Practical Solutions for Today's Agricultural Questions

Wheatland Conservation Area Inc.

AgriARM Applied Research Management

Cropportunities 2023

Wheatland Conservation Research Update

Bryan Nybo, Wheatland Conservation Area

Swift Current, SK.

Mar 14, 2023

Funding for this project provided by:

ADOPT

Agricultural Demonstration of Practices and Technologies

Government of Saskatchewan

Presentation Outline

-Brief Agri-ARM background
-Developing a Project
  Forages in Rotation
-Managing Drought with Split Application of N 2022

Project Development - steps that take place to carry a project from the idea stage to the field through to producer adoption.

- How do we come up with a project idea?
- Project ideas usually originates from a need, a situation or an current issue facing producers

-directly from producers, media, farm shows, industry.

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Example:	Resistant weeds	-rotations to slow down weed resistance. -move away from short rotations (Lentil-Wheat)
	Nutrient efficiencies	-rotations to reduce dependencies on fertilizer N.
	Soil Health	-rotation to improve soil health and Organic Matter.

Potential solutions

- Literature review / talk to other professionals to familiarize yourself with the issue. What work has been done and how can we adjust to make it practical and suitable to our area.
- Can it be done practically? and Do we have the Capacity?

Example: Forages in Rotation

-Can be a management tool help prevent weed resistance, and improve fertilizer efficiencies and soil health.

Forages in Rotation

- Develop Protocol

  -develop a treatment list that will best answer the issues at hand

  -list of parameters to measure to obtain pertinent data from which conclusions can be made.

X Attempt #1: Set up a rotation to show the benefits of including forages. -too long a time frame for funding sources.

X Attempt #2: Demonstrate each phase of the rotation by setting up a series of plots each plot represents a year or phase of the overall rotation. –no visual effects.

✓ Attempt #3: Demonstrate varieties / species best suited for including forages in rotation.

-Budget $$$ (labor, inputs, rent, insurance, equipment depreciation / replacement / repairs, administration, accounting, overhead, GROWTH.)

Selecting forage alfalfa options based on Fall Dormancy (FD) ratings

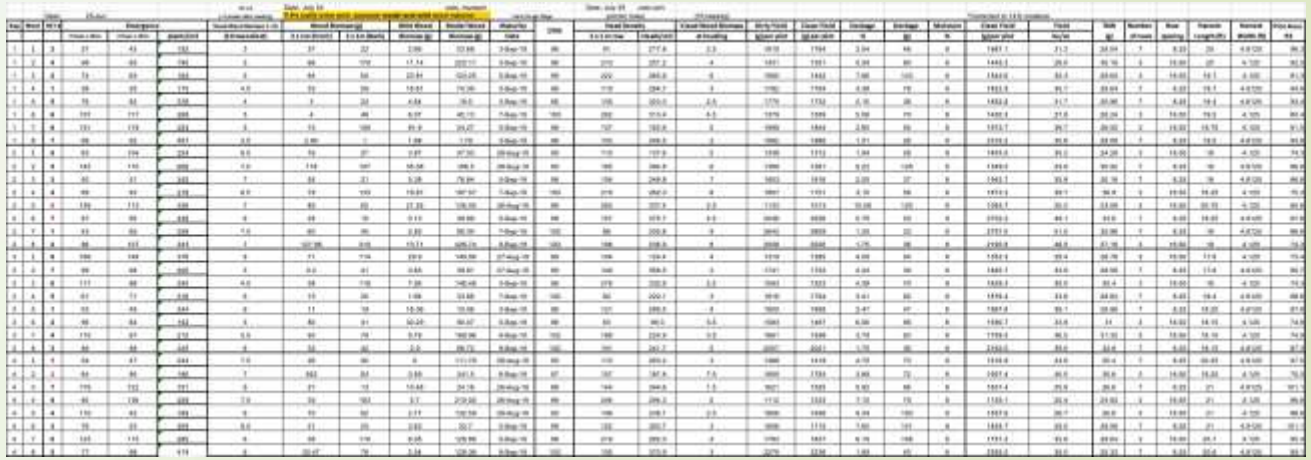
- Fall dormancy (FD) rating is a measure of how much an alfalfa variety will regrow in fall after cutting.
- Alfalfa with an FD rating of 1 will regrow less after cutting and instead will stockpile energy resources, primarily in the root system to help survive prolonged winter freezing temperatures.
- An alfalfa with an FD rating of 5 with exhibit more fall regrowth after cutting so a producer can “push the envelope” on a later season cut. (at the expense of stockpiling energy)
- With forages in a rotation, we are not concerned so much with prolonging the forage stand because we only want the forage to last 2 or 3 years of the rotation before moving back to annual crops. This may be a practical option.

Treatment List (not confirmed, seed availability?)

- Alfalfa (FD 0-1) Rangelander, Rambler
- Alfalfa (FD 4-5) Instinct, Perfection, or PV Ultima
- Short Term Red Clover (short lived perennial)
- Alfalfa (FD 0-1) mix with bromegrass
- Alfalfa (FD 4-5) mix with Dahrian Wild Rye
- Alfalfa (FD 4-5) mix with field pea cover crop
- Alfalfa (FD 4-5) mix with a forage triticale
- Short Term Red Clover mix with a forage barley

Data Collection

- Weather data
- Establishment
- Biomass yield
- Over winter establishment / survival
- Year 2 biomass yield
- Forage quality
- Economics



Results and Extension

-Collect all data.
-Statistical Analysis to determine data significance and determine confidence in the data.
-Interpretation of results.
-Extend results to the producer so they can confidently apply technology to their operation.

- Field Tours
- Seminars
- Fact sheets
- WCA website
- Agri-ARM website
- Social Media

Demonstrating Forages Options in Cropping Rotations

- Promote Benefits

  -improve fertilizer efficiencies

  -increased organic matter and soil quality

  -better water infiltration and drainage

  -reduce weed populations

  -break disease cycles

  -reduce salinity and soil erosion

  -divert the work load away from the busy seeding and harvest seasons.

  -Economic benefits. (can be difficult to quantify)

Agriculture and Agri-Food Canada plant breeder Dr. Yousef Papadopoulos holding a sample of AAC Trueman alfalfa to show its branching root and unique rhizomatous growth habit systems. Photo: AAFC

Managing Drought Risk with Split Applications of Nitrogen in Spring Wheat

This project falls under the 4 R Nutrient Stewardship Program

- Saskatchewan represents more than 37.1 million acres of cropland in Canada. The province will play a significant role toward sustainable farming in Canada
- In November 2016, the Government of Saskatchewan and Fertilizer Canada signed a Memorandum of Cooperation agreeing to work together on the ongoing implementation and adoption of fertilizer application practices using 4R Nutrient Stewardship (Right Source @ Right Rate, Right Time, Right Place ®).
- Why?? To strengthens existing environmental stewardship by adopting science-based fertilizer application practices using 4R Nutrient Stewardship.
- AND....Make fertilizer practices more efficient and economical for producers.

Managing Drought Risk with Split Applications of Nitrogen in Spring Wheat

Funding for this project provided by:

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Agricultural Demonstration of Practices and Technologies

Objective

The overall objective of this project is to demonstrate approaches to N management for Spring Wheat following a year of drought.

More specifically, to show the economics of holding back N at seeding, during droughts, and demonstrate the efficacy of split applications of N relative to placing all the nitrogen requirements at seeding.

Question 1

- In 2021, wide spread drought in Saskatchewan depleted reserves of soil moisture and increased background levels of nitrogen.
- In the spring of 2022, the perceived risk of drought was relatively high across much of Saskatchewan. In response, producers asked “should we hold back on rates of N applied at seeding to save money if drought continues?”

Question 2

- Should adequate and timely precipitation be received, producers may choose to apply more N post-emergent to support higher yield potentials. Will this approach come at a penalty compared to applying all the N at seeding time?
- To answer this, we will need 2 sites (one dry site and one wet site).

