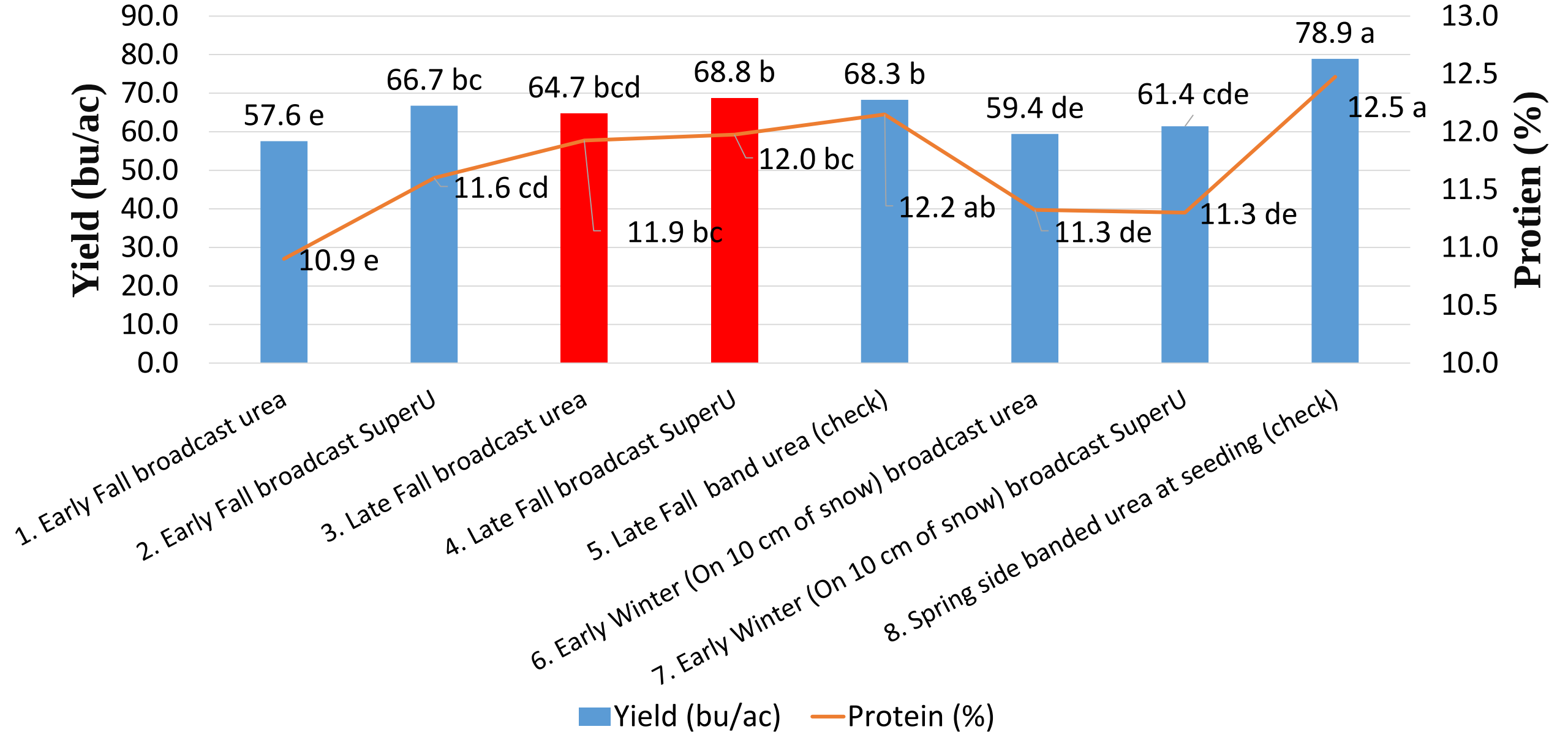

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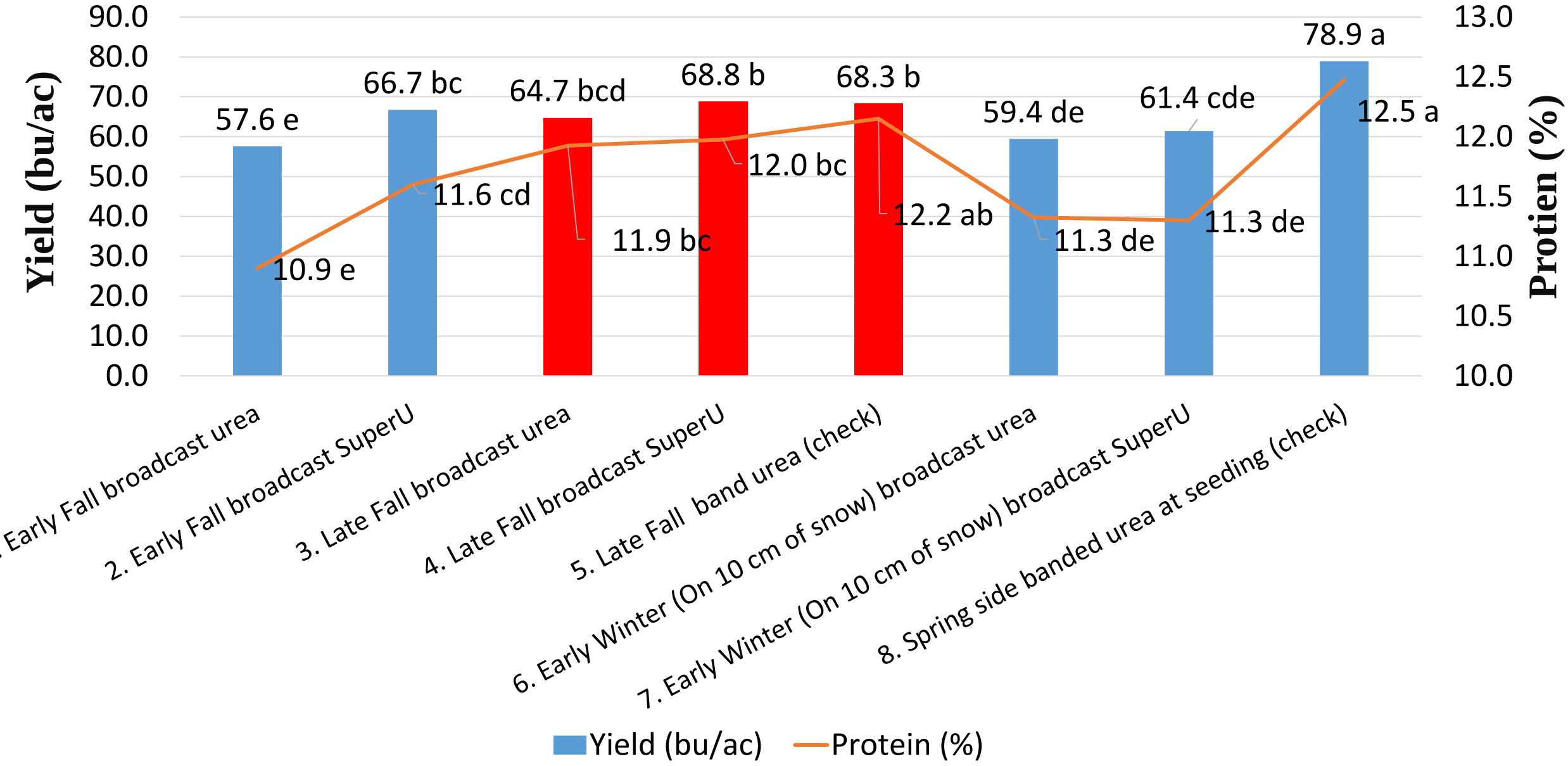

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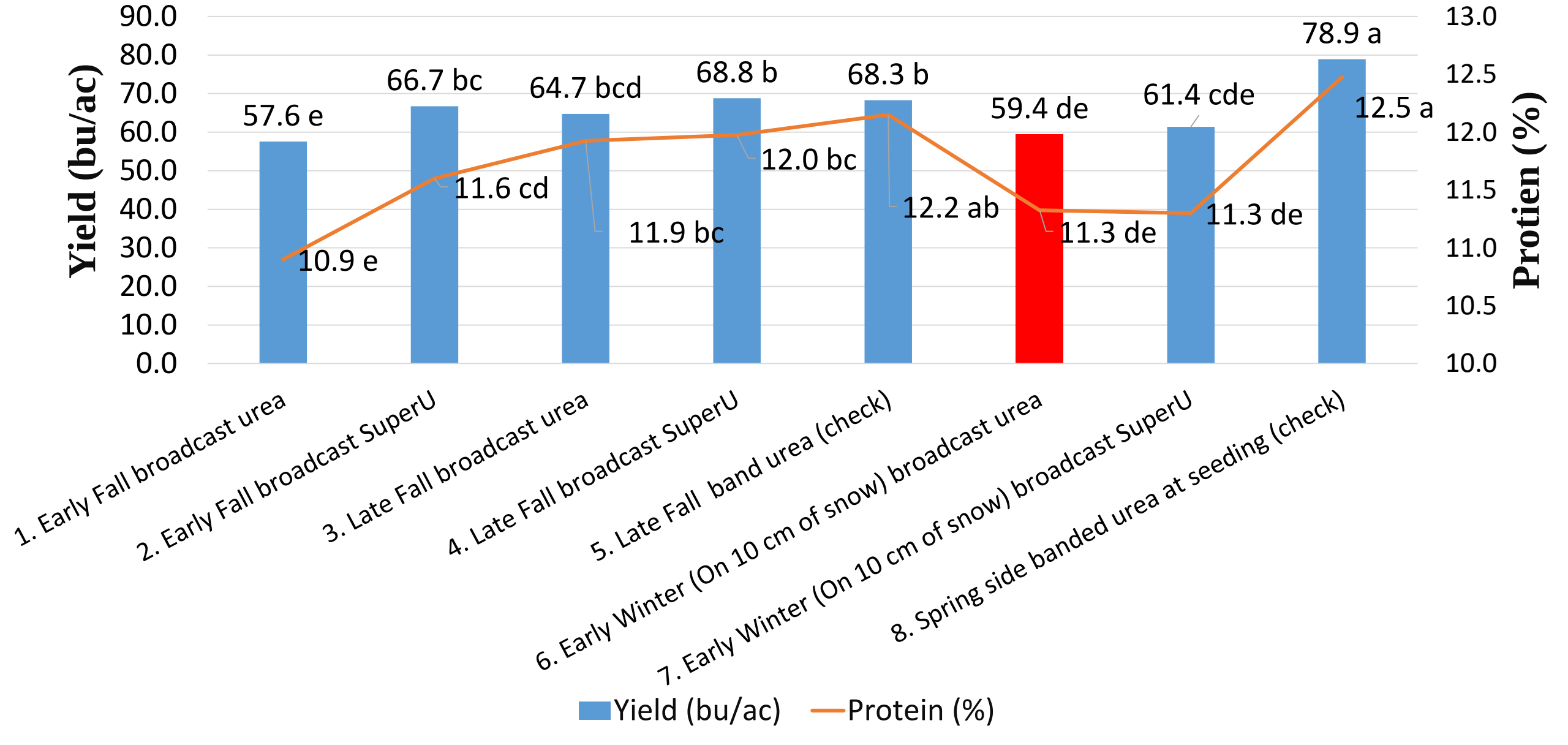

