IHARF Winter Meeting

Indian Head Long Term Rotation

Canary seed

Intercropping Chickpea and flax

Camelina – Seeding date

Intercropping Camelina and Lentil

Annual Forage Mixes

The Longterm Impact of Rotation, Fertilizer, Cover Crop, and Forage on Wheat and SOC over 60 Years and 28 Years after Conversion to No-till

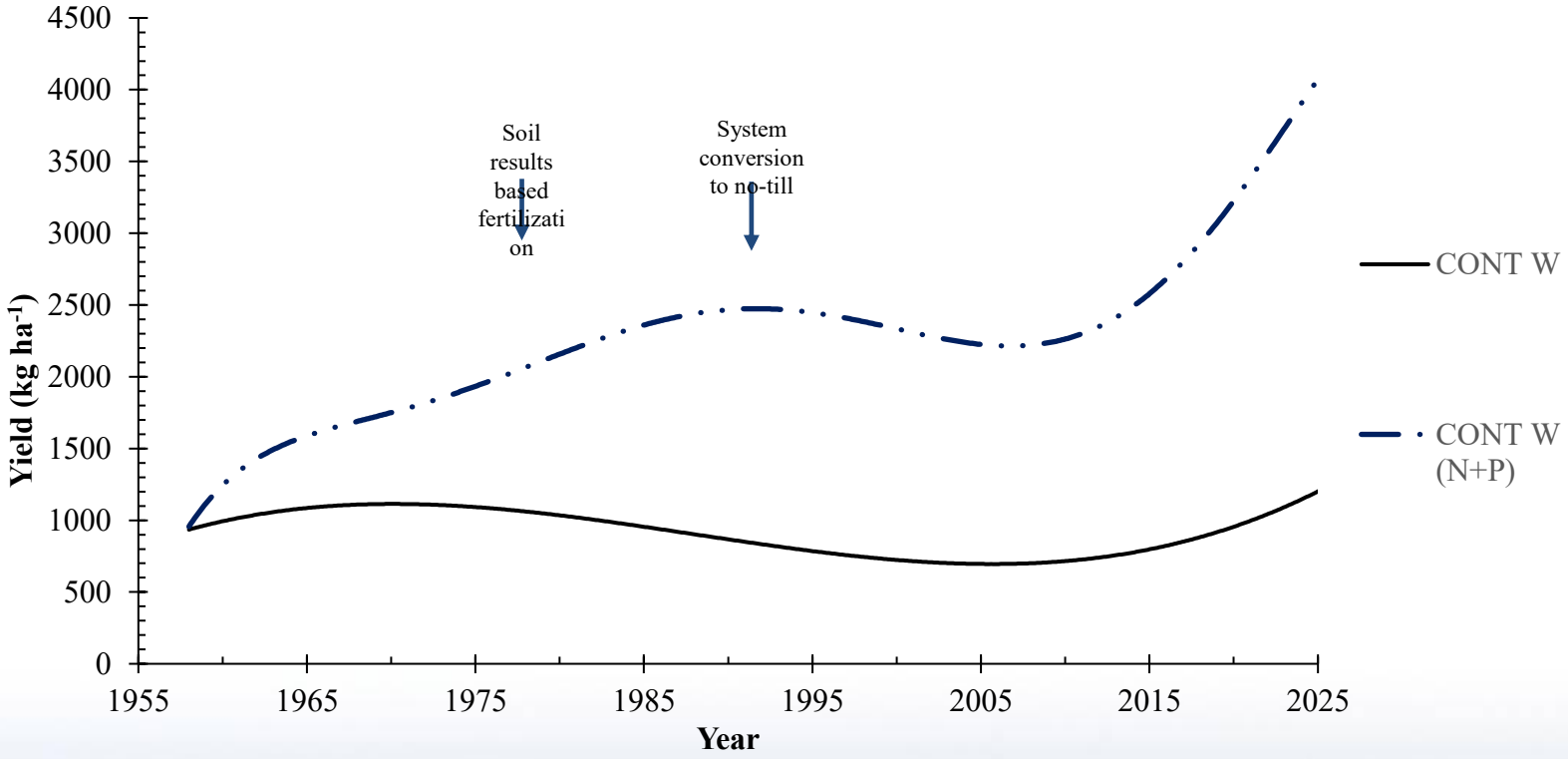
William May

Reynald Lemke

Indian Head Long Term Rotation 1958-2024

Trial	Rotation	Rotation Sequence	Fertilizer Application
200	CONT W	Continuous Wheat	No
	CONT W (N+P)	Continuous Wheat	Yes
	F-W	Fallow-Wheat	No
	F-W (N+P)	Fallow-Wheat	Yes
	F-W-W	Fallow-Wheat-Wheat	No
	F-W-W (N+P)	Fallow-Wheat-Wheat	Yes
	F-W-W (N+P) straw removed	Fallow-Wheat-Wheat (Straw Removed)	Yes
	F-W-W-H-H-H	Fallow-Wheat-Wheat-Hay-Hay-Hay	No
	GM-W-W	Green Manure-Wheat-Wheat	No
250 (initiated 2018)	C-W	Canola-Wheat	Yes
	C-S-W	Canola- Soybean-Wheat	Yes
	C-O-S-W	Canola- Oat-Soybean-Wheat	Yes

Wheat yields of unfertilized treatments and fertilized continuous wheat from 1958-2025



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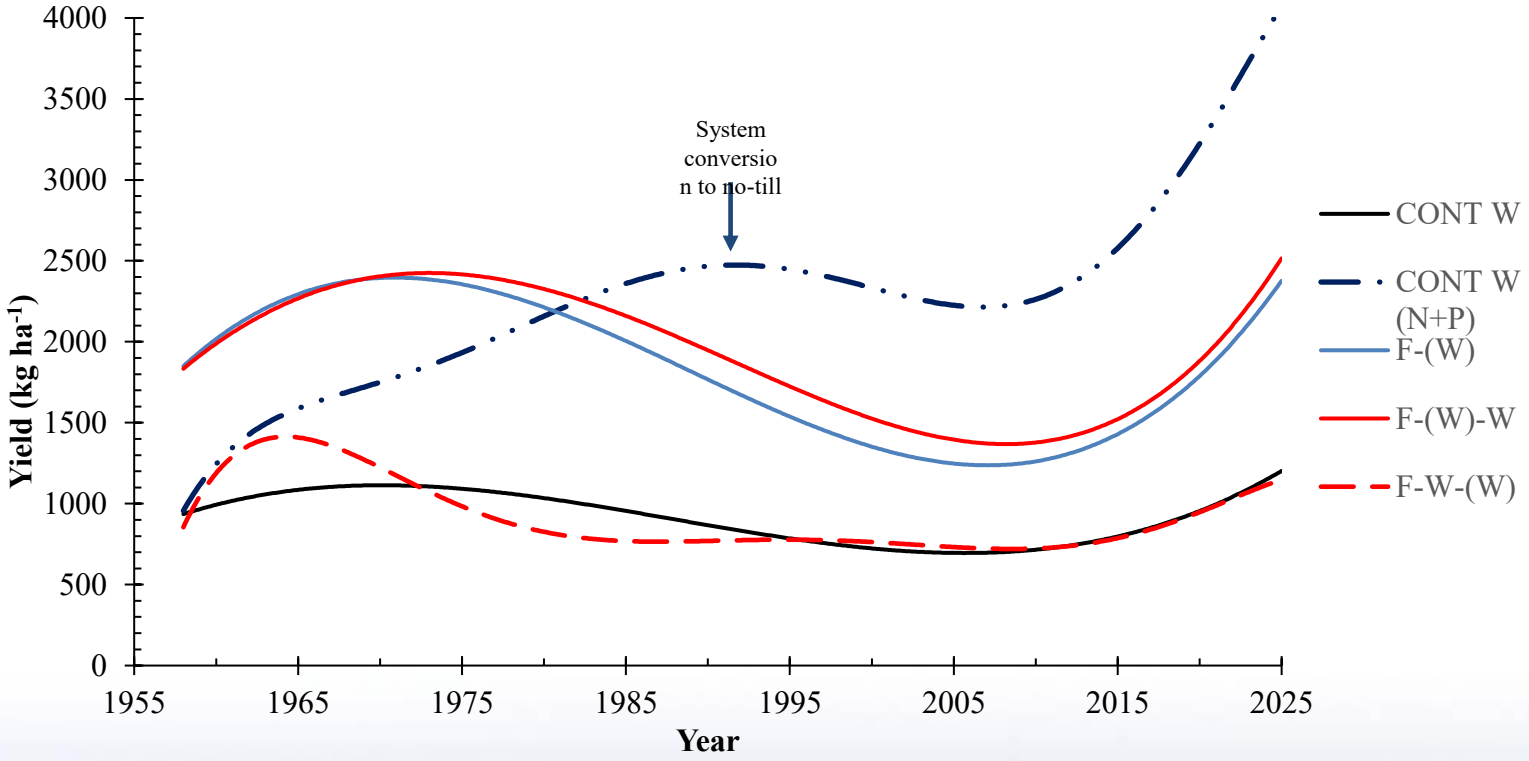

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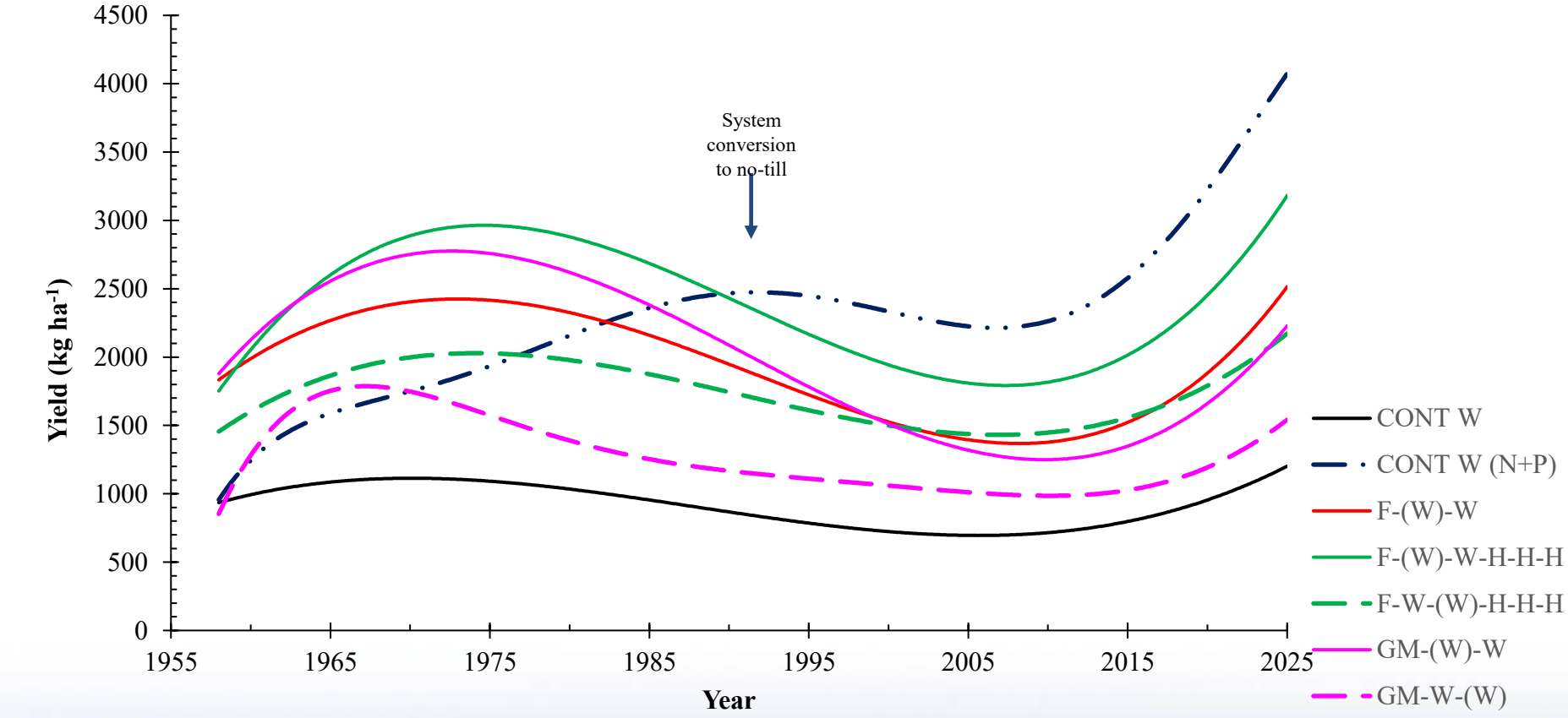
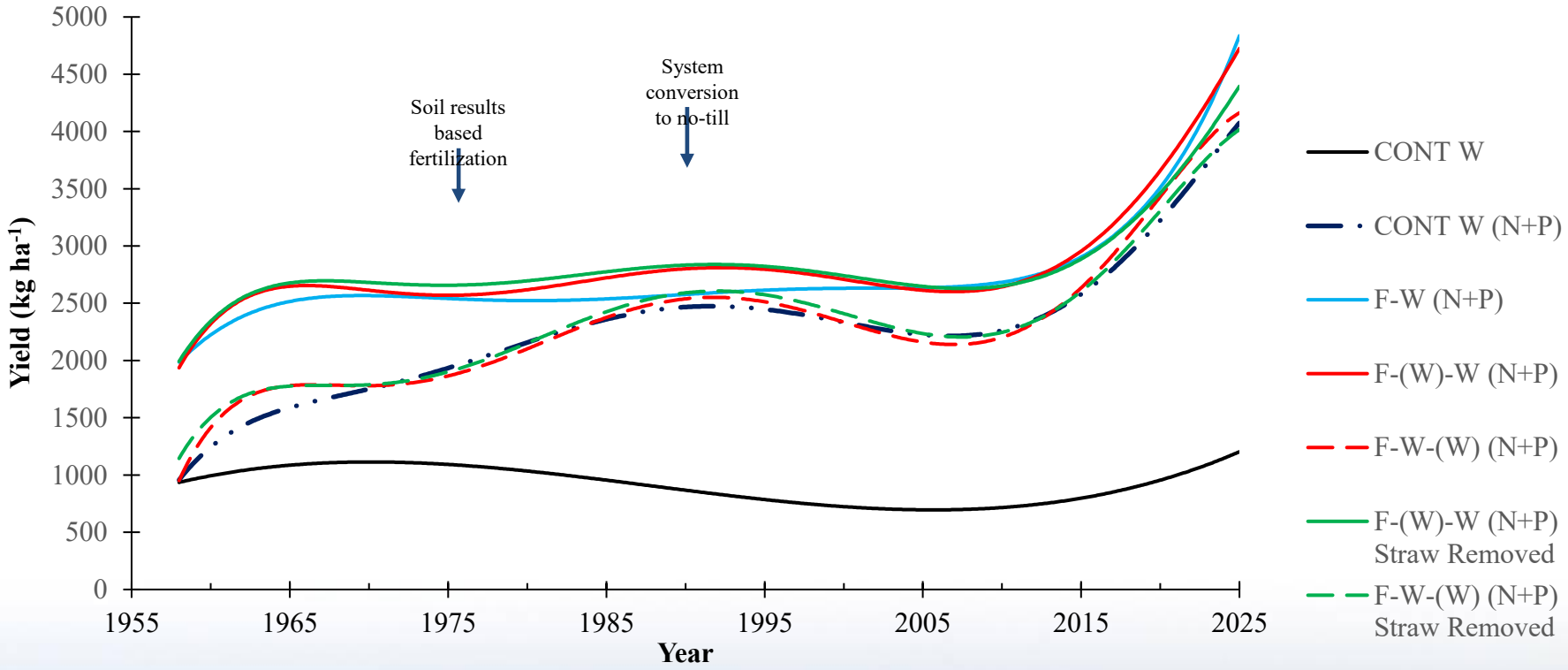
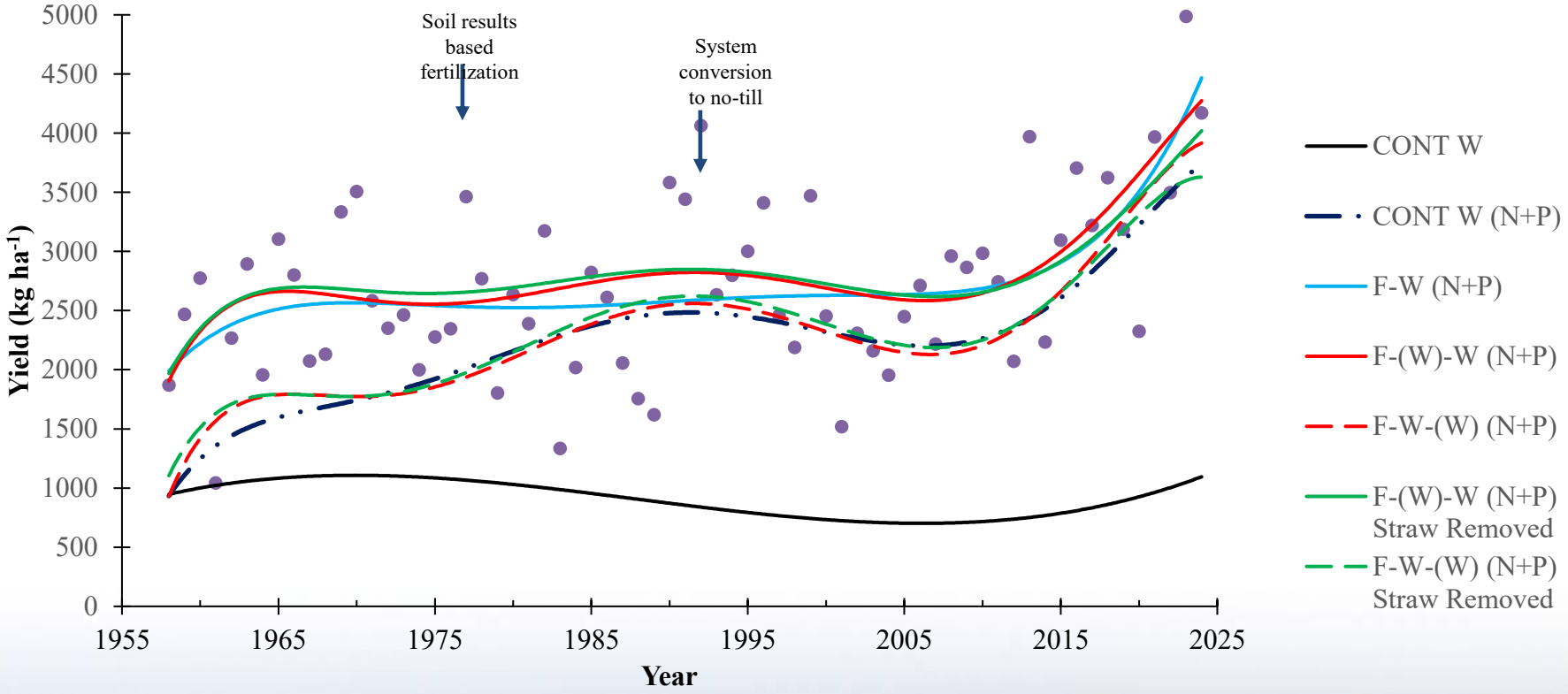


