HYPER YIELDING CROPS

2023 Annual Report

OUTPUT 1

Prepared by:

FAR AUSTRALIA

Contents

Values in tables and figures with different letters are statistically different. Non-significant LSD figures displayed as 'ns'.

2023 HYC Barley Results

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SA Crop Technology Centre

Millicent, South Australia

Sown: 10 May 2023
Harvested: 5 January 24 (B23-03 & B23-04); 4 January (on-time)/15 January 24 (delayed) (B23-05)
Rotation position: 2022 Canola
Soil type: Organosol over grey clay
Nitrogen 0-30cm: 253kg N/ha
Colwell P (ppm) 0-10cm: 59 ppm
pH ($CaCl_2$) 0-10cm: 7.5
Organic Carbon (%) 0-10cm: 8.0%

Trial 1. HYC Barley G.E.M Trial Series (FAR SAC B23-03)

Key Points:

- *The 2023 G.E.M trial looked to investigate the agronomic and economic influence of four management approaches- 'low' input (minimalist approach), 'high' input (no expenses spared), 'strategic' input (tailored approach based on pre-season forecasts/expectations) and 'tactical' (tailored approach based on strategic with in-season adjustment guided by climate and in-season triggers) on 6 varieties (details in table 7).*
- *The slower developing spring barley variety Laureate was the highest yielding cultivar under the high, strategic and tactical inputs, yielding over 9t/ha (Table 1).*
- *The 'strategic' management, where a management plan was set out prior to the season and adhered to, was on average the highest yielding across all varieties (Table 1).*
- *The winter 6-row barley Pixel produced yields between 8.01t/ha and 8.98t/ha where PGR were applied however the variety experienced high head loss in the low input management which only yielded 5.14t/ha (Figure 1).*
- *Through high proteins (Table 2) and/or low-test weights (Table 3), no treatment in this trial was able to achieve malt standards.*
- *With yields on par or higher than 'high' input and lower operational costs, the 'strategic' input was the most profitable under the partial gross margin analysis (Figure 1).*
- *Despite costing on average $225/ha less than the 'high' input, 'low' input approaches were the least profitable due to the reduced grain yields achieved with those managements (Figure 1).*

Treatments:

Six cultivars (RGT Planet, Rosalind, Laureate, Minotaur, Neo and Pixel) were tested under four different management programs:

1. Low Input- Two units of fungicide based on Tilt 500EC (propiconazole) applied at 500mL/ha (250g ai/ha) and Folicur 430SC (tebuconazole) applied at 290mL/ha (125g ai/ha) and 150kg N/ha.
2. High Input- Four units of fungicide (Systiva seed treatment plus foliar fungicides GS31, GS39, GS59), 225kg N/ha, PGR.
3. HYC Strategic Input – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 7.

Table 1. Influence of management strategy and cultivar on grain yield (t/ha).

		Yield (t/ha)									
		Low Input		High Input		Strategic		Tactical		Mean	
1.	**RGT Planet**	7.23	f-i	8.35	a-d	8.93	ab	7.86	def	**8.09**	**b**
2.	**Rosalind**	7.02	g-j	7.43	e-i	7.64	d-h	7.02	g-j	**7.28**	**d**
3.	**Laureate**	7.79	d-g	9.07	a	9.05	a	9.00	a	**8.73**	**a**
4.	**Minotaur**	6.62	ij	6.21	j	7.31	f-i	7.18	f-i	**6.83**	**e**
5.	**Neo**	6.87	hij	7.84	d-g	8.15	b-e	7.29	f-i	**7.54**	**cd**
6.	**Pixel**	5.14	k	8.98	ab	8.80	abc	8.01	c-f	**7.73**	**bc**
Mean		**6.78**	**c**	**7.98**	**ab**	**8.32**	**a**	**7.73**	**b**	**7.70**	
LSD Cultivar P=0.05				0.42		**P Value**				<0.001	
LSD Management P=0.05				0.39		**P value**				<0.001	
LSD Cultivar x Man. P=0.05				0.83		**P value**				<0.001	

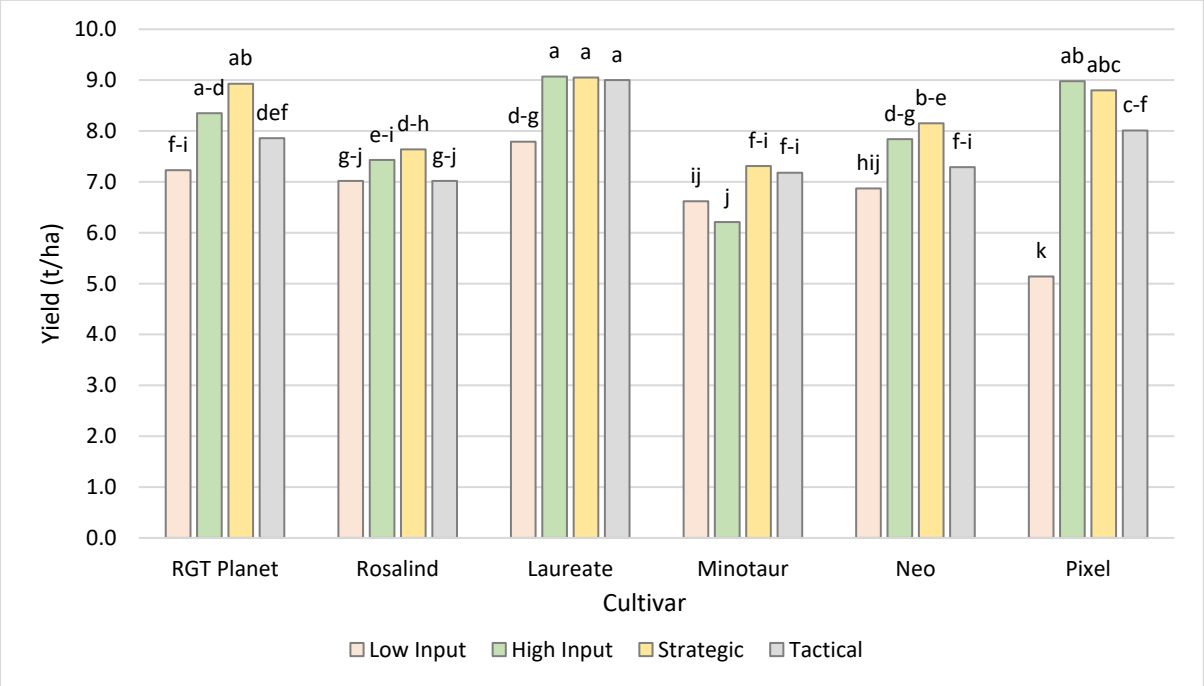

Figure 1. Influence of management strategy and cultivar on grain yield (t/ha).