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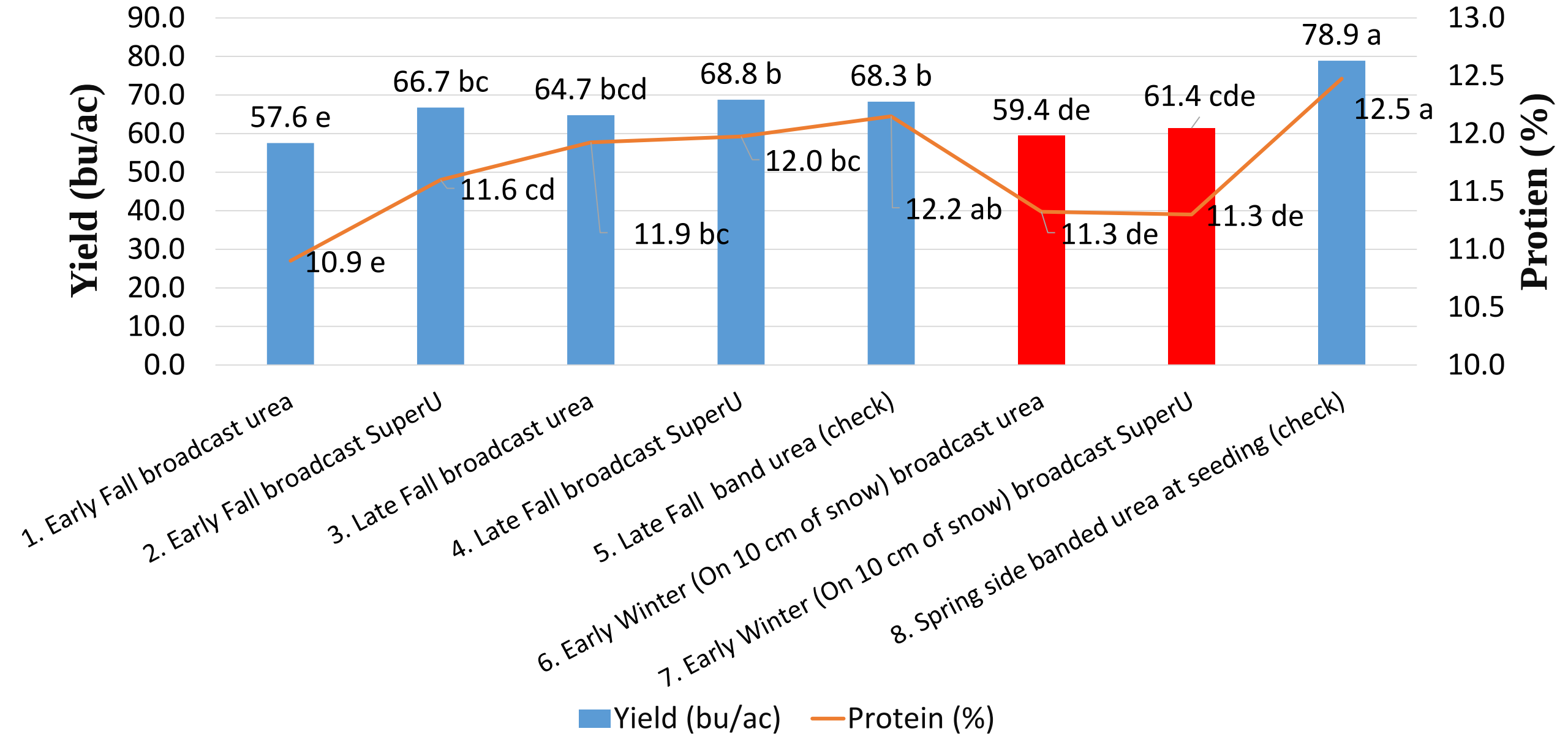


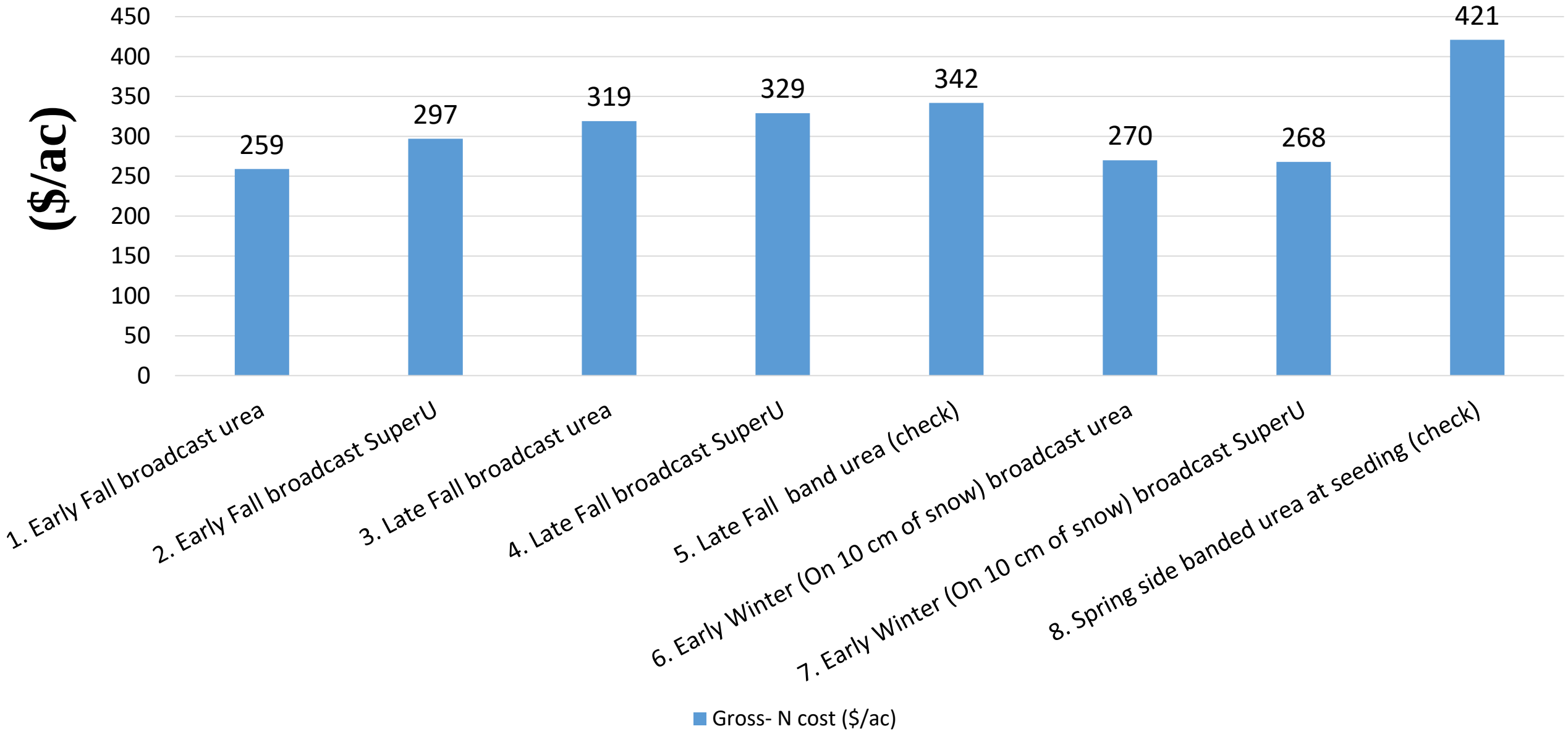
Wheat price available for Yorkton on Feb 9, 2018 for CWRS No 1.

Grain Protein (%)	$/bushel
15.5	7.74
15	7.44
14.5	7.14
14	6.79
13.5	6.44
13	6.14
12.5	5.84
12	5.54
11.5	5.24
11	5.19
10.5	5.04
10	4.89

Urea- $509/tonne
SUPERU- $725/tonne

Urea- $509/tonne
SUPERU- $664/tonne

Effect of Urea (174 lbs/ac) Source and Timing on Gross Return - N cost ($/ac)[1]



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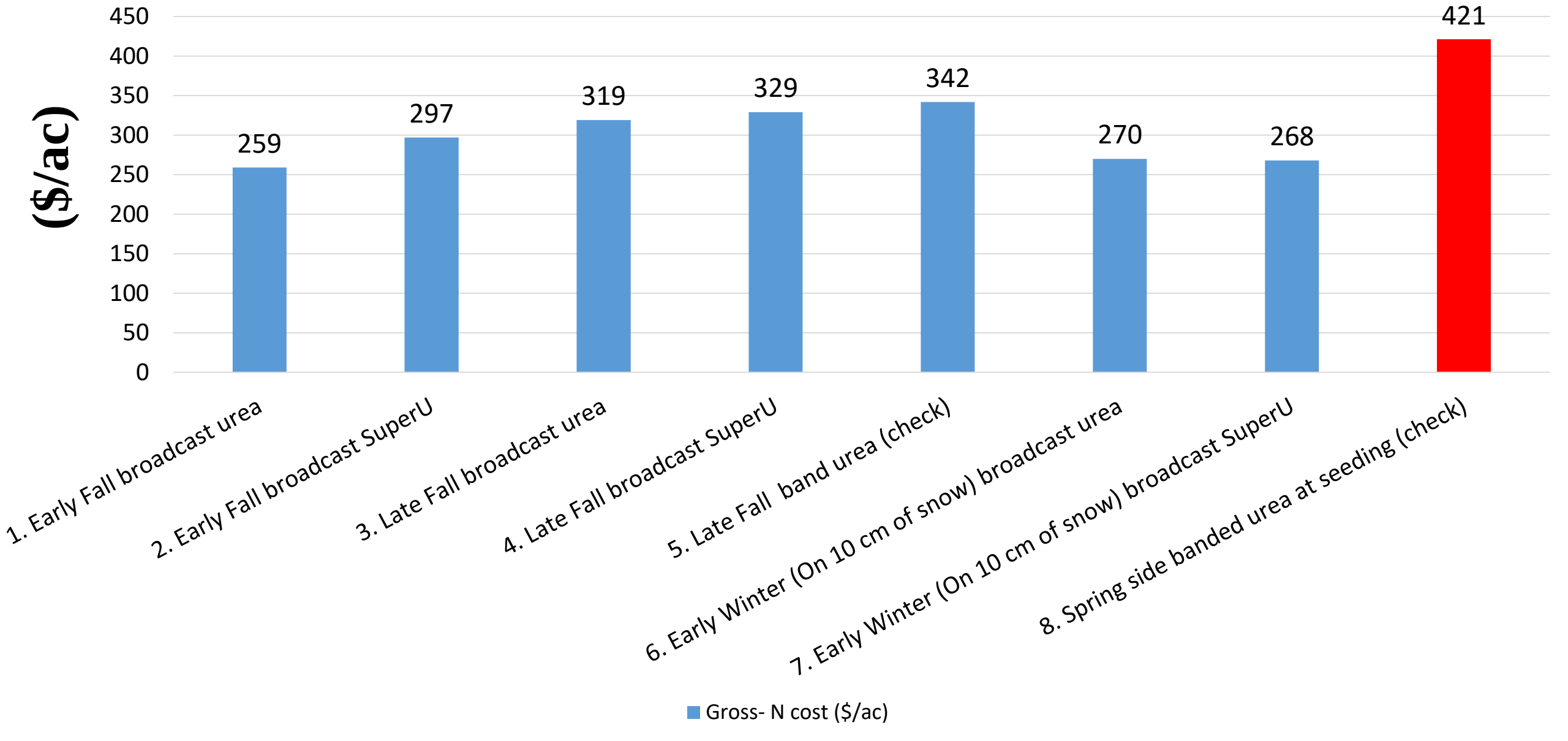