2022 Project Locations

Six locations involved in this study include:

-Swift Current (WCA) Bryan Nybo / Amber Wall

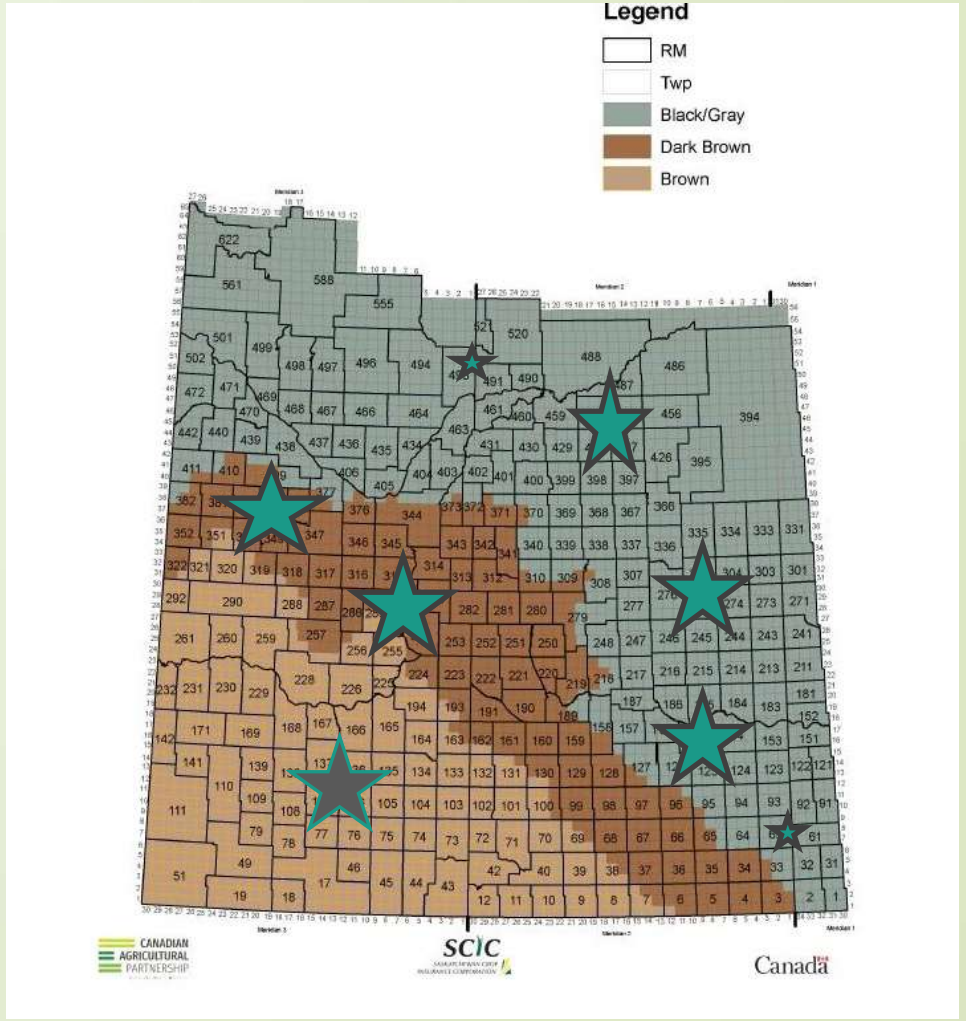
-Indian Head (IHARF) Chris Holzapfel

-Melfort (NARF) Brianne McInnes

-Scott (WARC) Jessica Enns

-Outlook (ICDC) Gursahib Singh

-Yorkton (ECRF Project Lead) Mike Hall



Treatment List (SB urea – Dribble band UAN w/Agrotain)

Trt#	Lb N/ac at seeding (Soil+Fert N)	Post-emergent UAN[b] (30 lb N/ac)	Post-emergent UAN[b] (60 lb N/ac)	Post-emergent UAN[b] (90 lb N/ac)	Total N (lb N/ac)
1	Soil N	--	--	--	Soil N
2	80	--	--	--	80
3	110	--	--	--	110
4	140	--	--	--	140
5	170	--	--	--	170
6	80	--	60@3-5 leaf	--	140
7	80	--	60@early flag	--	140
8	80	--	--	90@3-5 leaf	170
9	80	--	--	90@early flag	170
10	110	30@3-5 leaf	--	--	140
11	110	30@early flag	--	--	140
12	110	--	60@3-5 leaf	--	170
13	110	--	60@early flag	--	170

- Target 60 bu/ac. (requires 162 lbs N)
- N @ seeding includes Soil + Fert N.
- N response curve
- 140 @ seeding vs four split options
- 170 @ seeding vs four split options

What was Measured?

- **Residual soil nutrients & qualities:** Composite sample (0-15 cm, 15-60 cm) submitted to AgVise for OM, pH, CEC, NO3-N, Olsen-P, K & S determination (minimum, complete analyses)
- **Spring Emergence:** (~4 weeks after seeding)
- **Lodging:** On a scale (0-9)
- **Seed Yield:** Corrected for dockage and to 10% seed moisture content
- **Grain Protein:** (%)
- **Precipitation:** Precipitation (date and amount) from Environment Canada records was used from local weather stations when interpreting the data.
- **Economic Analysis:** Basic marginal economic analyses for each treatment to estimate the relative economic returns

Growing Season Precipitation (May – Aug 2022)

Location	Year	May	June	July	August	Total
		---------- Precipitation (mm) ----------				
Swift Current	2022	51.2	37.7	90.4	7.5	**187**
	Long-term	44.1	74.5	51.9	43.2	214
Scott	2022	11.0	57.1	86.5	32.1	**187**
	Long-term	38.9	69.7	69.4	48.7	227
Indian Head	2022	97.7	27.5	114.5	45.9	**286**
	Long-term	51.7	77.4	63.8	51.2	244
Melfort	2022	90.8	78.1	34.9	36.5	**240**
	Long-term	42.9	54.3	76.7	52.4	226.3
Yorkton	2022	137.9	57.9	38.4	90.8	**325**
	Long-term	51	80	78	62	271
Outlook	2022	30.4	69.4	51.4	8	**159**
(190 mm Irr)	Long-term	43.2	69.3	57.6	44.2	214.3