Table 2. Influence of management strategy and cultivar on grain protein (%).

		Protein (%)									
		Low Input		High Input		Strategic		Tactical		Mean	
1.	**RGT Planet**	11.9	-	12.5	-	12.2	-	12.5	-	**12.3**	**d**
2.	**Rosalind**	12.5	-	13.4	-	13.1	-	13.2	-	**13.0**	**ab**
3.	**Laureate**	12.6	-	13.3	-	12.7	-	12.8	-	**12.8**	**b**
4.	**Minotaur**	12.3	-	13.8	-	13.4	-	13.1	-	**13.2**	**a**
5.	**Neo**	12.1	-	12.8	-	12.6	-	12.7	-	**12.5**	**c**
6.	**Pixel**	12.5	-	12.8	-	12.9	-	13.0	-	**12.8**	**b**
Mean		**12.3**	**c**	**13.1**	**a**	**12.8**	**b**	**12.9**	**ab**	**12.8**	
LSD Cultivar P=0.05				0.22		**P value**				<0.001	
LSD Management P=0.05				0.26		**P Value**				<0.001	
LSD Cultivar x Man. P=0.05				ns		**P Value**				0.234	

Table 3. Influence of management strategy and cultivar on test weight (kg/hL).

		Test Weight (kg/hL)									
		Low Input		High Input		Strategic		Tactical		Mean	
1.	**RGT Planet**	61.7	-	62.0	-	61.7	-	62.5	-	**61.9**	**b**
2.	**Rosalind**	62.6	-	63.4	-	62.7	-	62.3	-	**62.8**	**ab**
3.	**Laureate**	61.6	-	62.6	-	61.2	-	62.6	-	**62.0**	**b**
4.	**Minotaur**	63.7	-	63.4	-	63.2	-	63.6	-	**63.5**	**a**
5.	**Neo**	58.7	-	60.4	-	61.1	-	60.1	-	**60.1**	**c**
6.	**Pixel**	62.3	-	63.0	-	61.4	-	62.2	-	**62.2**	**b**
Mean		**61.8**	**-**	**62.5**	**-**	**61.9**	**-**	**62.2**	**-**	**62.1**	
LSD Cultivar P=0.05				0.8		**P Value**				<0.001	
LSD Management P=0.05				ns		**P Value**				0.428	
LSD Cultivar x Man. P=0.05				ns		**P Value**				0.516	

Table 4. Influence of management strategy and cultivar on grain retention (%).

		Retention (%)									
		Low Input		High Input		Strategic		Tactical		Mean	
1.	**RGT Planet**	83.8	cd	84.9	a-d	83.8	cd	85.0	a-d	**84.4**	**b**
2.	**Rosalind**	79.9	ef	70.7	g	72.8	g	70.6	g	**73.5**	**c**
3.	**Laureate**	86.8	abc	86.7	abc	86.6	abc	86.6	abc	**86.7**	**a**
4.	**Minotaur**	84.5	bcd	82.7	de	84.5	bcd	86.6	abc	**84.6**	**b**
5.	**Neo**	72.2	g	78.5	f	79.1	f	70.4	g	**75.0**	**c**
6.	**Pixel**	88.1	a	87.2	ab	84.5	bcd	85.5	a-d	**86.3**	**a**
Mean		**82.5**	**-**	**81.8**	**-**	**81.9**	**-**	**80.8**	**-**	**81.7**	
LSD Cultivar P=0.05				1.6		**P Value**				<0.001	
LSD Management P=0.05				ns		**P Value**				0.548	
LSD Cultivar x Man. P=0.05				3.2		**P Value**				<0.001	

Table 5. Influence of management strategy and cultivar on grain screening (%).

		Screening (%)									
		Low Input		High Input		Strategic		Tactical		Mean	
1.	**RGT Planet**	6.8	c-g	6.8	c-g	7.1	c-f	6.5	d-g	**6.8**	**b**
2.	**Rosalind**	7.4	bcd	9.7	a	8.8	ab	9.6	a	**8.9**	**a**
3.	**Laureate**	6.2	d-h	5.4	ghi	5.9	e-i	5.8	f-i	**5.8**	**c**
4.	**Minotaur**	6.9	c-f	8.1	bc	7.3	cde	6.4	d-g	**7.2**	**b**
5.	**Neo**	9.6	a	8.1	bc	7.2	c-f	9.6	a	**8.6**	**a**
6.	**Pixel**	4.5	ij	3.9	j	4.8	hij	4.7	ij	**4.5**	**d**
Mean		**6.9**	**-**	**7.0**	**-**	**6.9**	**-**	**7.1**	**-**	**7.0**	
LSD Cultivar P=0.05				0.7		**P Value**				<0.001	
LSD Management P=0.05				ns		**P Value**				0.958	
LSD Cultivar x Man. P=0.05				1.5		**P Value**				0.005	