Wheat yields of fertilized treatments and unfertilized continuous wheat from 1958-2025



Wheat yields of fertilized treatments and unfertilized continuous wheat from 1958-2024



Grain Yield from Diversified Rotation

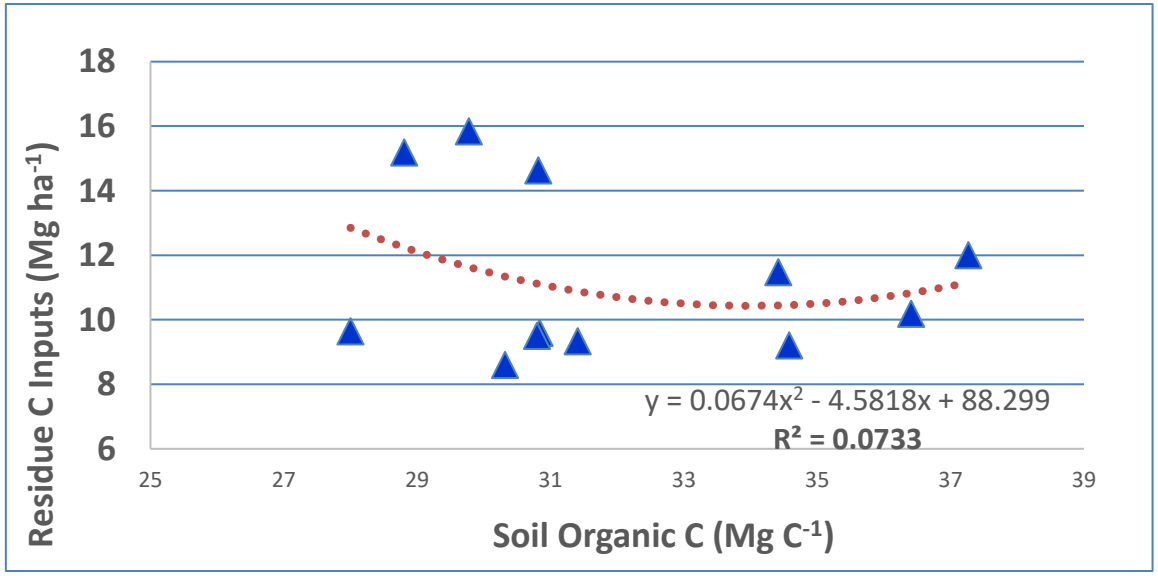
Rotation	2019	2020	2021	2022	2023	2024	2025
	bu/ac						
C. Wheat no fert	12.0 b	9.2 d	8.8 d	19.5 f	20.8 e	17.0 e	20.9 d
C. Wheat	42.9	36.5 b	49.2 a	44.6 bcd	60.3 c	55.5 c	63.7 b
Wheat – (F)	40.2 a	36.5 b	56.2 a	51.7 ab	64.4 bc	61.9 bc	72.4 a
Wheat – (C)	41.9 a	36.6 b	50.0 a	48.5 bc	58.0 c	57.0 c	72.3 a
Wheat – (C -S)		42.9 a	55.4 a	56.5 a	75.4 a	73.2 a	77.3 a
Wheat – (C-O-S)			44.3 a	51.4 ab	70.6 ab	71.2 ab	77.2 a
Canola – (W)		27.5 c	31.7 b	41.2 cde	29.2 e	37.4 d	48.3 c
Canola – (S-W)		32.7 c	27.2 b	36.0 def	40.0 d	35.6 d	52.0 c
Canola –(O-S-W)			32.7 b	39.4 c-f	39.7 d	33.6 d	51.0 c

Soil Organic Carbon Measured (0-15 cm) from Nine Crop Rotations in the Long-Term Experiment at Indian Head, SK

Rotation	Management	2007 [a]	2017 [b]	Δ Significance (p<0.5)
Cont. Wheat	No fert	34.6	37.3	N
Cont. Wheat	N,P	38.2	42.5	Y
Fallow-Wheat	No fert	30.3	36.4	Y
Fallow-Wheat	N,P	32.8	35.3	N
Fallow-Wheat-Wheat	No fert	30.8	34.4	N
Fallow-Wheat-Wheat	N,P	34.3	37.0	N
Fallow-Wheat-Wheat	N,P straw baled	33.3	37.3	Y
Green Manure –Wheat-Wheat	No fert	33.5	33.1	N
Fallow-Wheat-Wheat-Hay-Hay-Hay	No fert	39.6	42.1	N

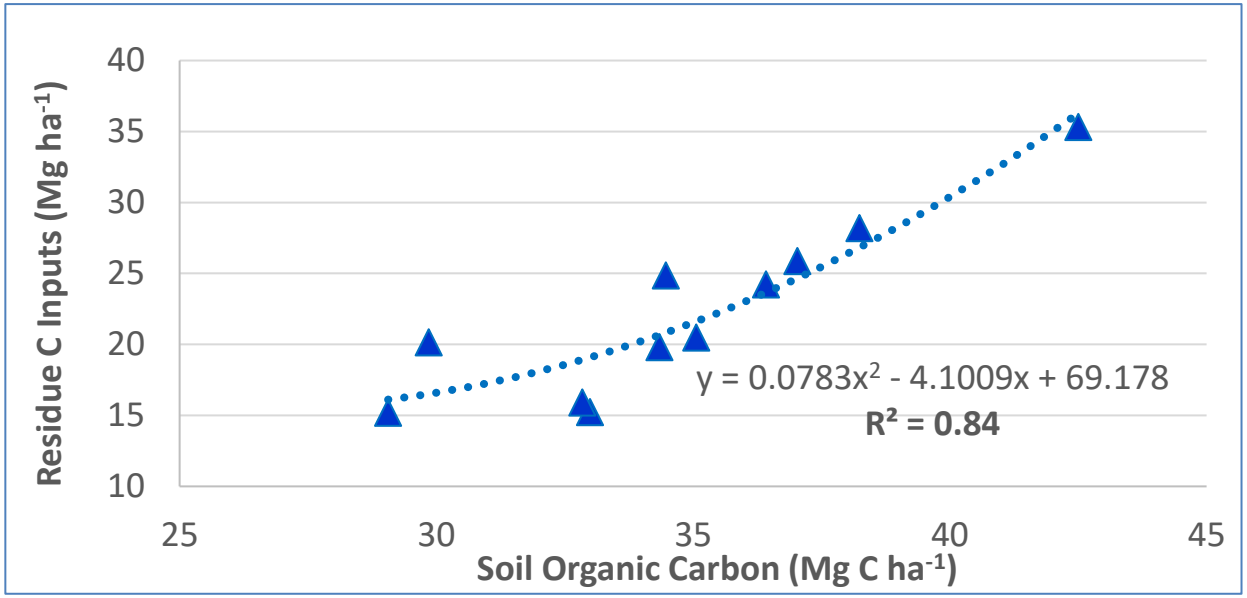
[a] Lemke et al. 2012; [b] Lemke/May (unpublished data)

Relationship between Residue C Inputs* and Soil Organic Carbon Status (0-15 cm) on Wheat Rotations (unfertilized) at Indian Head



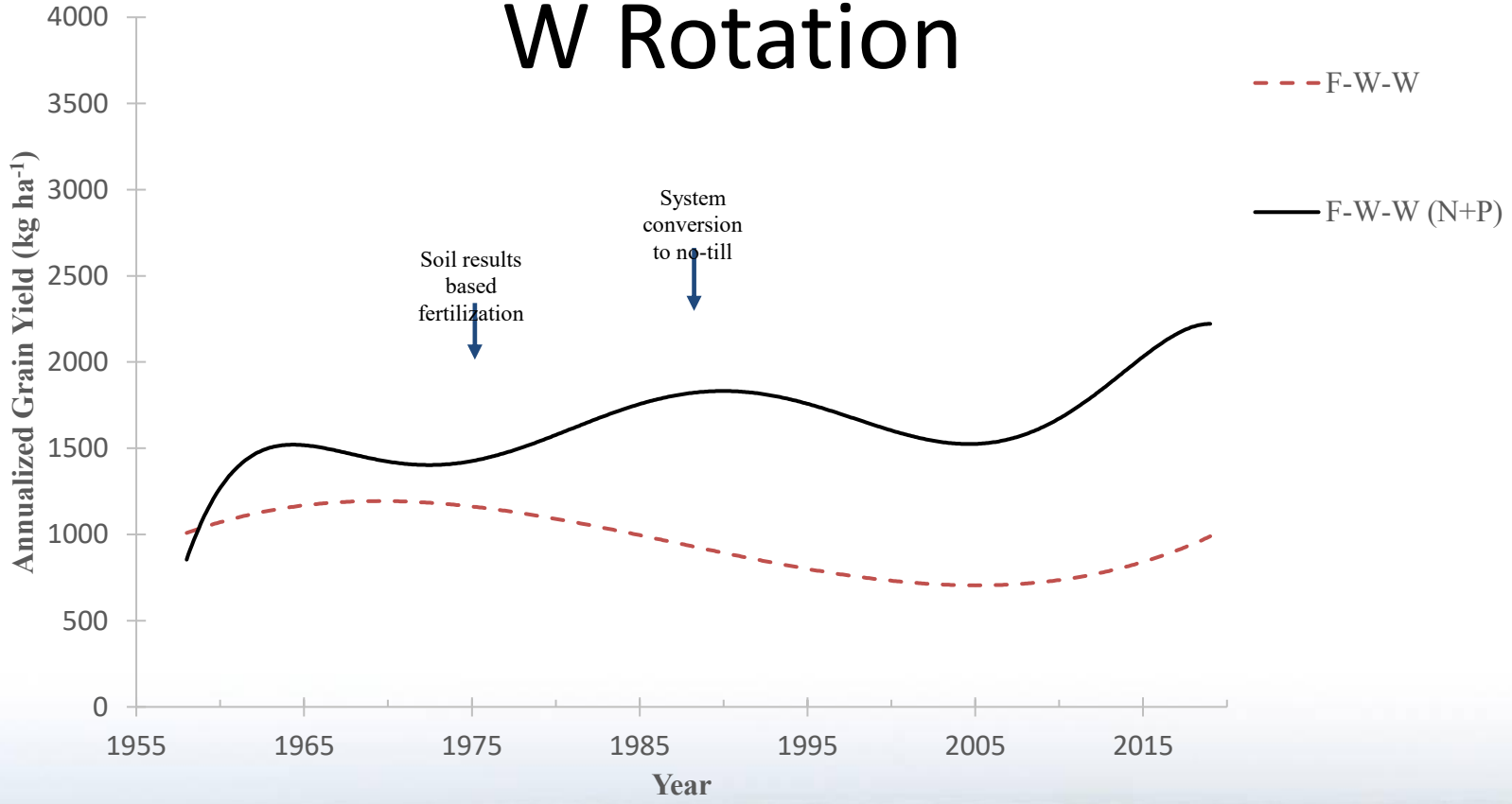
* Residue C inputs = Above ground residue C + estimate of root C

Relationship between Residue C Inputs* and SOC (0-15 cm) from 1987 to 2017 on Wheat Rotations (N,P) at Indian Head