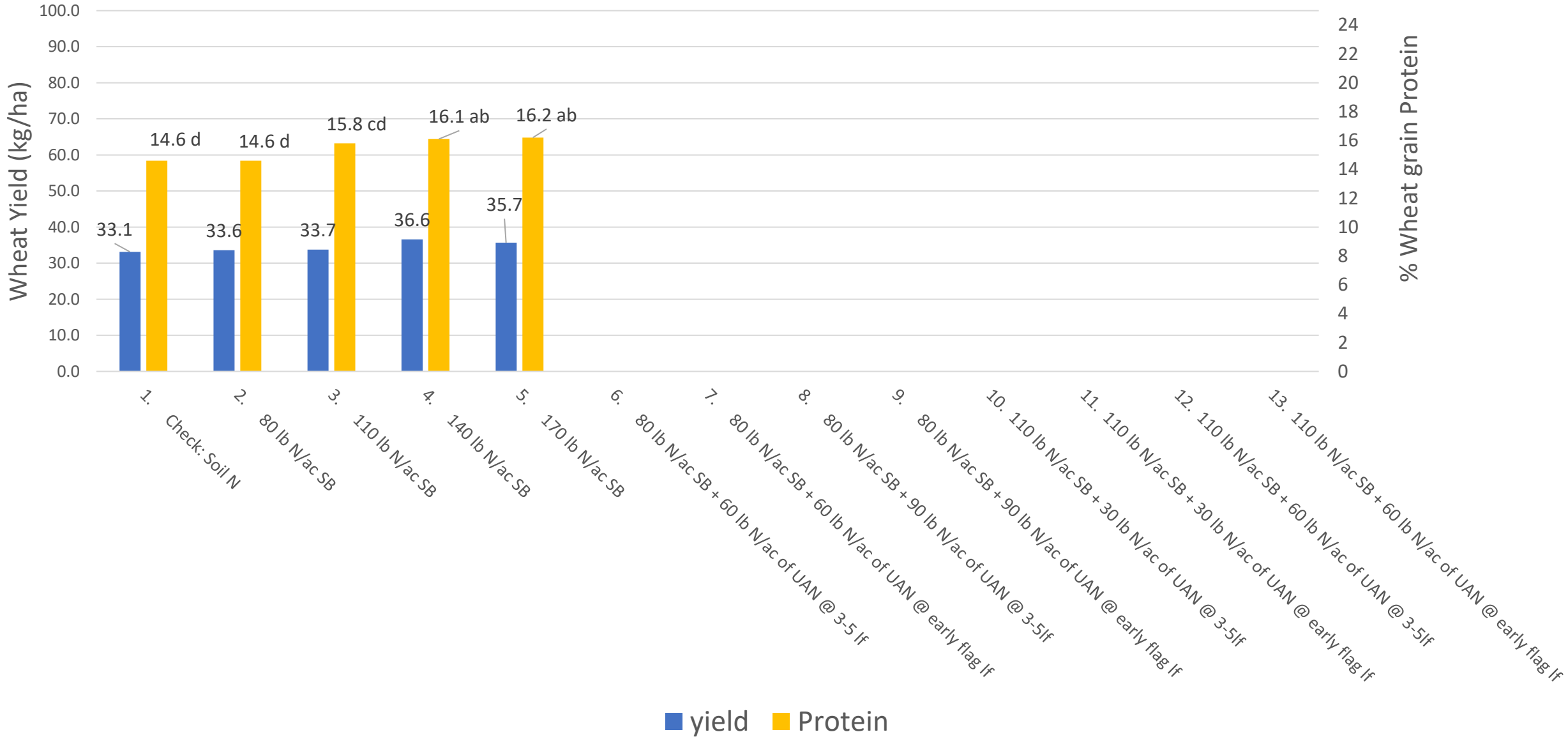
Wheatland Conservation Area Inc. (WCA)

-Well below average growing season precipitation

-High residual N levels (59 lbs N/ ac 0-24 inches)

Question 1. Can we save money by holding back N at seeding in drought conditions?

WCA-Swift Current



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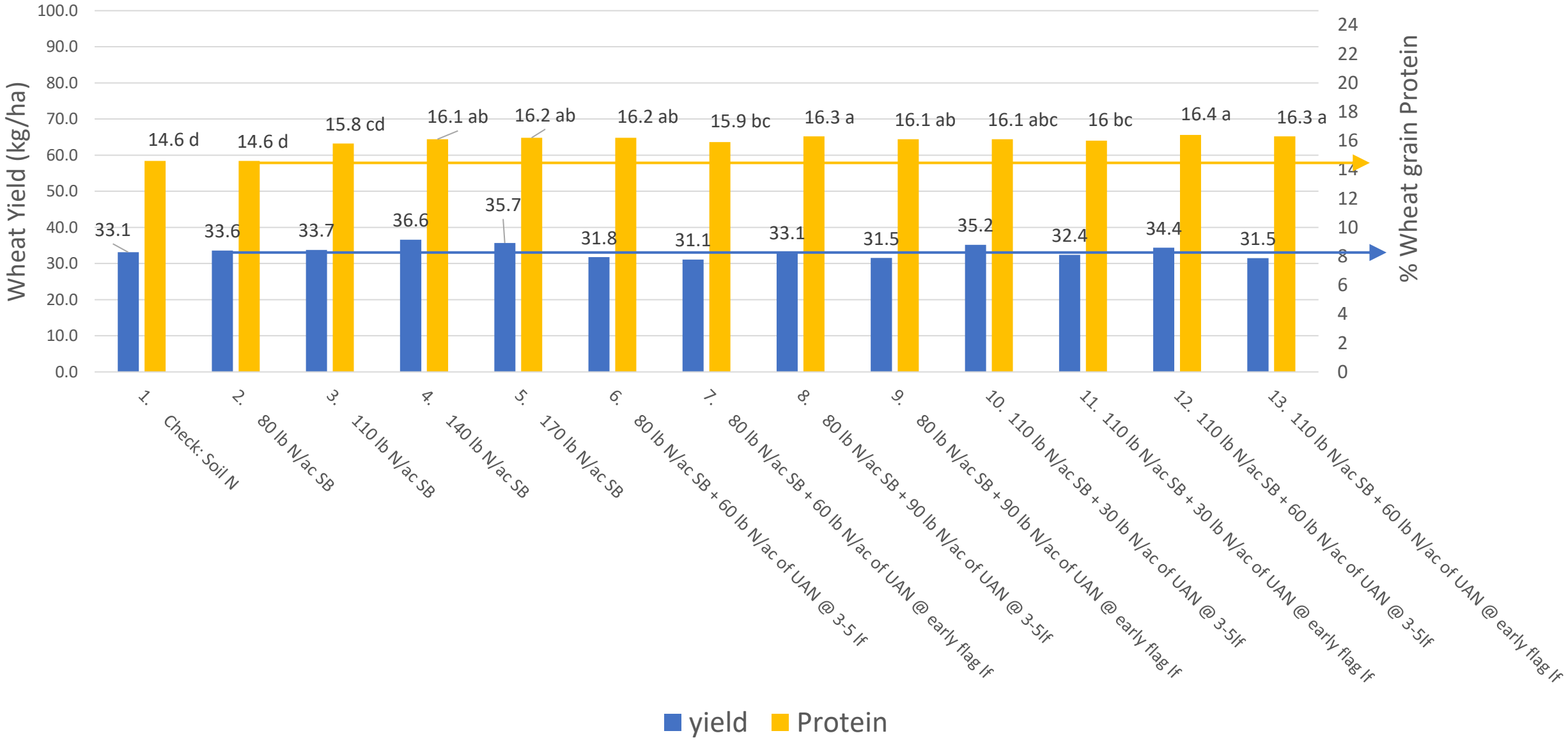