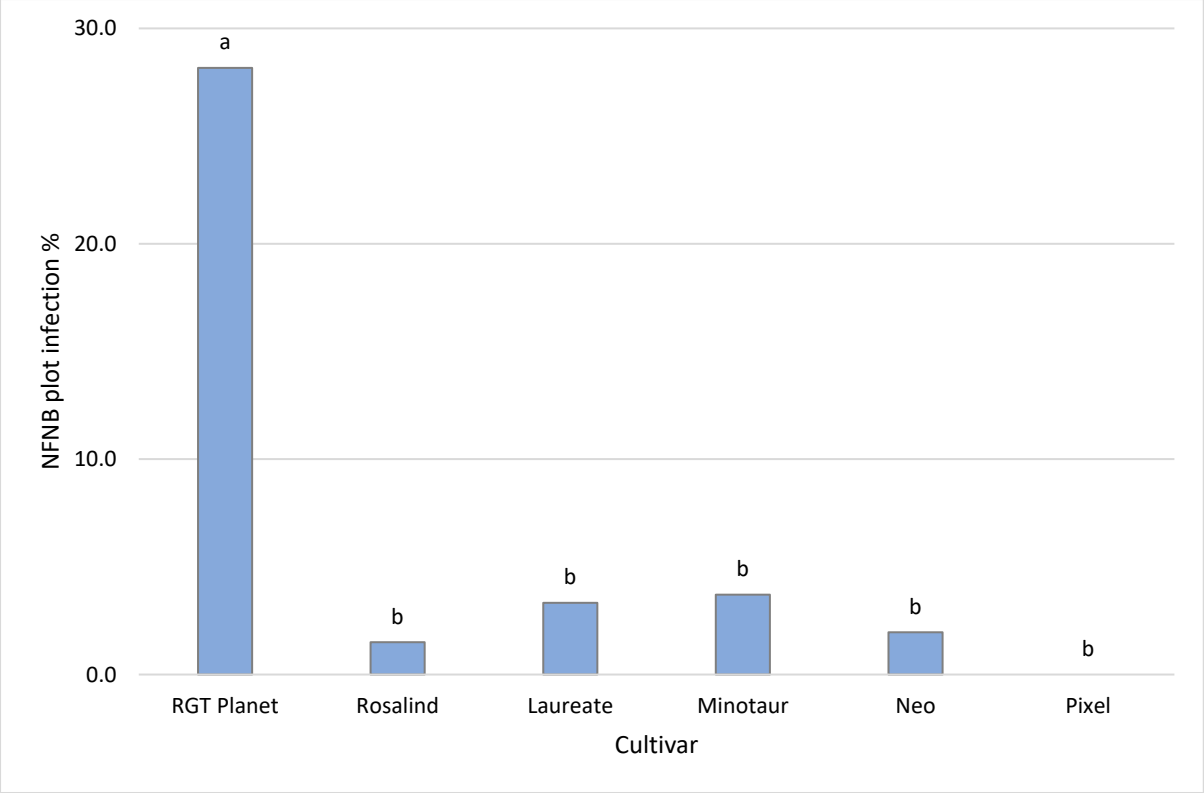

Figure 2. Influence of cultivar on the plot infection % of net form of net blotch (NFNB) (P value=<0.001, LSD=4.4). Management and cultivar x management were non-significant. Assessed at GS78 on 7 November.

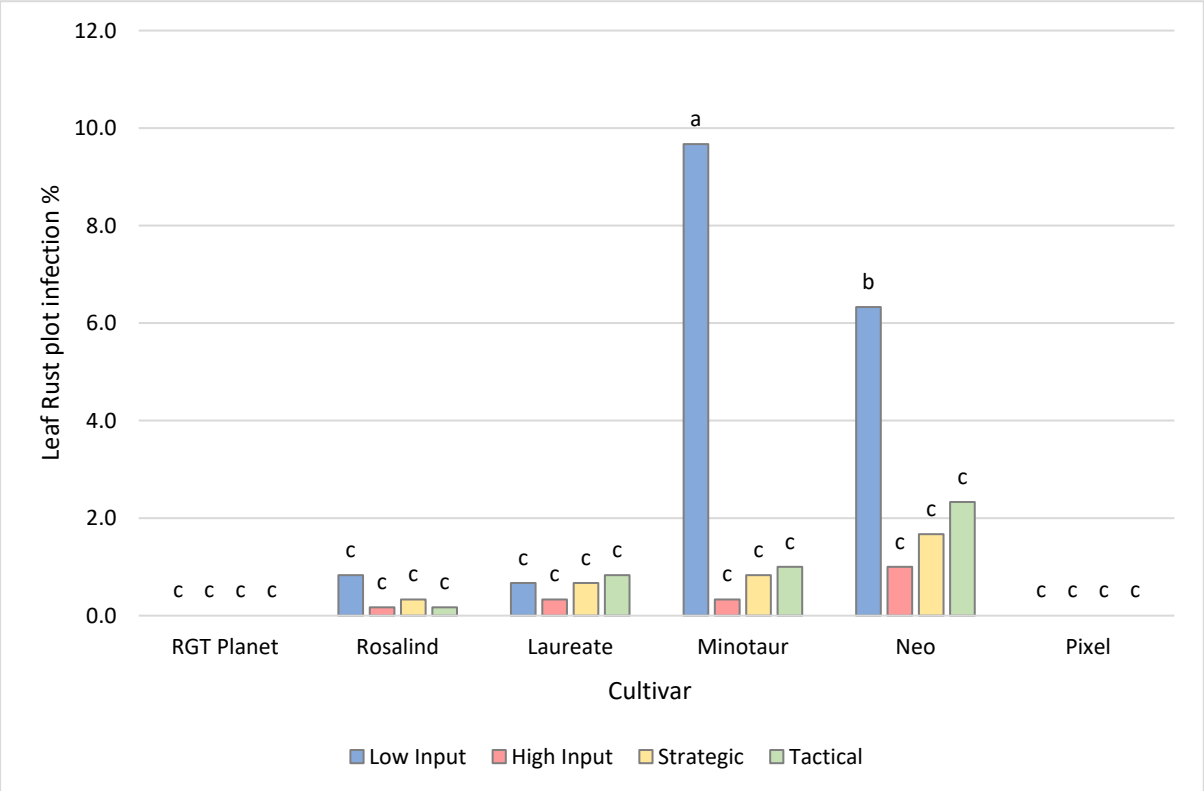

Figure 3. Influence of cultivar and management on the plot infection % of leaf rust (P value=0.002, LSD=2.6). Assessed at GS78 on 7 November.

Table 6. Influence of cultivar and management on crop parameters at harvest – harvested 5 January.

	Harvest Crop Parameters			
Cultivar	**Dry Matter (t/ha)**	**Head Count (heads/m²)**	**Harvest Index (%)**	**Lodging (0-500)**
RGT Planet	15.4 abc	618 b	46.7 a	82.5 b
Rosalind	16.0 ab	830 a	40.5 b	142.2 a
Laureate	16.3 ab	676 b	48.2 a	168.1 a
Minotaur	14.3 c	816 a	42.2 b	71.3 b
Neo	15.1 bc	844 a	44.7 ab	156.6 a
Pixel	16.6 a	455 c	40.6 b	76.9 b
P value	0.026	<0.001	0.002	<0.001
LSD P=0.05	1.4	88	4.4	30.1
Management				
Low Input	13.4 b	607 b	45.7 a	132.7 -
High Input	15.9 a	742 a	44.2 a	115.8 -
Strategic	16.3 a	721 a	45.3 a	111.7 -
Tactical	17.0 a	756 a	40.2 b	104.8 -
P value	<0.001	0.019	0.014	0.180
LSD P=0.05	1.2	92	3.2	ns
Cultivar x *Management*				
P value	0.577	0.471	0.051	0.084
LSD P=0.05	ns	ns	ns	ns

*Lodging index definition in 'Appendix. HYC Barley SA Crop Technology Centre'.