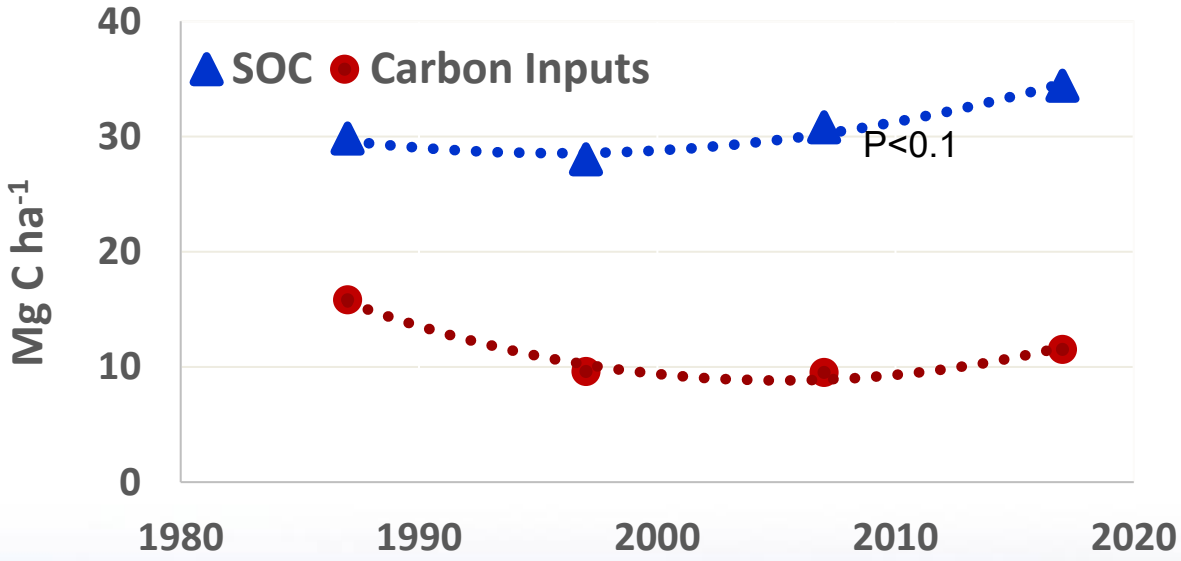


* Residue C inputs = above ground residue C plus estimated root C

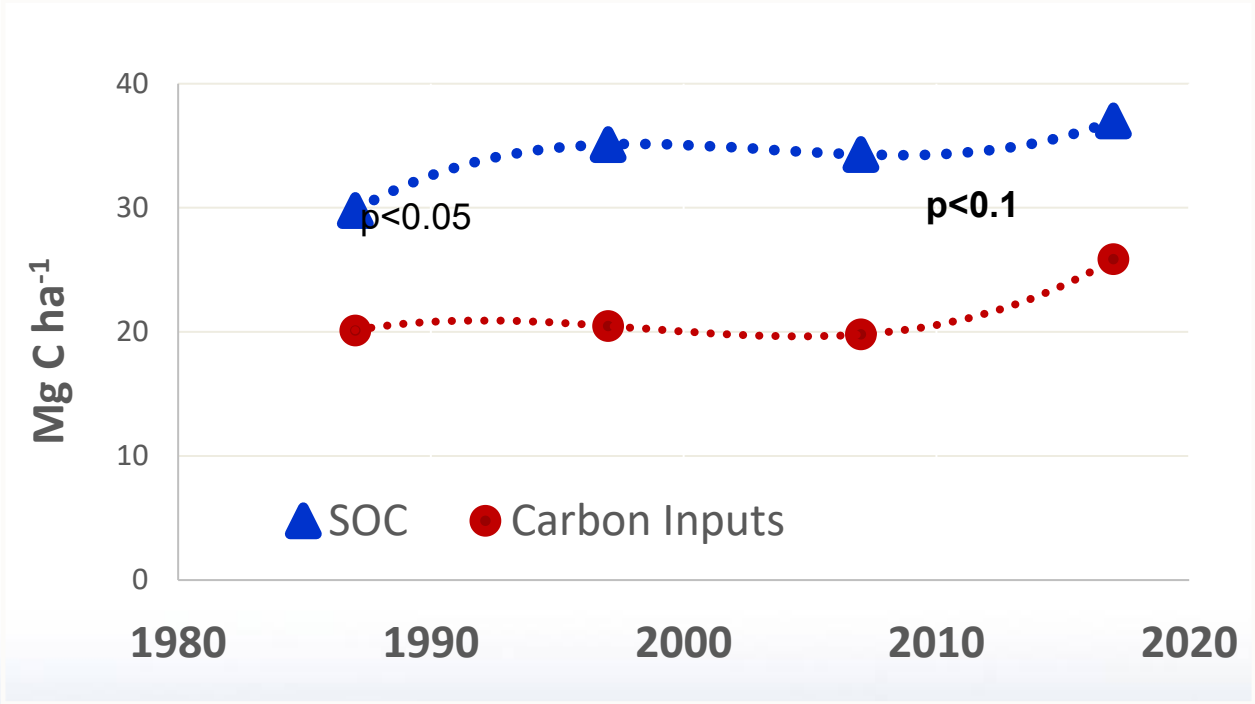
Annualized Grain Yield of F-W-W Rotation



Residue C inputs and soil organic carbon status (0-15 cm depth) measured on a Fallow-Wheat-Wheat [unfertilized] rotation



Residue C inputs and soil organic carbon status (0-15 cm depth) measured on a Fallow-Wheat-Wheat fertilized rotation



Observations

- Unfertilized wheat yields have stabilized
- Fertilized (F) wheat yields have increased over time - Not Linear
- Small decrease in yield after NT 14 years
- Large increase in the last 15 years
- Wheat yields are benefiting from the more diversified rotations

Observations

- Wheat yields are benefiting from the more complex rotation or soybean stubble verses canola stubble
- Canola yields unaffected by rotation or seeding into wheat stubble in all three rotations.
- Is stubble having a bigger impact than rotation

Observations

- Soil carbon increased after NT introduction
- Now soil carbon is increasing due to increase and yield and biomass in fertilized rotations

Funding

WGRF
Sask Wheat
Government of Canada

Plant Growth Regulators

PGR Treatments

1.None

2.Trinexapac **(**Modus**),** full rate, first node

3.Chlormequat (Manipulator), full rate, first node

4.Trinexapac + Chlormequat, half rate, first node

5.Trinexapac, full rate, forth node

6.Chlormequat full rate, forth node

7.Trinexapac + Chlormequat , half rate, forth node

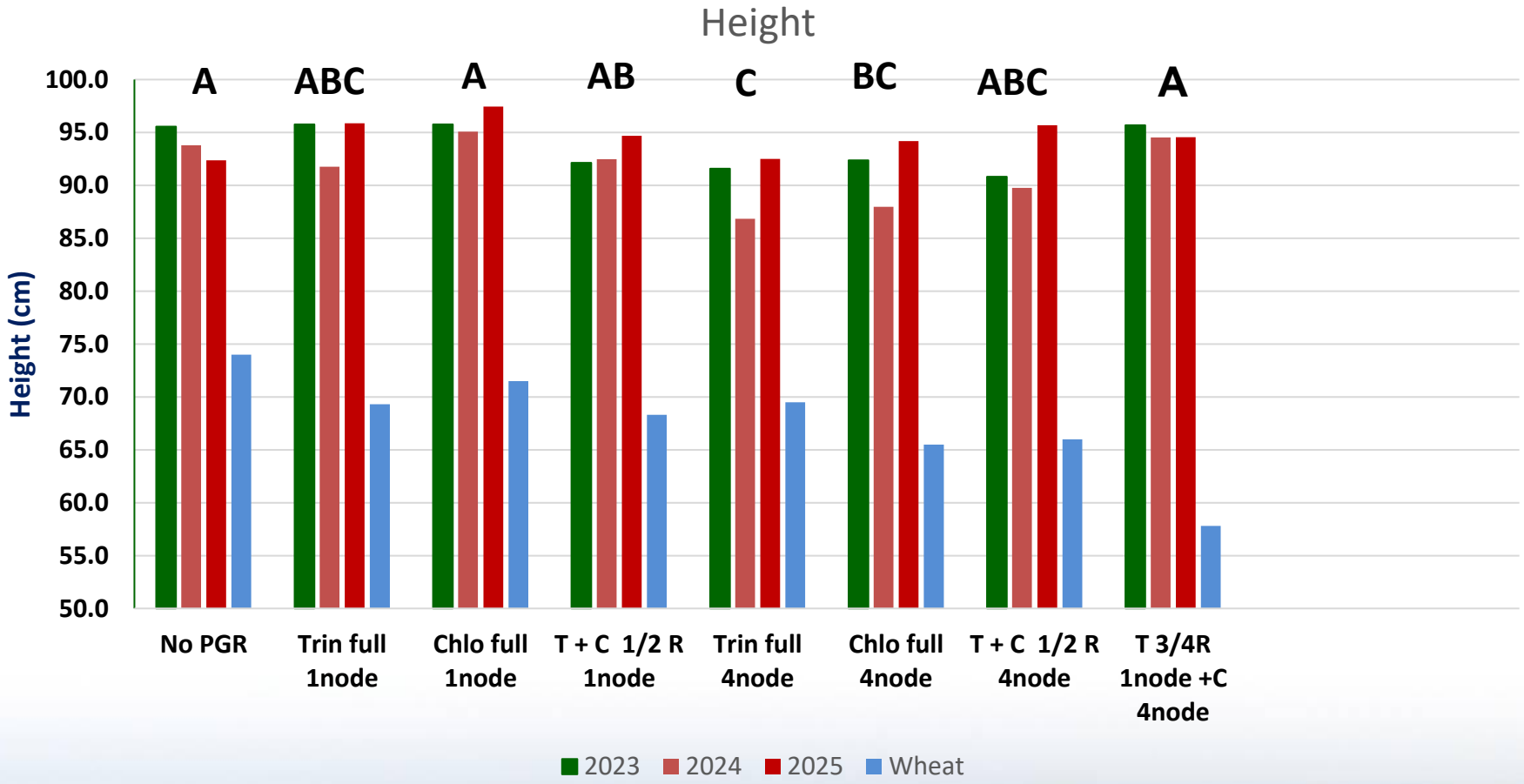
8.Trinexapac 3/4 rate, first node, + Chlormequat 3/4 rate forth node

Plant Growth Regulators

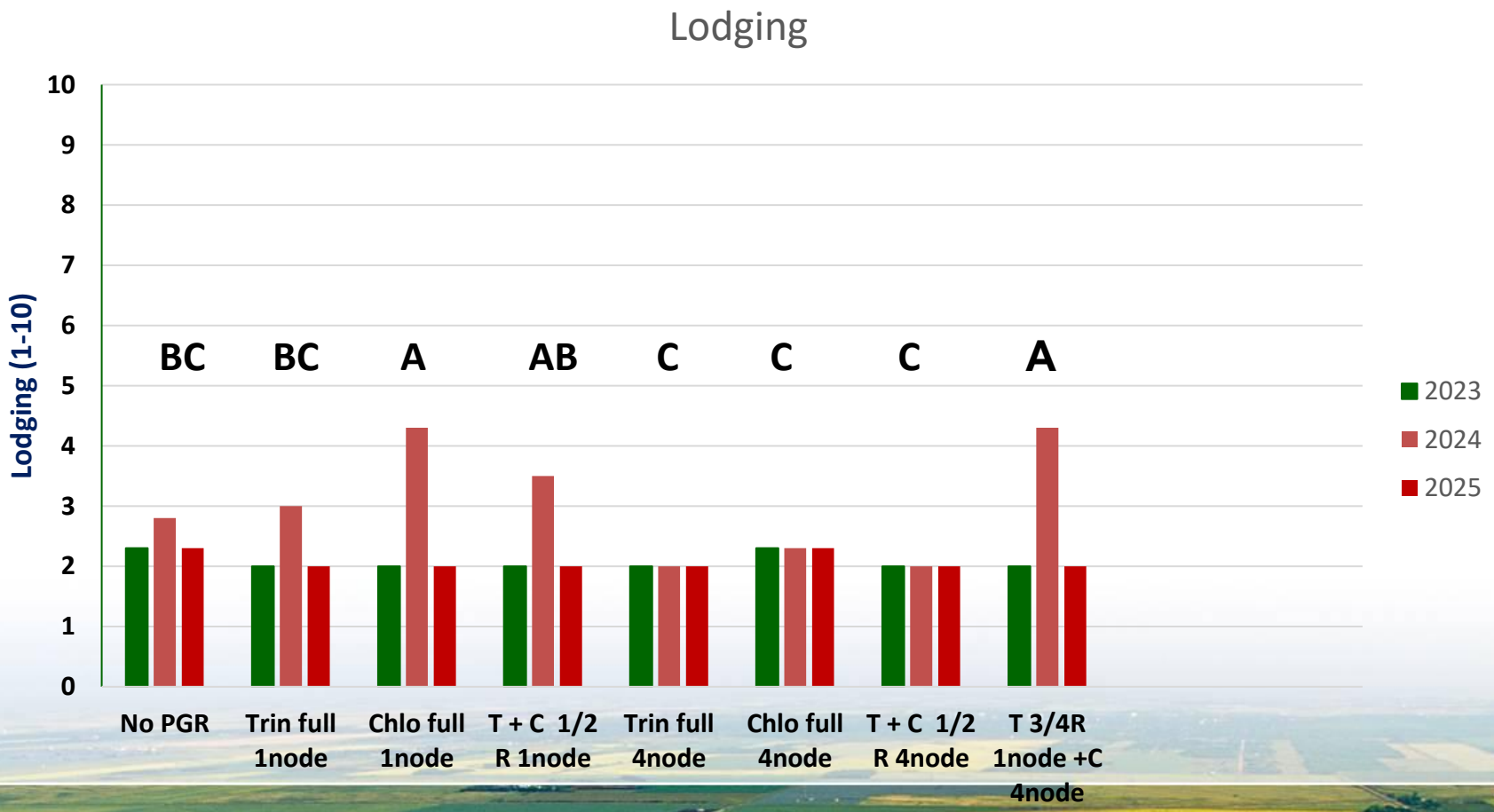
Questions

- Dry year – do no harm
- Wet year – improve harvestability and/or improve yield
- **Higher yields tend to come from later tillering – will PGR affect this?**

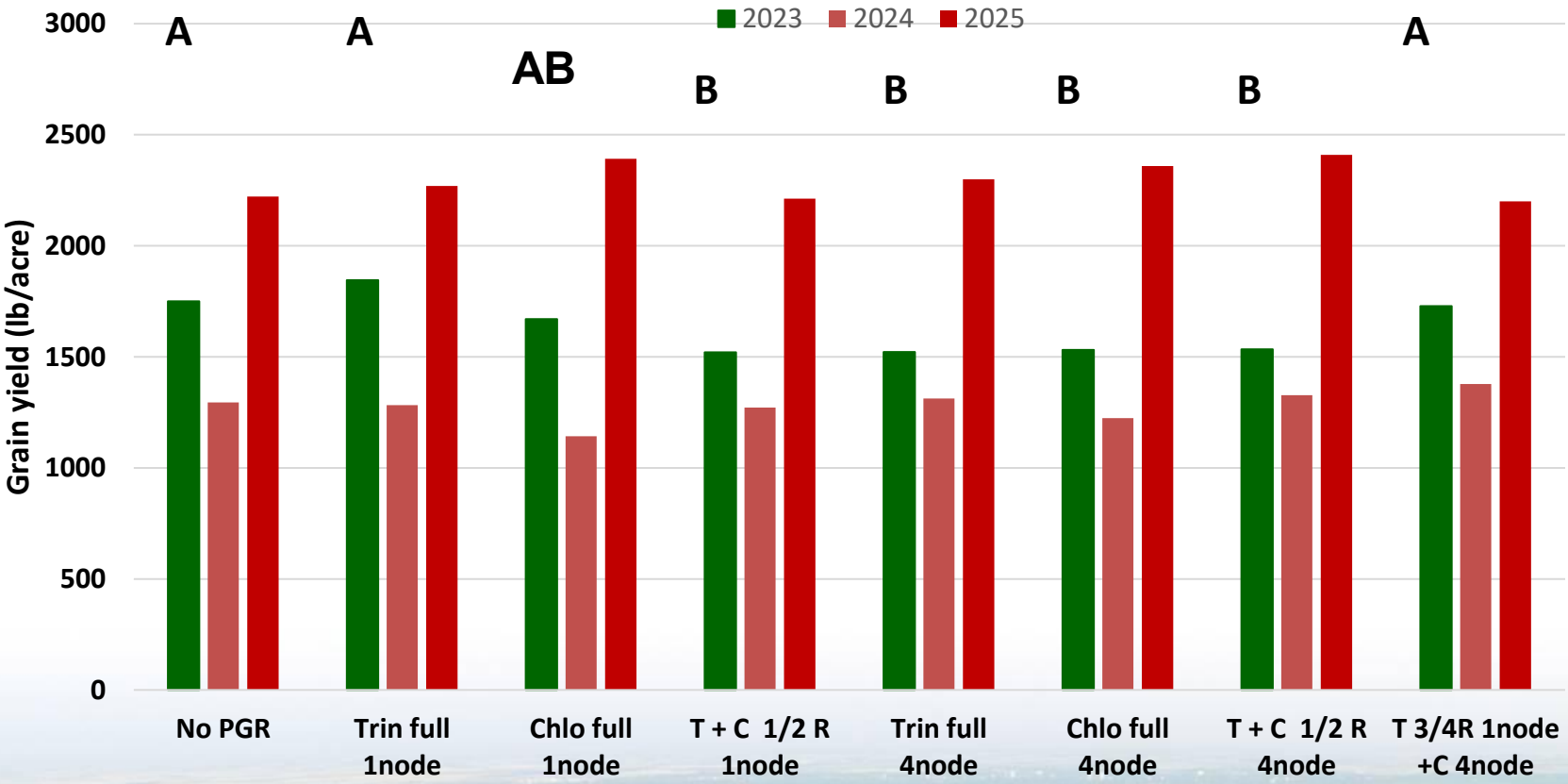
PGR on Canaryseed in 2023, 2024 and 2025



PGR on Canaryseed in 2023, 2024 and 2025



PGR on Canaryseed



Plant Growth Regulators

Questions

- No large impacts yet

- Using oat rates do we need to try high wheat rate for modus?