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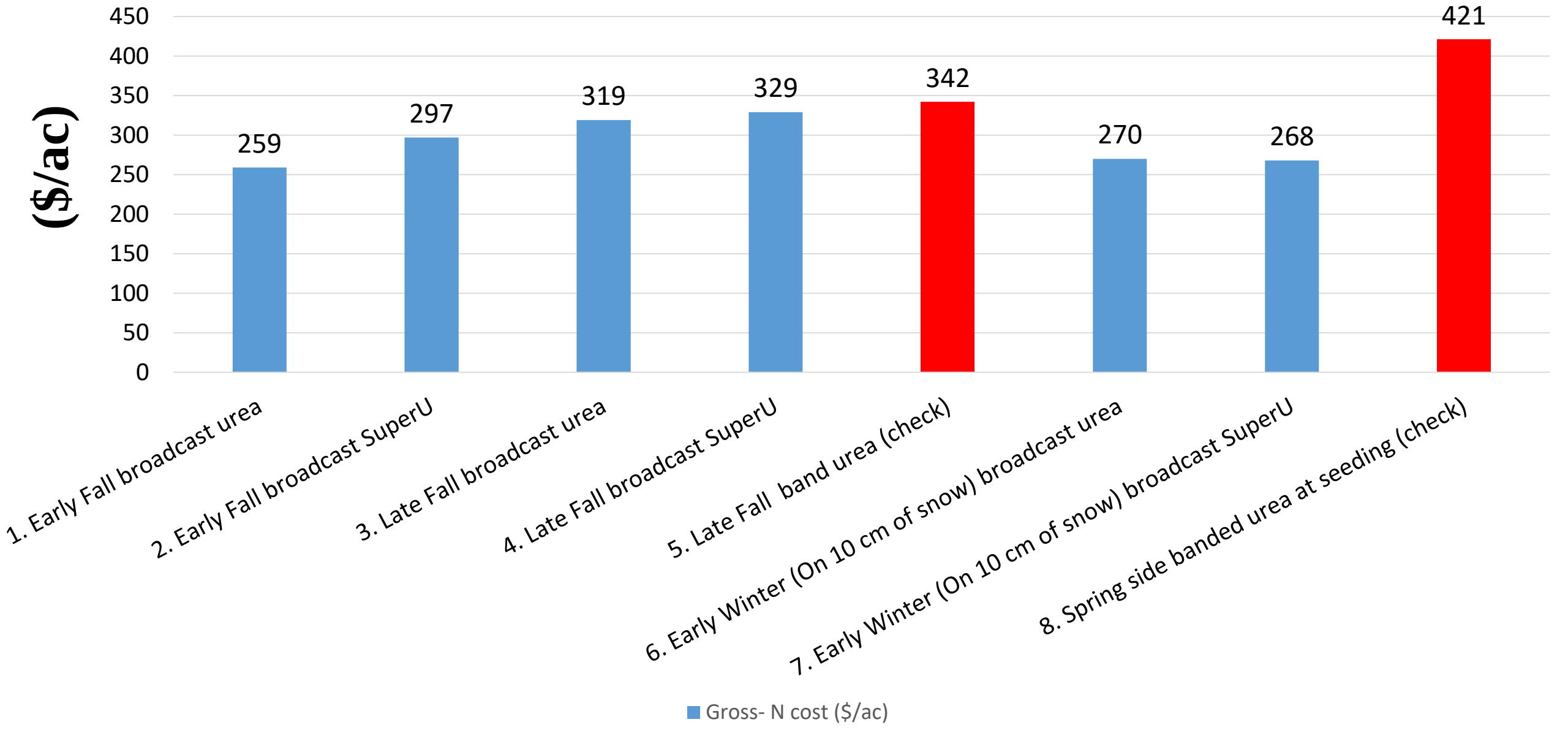

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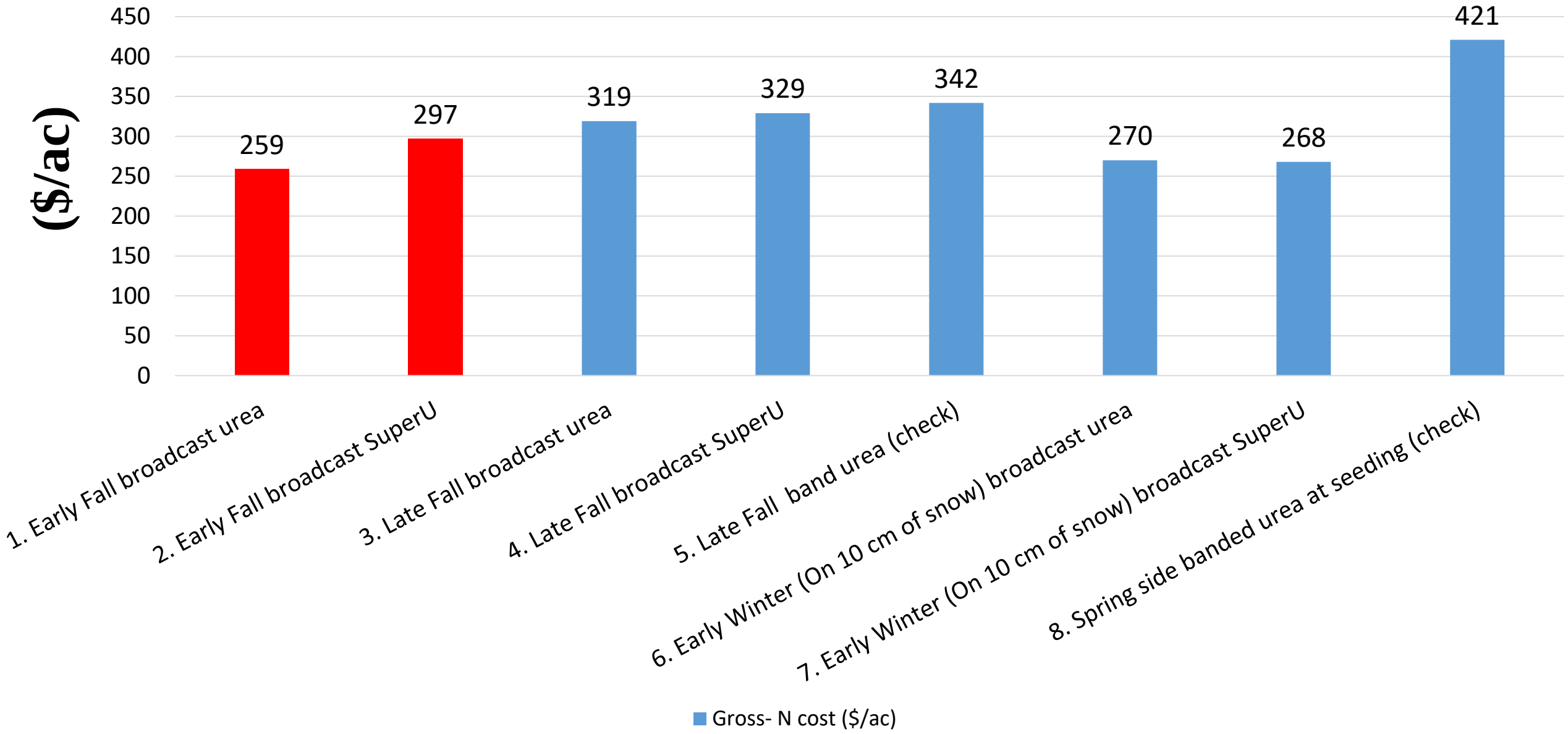

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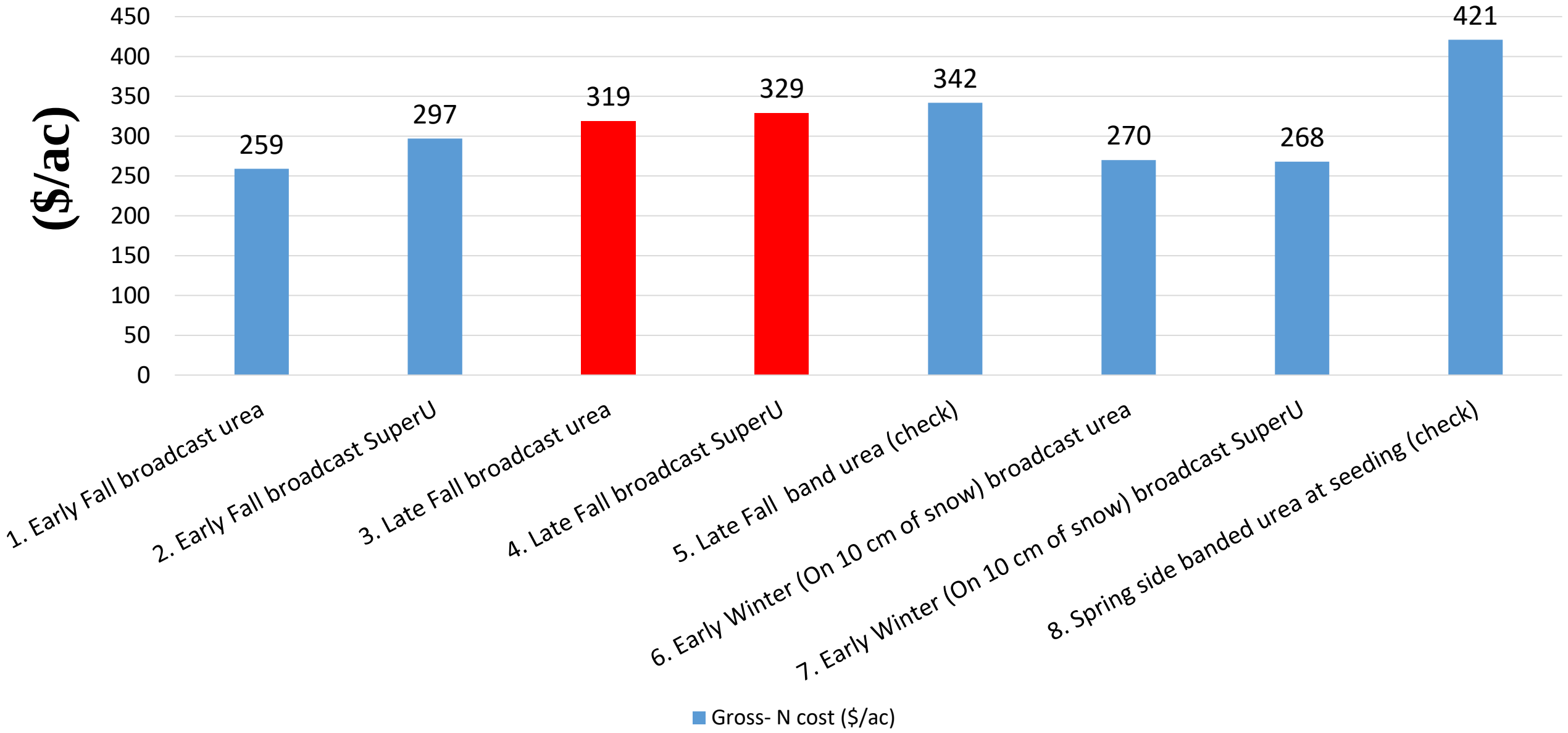