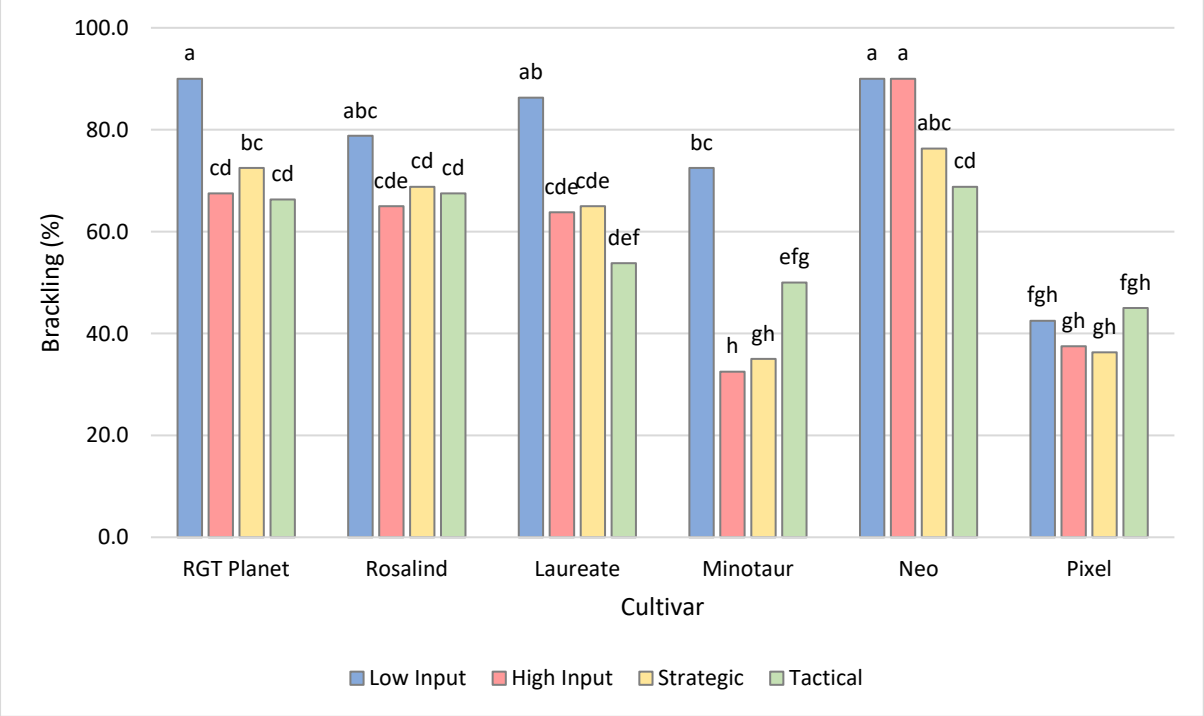

Figure 4. Influence of cultivar and management on crop brackling (%) – assessed 5 January.

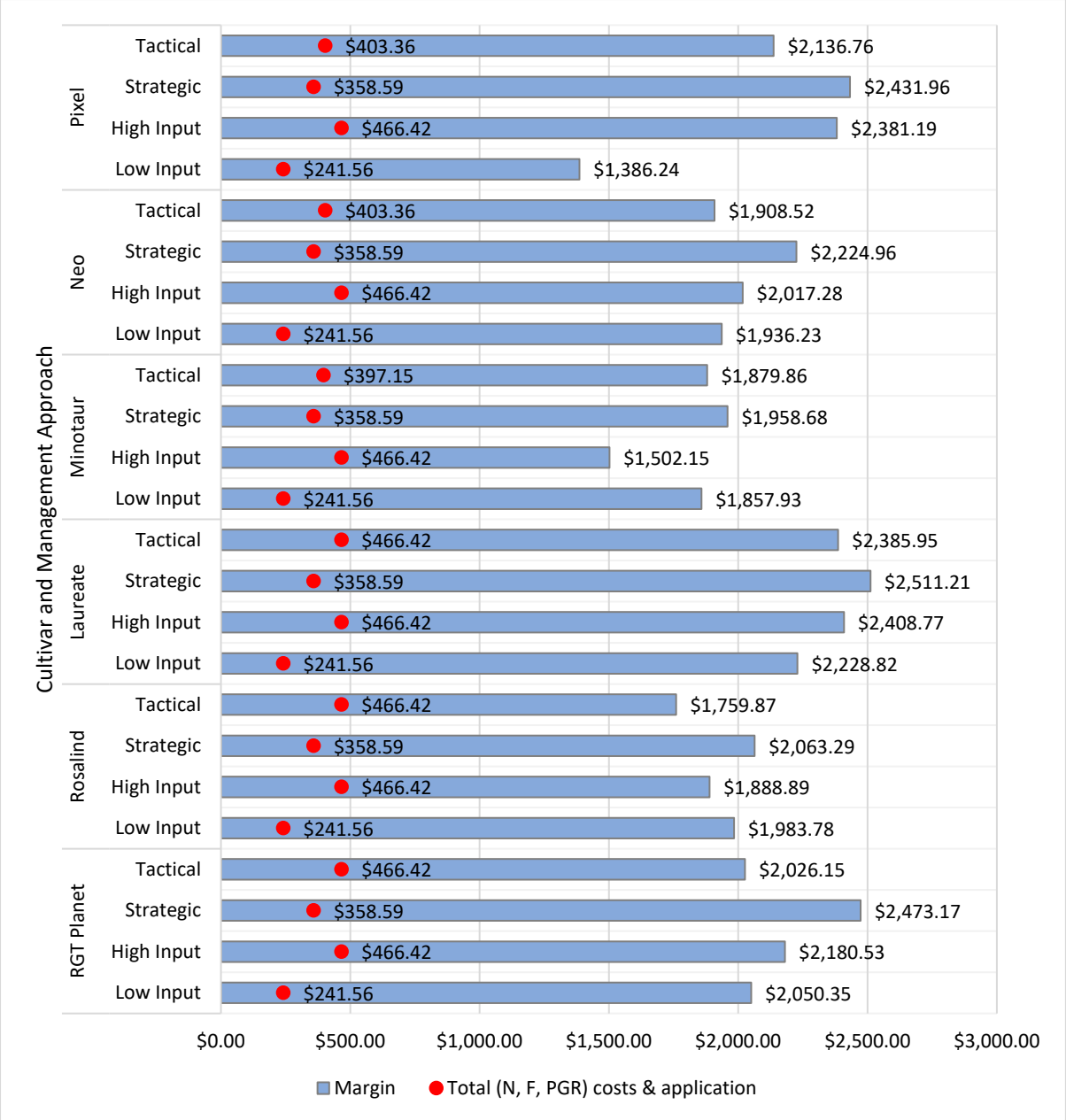

Figure 5. Influence of management and cultivar on partial gross margin and total (N, F, PGR) & application costs.

Table 7. Trial input and management details.