Septoria Leaf Mottle

What has been done in the past?

Septoria Leaf Mottle Research

- Canaryseed is the cereal with the most consistent response to a fungicide in the black and grey soil zones
- However, recently precipitation in large areas of the black soil zone has looked like brown soil zone
- Application timing is to delay until anthesis

Septoria Leaf Mottle Current Research

- Best fungicides not register for use
- Worked with Ron Pidskalny to put together a fungicide list for testing and registration
- Small plot trial
- Field scale trial near Indian Head

Septoria control with fungicides

Small plots

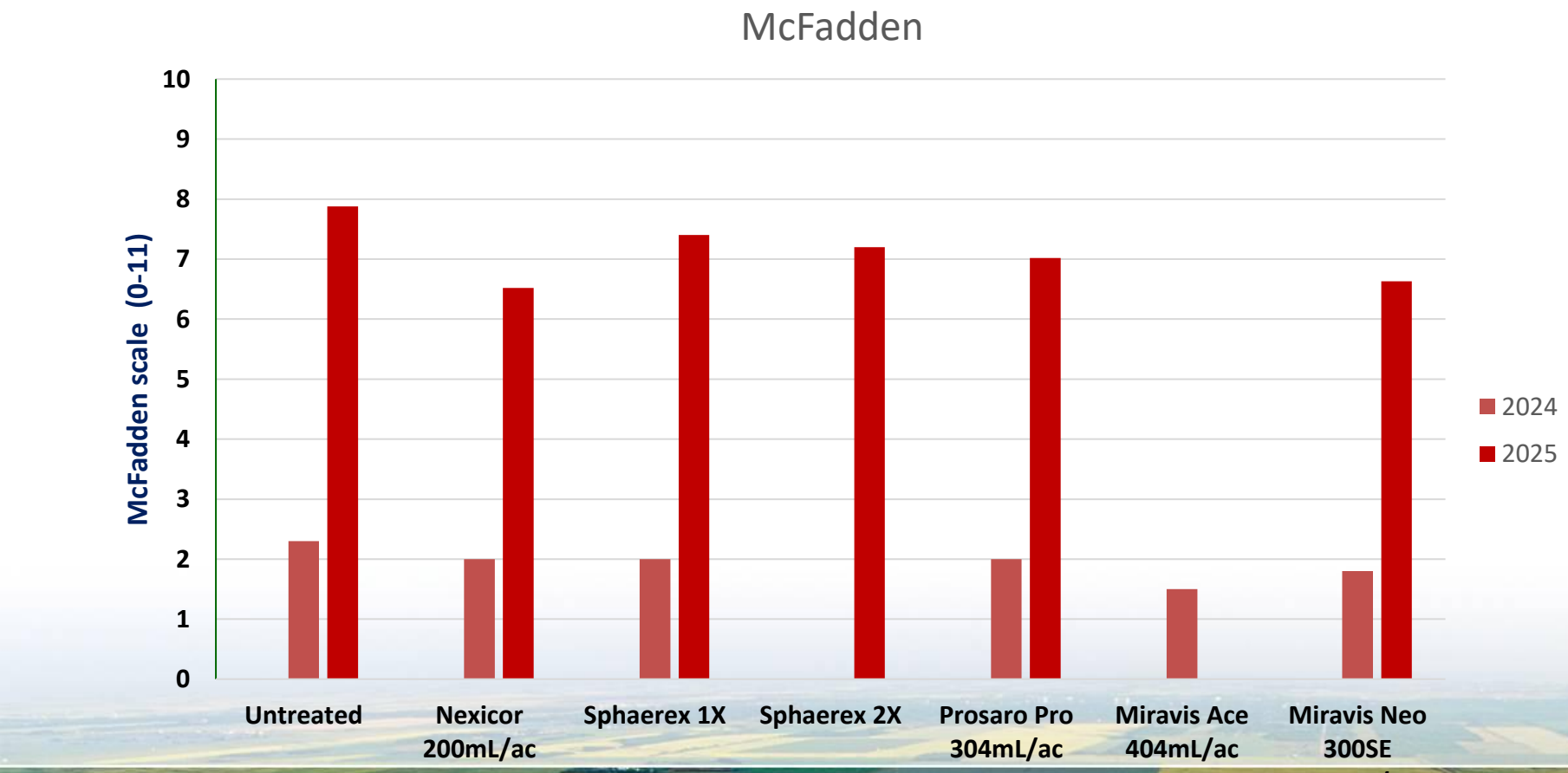
Application timing

1) Flag leaf emergence
2) 10 to 14 days after flag leaf emergence (anthesis)

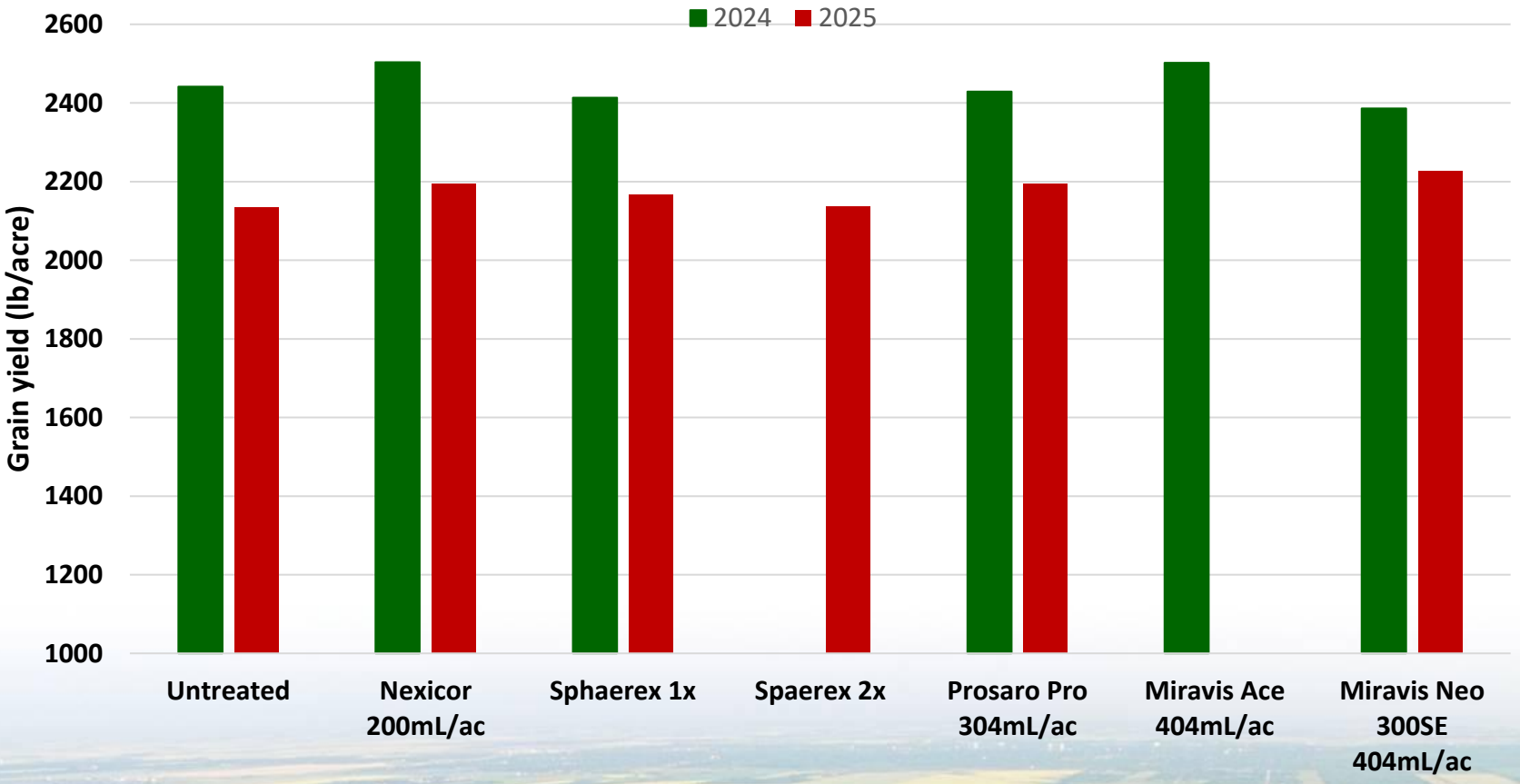
Fungicide:

1) control
2) Nexicor applied at 200ml/acre in 20 US gal/acre solution
3) Sphaerex applied at 215ml/acre in 20 US gal/acre of solution
4) Prosaro Pro applied at 304ml/acre in 20 US gal/acre of solution
5) Miravis Ace applied at 404ml/acre in 20 US gal/acre of solution
6) Miravis Neo 300SE applied at 404ml/acre in 20 US gal of solution (flag leaf)