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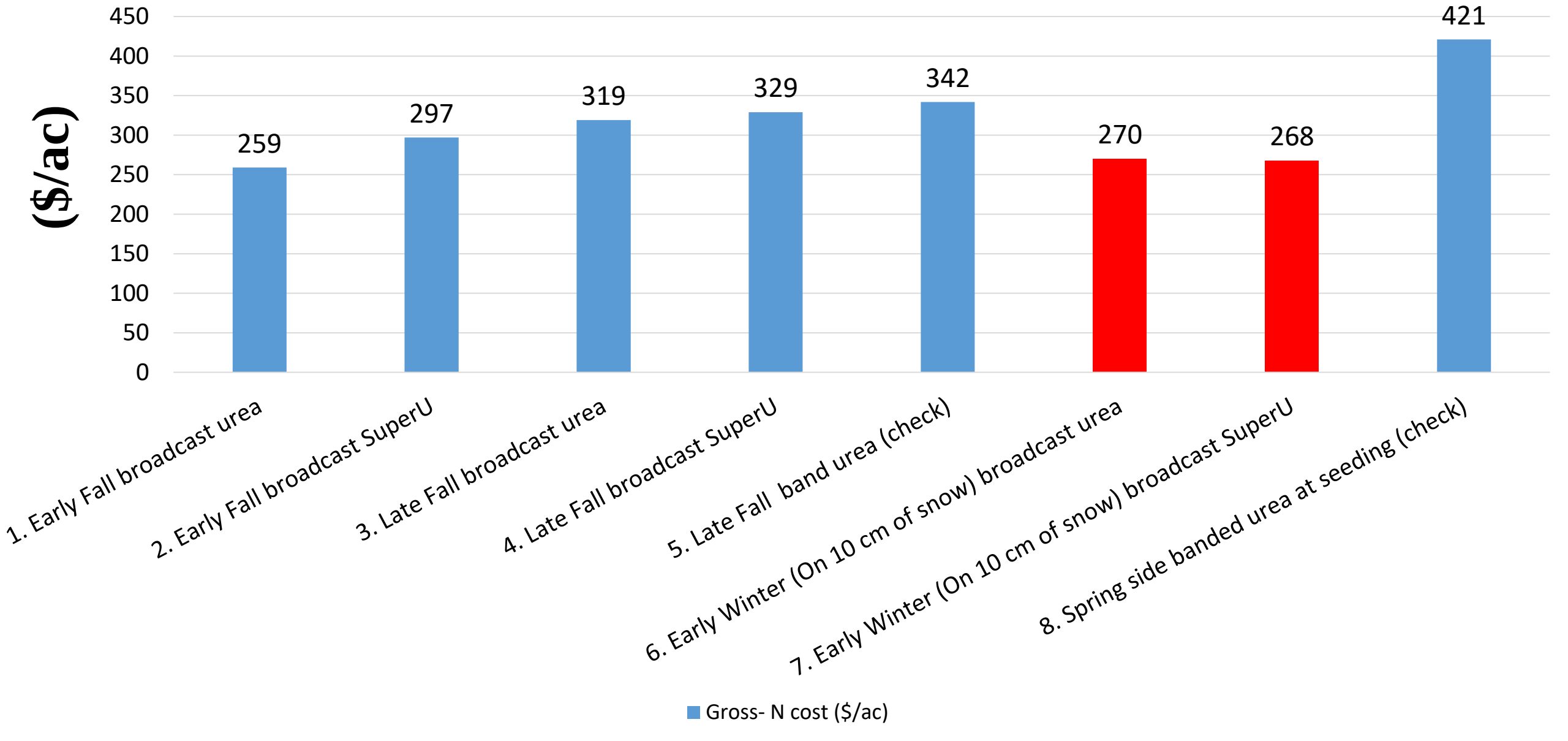
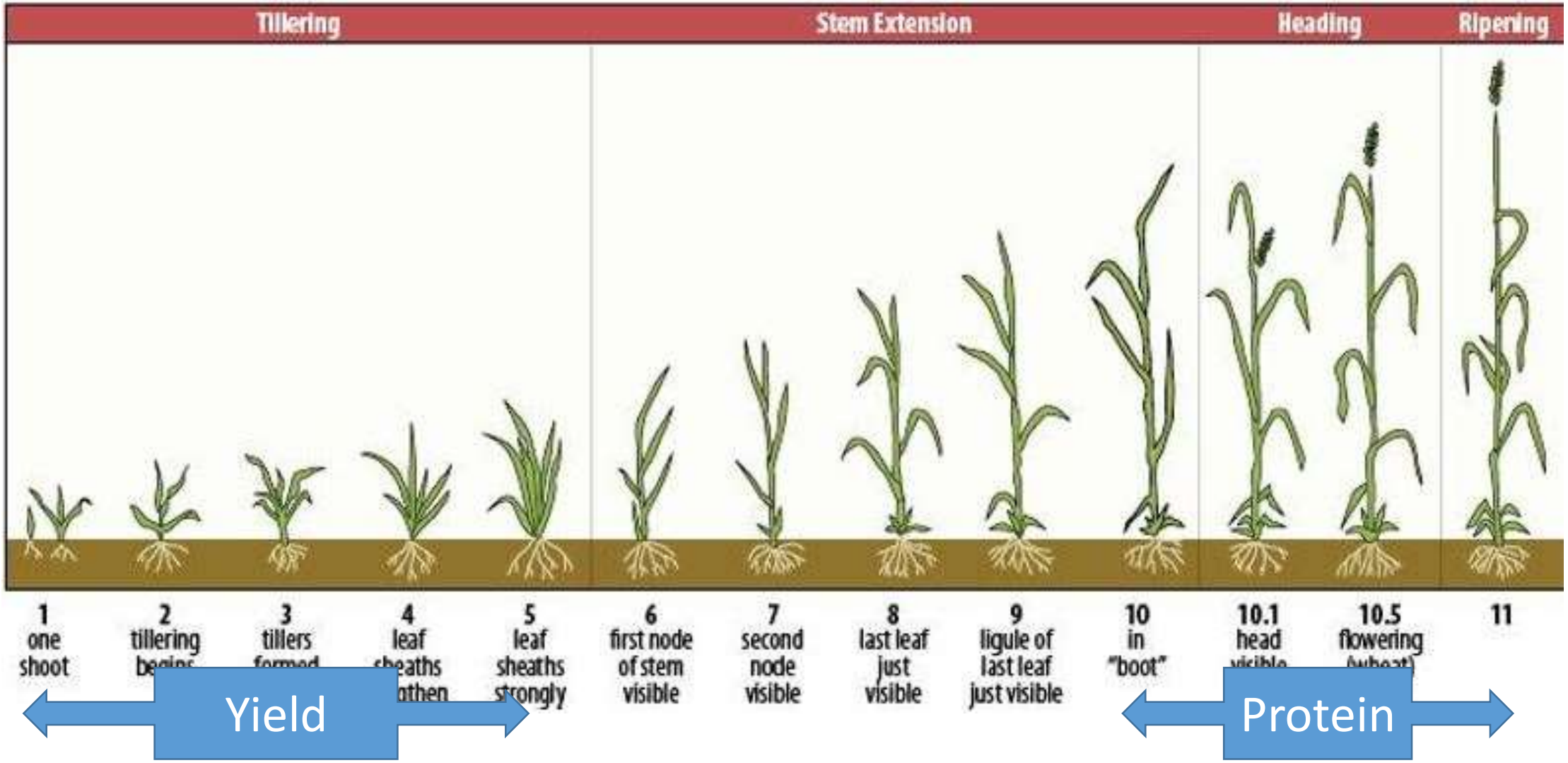


Conclusions

- Right Rate
- Right Time
- Right Place
- Right Form
  - SUPERU
  - Agrotain

- **Post seeding applications?**
  - Applications of N prior to 5 leaf stage mostly go towards yield (needs rain)
  - Application of N at boot or after flowering go most towards protein (needs rain)



Increasing Wheat Protein with a Post Emergent Application of UAN

Funded by:
ADOPT
and
SaskWheat

Mike Hall – Research Coordinator
Heather Sorestad- Research Assistant

PARKLAND COLLEGE

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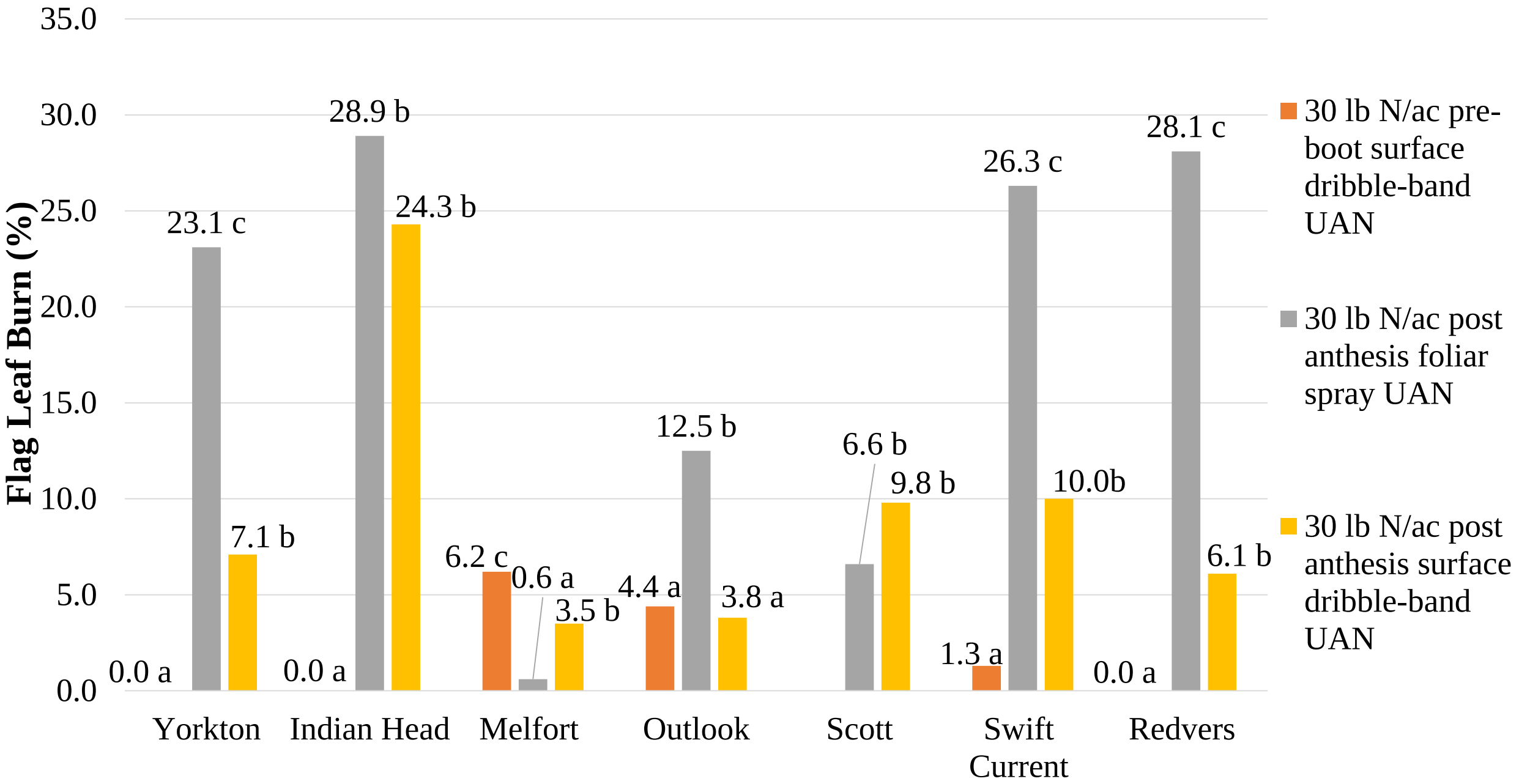
ECRF

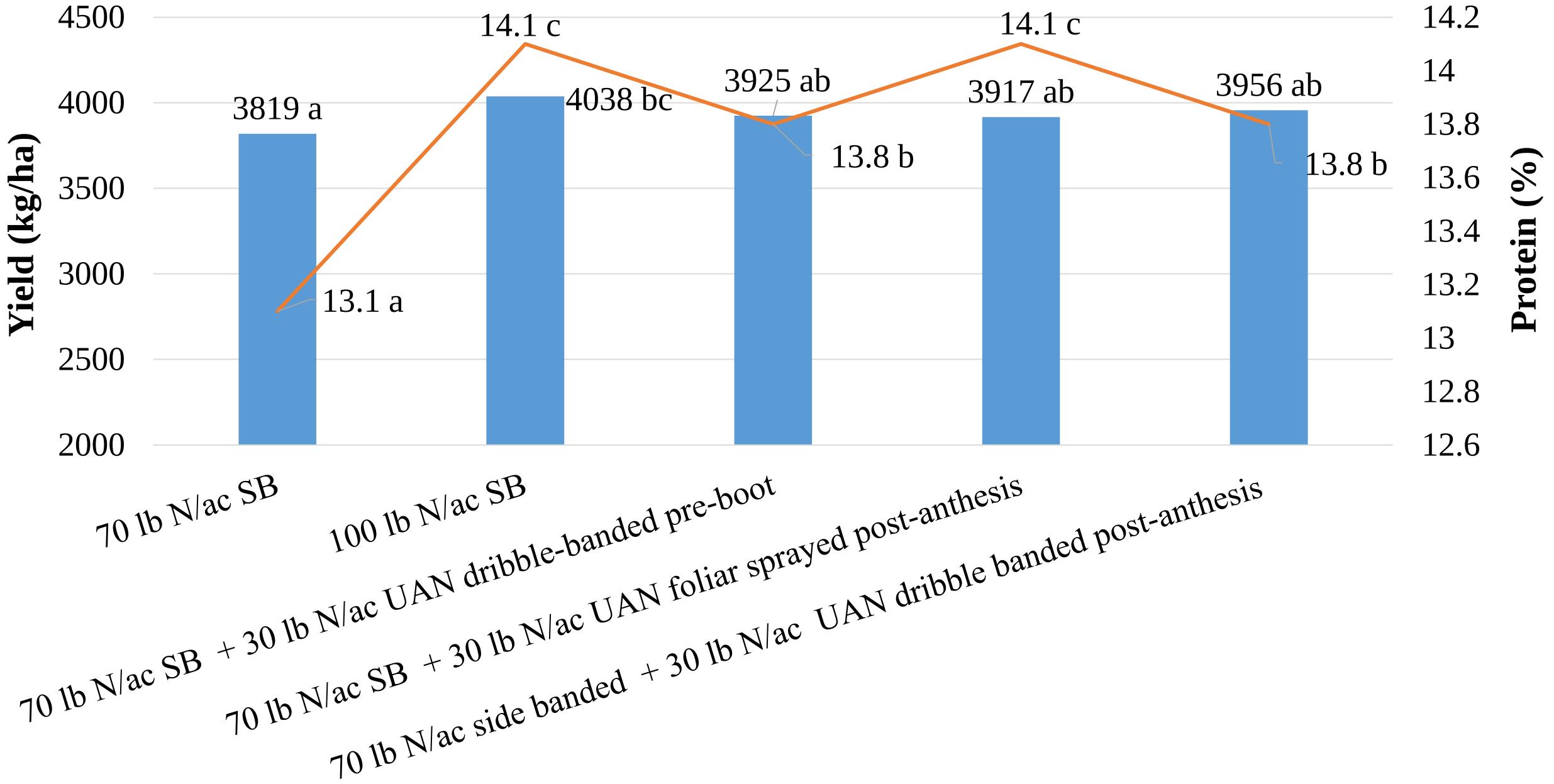
Scott – Western Applied Research Corporation (WARC)
Outlook – Irrigation Crop Diversification Corporation (ICDC)
Swift Current – Western Conservation Area Inc. (WCA)
Melfort – Northeast Agriculture Research Foundation (NARF)
Yorkton – East Central Research Foundation (ECRF)
Indian Head – Indian Head Agricultural Research Foundation (IHARF)
Redvers – South East Research Farm (SERF)