Sowing date:		**11 May 2023**	
Harvest date:		**05 January 2024**	
Seed rate:		200 seeds/m^2	
Basal fertiliser:	11 May	100kg/ha MAP	
Trace Elements:		4x SprayGro Smartrace Triple 4 L/ha	
Nitrogen:		**Low Input**	**High Input**
		150kgN/ha	225kgN/ha
		Strategic	**Tactical**
		150kg N/ha	225kg N/ha
PGR:		**Low Input**	**High Input**
	GS31	----	Moddus Evo 0.20 L/ha
		Strategic	**Tactical**
	GS31	----	Moddus Evo 0.20 L/ha (except Minotaur)
Fungicide:		**Low Input**	**High Input**
	GS00	----	Systiva
	GS31	Tilt 0.50 L/ha	Prosaro 0.30 L/ha
	GS39	Folicur 0.29 L/ha	Aviator Xpro 0.50 L/ha
	GS59	----	Opus 0.50 L/ha
		Strategic	**Tactical**
	GS00	----	----
	GS31	Prosaro 0.30 L/ha	See below
	GS39	Aviator Xpro 0.50 L/ha	See below
	GS59	Opus 0.50 L/ha	See below

	Tactical Fungicide:					
	RGT Planet	**Rosalind**	**Laureate**	**Minotaur**	**Neo**	**Pixel**
GS31	Prosaro 0.30 L/ha	Prosaro 0.30 L/ha	Prosaro 0.30 L/ha	Tilt 0.50 L/ha	Tilt 0.50 L/ha	Tilt 0.50 L/ha
GS39	Aviator Xpro 0.50 L/ha	Aviator Xpro 0.50 L/ha	Aviator Xpro 0.50 L/ha	Aviator Xpro 0.50 L/ha	Folicur 0.29 L/ha	Folicur 0.29 L/ha
GS59	Opus 0.50 L/ha	Opus 0.50 L/ha	Opus 0.50 L/ha	Opus 0.50 L/ha	----	----

The HYC strategic management approach was based on previous results from the Hyper Yielding Program.

Table 8. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Systiva	Fluxapyroxad	333 g/L	---	---	FS
Tilt	Propiconazole	500 g/L	---	---	EC
Folicur	Tebuconazole	430 g/L	---	---	SC
PGR					
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Trial 2. HYC Barley Disease Management (FAR SAC B23-04)

Key Points:

- *Despite RGT Planet's SVS rating to Net Form Net Blotch (NFNB), drier conditions in spring meant little disease was present in this trial.*
- *When assessed during mid-flower on the 16 October, severity of NFNB (% leave area infected) peaked at only 1% with an incidence score of 40% on flag-1, the most important leaf in barley (Table 2).*
- *Although only low levels of disease were found, there were differences in yield with the untreated yielding 6.92t/ha, which was significantly lower than treatments where 2-4 fungicide units had been used. The exception was the use of Aviator Xpro as a single spray at GS39-45. (Table 1).*
- *Treatments with only a single fungicide unit, used earlier in the season, or treatments not using higher rates of products, did not yield statistically different from the untreated (Table 1).*

Table 1. Influence of management strategy on grain yield (t/ha).

	Treatment				Yield	
	GS00	**GS31**	**GS39-45**	**GS59**	**t/ha**	
1.	---	---	---	---	6.92	d
2.	Systiva	---	---	---	7.11	cd
3.	---	Prosaro 300 mL/ha	----	---	7.44	a-d
4.	---	---	Aviator Xpro 420 mL/ha	---	7.80	abc
5.	---	Prosaro 150 mL/ha	Radial 420 mL/ha	---	7.33	bcd
6.	---	Prosaro 300 mL/ha	Radial 840 mL/ha	---	7.77	abc
7.	---	Prosaro 300 mL/ha	Revystar 750 mL/ha	---	7.49	a-d
8.	---	Revystar 750 mL/ha	Radial 840 mL/ha	---	7.85	abc
9.	---	Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	---	7.86	abc
10.	---	Aviator Xpro 420 mL/ha	Radial 840 mL/ha	---	7.81	abc
11.	Systiva	---	Radial 840 mL/ha	---	7.95	abc
12.	Systiva	Prosaro 300 mL/ha	Radial 840 mL/ha	---	7.67	a-d
13.		Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	Opus 500 mL/ha	8.26	a
14.	Systiva	Prosaro 300 mL/ha	Radial 840 mL/ha	Opus 500 mL/ha	8.06	ab
15.	Systiva	Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	Opus 500 mL/ha	7.86	abc
				Mean	7.68	
				LSD P=0.05	0.54	
				P Value	<0.001	

Table 2. Influence of fungicide treatment on Net Form of Net Blotch (NFNB) severity (%) and incidence (%) on Flag, Flag-1 and Flag-2 – assessed 16 October at GS65.

Trt	Flag		Flag -1		Flag -2	
	Severity (%)	Incidence (%)	Severity (%)	Incidence (%)	Severity (%)	Incidence (%)
1.	0.4 -	12.5 -	1.0 -	40.0 a	1.6 a	62.5 a
2.	0.3 -	17.5 -	0.8 -	40.0 a	1.6 a	47.5 ab
3.	0.2 -	12.5 -	0.5 -	25.0 ab	1.1 ab	42.5 abc
4.	0.1 -	5.0 -	0.4 -	20.0 bc	0.8 ab	35.0 bcd
5.	0.2 -	5.0 -	0.5 -	25.0 ab	0.9 ab	32.5 b-e
6.	0.1 -	5.0 -	0.4 -	22.5 ab	0.5 ab	22.5 cde
7.	0.1 -	2.5 -	0.2 -	12.5 bc	0.3 b	12.5 e
8.	0.2 -	7.5 -	0.3 -	12.5 bc	0.5 ab	17.5 de
9.	0.1 -	2.5 -	0.3 -	17.5 bc	0.5 ab	20.0 de
10.	0.0 -	0.0 -	0.5 -	20.0 bc	0.5 ab	22.5 cde
11.	0.0 -	2.5 -	0.5 -	20.0 bc	0.3 b	22.5 cde
12.	0.1 -	2.5 -	0.3 -	12.5 bc	0.6 ab	35.0 bcd
13.	0.1 -	5.0 -	0.3 -	10.0 bc	0.4 b	25.0 cde
14.	0.0 -	0.0 -	0.5 -	25.0 ab	0.6 ab	27.5 b-e
15.	0.1 -	2.5 -	0.0 -	2.5 c	0.5 ab	27.5 b-e
Mean	**0.1**	**5.5**	**0.4**	**20.3**	**0.7**	**30.2**
LSD P=0.05	ns	ns	ns	18.9	0.7	20.3
P Value	0.527	0.258	0.070	0.015	0.004	0.001

Table 3. Influence of fungicide treatment on Spot Form of Net Blotch (NFNB) severity (%) and incidence (%) on Flag-1, and Flag-2 and green leaf retention (GLR) on Flag-3– assessed 16 October at GS65.