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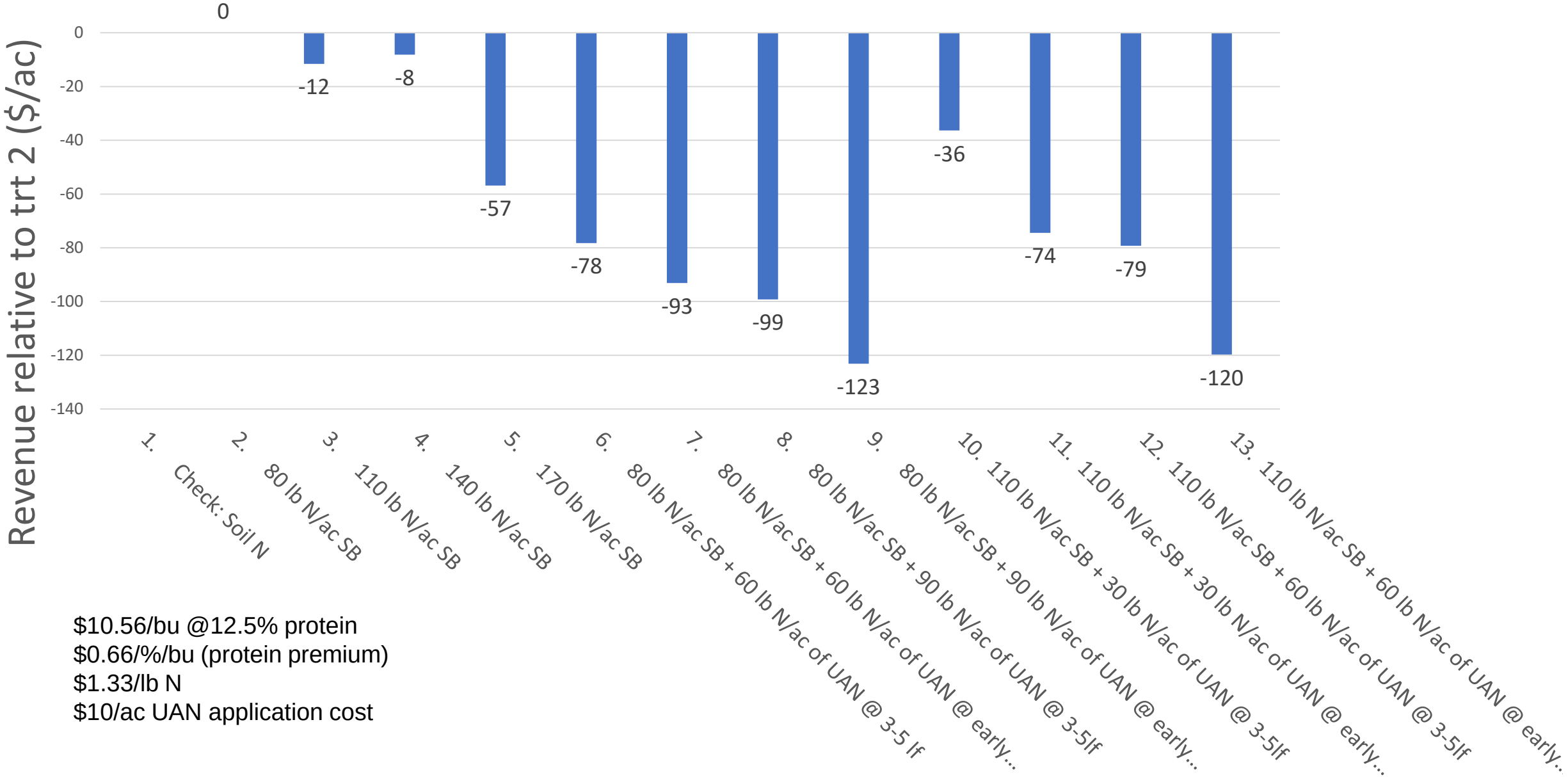
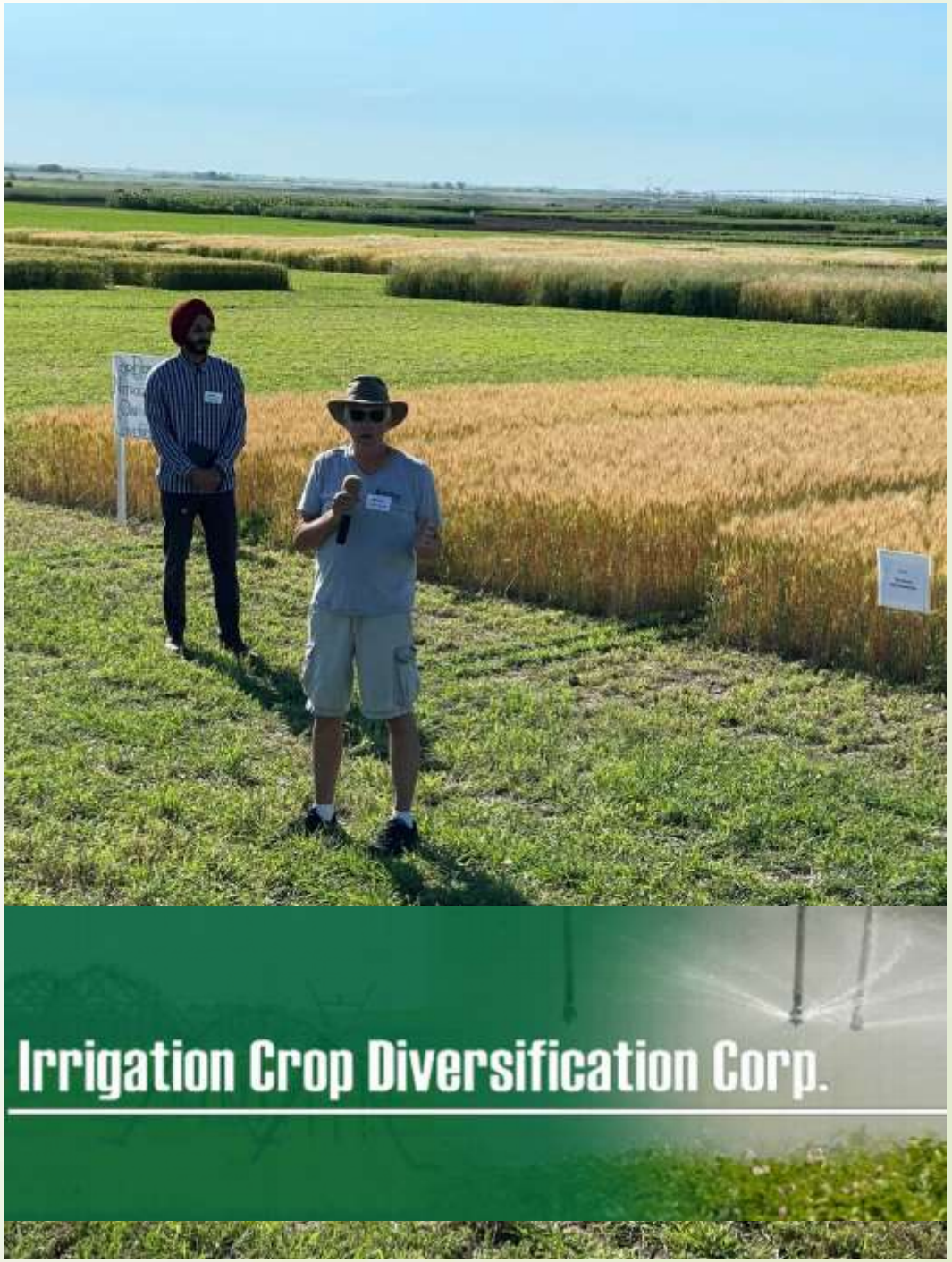


$10.56/bu @12.5% protein
$0.66/%/bu (protein premium)
$1.33/lb N
$10/ac UAN application cost