Treatment	Side Banded Urea	UAN Application
1	70 lbs N/ac	None
2	100 lbs N/ac	None
3	130 lbs N/ac	None
4	70 lbs N/ac	30 lbs N/ac pre-boot surface dribble-band
5	100 lbs N/ac	30 lbs N/ac pre-boot surface dribble-band
6	70 lbs N/ac	30 lbs N/ac post-anthesis foliar spray
7	100 lbs N/ac	30 lbs N/ac post-anthesis foliar spray
8	70 lbs N/ac	30 lbs N/ac post-anthesis surface dribble-band
9	100 lbs N/ac	30 lbs /ac N post-anthesis surface dribble-band

Flag Leaf Burn from UAN, Averaged over Total Nitrogen Rate



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



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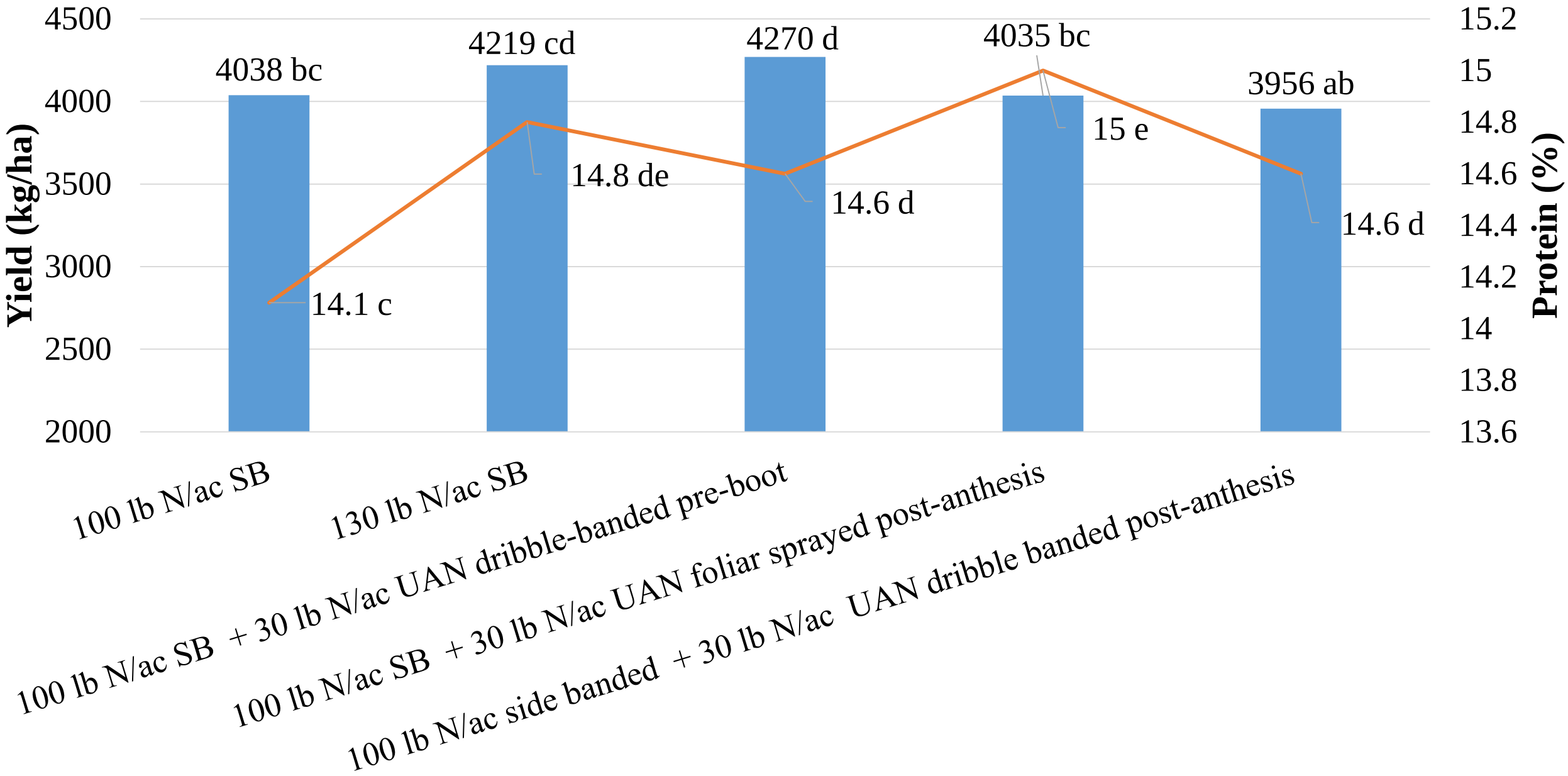


Spread (cents/%/bu) required to cover the cots of 30 lbs N/ac + $5/ac cost of application

Crop Yield (bu/ac)	40	50	60	70
Protein Increase (%)	0.5	0.5	0.5	0.5
$N/lbs				
0.3	70	56	47	40
0.35	78	62	52	44
0.4	85	68	57	49
0.45	93	74	62	53
0.5	100	80	67	57
0.55	108	86	72	61
0.6	115	92	77	66
0.65	123	98	82	70

Crop Yield (bu/ac)	40	50	60	70
Protein Increase (%)	1	1	1	1
$N/lbs				
0.3	35	28	23	20
0.35	39	31	26	22
0.4	43	34	28	24
0.45	46	37	31	26
0.5	50	40	33	29
0.55	54	43	36	31
0.6	58	46	38	33
0.65	61	49	41	35

Funding Provided by:

Sask Wheat DEVELOPMENT COMMISSION

Growing Forward 2

A federal-provincial-territorial initiative

Agricultural Demonstration of Practices and Technologies (ADOPT)

THE END

Strategies for Managing Feed and Malt Barley (2017-2018)

Funding Provided by:

Agricultural Demonstration of Practices and Technologies (ADOPT)

Western Applied Research Corporation- Scott
East Central Research Foundation- Yorkton
Indian Head Agricultural Research Foundation- Indian Head

Strategies for Managing Feed and Malt Barley (2017)

Agronomic factor evaluated in 2017:

- Seeding Date
  - Early May
  - Late May
- Variety
  - AC Metcalfe
  - CDC Austenson
- Nitrogen Rate (IHARF and WARC)
  - 40 lbs/ac
  - 80 lbs/ac
  - 120 lbs/ac

Agronomic factor evaluated in 2017:

- Seeding Date
  - Early May
  - Late May
- Variety
  - AC Metcalfe
  - CDC Austenson
- Nitrogen Rate (IHARF and WARC)
  - 40 lbs/ac
  - 80 lbs/ac
  - 120 lbs/ac
- Nitrogen Rate (ECRF)
  - 60 lbs/ac
  - 80 lbs/ac
  - 100 lbs/ac
  - 120 lbs/ac

Strategies for Managing Feed and Malt Barley (2018)

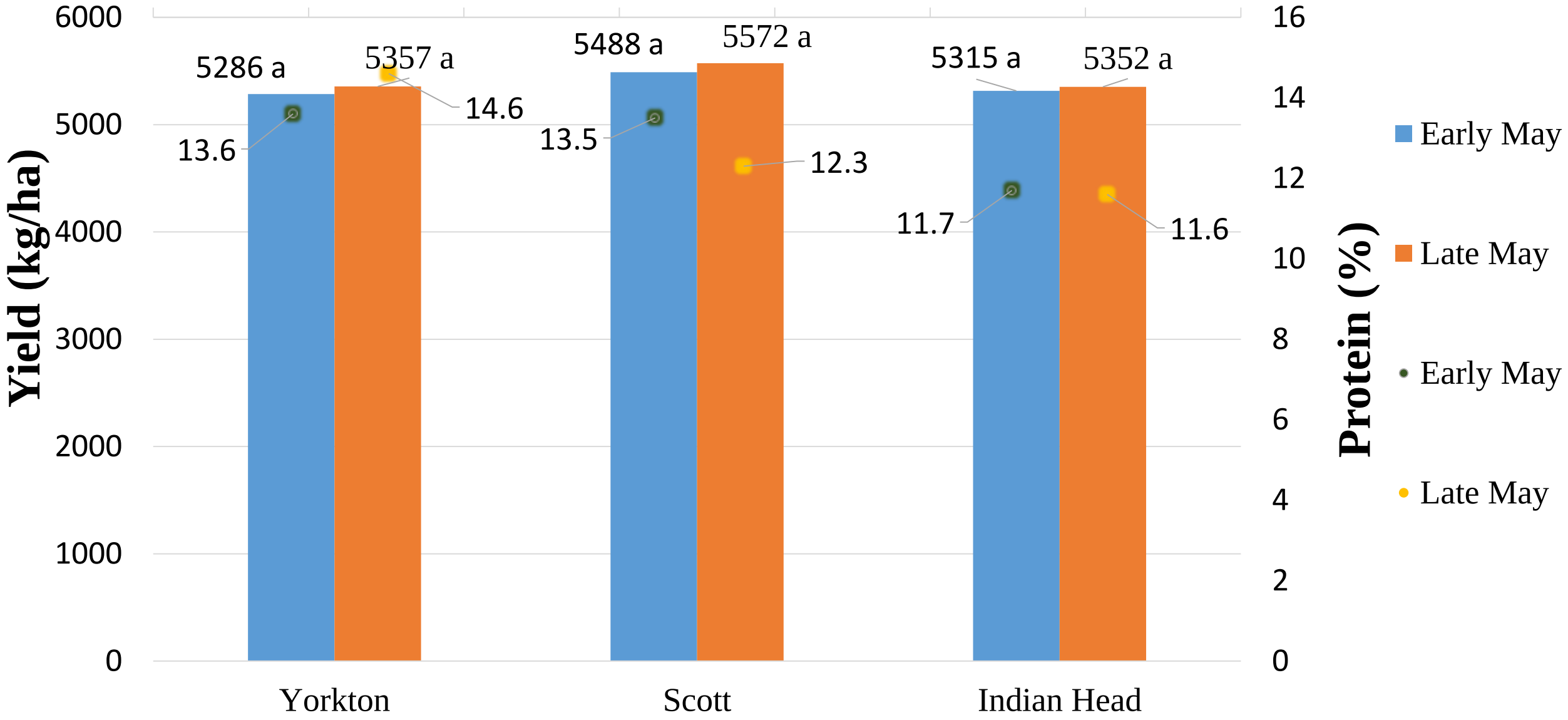
Western Applied Research Corporation- Scott
East Central Research Foundation- Yorkton
South East Research Farm- Redvers
Indian Head Agricultural Research Foundation- Indian Head
Northeast Agriculture Research Foundation- Melfort
Conservation Learning Centre- Prince Albert
Irrigation Crop Diversification Corporation- Outlook