	NFNB				GLR
Trt	Flag -1		Flag -2		Flag -3
	Severity (%)	Incidence (%)	Severity (%)	Incidence (%)	%
1.	1.3 -	2.5 -	2.0 -	10.0 -	78.7 -
2.	0.0 -	0.0 -	0.0 -	0.0 -	83.4 -
3.	0.0 -	0.0 -	0.3 -	5.0 -	86.3 -
4.	0.0 -	0.0 -	0.0 -	0.0 -	90.9 -
5.	0.0 -	0.0 -	0.1 -	2.5 -	91.4 -
6.	0.0 -	0.0 -	0.0 -	0.0 -	88.2 -
7.	0.0 -	0.0 -	0.0 -	0.0 -	92.0 -
8.	0.0 -	0.0 -	0.5 -	2.5 -	87.1 -
9.	0.0 -	0.0 -	0.0 -	0.0 -	89.0 -
10.	0.0 -	0.0 -	0.0 -	0.0 -	93.7 -
11.	0.0 -	0.0 -	0.0 -	0.0 -	85.3 -
12.	0.0 -	0.0 -	0.0 -	0.0 -	91.2 -
13.	0.0 -	0.0 -	0.3 -	5.0 -	91.2 -
14.	0.0 -	0.0 -	0.1 -	2.5 -	84.8 -
15.	0.0 -	2.5 -	0.0 -	0.0 -	88.6 -
Mean	**0.1**	**0.3**	**0.2**	**1.8**	**88.1**
LSD P=0.05	ns	ns	ns	ns	ns
P Value	0.471	0.471	0.471	0.471	0.097

Table 4. Trial input and management details**.**

Sowing date:		**11 May 2023**
Harvest date:		**05 January 2024**
Variety:		RGT Planet
Seed rate:		200 seeds/m^2
Basal fertiliser:	11 May	100 kg/ha MAP
Nitrogen:	26 Jul	50kg N/ha
	19 Sep	100kg N/ha
Fungicide:		As per treatment list
	22 Aug	GS31
	18 Sep	GS39-45
	10 Oct	GS59

Table 5. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC
Systiva	Fluxapyroxad	333 g/L	---	---	FS

Trial 3. HYC Barley PGR x Harvest Date Interaction (FAR SAC B23-05)

Key Points:

- *Although there was no statistical interaction between the three factors (variety x PGR x harvest date), on average harvesting on time lead to higher yields (Table 1).*
- *There was an interaction between variety and PGR management where a single, early trinexapac ethyl application produced the best yield in RGT Planet and was significantly higher yielding than the 'European' approach which also included a late application on ethephon. This contrasted with the winter variety Pixel where the European' approach yielded best (Table 1).*
- *Variety, PGR and harvest date all influenced the level of brackling measured in the crop canopy at harvest. At both harvest dates RGT Planet benefited from the 'European' approach, whereas Pixel gave little response when harvested on time (Table 2).*
- *Other canopy measurements at harvest demonstrated that on average there was significantly higher lodging when harvest was delayed by 11 days. Head loss was also significantly more prevalent in the variety Pixel compared to RGT Planet (Table 2).*

Treatments:

4 PGR management approaches applied to two cultivars (RGT Planet and Pixel) and harvested at two harvest dates.

Harvest dates:

1. On Time harvested on the 4 January 2024.
2. Delayed harvested on the 15 January 2024.

Plant growth regulators (PGR) treatments:

1. Untreated.
2. GS31 PGR trinexapac ethyl based (Single Moddus Evo @ 200 mL/ha (50g ai/ha).
3. GS31 + GS37 PGR trinexapac ethyl based (Double Moddus Evo @ 200mL/ha (100g ai/ha).
4. European approach based on GS31 trinexapac ethyl (Moddus Evo @ 200 mL/ha) (50g ai/ha) and at GS37 of Ethephon 720 @500 mL/ha (360g ai/ha).

Table 1. Influence of PGR management strategy, cultivar and canopy management regime on grain yield (t/ha).

	RGT Planet	Pixel	Mean
Cultivar	8.16 a	7.15 b	7.66
LSD Cultivar P=0.05	0.31	**P Value**	<0.001
Harvest Date x Cultivar			
On time	8.57 -	7.68 -	8.13 a
Delayed (11 days delay)	7.76 -	6.62 -	7.19 b
LSD Harvest Date P=0.05	0.25	**P Value**	0.001
LSD Harvest Date x Cultivar P=0.05	ns	**P Value**	0.348
Canopy Management Regime X Cultivar			
Untreated	8.07 abc	6.75 d	7.41 -
GS31 PGR	8.51 a	6.76 d	7.64 -
GS31 + GS37 PGR	8.29 ab	7.44 cd	7.87 -
GS31 + GS37 PGR (European style)	7.78 bc	7.65 bc	7.71 -
LSD Canopy Management P=0.05	ns	**P Value**	0.323
LSD Cultivar X Canopy Mgmt P=0.05	0.70	**P Value**	0.015
Harvest Date X Canopy Mgmt. X Cultivar			
On Time			
Untreated	8.47 -	7.24 -	7.86 -
GS31 PGR	8.72 -	7.39 -	8.05 -
GS31 + GS37 PGR	8.91 -	7.96 -	8.43 -
GS31 + GS37 PGR (European style)	8.18 -	8.15 -	8.16 -
Delayed			
Untreated	7.67 -	6.26 -	6.97 -
GS31 PGR	8.31 -	6.14 -	7.22 -
GS31 + GS37 PGR	7.68 -	6.93 -	7.30 -
GS31 + GS37PGR (European style)	7.38 -	7.15 -	7.26 -
LSD Harvest Date X Canopy Mgmt P=0.05	ns	**P Value**	0.935
LSD Harvest Date X Canopy Mgmt X Cultivar P=0.05	ns	**P Value**	0.766

*Ethephon is not on label in SA with the excepting of the varieties Weeah, Maleba and Parwan. Ethephon is registered for use for anti-lodging purposes in Qld, NSW, Vic, Tas and WA.

Table 2. Canopy management and harvest date effect on head loss (heads/m^2 – heads on ground post-harvest), lodging index (0-500) and brackling (%) across two cultivars (RGT Planet and Pixel).

	Treatment	Head Loss (heads/m^2)				Lodging Index (0-500)				Brackling (%)			
		RGT Planet		Pixel		RGT Planet		Pixel		RGT Planet		Pixel	
On Time	Untreated	6.7	-	9.2	-	50.0	-	65.0	-	77.5	abc	56.3	cd
	GS31	5.8	-	9.6	-	48.8	-	72.5	-	87.5	ab	55.0	cd
	GS31 + GS37	8.1	-	8.0	-	70.0	-	62.5	-	78.8	abc	58.8	cd
	European GS31	5.3	-	6.3	-	50.0	-	63.8	-	26.3	e	71.3	bc
	Cul. x man. Mean	**6.4**	**b**	**8.3**	**a**	**54.7**	**c**	**65.9**	**c**	**67.5**	**-**	**60.3**	**-**
Delayed	Untreated	4.3	-	7.5	-	250.0	-	133.3	-	75.0	abc	96.7	a
	GS31	3.3	-	12.6	-	275.0	-	233.3	-	77.5	abc	76.7	abc
	GS31 + GS37	7.0	-	7.5	-	250.0	-	133.3	-	87.5	ab	70.0	bc
	European GS31	2.4	-	9.9	-	175.0	-	166.7	-	40.0	de	61.7	cd
	Cul. x man. Mean	**4.3**	**c**	**9.4**	**a**	**237.5**	**a**	**166.7**	**b**	**70.0**	**-**	**76.3**	**-**
	Cultivar Mean	**5.3**	**b**	**8.8**	**a**	**146.1**	**-**	**116.3**	**-**	**68.8**	**-**	**68.3**	**-**
Grand Mean		**7.1**				**131.2**				**68.5**			
LSD P=0.05		ns				ns				24.6			
P Value		0.443				0.409				0.042			

*Lodging index definition in 'Appendix. HYC Barley SA Crop Technology Centre'.