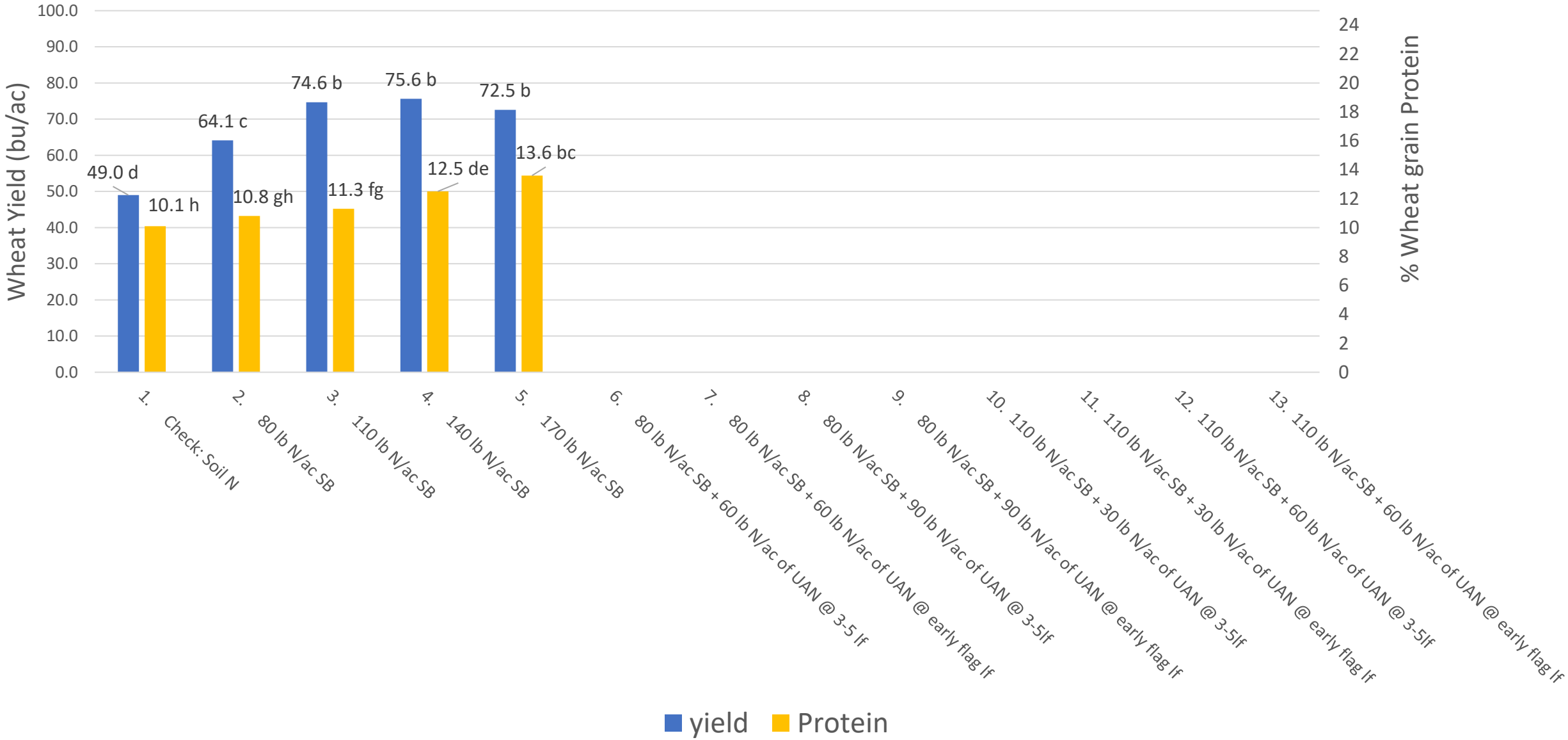


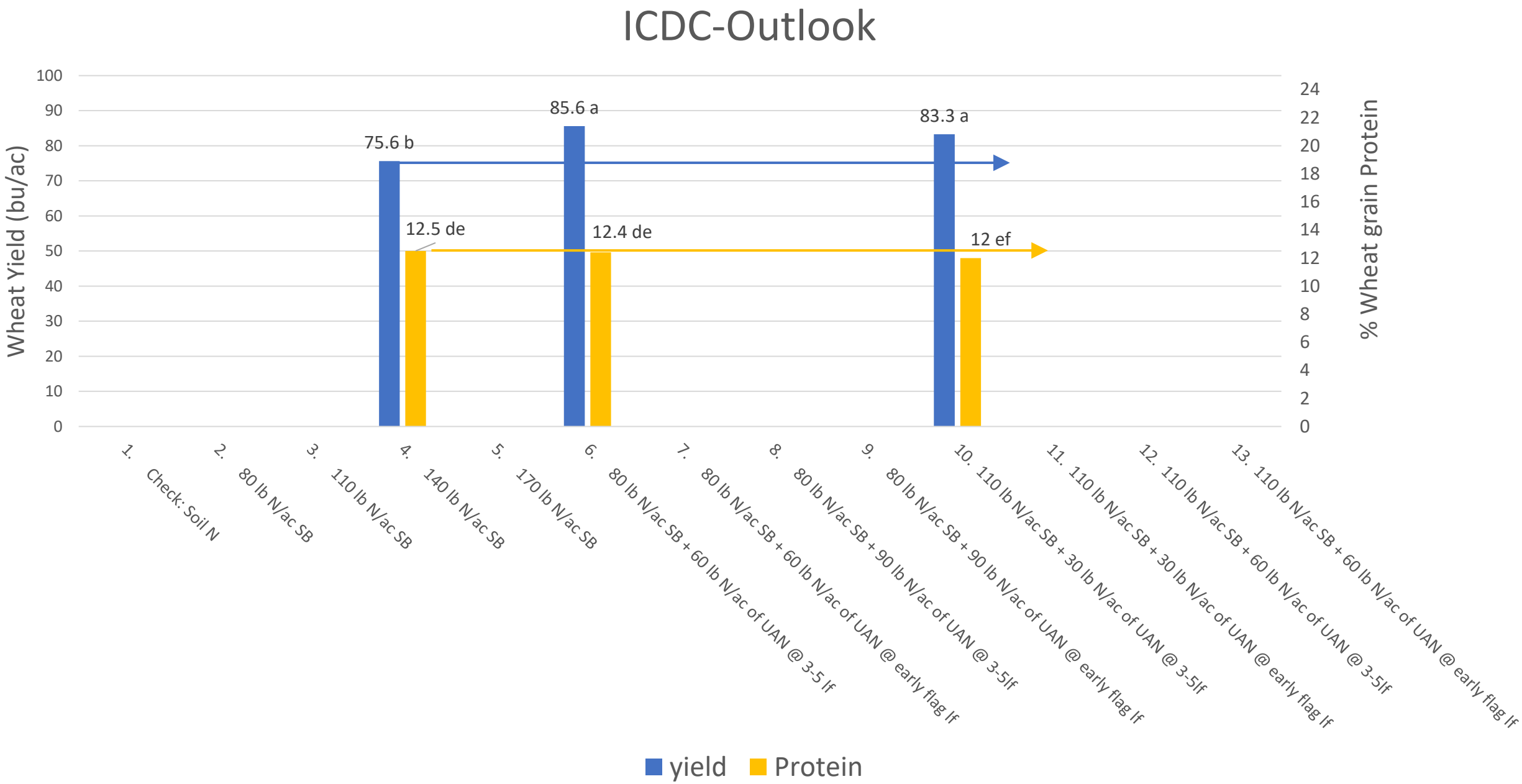
-160 mm precipitation + 190 mm irrigation = 350 mm total

-Relatively high residual N for an irrigated site. (37 lbs/ac 0-24 inches)

Question 2. If you “hold back” N at seeding and top up N later, are there yield penalties associated with split applic of N verses applying all the N at seeding?

ICDC-Outlook




ICDC-Outlook
Wheat Yield (bu/ac)
% Wheat grain Protein
100
90
80
70
60
50
40
30
20
10
0
24
22
20
18
16
14
12
10
8
6
4
2
0
75.6 b
85.6 a
83.3 a
12.5 de
12.4 de
12 ef
1. Check: Soil N
2. 80 lb N/ac SB
3. 110 lb N/ac SB
4. 140 lb N/ac SB
5. 170 lb N/ac SB
6. 80 lb N/ac SB + 60 lb N/ac of UAN @ 3-5 lf
7. 80 lb N/ac SB + 60 lb N/ac of UAN @ early flag lf
8. 80 lb N/ac SB + 90 lb N/ac of UAN @ 3-5lf
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yield
Protein