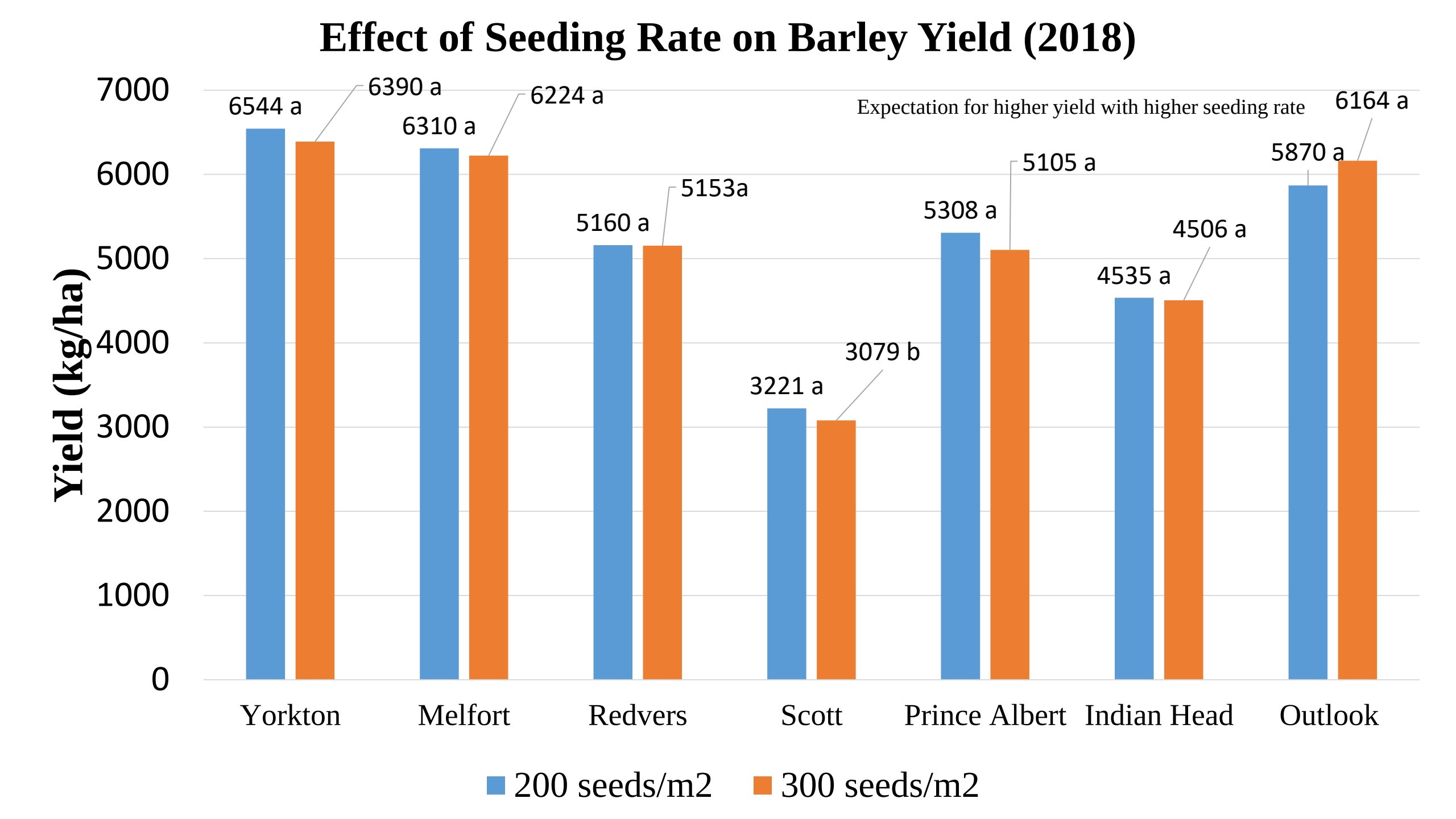
Agronomic factor evaluated in 2018:

- Variety
  - CDC Bow
  - CDC Austenson
- Seeding Rate
  - 200 seeds/m^2
  - 300 seeds/m^2
- Nitrogen Rate
  - 50 lbs/ac
  - 75 lbs/ac
  - 100 lbs/ac

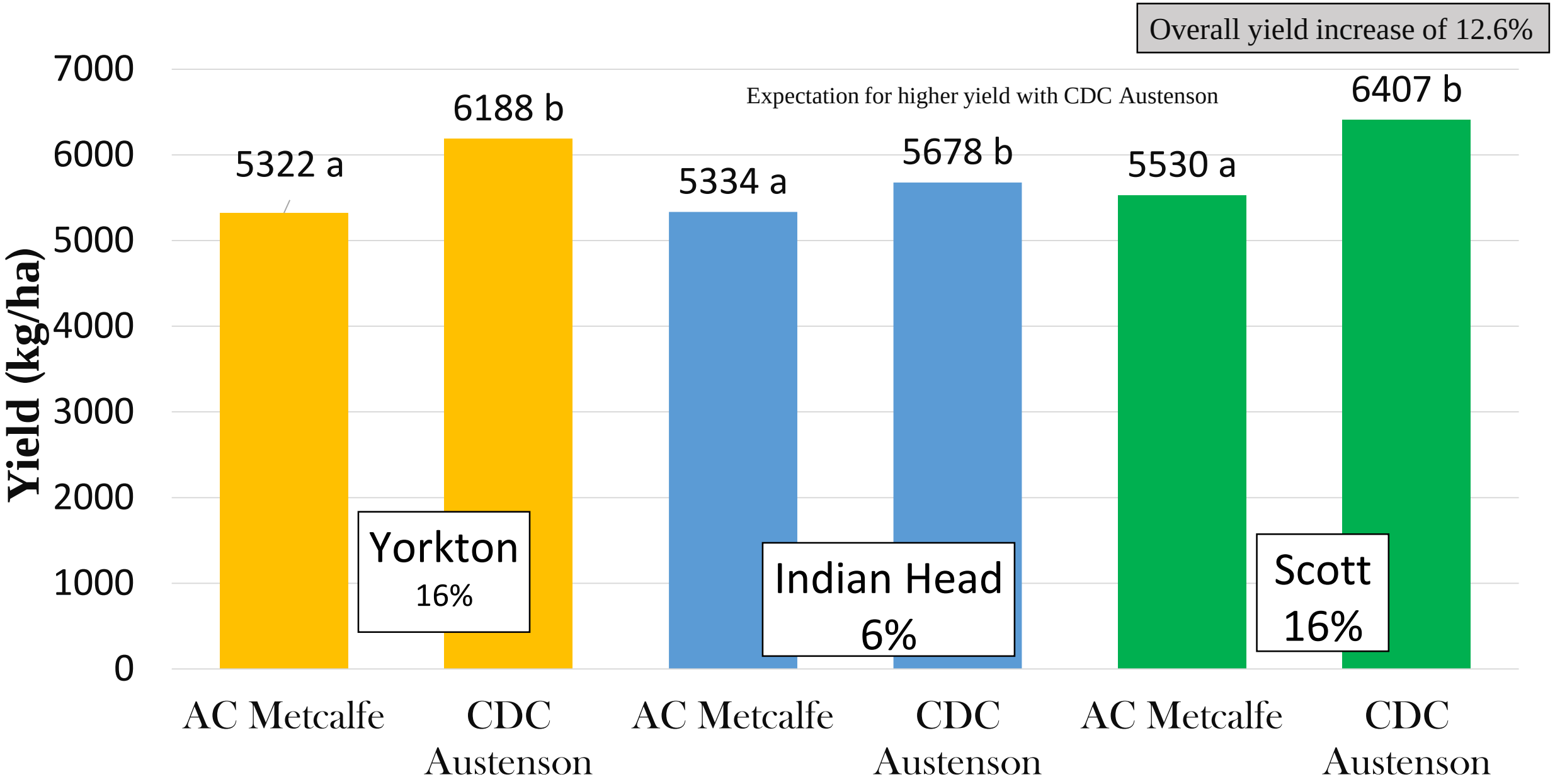
Effect of Seeding date on Yield and Protein of AC Metcalfe (2017)

Expectation for higher yield and lower protein with early seeding date




Effect of Seeding Rate on Barley Yield (2018)
Yield (kg/ha)
7000
6000
5000
4000
3000
2000
1000
0
6544 a
6390 a
6310 a
6224 a
5160 a
5153a
3221 a
3079 b
5308 a
5105 a
4535 a
4506 a
5870 a
6164 a
Expectation for higher yield with higher seeding rate
Yorkton
Melfort
Redvers
Scott
Prince Albert
Indian Head
Outlook
200 seeds/m2
300 seeds/m2

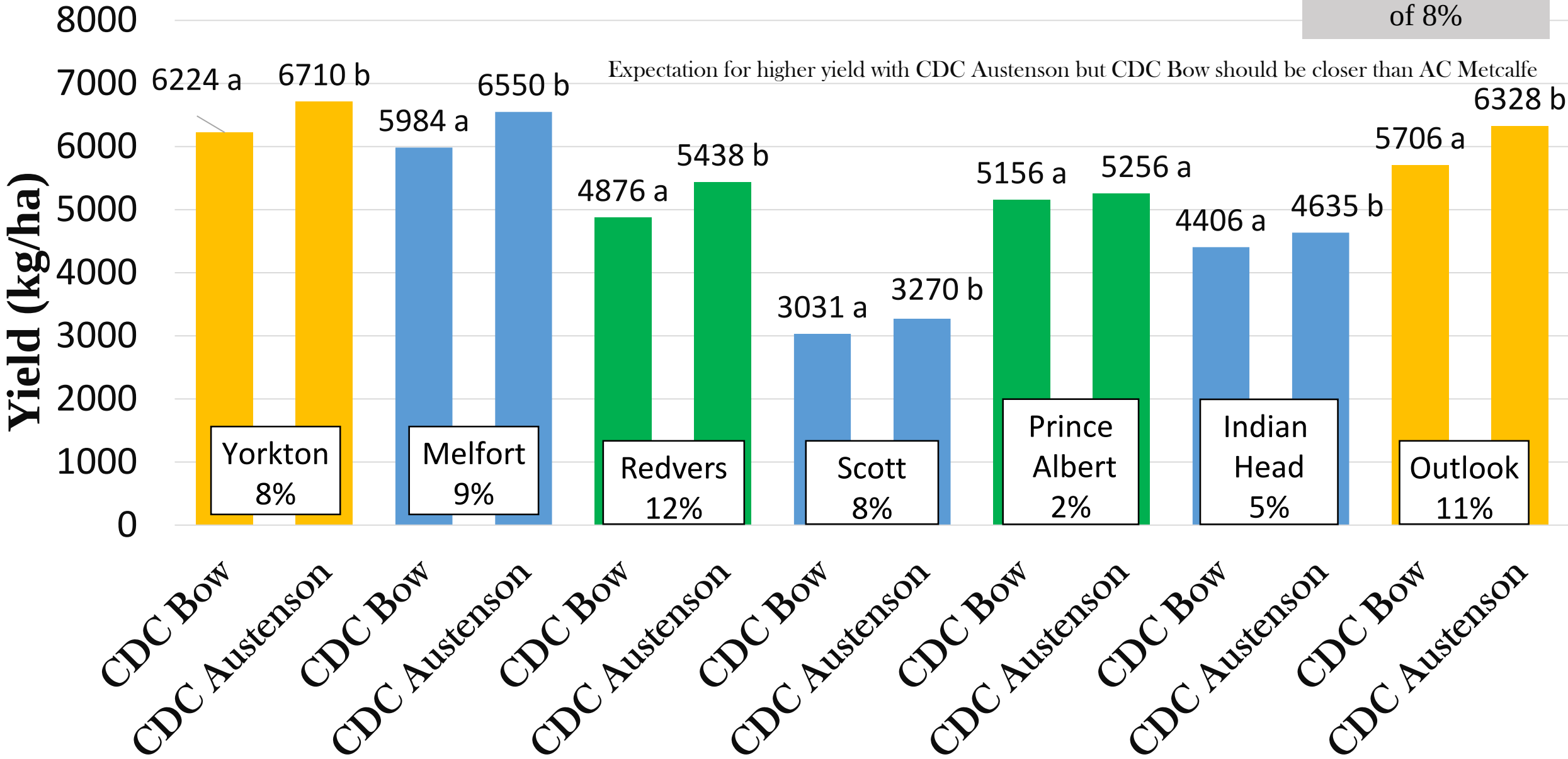
Yield of AC Metcalfe vs CDC Austenson 2017