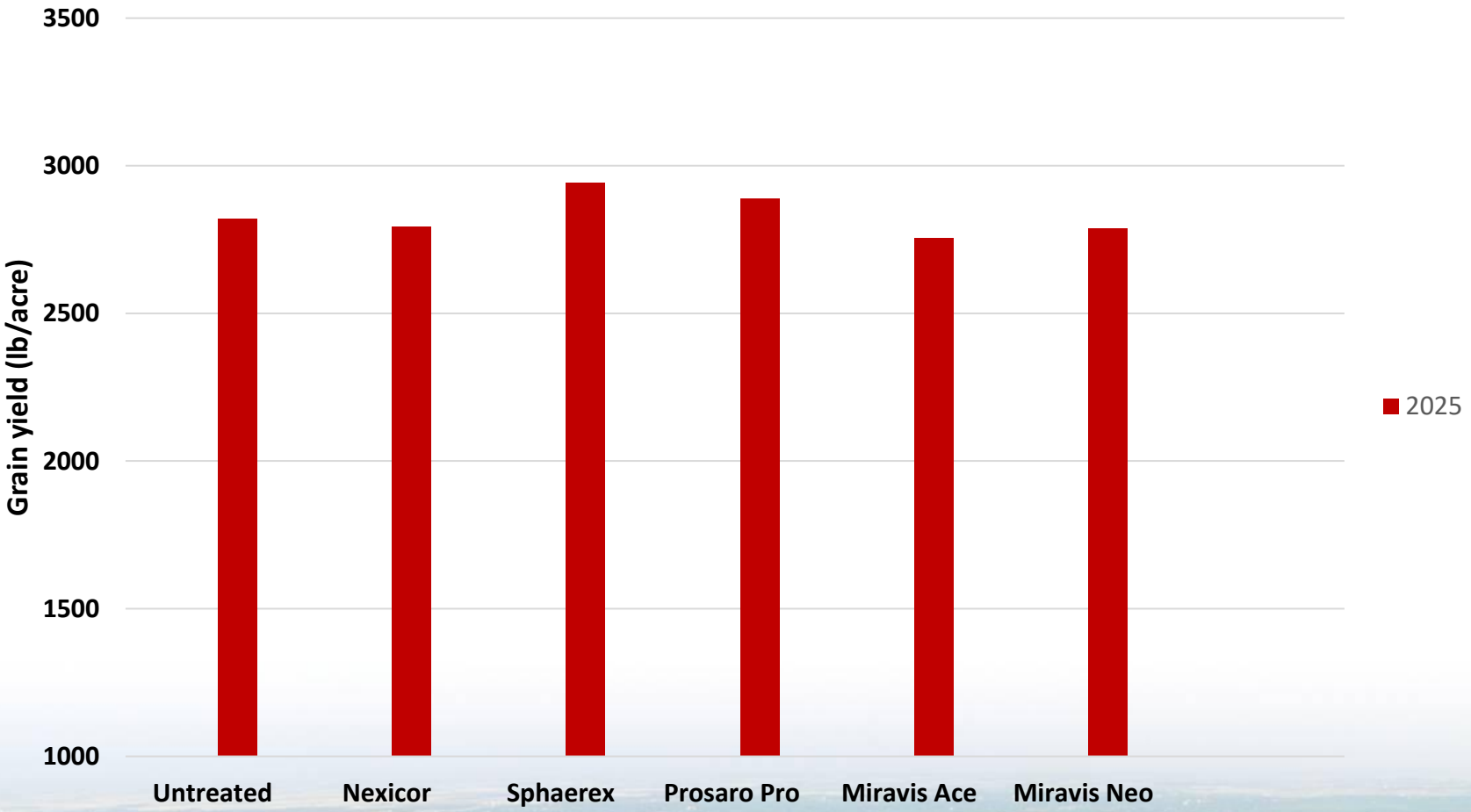
Septoria on Canaryseed



Septoria on Canaryseed



Septoria in Canaryseed on field scale in 2025



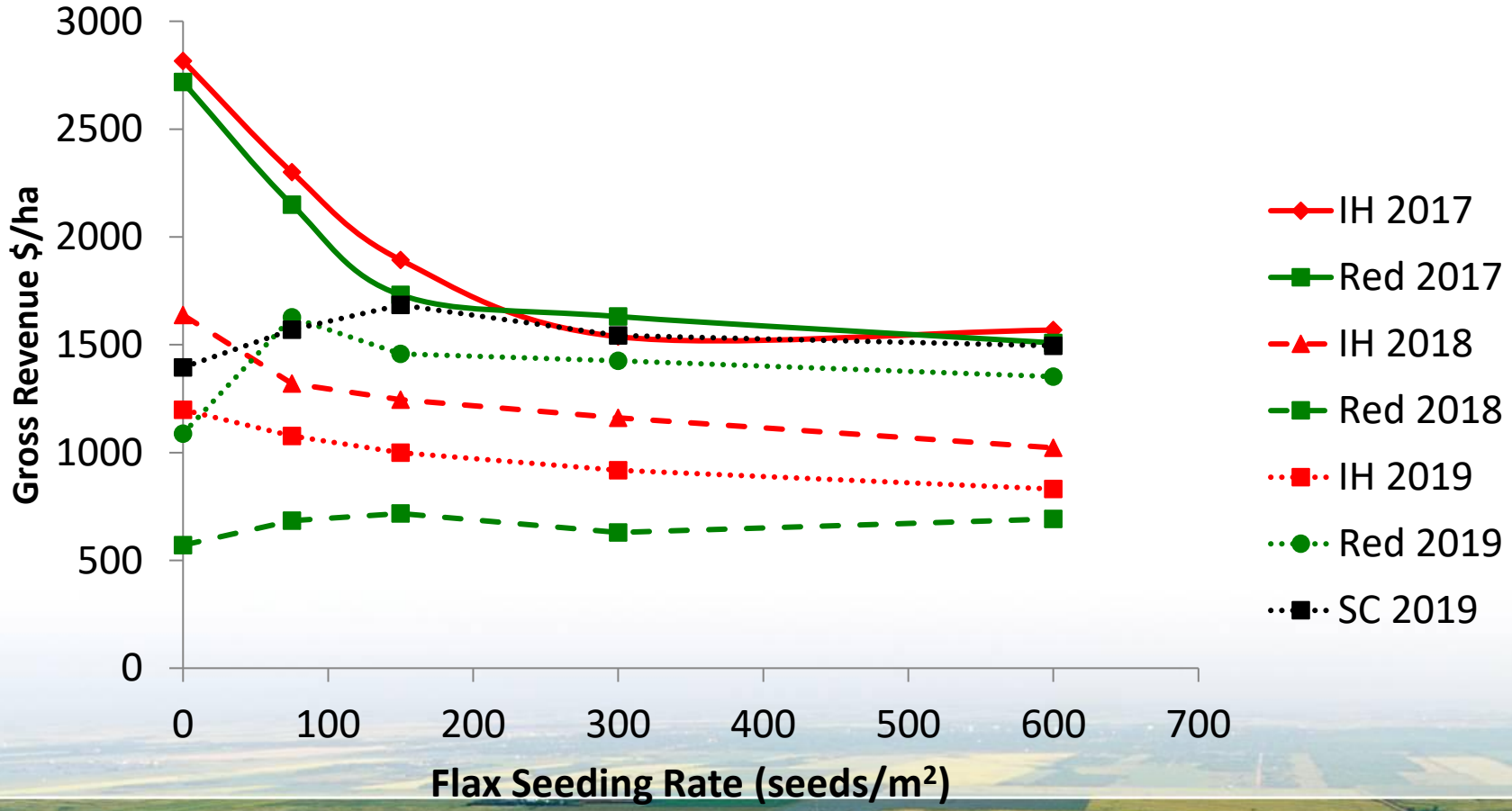
I would like to thank the

Canary Seed Development Commission of Saskatchewan

For their ongoing support

Intercropping Chickpea and Flax

Gross Income



Field Scale Chickpea-Flax

		Flax Density	Chickpea Density	Flax Yield	Chickpea
Flax	Nitrogen (lbs/acre)	Plants/m2	Plants/m2	Kg/ha	Kg/ha
			2023		
10 lbs/acre	8.5	99	67	401	2221
20 lbs/acre	76	258	46	689	1594
			2024		
6.4 lbs/acre	8.5	91	49	786	2149
12.8 lbs/acre	76	162	45	1230	1359
			2025		
6.6 lbs/acre	8.5	72	54	762	1817
9.9 lbs/acre	76	105	54	1176	1836

Conclusions

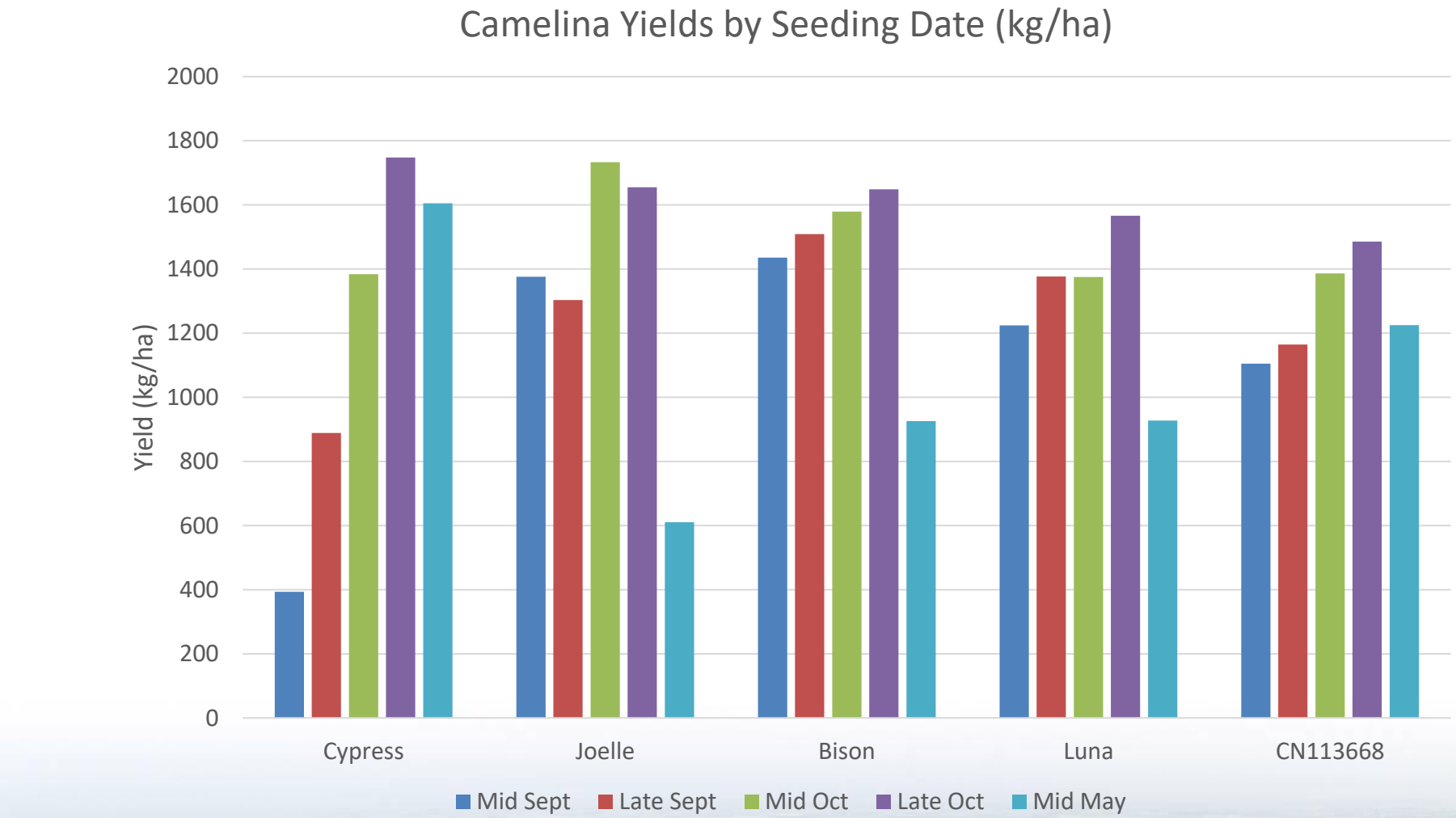
- **Flax Seeding Rate is the Driver**
- **Stability of economic returns is the greatest advantage**
- **Proven that it works in areas adapted and semi-adapted to chickpeas**
- **Need normal wet years**

Producer Tips

- **Focus on**
  - **Use full chickpea seeding rate**
  - **Place Seed at 1 inch or a little deeper if dry (favour chickpea)**
  - **Flax seeding rate start at 20 lbs/acre**
  - **You can lower rate if needed as you gain experience**
  - **Only failure was late rain after dry conditions**
    - **flax matured while chickpea regreened**

Seeding Date of Camelina

- Fall
    - Mid September
    - Late September
    - Mid October
    - Late October
    - Mid May
- 5 cultivars


Camelina Yields by Seeding Date (kg/ha)
Yield (kg/ha)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Cypress
Joelle
Bison
Luna
CN113668
Mid Sept
Late Sept
Mid Oct
Late Oct
Mid May

Intercropping Camelina and Lentil

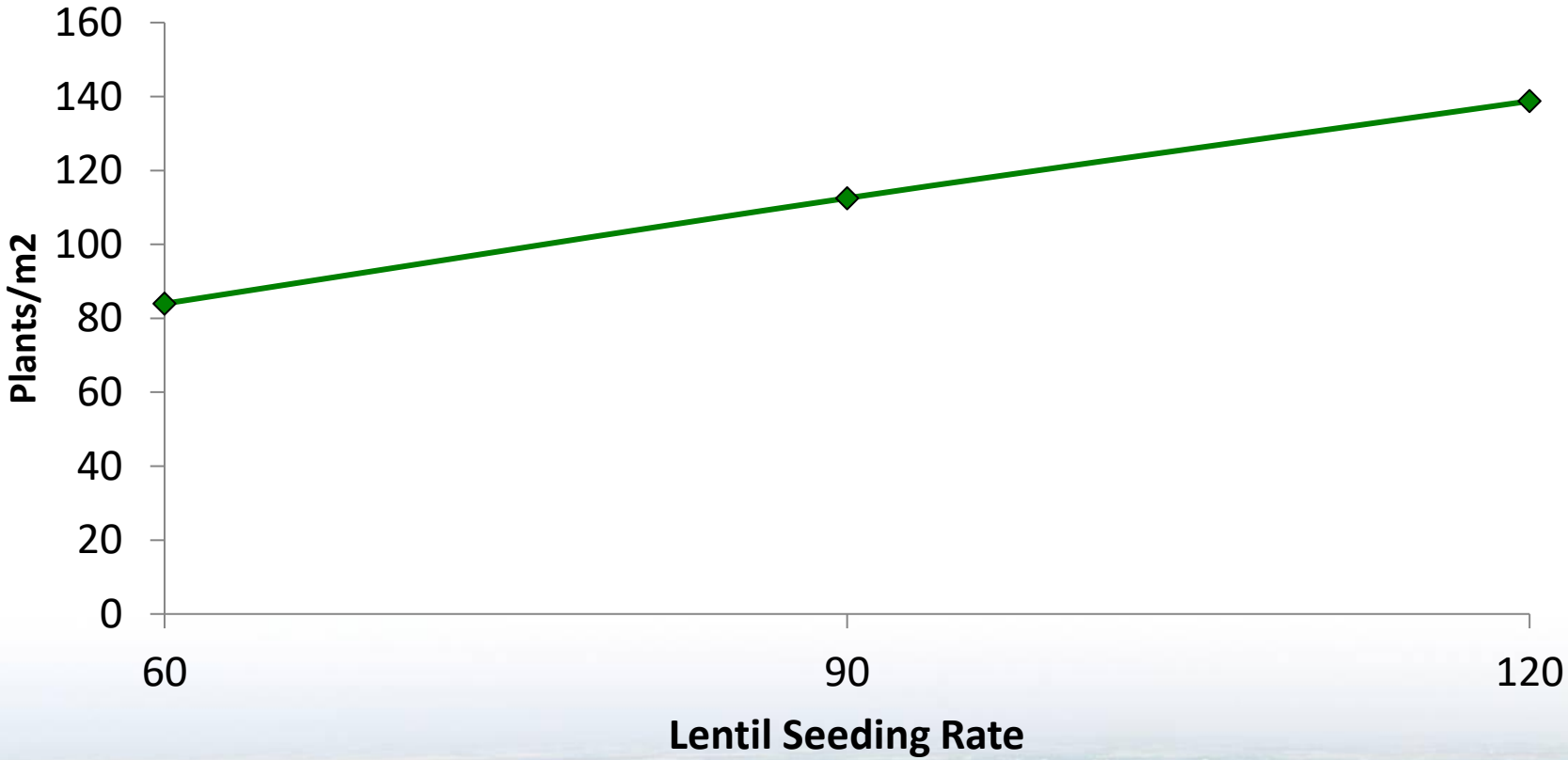
1) **Lentil seeding Rate (seeds m^{-2}):**
   a. **60**
   b. **90**
   c. **120**