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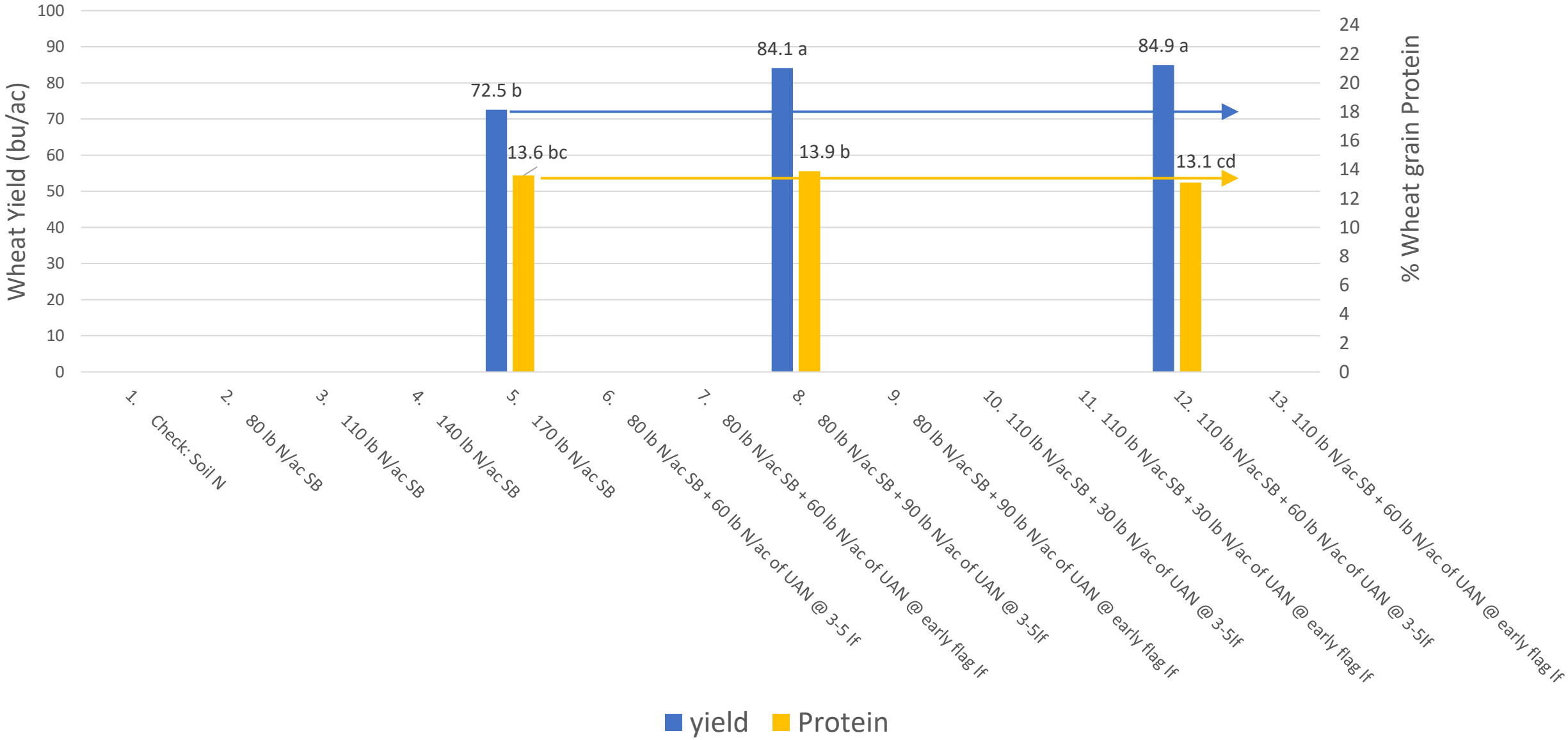