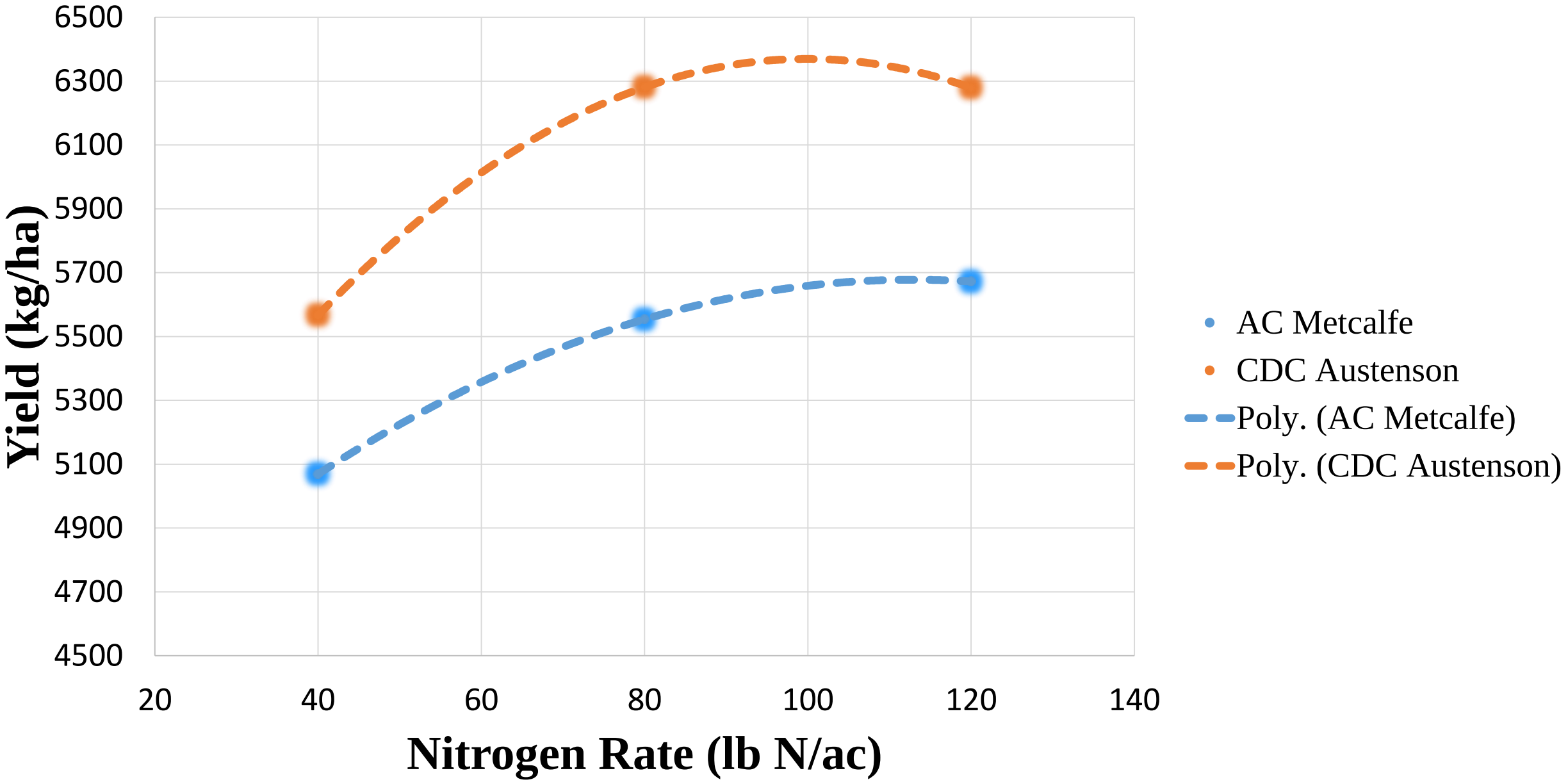
Yield of CDC Bow vs CDC Austenson 2018

Yield difference of 8%

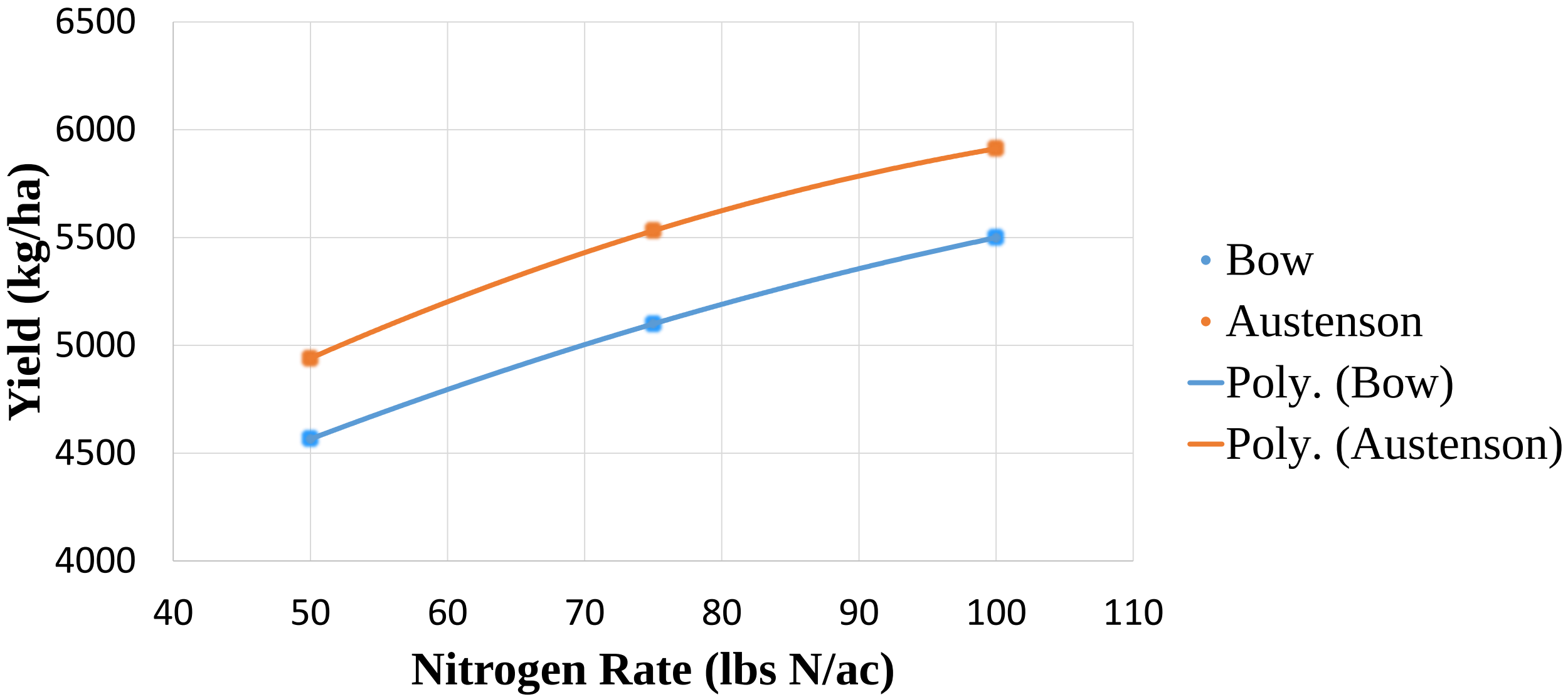
Expectation for higher yield with CDC Austenson but CDC Bow should be closer than AC Metcalfe



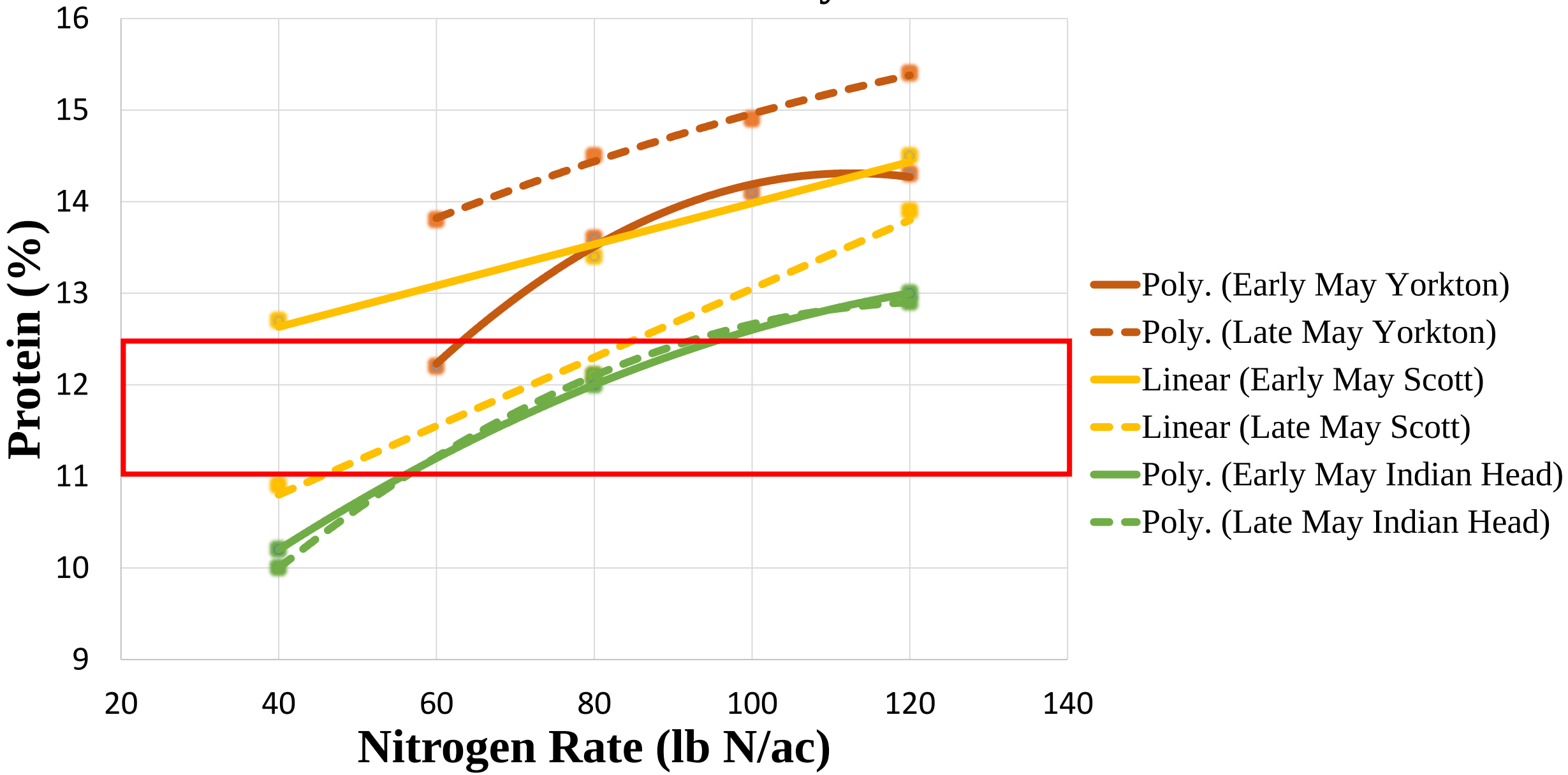
Effect of Nitrogen Rate on Yield of AC Metcalfe and CDC Austenson, Averaged over Seeding Date and Scott and Indian Head 2017