2) **Nitrogen Rate (kg ha^{-1})**
   21
   75

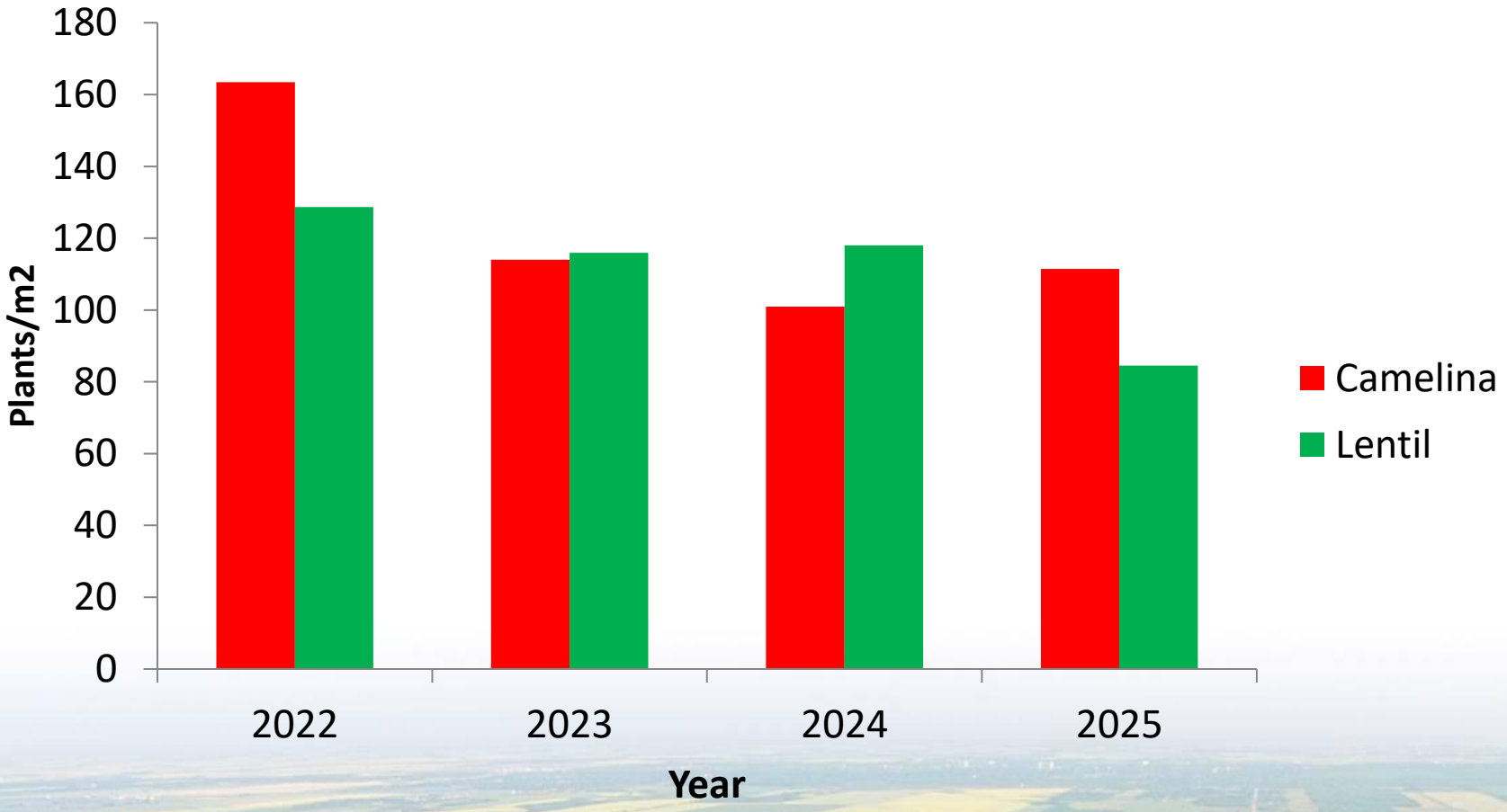
Camelina Mono Crop

Lentil Mono Crop

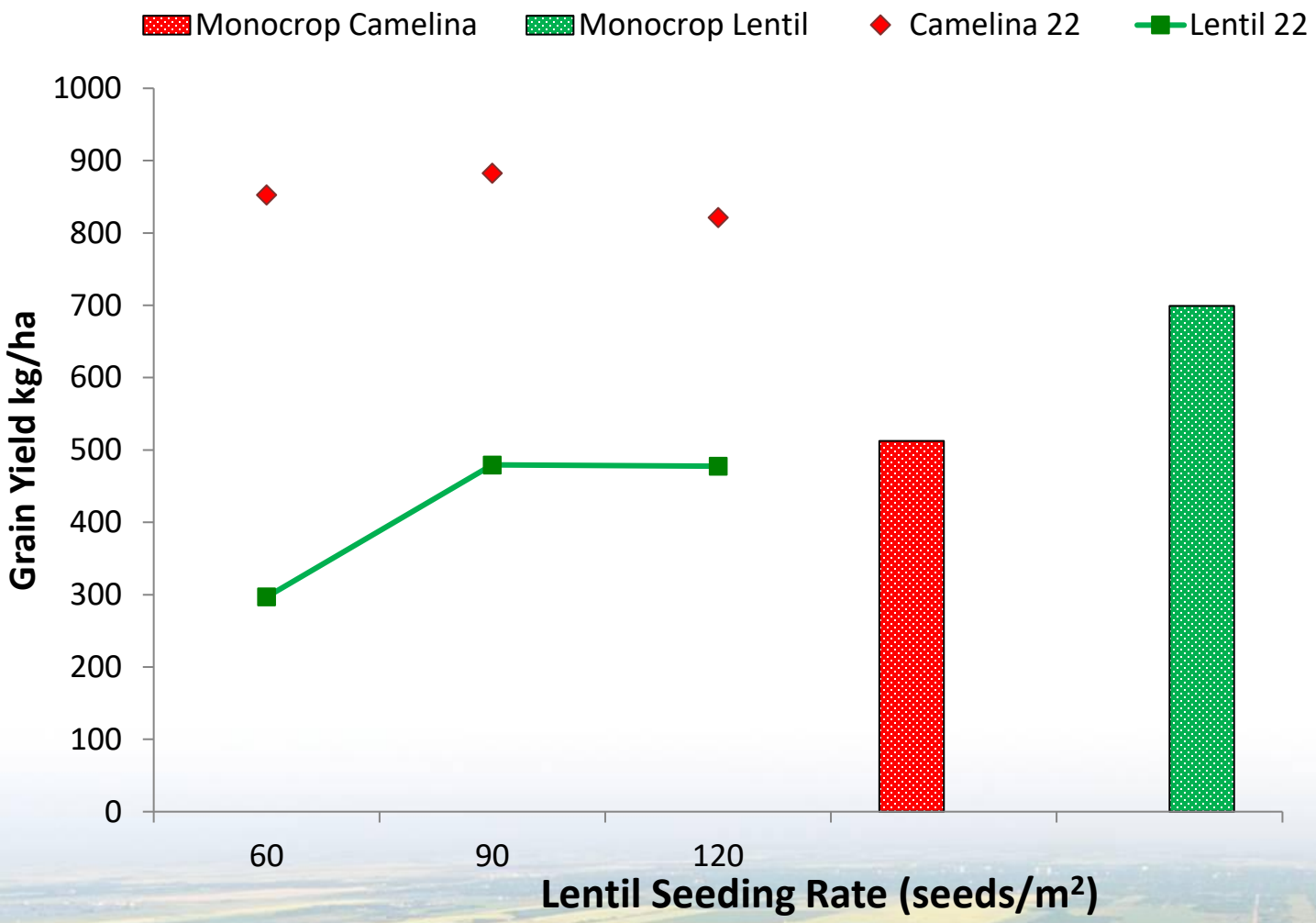
Lentil Plant Density



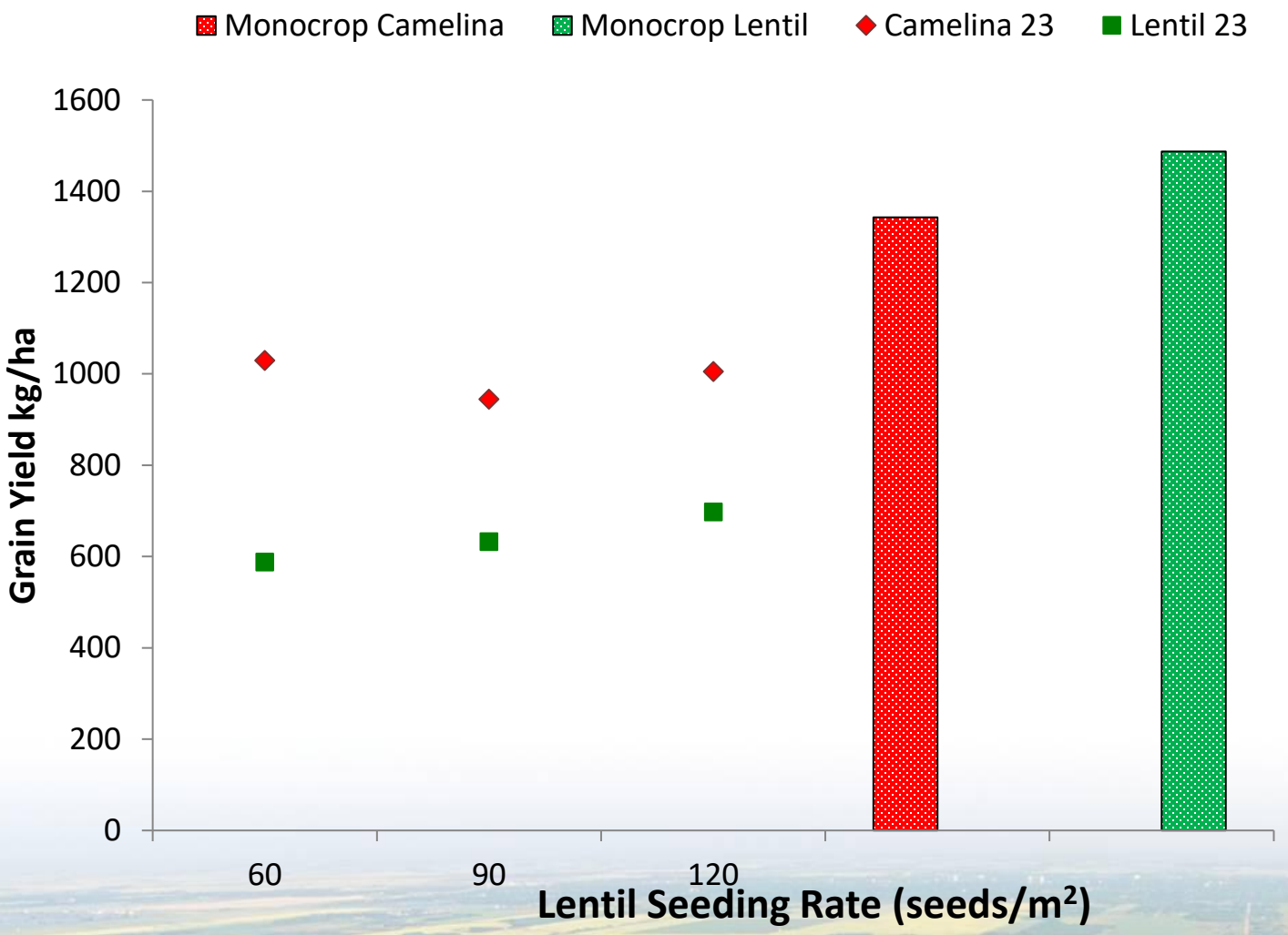
Camelina and Lentil Plant Density



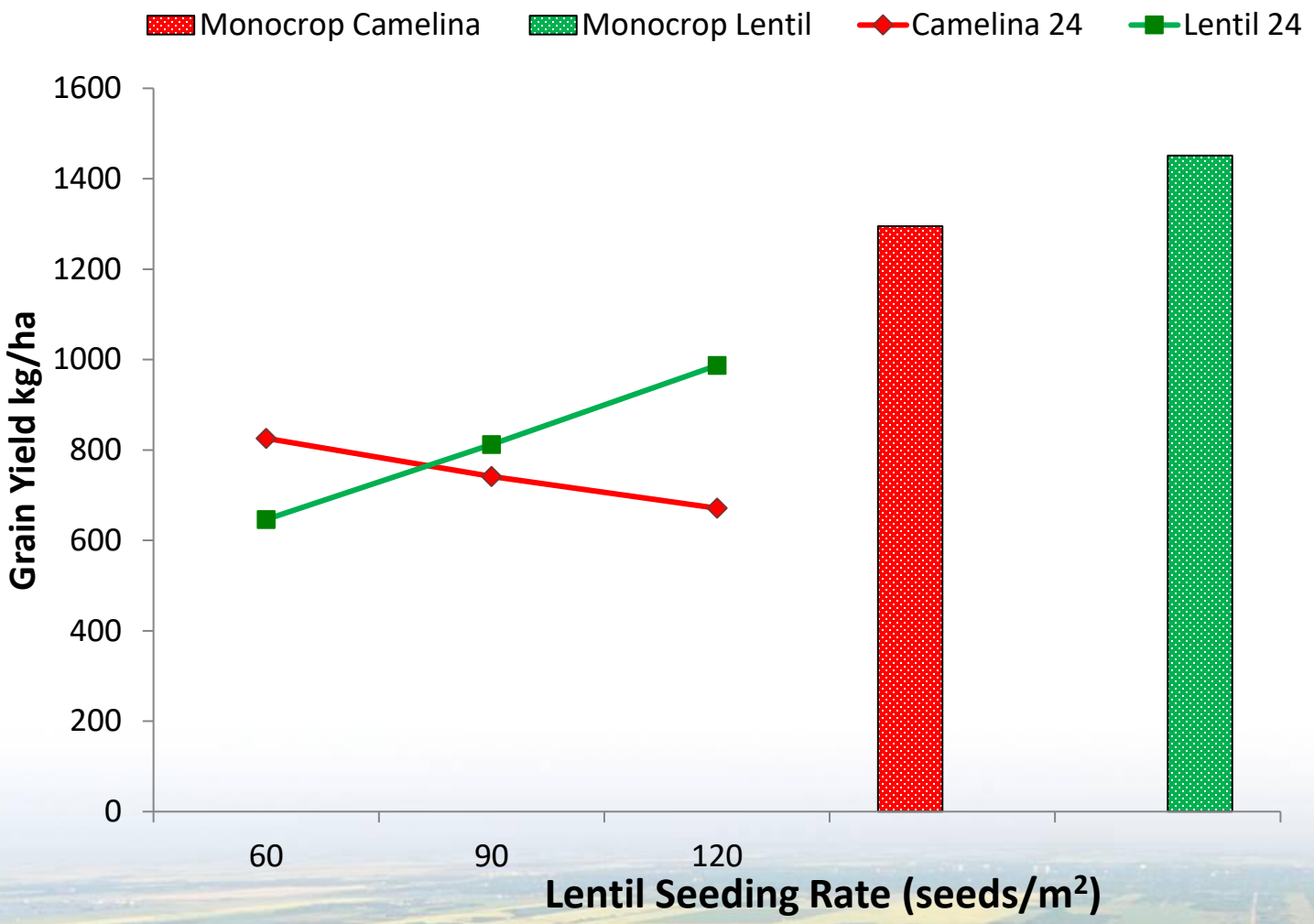
Grain Yield Indian Head 2022



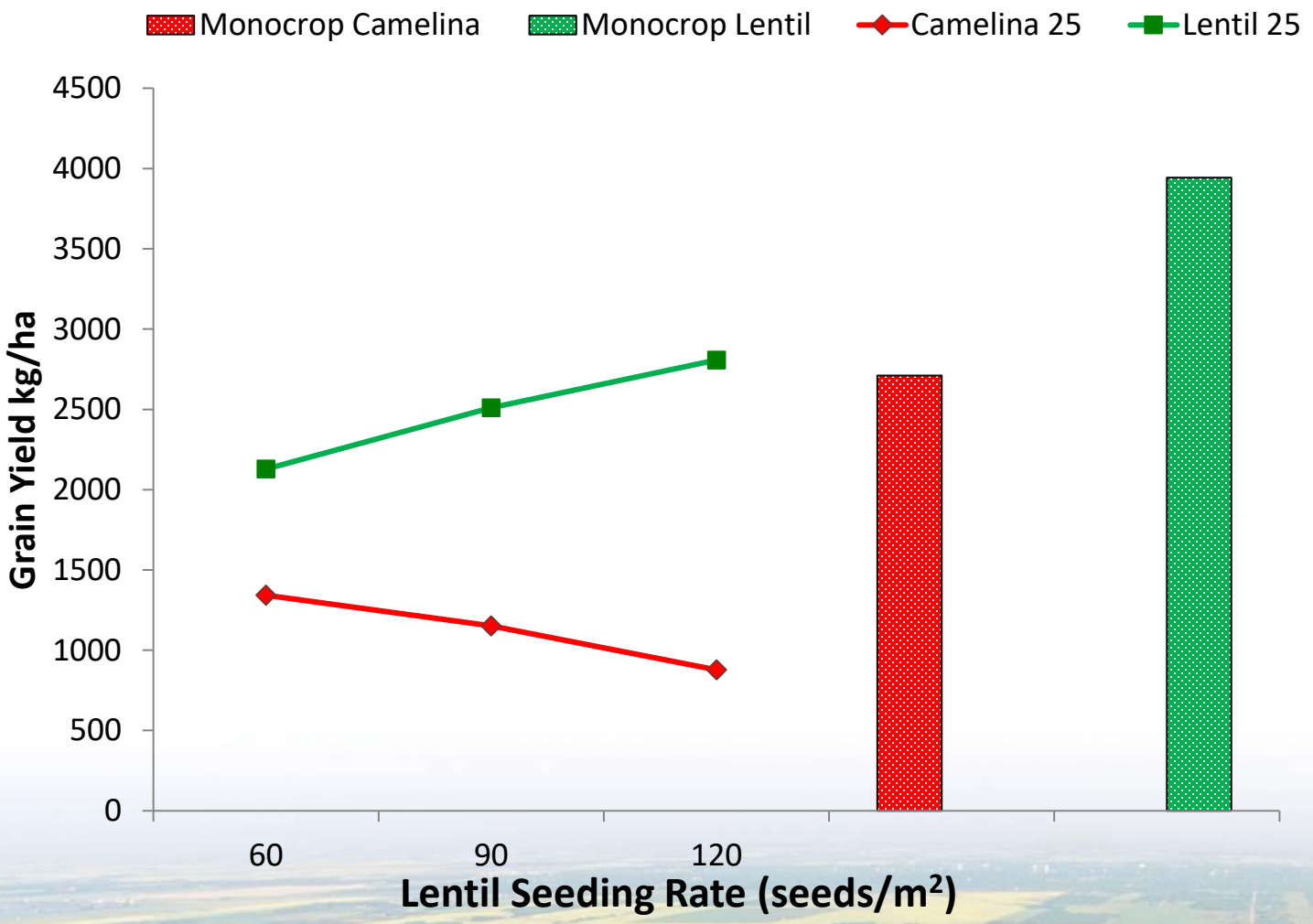
Grain Yield Indian Head 2023



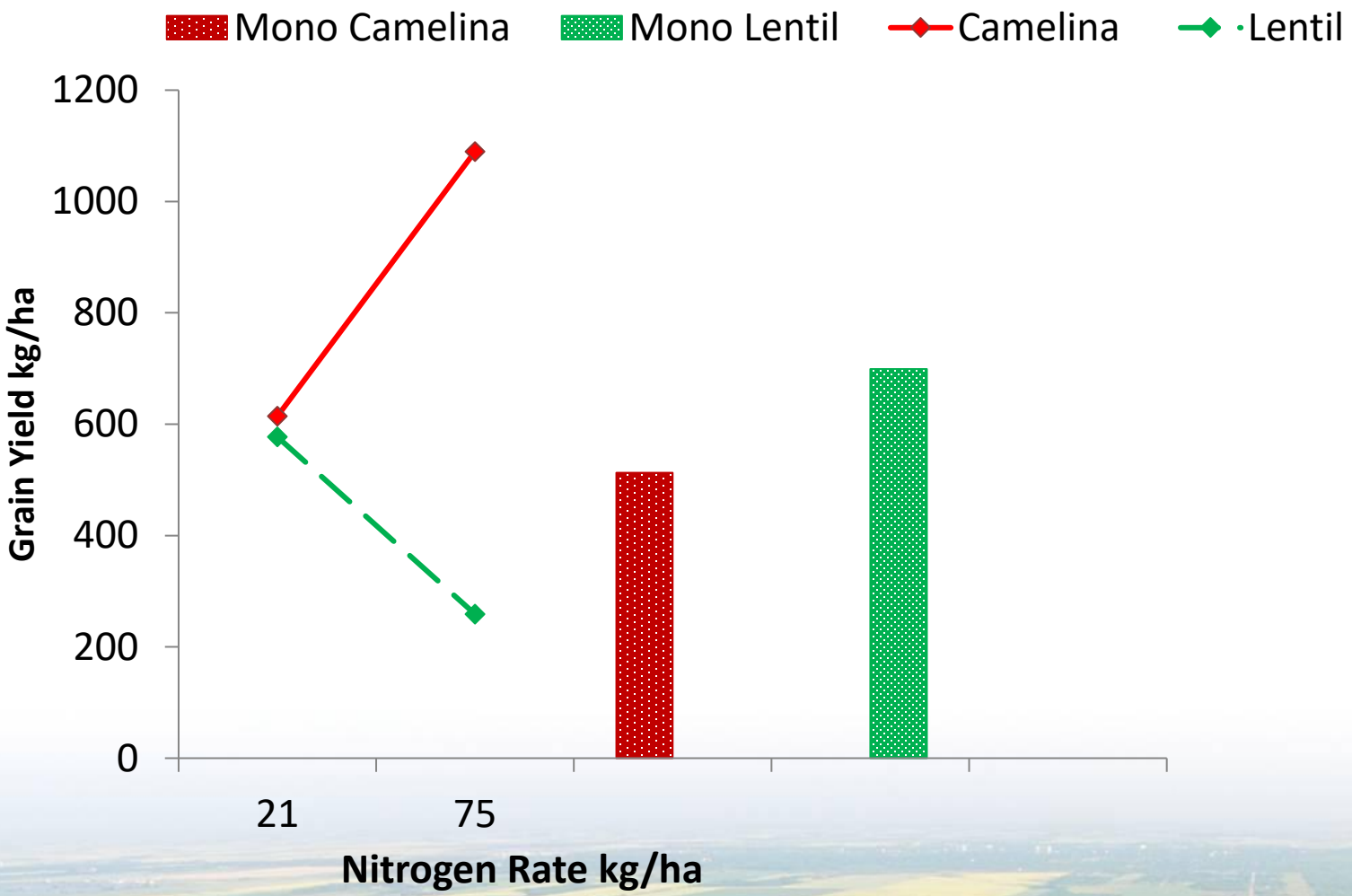
Grain Yield Indian Head 2024



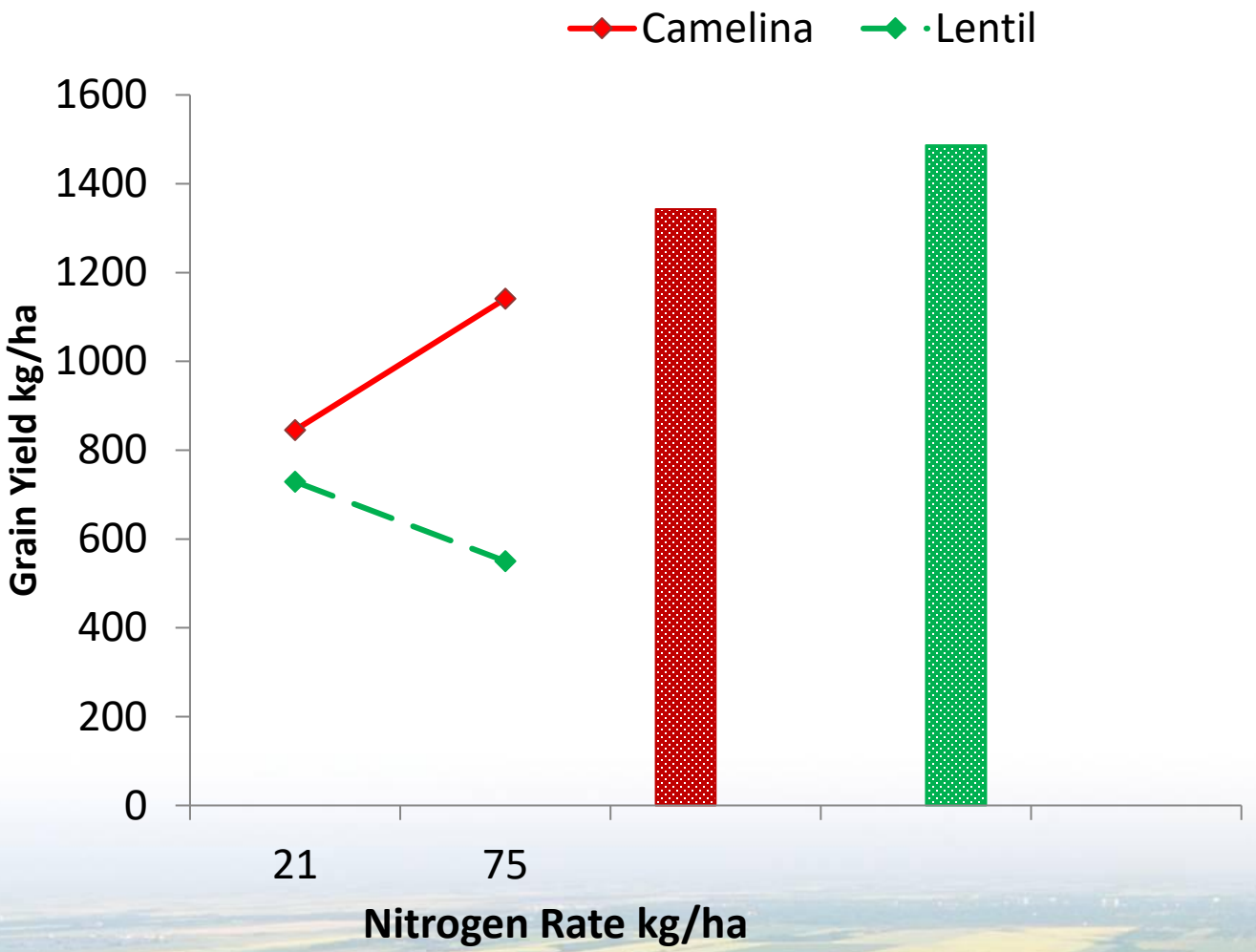
Grain Yield Indian Head 2025



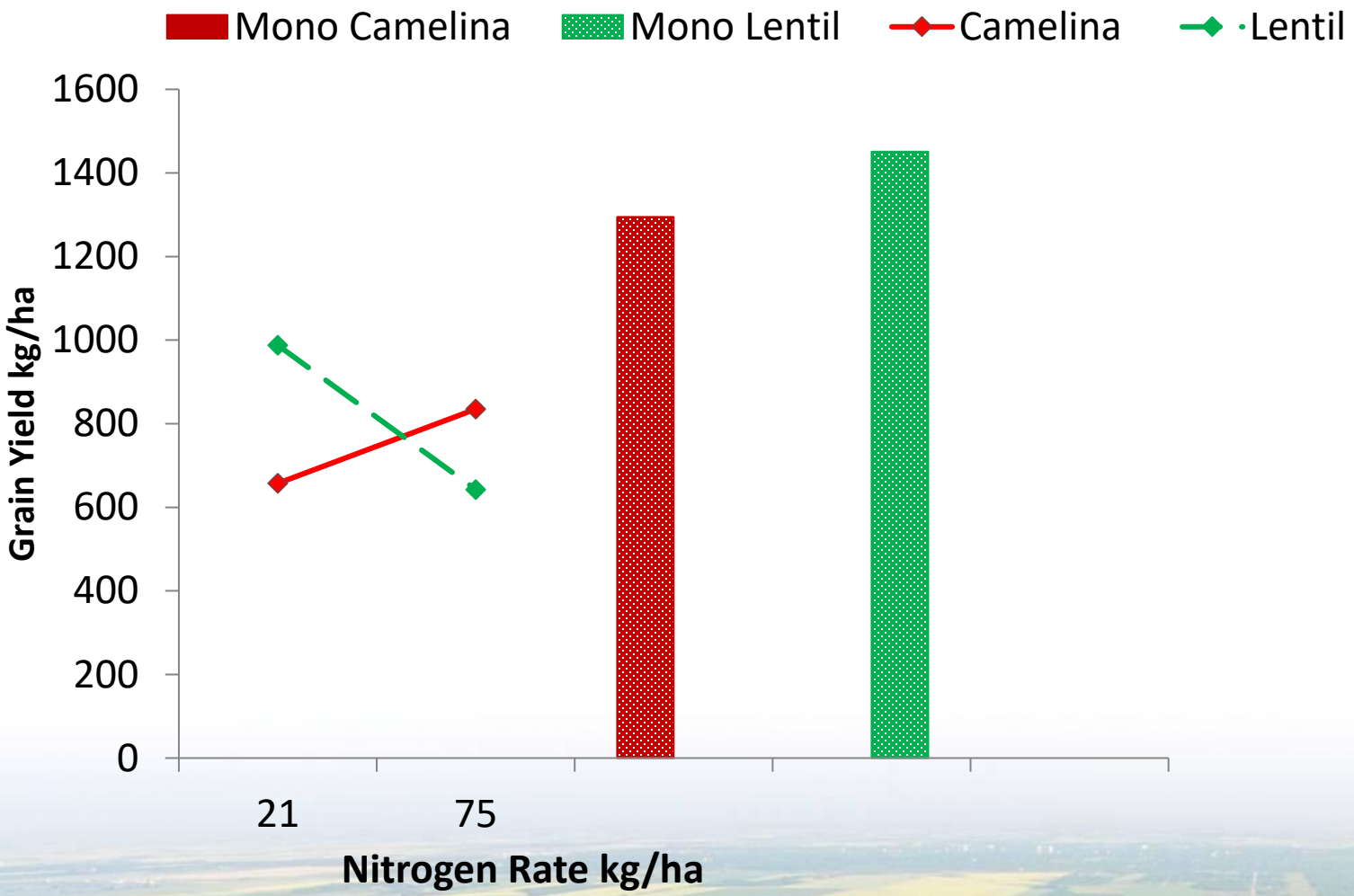
Grain Yield Indian Head 2022