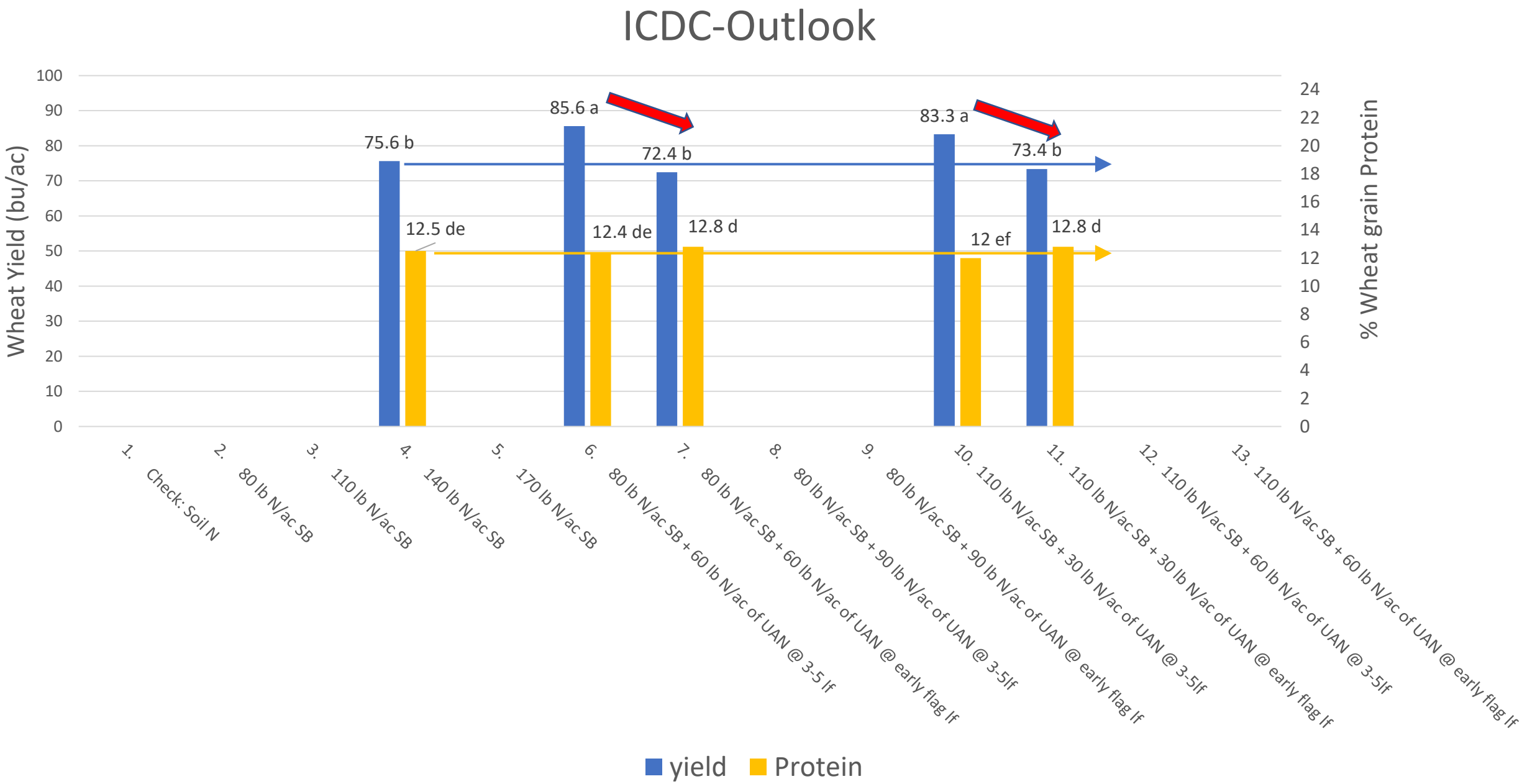
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10
8
6
4
2
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75.6 b
85.6 a
72.4 b
83.3 a
73.4 b
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12.8 d
12 ef
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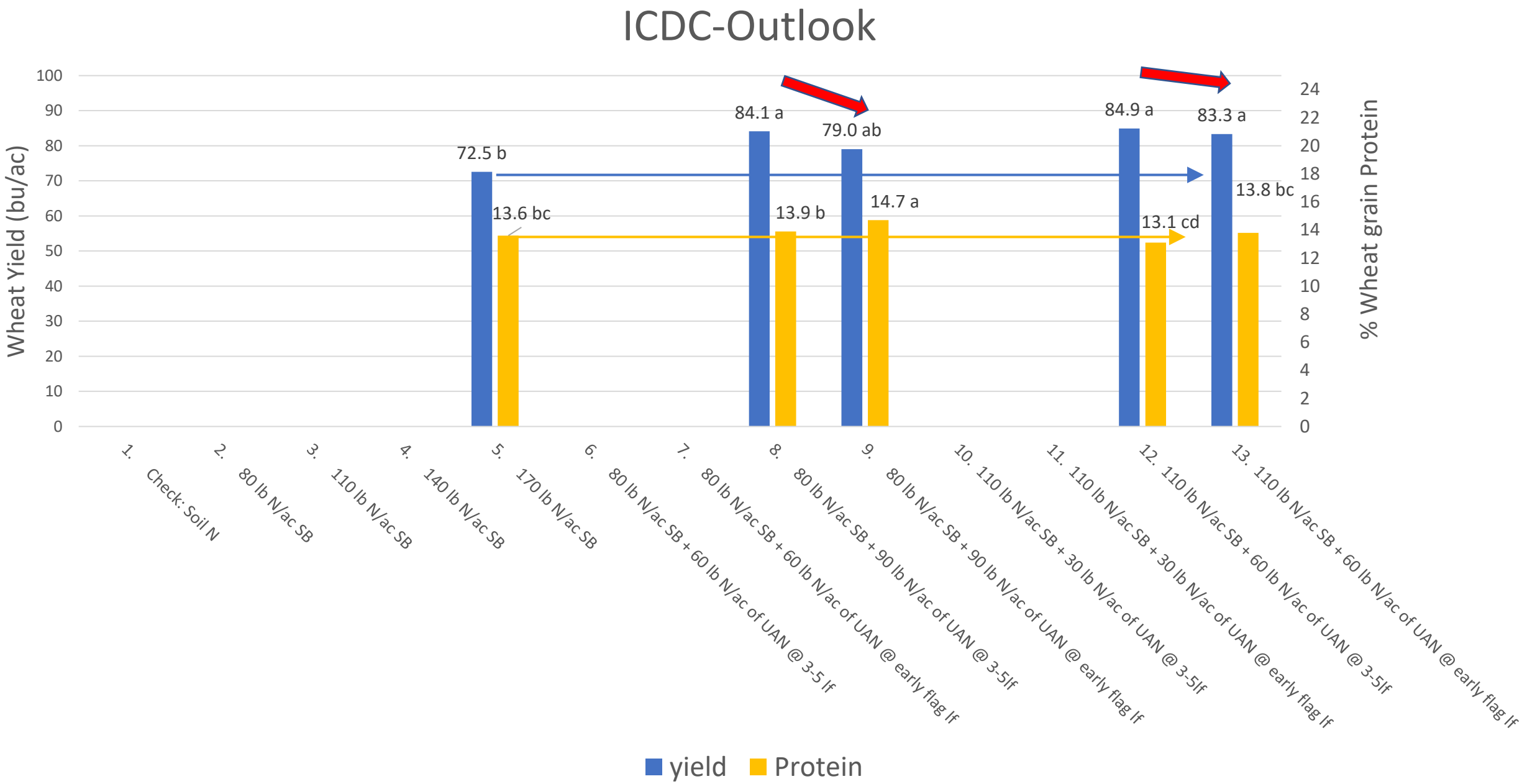
Protein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22
20
18
16
14
12
10
8
6
4
2
0
72.5 b
13.6 bc
84.1 a
13.9 b
79.0 ab
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84.9 a
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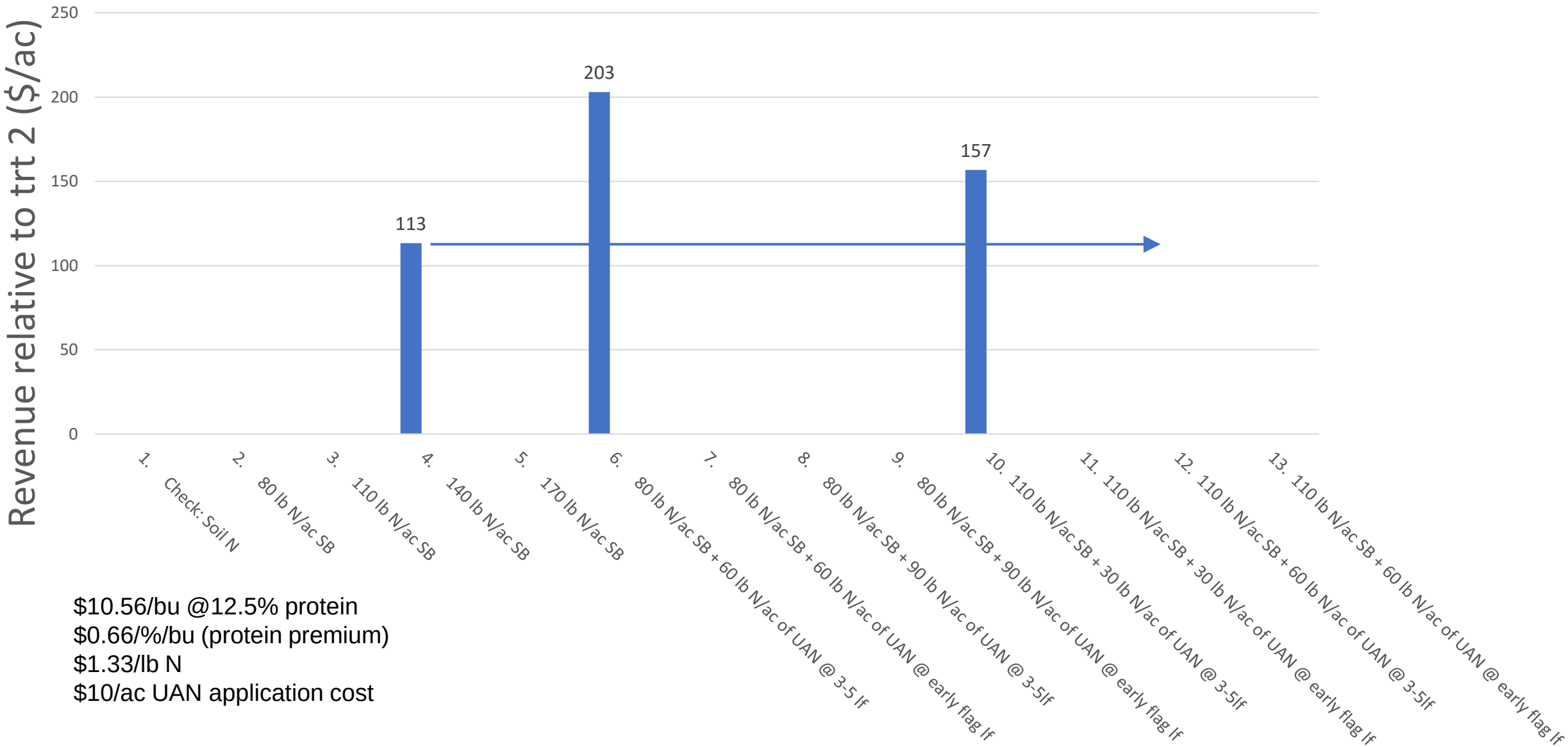