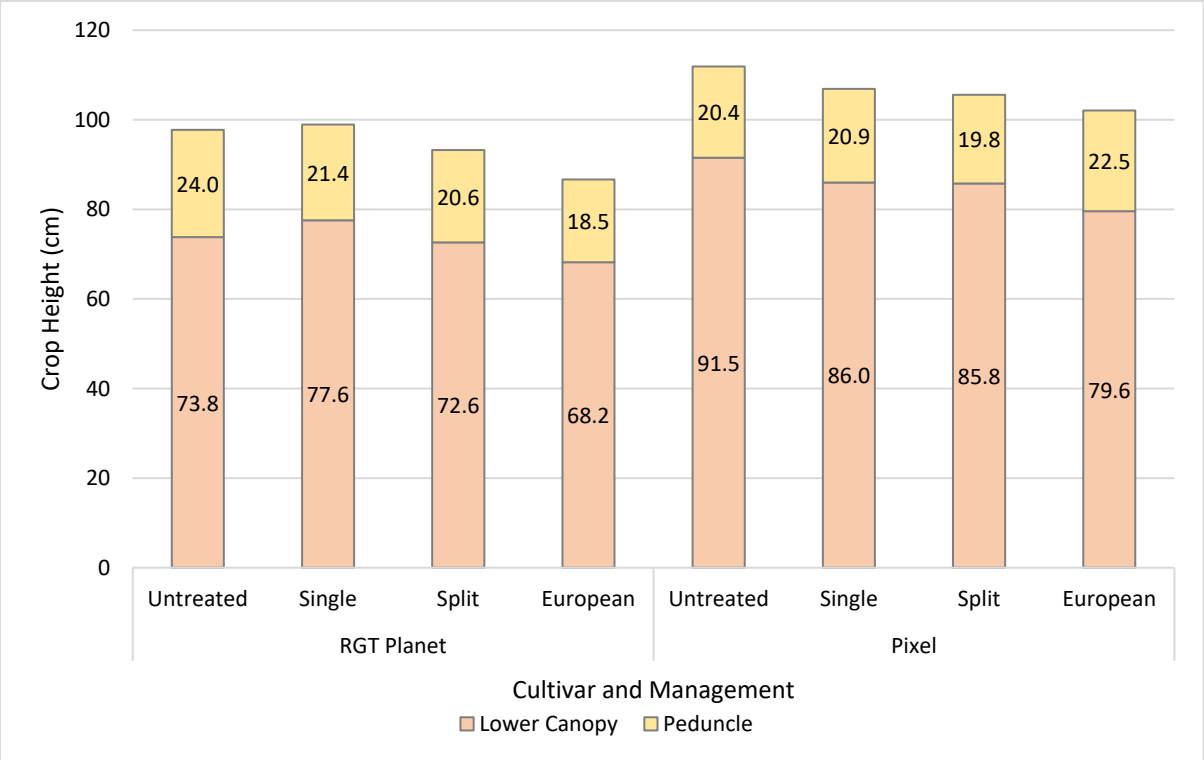

Figure 1. Relative differences in total crop height (combined peduncle and lower canopy), lower canopy length, and peduncle length (all differences are non-significant).

Table 3. Influence of PGR management strategy, cultivar and canopy management regime on grain protein (%).

	RGT Planet	Pixel	Mean
Cultivar	12.8 b	13.2 a	**13.0**
LSD *C*ultivar P=0.05	0.3	**P Value**	0.016
Canopy Management Regime X Cultivar			
Untreated	12.6 -	13.1 -	12.8 b
GS31 PGR	12.7 -	13.2 -	13.0 b
GS31 + GS37 PGR	12.5 -	13.1 -	12.8 b
GS31 + GS37 PGR (European style)	13.5 -	13.4 -	13.5 a
LSD Canopy Management P=0.05	0.4	**P Value**	0.018
LSD Cultivar x Canopy Mgmt P=0.05	ns	**P Value**	0.449
LSD Harvest Date P=0.05	ns	**P Value**	0.637
LSD Harvest Date x Cultivar P=0.05	ns	**P Value**	0.293
LSD Harvest Date. X Canopy Mgmt. P=0.05	ns	**P Value**	0.643
LSD Harvest Date. x Canopy Mgmt. x Cultivar P=0.05	ns	**P Value**	0.323

Table 4. Influence of PGR management strategy, cultivar and canopy management regime on grain test weight (kg/hL).

	RGT Planet	Pixel	Mean
Cultivar	61.5 b	62.3 a	**61.9**
LSD Cultivar P=0.05	0.2	**P Value**	<0.001
Canopy Management Regime X Cultivar			
Untreated	61.5 -	62.9 -	62.2 ab
GS31 PGR	61.8 -	63.1 -	62.5 a
GS31 + GS37 PGR	61.4 -	61.9 -	61.7 bc
GS31 + GS37 PGR (European style)	61.1 -	61.2 -	61.2 c
LSD Canopy Management P=0.05	0.7	**P Value**	0.005
LSD Cultivar X Canopy Mgmt P=0.05	ns	**P Value**	0.434
Harvest Date X Cultivar			
On time	63.0 -	63.7 -	63.3 a
Delayed (11 days delay)	60.0 -	60.9 -	60.4 b
LSD Harvest Date P=0.05	1.0	**P Value**	0.003
LSD Harvest Date X Cultivar P=0.05	ns	**P Value**	0.240
LSD Harvest Date X Canopy Mgmt. P=0.05	ns	**P Value**	0.878
LSD Harvest Date X Canopy Mgmt. X Cultivar P=0.05	ns	**P Value**	0.080

Table 5. Influence of PGR management strategy, cultivar and canopy management regime on grain retention (%).