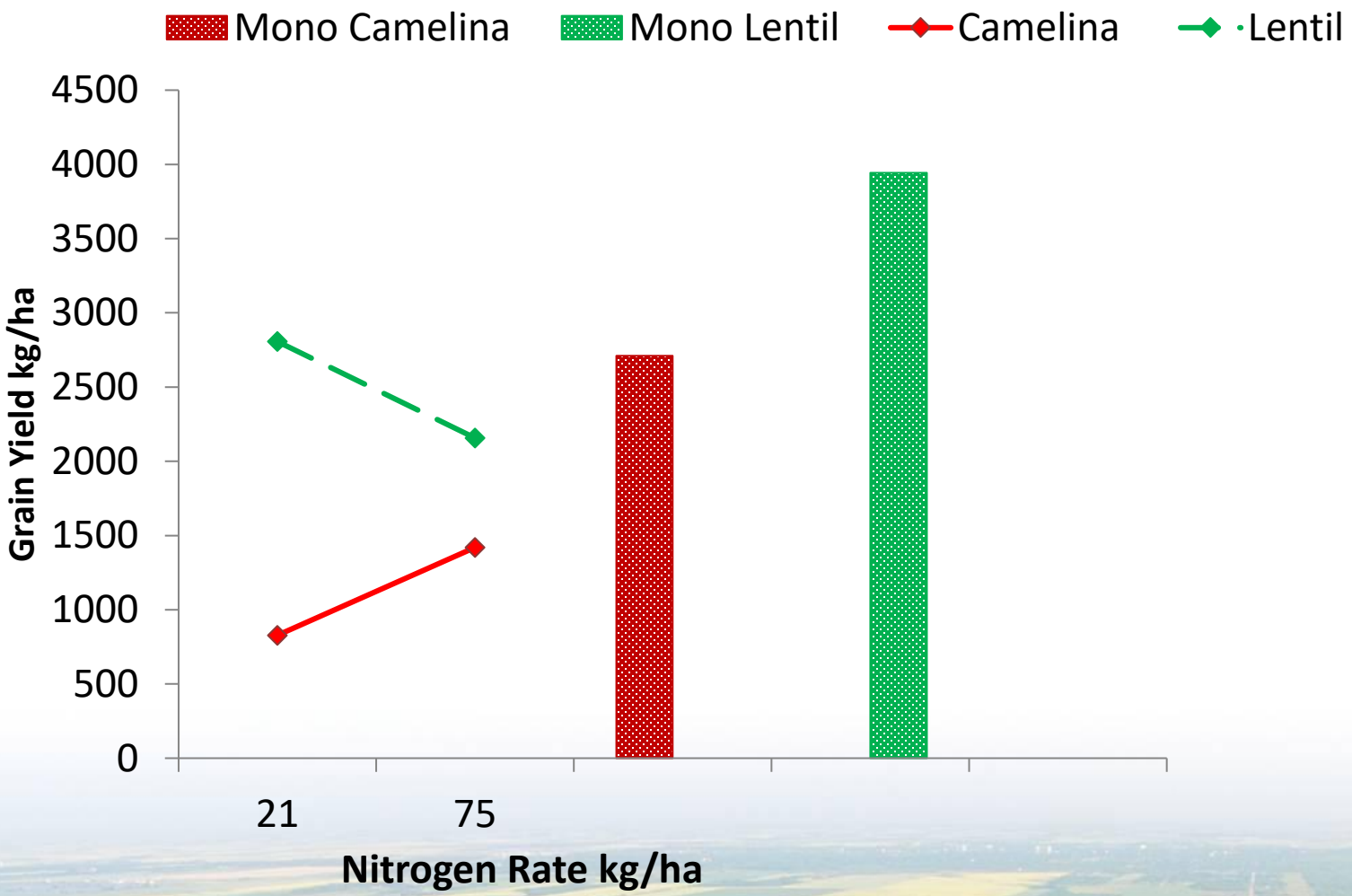
Grain Yield Indian Head 2023



Grain Yield Indian Head 2024



Grain Yield Indian Head 2025



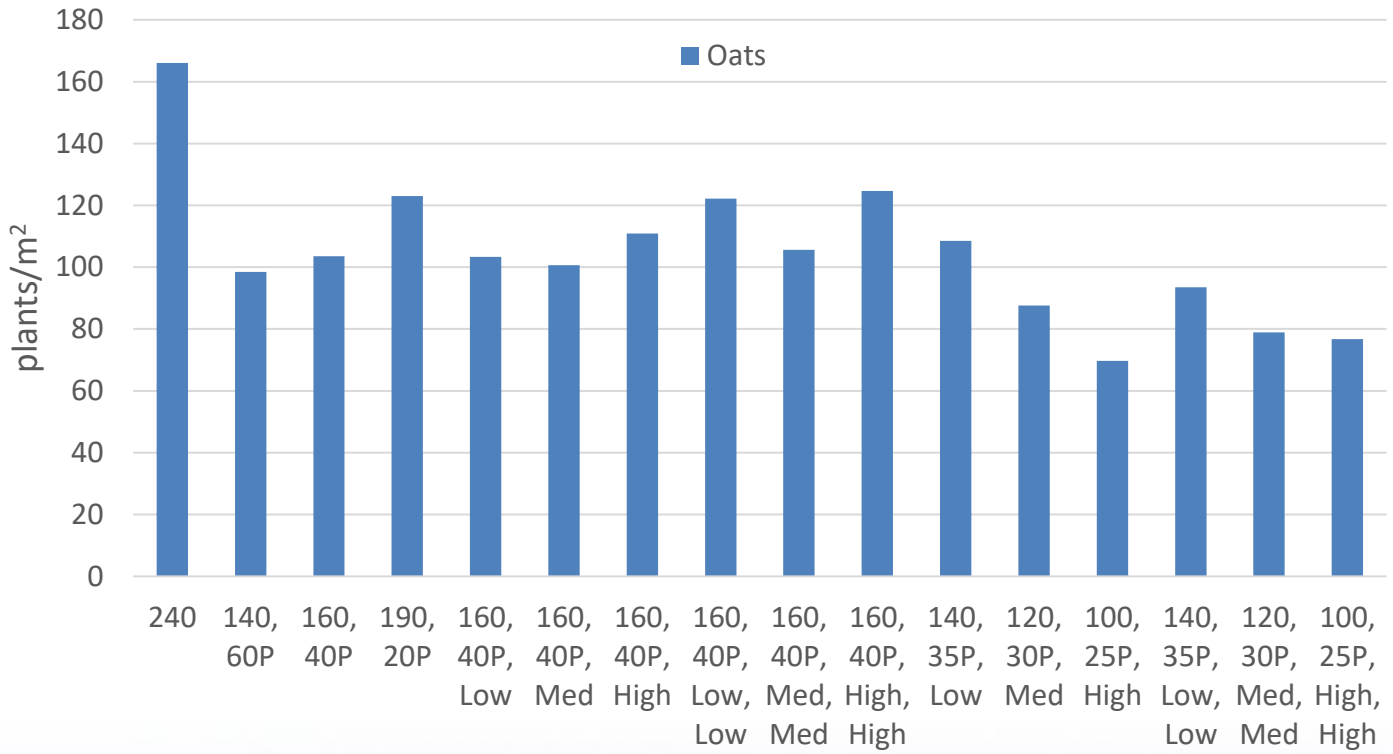
Conclusions

- Limited herbicide options
- If you are going to grow camelina then this may be a good option
- Still need to look at how well it raises the lentils and keeps them from going flat

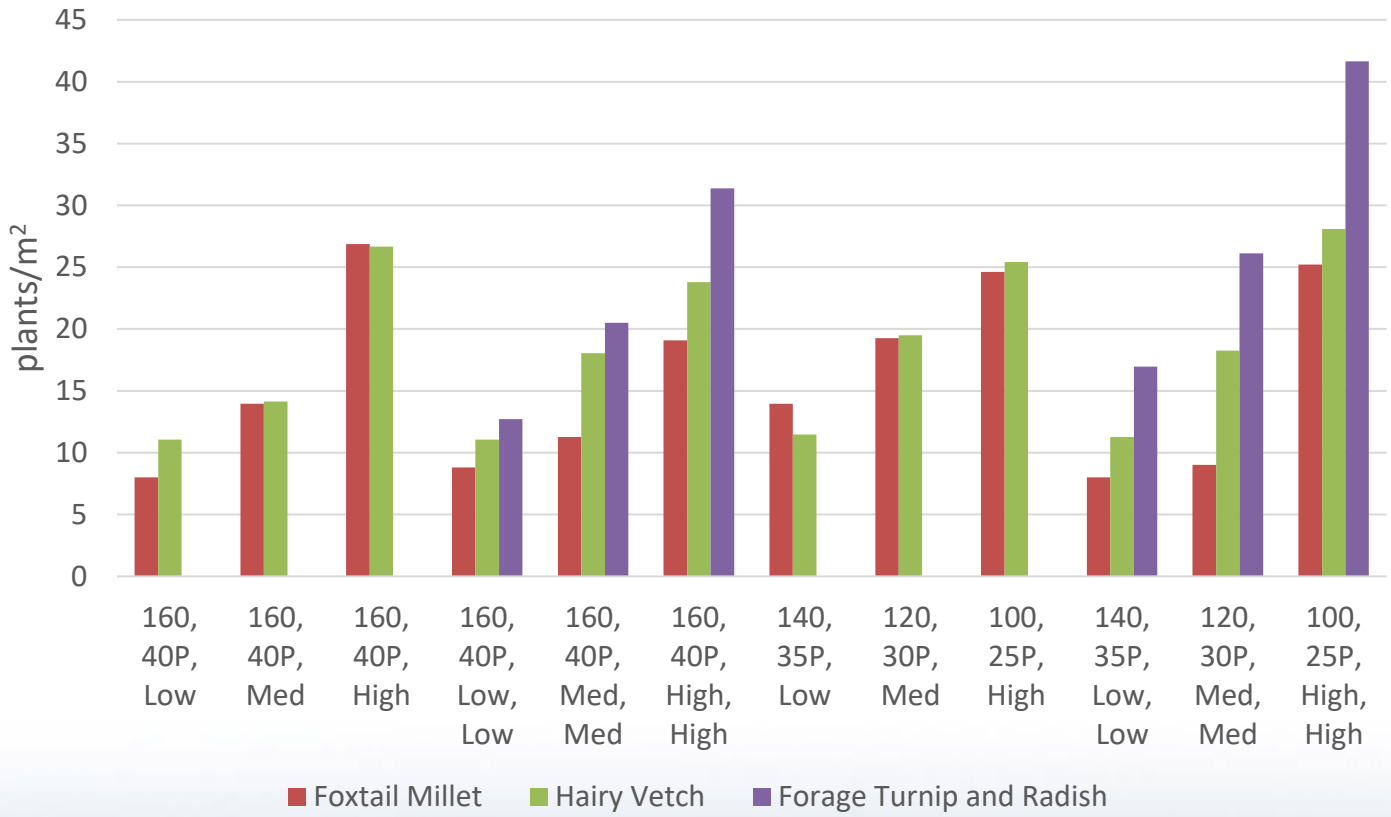
Annual Forage Mixes

Treatment	Annual Forage Species					
			Foxtail	Hairy		Forage
x	Oat	Pea	Millet	Vetch	Turnip	Rape
	Seeding Rate (seeds/m2)					
1	240	X	X	X	X	X
2	140	60	X	X	X	X
3	160	40	X	X	X	X
4	190	20	X	x	X	X
5	160	40	40	10	X	X
6	160	40	80	20	X	X