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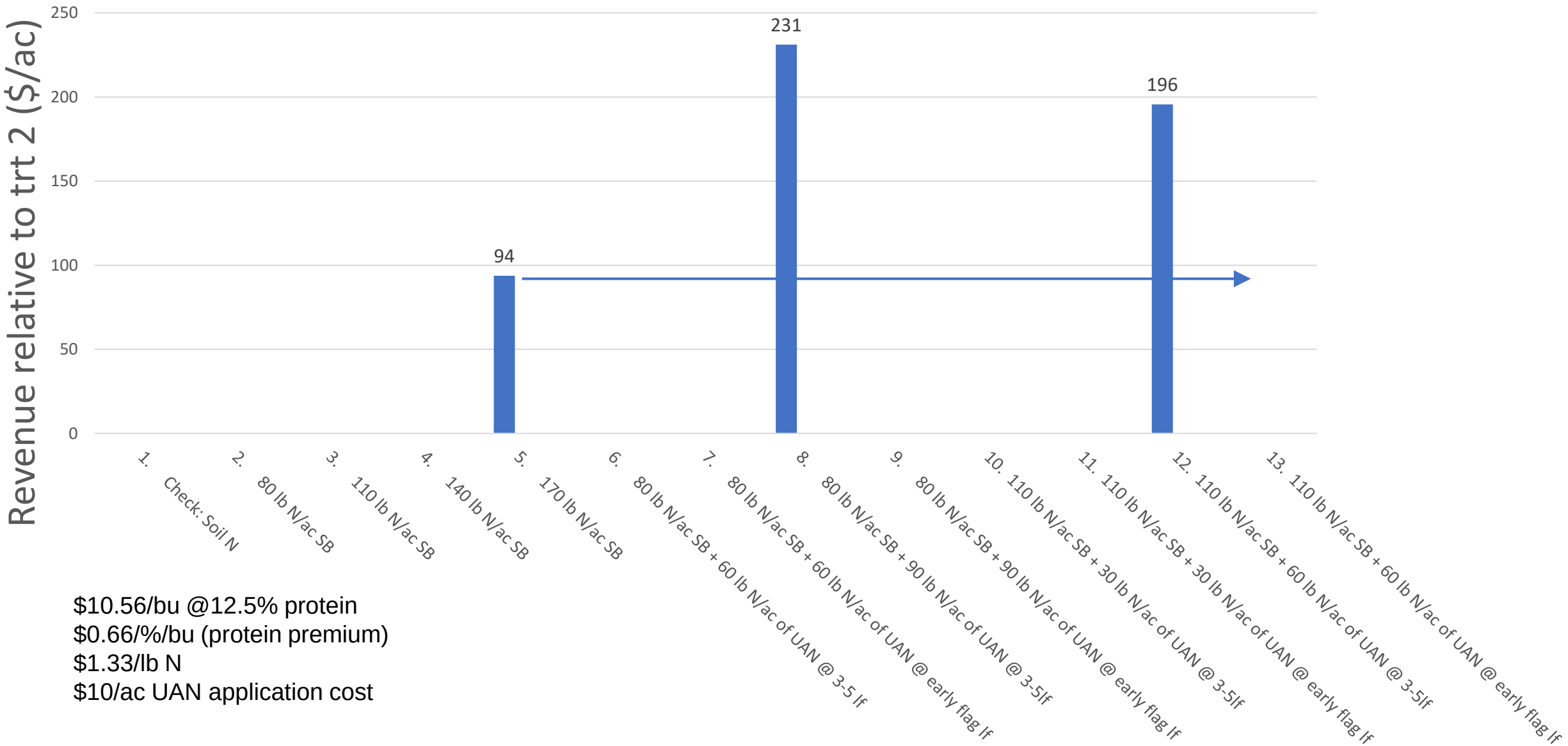

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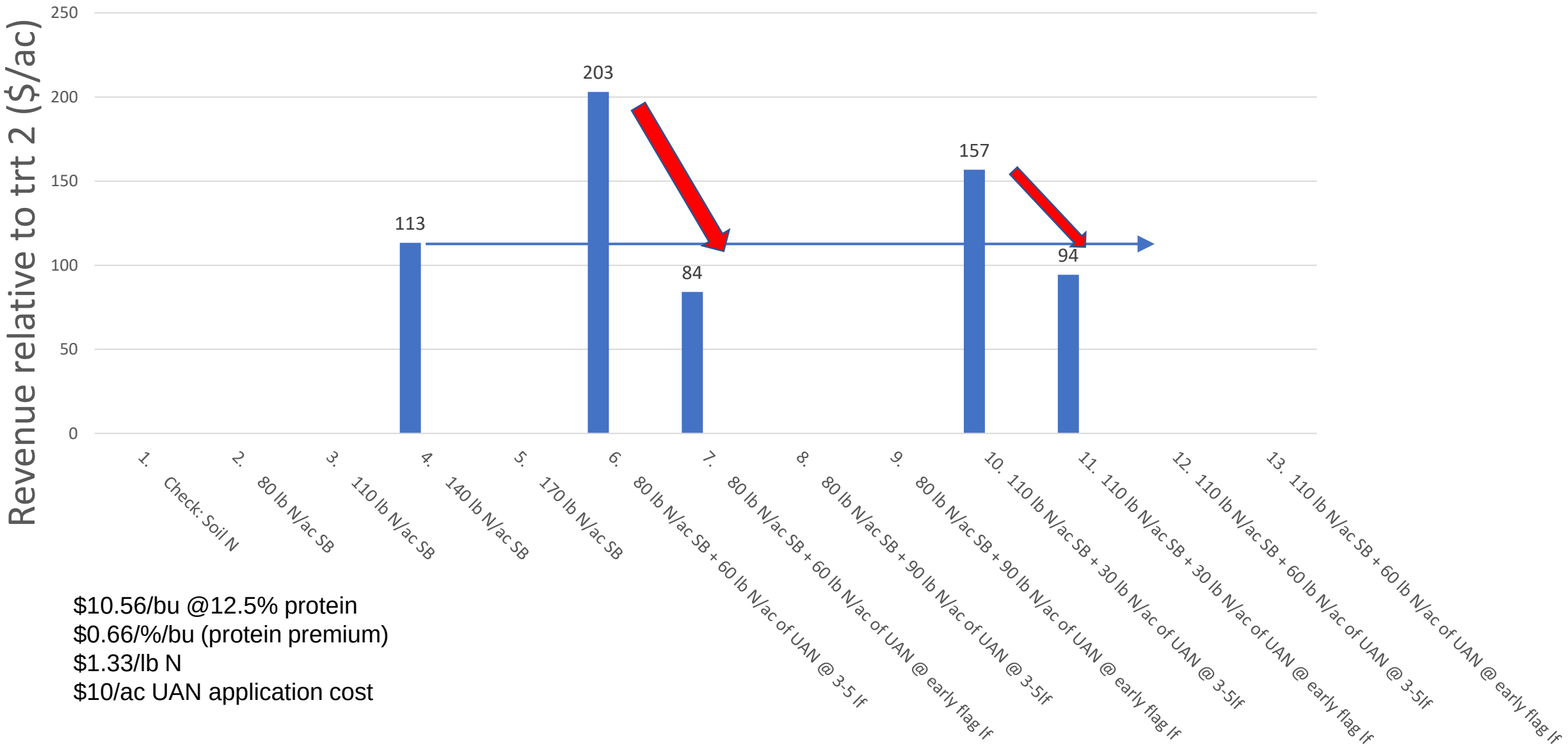

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Is the strategy of applying split applications a viable option to manage N following a drought year?

- Yes, if 4R guidelines are followed.
- Right Source
- Right Rate
- Right Time
- Right Place

Summary

Question 1. Can we save money by holding back N at seeding in drought conditions?

The strategy of “holding back” N at seeding and having the option to opt out of applying additional post emergent N when growing conditions don't improve showed substantial savings at Swift Current and Scott.

Question 2. Is there a yield penalty when you “hold back” N at seeding and top up N later as a split application?

The strategy of “holding back” N at seeding and using split application showed substantial benefits **under wetter conditions when applied at the right time**.

Stay Tuned!!!

Future work could be done involving:

-Fine tuning rates and timing of split application nitrogen.

-Comparing different N sources (urea or urea treated with N stabilizers).

-Where is the unused N applied at Swift Current and Scott? Some might be there next spring but very vulnerable to losses in the absents of plant growth through volatilization, leaching, and denitrification.

2023 Wheatland Annual Meeting 3:30 pm
2023 Wheatland Annual Tour July 20th

www.wheatlandconservation.ca

Funding for this project provided by:

ADOPT

Agricultural Demonstration of Practices and Technologies

Practical Solutions for Today's Agricultural Questions

Wheatland Conservation Area Inc.

Thank you!

Mike Hall Project Lead ECRF Yorkton
Participating Sites
IHARF Indian Head
ICDC Outlook
NARF Melfort
WARC Scott
WCA Swift Current