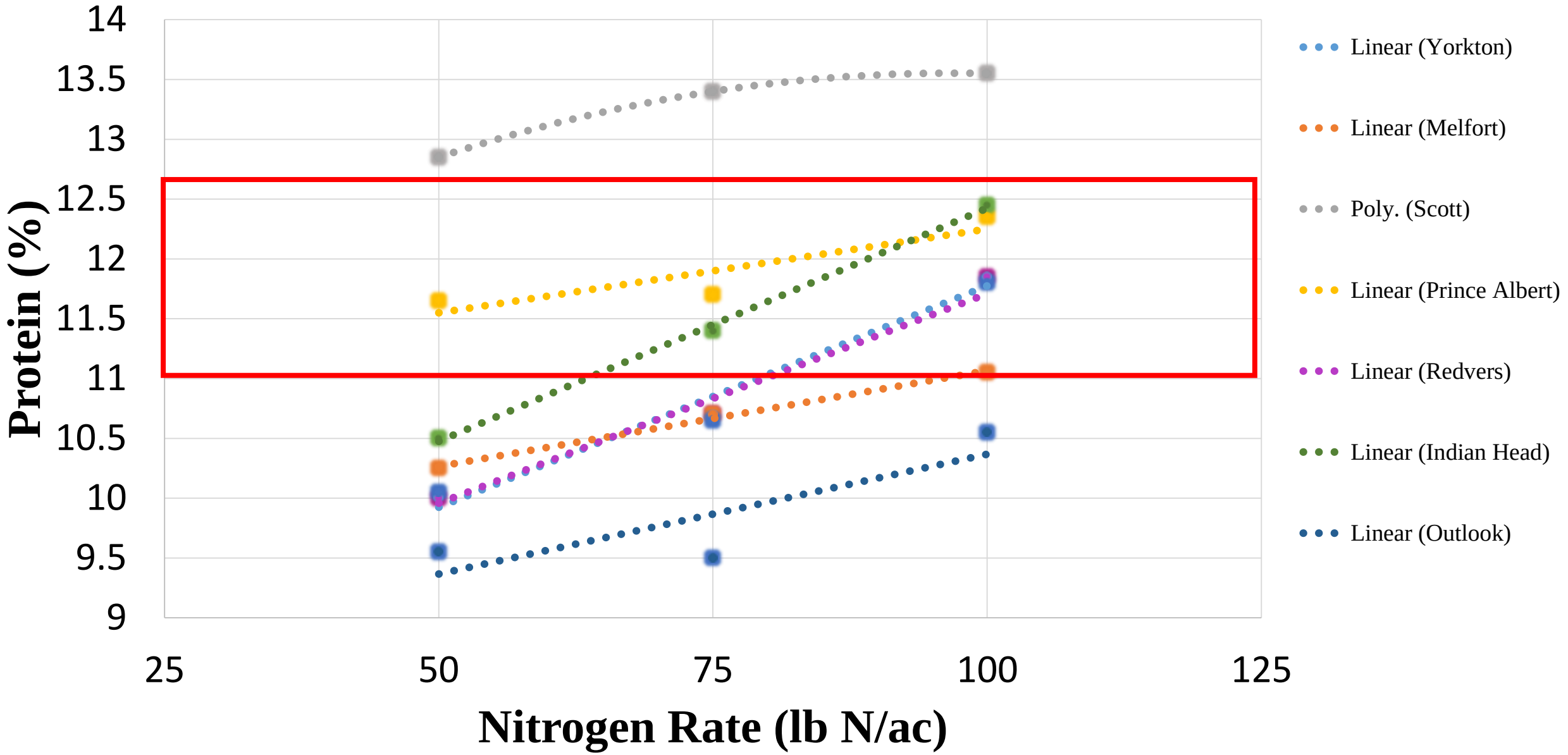
Yield Response of CDC Bow and CDC Austenson to Added Nitrogen Rate, Averaged over Seeding Rate and Location (2018)



Effect of Increasing Nitrogen on Grain Protein of CDC Metcalfe Seeded Early and Late 2017



Effect of Increasing Nitrogen on Grain Protein of CDC Bow 2018



Economic Analysis for Growing AC Metcalfe for Malt over CDC Austenson for Feed (2017 Prices of $5.44/bu of Malt and $3.22/bu of Feed from Saskatchewan Crop Planning Guide)				
	Yorkton	Indian Head	Scott	All sites
	----------bu/ac----------			
AC Metcalfe -80 lb N/ac (late may seeding date)		101	107	
CDC Austenson -80 lb N/ac (late may seeding date)		110	121	
AC Metcalfe -60 lb N/ac (early may seeding date)	96			
CDC Austenson -60 lb N/ac (early may seeding date)	115			
	----------$/ac----------			
Gross $ selling AC Metcalfe for malt	522	549	582	236
Gross $ selling AC Metcalfe for feed	309	325	345	140
Gross $ selling CDC Austenson for feed	370	354	390	159
Value of selling AC Metcalfe for malt over CDC Austenson for feed	152	195	192	77
Value of selling CDC Austenson for feed over AC Metcalfe for feed	61	29	45	19
	---------- %----------			
Percent chance of making malt that is required to justify growing AC Metcalfe over CDC Austenson	28.7	12.9	19.0	20.0

Economic Analysis for Growing AC Metcalfe for Malt over CDC Austenson for Feed (2018 prices of $4.68/ bu of Malt and $3.70/bu of Feed)				
	Yorkton	Indian Head	Scott	All sites
	----------bu/ac----------			
AC Metcalfe -80 lb N/ac (late may seeding date)		101	107	
CDC Austenson - 80 lb N/ac (late may seeding date)		110	121	
AC Metcalfe -60 lb N/ac (early may seeding date)	96			
CDC Austenson -60 lb N/ac (early may seeding date)	115			
	----------$/ac----------			
Gross $ selling AC Metcalfe for malt	449	473	501	203
Gross $ selling AC Metcalfe for feed	355	374	396	161
Gross $ selling CDC Austenson for feed	426	407	448	183
Value of selling AC Metcalfe for malt over CDC Austenson for feed	24	66	53	20
Value of selling CDC Austenson for feed over AC Metcalfe for feed	70	33	52	22
	---------- %----------			
Percent chance of making malt that is required to justify growing AC Metcalfe over CDC Austenson	74.7	33.6	49.4	52.3

Economic Analysis for Growing CDC Bow for Malt over CDC Austenson for Feed (2017 prices of $5.44/ bu of Malt and $3.22/bu of Feed)								
	Yorkton	Melfort	Prince Albert	Indian Head	Outlook	Redvers	Scott	All sites
	----------bu/ac----------							
CDC Bow -100 lb N/ac (averaged over seeding rate)	123.1	123.8	100.8	87.7	119.5	101.8	Na	
CDC Austenson -100 lb N/ac (averaged over seeding rate)	134.7	134.7	101.3	89.7	132.6	110.0	Na	
CDC Bow -50 lb N/ac (averaged over seeding rate)	Na	Na	Na	Na	Na	Na	53.1	
CDC Austenson -50 lb N/ac (averaged over seeding rate)	Na	Na	Na	Na	Na	Na	56.7	
	----------$/ac----------							
Gross $ selling CDC Bow for malt	670	673	549	477	650	554	289	552
Gross $ selling CDC Bow for feed	396	399	325	283	385	328	171	327
Gross $ selling CDC Austenson for feed	434	434	326	289	427	354	183	349
Value of selling CDC Bow for malt over CDC Austenson for feed	236	240	222	188	223	200	106	202
Value of selling CDC Austenson for feed over CDC Bow for feed	37	35	2	6	42	26	12	23
	---------- %----------							
Percent chance of making malt that is required to justify growing CDC Bow over CDC Austenson	14	13	1	3	16	12	10	10

Economic Analysis for Growing CDC Bow for Malt over CDC Austenson for Feed (2018 prices of $4.68/ bu of Malt and $3.70/bu of Feed)								
	Yorkton	Melfort	Prince Albert	Indian Head	Outlook	Redvers	Scott	All sites
	----------bu/ac----------							
CDC Bow -100 lb N/ac (averaged over seeding rate)	123.1	123.8	100.8	87.7	119.5	101.8	Na	
CDC Austenson -100 lb N/ac (averaged over seeding rate)	134.7	134.7	101.3	89.7	132.6	110.0	Na	
CDC Bow -50 lb N/ac (averaged over seeding rate)	Na	Na	Na	Na	Na	Na	53.1	
CDC Austenson -50 lb N/ac (averaged over seeding rate)	Na	Na	Na	Na	Na	Na	56.7	
	----------$/ac----------							
Gross $ selling CDC Bow for malt	576	579	472	411	559	476	249	475
Gross $ selling CDC Bow for feed	455	458	373	325	442	377	197	375
Gross $ selling CDC Austenson for feed	498	498	375	332	491	407	210	402
Value of selling CDC Bow for malt over CDC Austenson for feed	78	81	97	79	69	70	39	73
Value of selling CDC Austenson for feed over CDC Bow for feed	43	40	2	7	48	30	13	26
	---------- %----------							
Percent chance of making malt that is required to justify growing CDC Bow over CDC Austenson	36	33	2	8	41	30	25	27

Conclusions

- Use higher seeding rates (200 vs 300 seeds/m2)
  - Yield?
  - More competitive, hastens maturity, reduces kernel plumpness but increases uniformity
- Use higher rates of N with Feed. Manage N for Malt.
- Seed early May vs Late May?
  - Higher yield, lower protein, harvesting in better weather.
  - However, if seeding late May don’t give up hope for malt.

Conclusions

- The feed variety CDC Austenson is about 12.6% higher yielding than AC Metcalfe and about 8% higher yielding than CDC Bow.
- With a wide price differential ($5.44/ bu malt vs $3.22/ bu feed), we need a 20% chance for AC Metcalfe and 10% chance for CDC Bow making malt to justify growing these varieties over CDC Austenson for feed.
- With a narrow price differential ($4.68/bu malt vs $3.70/ bu feed), these probabilities increase to 53% for AC Metcalfe and 27% for CDC Bow.
- When the yield of varieties accepted by maltsters is the same as feed, there will be little reason to grow feed (AAC Synergy showing promise).

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Agricultural Demonstration of
Practices and Technologies
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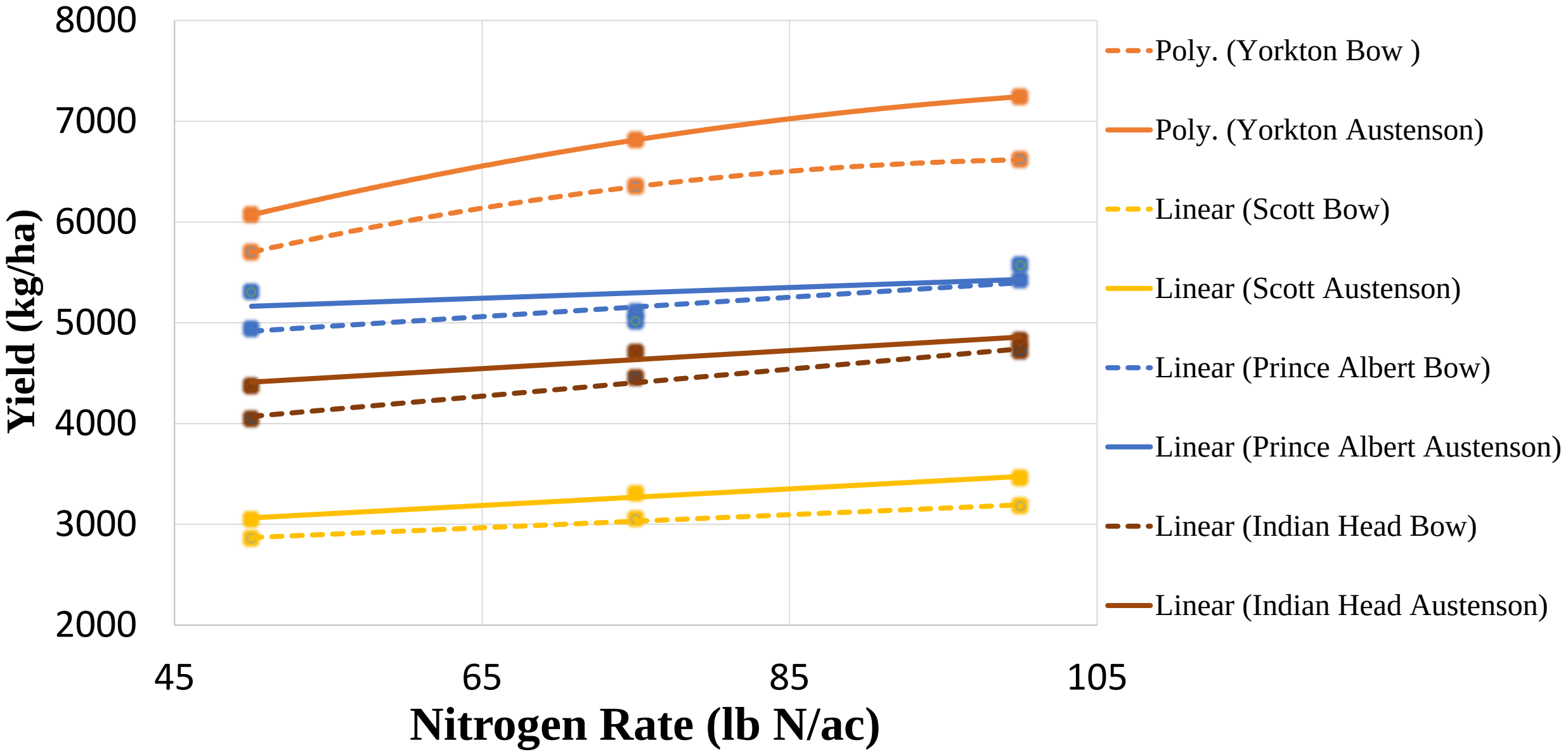
Growing Forward 2

A federal-provincial-territorial initiative

SaskBarley

DEVELOPMENT COMMISSION

CDC Bow and CDC Austenson's Yield Response to Nitrogen Rate Averaged over Seeding Rate



CDC Bow and CDC Austenson's Yield Response to Nitrogen Rate Averaged over Seeding Rate