7	160	40	120	30	X	x
8	160	40	40	10	10	10
9	160	40	80	20	20	20
10	160	40	120	30	30	30
11	140	35	40	10	X	X
12	120	30	80	20	X	X
13	100	25	120	30	x	X
14	140	35	40	10	10	10
15	120	30	80	20	20	20
16	100	25	120	30	30	30

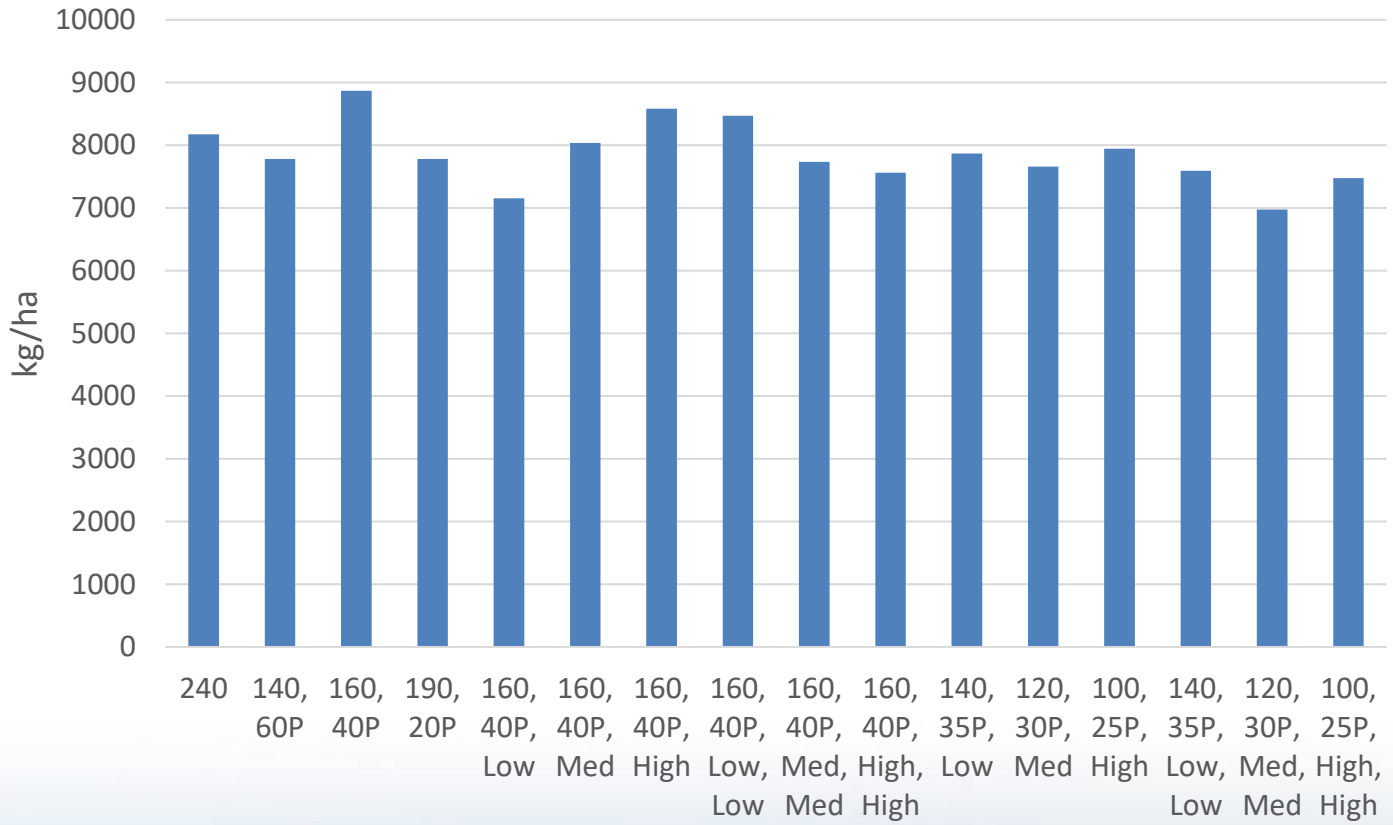
Plant Density by Treatment



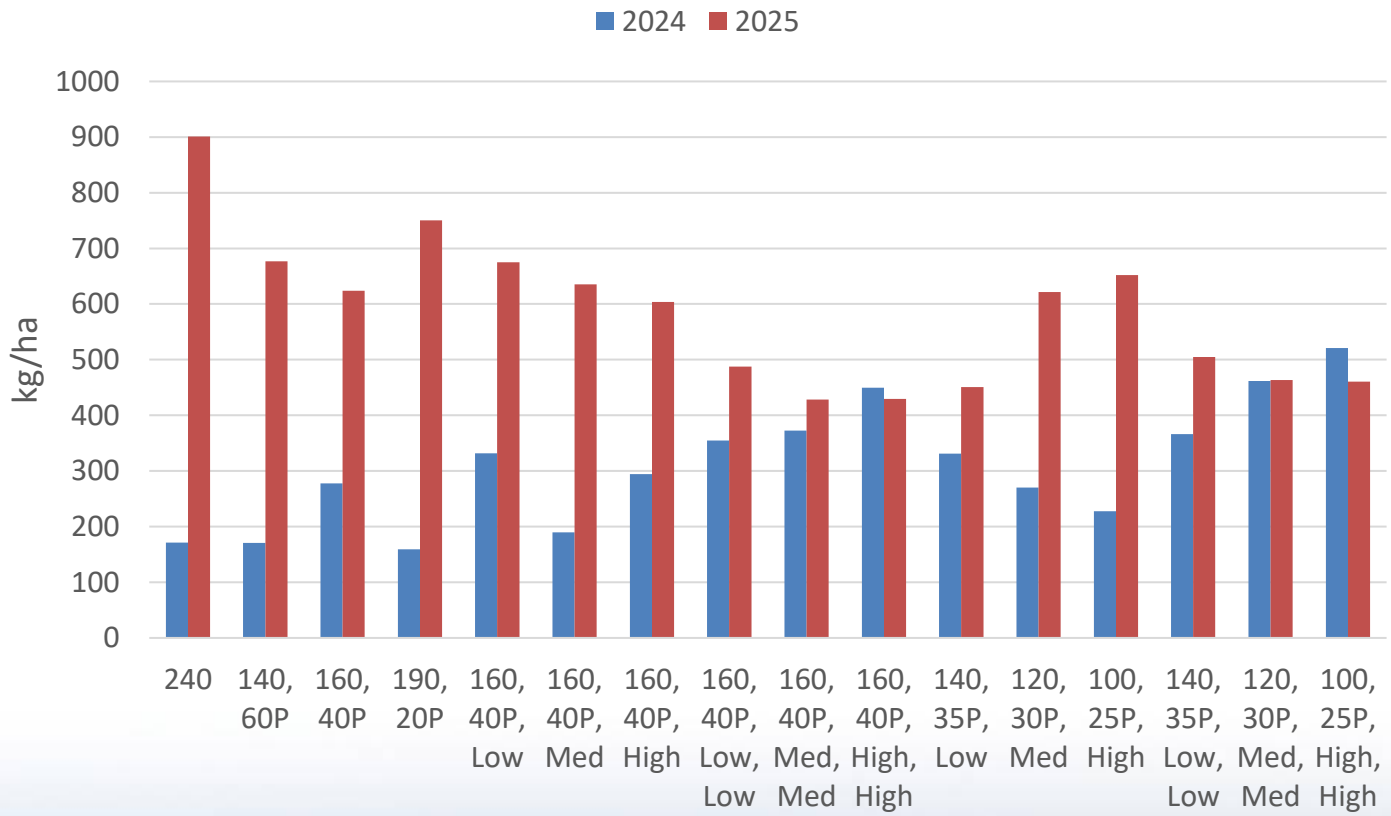
Plant Density by Treatment



First Cut Biomass



Second Cut Biomass



Observations

- First cut biomass not impacted by seeding rates
- Second cut very weather dependent

People who do the work
Thank You!

Indian Head Technicians:

Rebecca Davies, Kathy Ringdal, Joanne MacKay,,
Kyle Stewart, and Emma Chappell