	RGT Planet	Pixel	Mean
Cultivar	85.2 b	87.8 a	**86.5**
LSD Cultivar P=0.05	1.3	**P Value**	0.002
Canopy Management Regime X Cultivar			
Untreated	88.6 ab	88.8 a	88.7 a
GS31 PGR	85.9 b	88.5 ab	87.2 a
GS31 + GS37 PGR	86.2 ab	87.8 ab	87.0 a
GS31 + GS37 PGR (European style)	80.0 c	86.3 ab	83.1 b
LSD Canopy Management P=0.05	2.0	**P Value**	<0.001
LSD Cultivar X Canopy Mgmt P=0.05	2.8	**P Value**	0.026
LSD Harvest Date P=0.05	ns	**P Value**	0.539
LSD Harvest Date X Cultivar P=0.05	ns	**P Value**	0.667
LSD Harvest Date X Canopy Mgmt. P=0.05	ns	**P Value**	0.342
LSD Harvest Date X Canopy Mgmt. X Cultivar P=0.05	ns	**P Value**	0.569

Table 6. Influence of PGR management strategy, cultivar and canopy management regime on grain screening (%).

	RGT Planet	Pixel	Mean
Cultivar	5.3 a	3.1 b	**4.2**
LSD Cultivar P=0.05	0.5	**P Value**	<0.001
Canopy Management Regime X Cultivar			
Untreated	4.5 -	2.8 -	3.6 b
GS31 PGR	4.9 -	2.8 -	3.9 b
GS31 + GS37 PGR	5.8 -	3.3 -	4.6 a
GS31 + GS37 PGR (European style)	5.9 -	3.3 -	4.6 a
LSD Canopy Management P=0.05	0.7	**P Value**	0.009
LSD Cultivar X Canopy Mgmt P=0.05	ns	**P Value**	0.499
LSD Harvest Date P=0.05	ns	**P Value**	0.733
LSD Harvest Date X Cultivar P=0.05	ns	**P Value**	0.616
LSD Harvest Date X Canopy Mgmt. P=0.05	ns	**P Value**	0.999
LSD Harvest Date x Canopy Mgmt. X Cultivar P=0.05	ns	**P Value**	0.298

Table 7. Trial input and management details.

Sowing date:		**10 May 2023**
Harvest date:		**4 January / 15 January 2024**
Seed rate:		200 seeds/m^2
Basal fertiliser:	10 May	100 kg/ha MAP
Nitrogen:	26 Jul	50kg N/ha
	19 Sep	100kg N/ha
Fungicide:	8 Aug	Prosaro 0.3 L/ha
	12 Sep	Aviator Xpro 0.5 L/ha

Table 8. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
PGR					
Ethephon 720	Ethephon*	720 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

*Ethephon is not on label in SA with the excepting of the varieties Weeah, Maleba and Parwan. Ethephon is registered for use for anti-lodging purposes in Qld, NSW, Vic, Tas and WA.

Appendix. HYC Barley SA Crop Technology Centre

The following details apply to all South Australian barley trials unless specified differently.

Table 1. Overall Inputs (L/ha)

	Date applied	Product
Herbicide:	9 May	TriflurX 3 L/ha
	9 May	Spreadwet 0.2 L/ha
	15 Aug	Broadside 1.4 L/ha
Crop protection:	20 Jun	Metarex 3 kg/ha
	10 Nov	Alpha Scud 0.08 L/ha
	7 Jan	Metarex 3 kg/ha
Trace elements:	15 Aug	SprayGro Smartrace Triple 4 L/ha
	2 Sep	SprayGro Smartrace Triple 4 L/ha
	5 Sep	SprayGro Smartrace Triple 4 L/ha
	16 Sep	SprayGro Smartrace Triple 4 L/ha

**SprayGro Smartrace Triple*

Table 2. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Active 3		Type
Herbicide							
TriflurX	Trifluralin	480 g/L	---	---	---	---	EC
Broadside	MCPA	280 g/L	Bromoxynil	140 g/L	Dicamba	40 g/L	EC
Adjuvant							
Spreadwet	Alkoxylated Alcohols	1000 g/L	---	---	---	---	
Crop Protection							
Metarex	Metaldehyde	50 g/kg	---	---	---	---	
Alpha Scud	Alpha-cypermethrin	300 g/L	---	---	---	---	SC

Lodging Index

Lodging index is derived from % area of the plot lodged on a scale of 0-100 multiplied by the degree of lodging on a scale of 0 – 5 with 0 being upright and 5 being completely flat. For example, a plot with 100% of the plot standing upright would have a lodging index of 0. If 84% of the plot was lodged to a severity degree of 3 (halfway lodged to the ground), the lodging index would be 252. If 100% of the plot was completely flat on the ground, the lodging index would be 500.

VIC Crop Technology Centre

Gnarwarre, Victoria

Time of Sowing 1: 29 April 2023
Time of sowing 2: 22 May 2023
Harvested: 22 Dec 23 (B23-03-01); 23 Dec 23 (B23-03-02; 04-02), 22 Dec 23 (on-time)/23 Jan 24 (delayed) (B23-05-1; 05-02)
Rotation position: 2022 Faba beans
Soil type: Grey clay loam
Nitrogen 0-60 cm: 118kg N/ha
Colwell P (ppm) 0-10cm: 74 mg/kg
pH ($CaCl_2$) 0-10cm: 5.8
Organic Carbon (%) 0-10cm: 2.4%

Trial 1 HYC Barley G.E.M Trial Series- Time of Sowing 1 (FAR VIC B23-03-01)

Key Points:

- *The 2023 G.E.M trials looked to investigate the agronomic and economic influence of four management approaches- 'low' input (minimalist approach), 'high' input (no expenses spared), 'strategic' input (tailored approach based on pre-season forecasts/expectations) and 'tactical' (tailored approach based on strategic with in-season adjustment guided by climate and in-season triggers) on 6 varieties (details in table 10).*
- *There was no interaction between variety and management with all varieties responding similarly. Low input, which was characterised by cheaper fungicides, no PGR and less applied nitrogen, yielding significantly less than the other management approaches (Table 1).*
- *On average the quick developing but adaptable variety Rosalind yielded best (7.19 t/ha) with the slower developing spring barley Laureate also preforming strongly (6.98 t/ha) (Figure 1).*
- *RGT Planet and Neo suffered from high Net Form Net Blotch infection with untreated plots recording 98% and 55% of plot infected respectively. Robust fungicide in strategic and high input managements significantly reduced disease levels to less than 10% of plot infected in Neo. While still reducing infection in RGT Planet, NFNB infection was still between 88% and 94% plot severity (Figure 2).*
- *High grain protein results meant no treatment achieved malting grade (Table 3).*
- *Although there was no interaction between variety and management, economic differences have been observed when completing a partial net margin analysis. Varieties that showed very little yield differences between management, such as Pixel, meant reducing total operational costs under 'low input' was most economical (Table 7).*
- *There was a yield trend in Neo and RGT Planet to yield less where less fungicide input had been implemented and higher disease was found. Therefore, the economic analysis shows that the additional expenditure in the 'High' input was justified. An additional margin of $160/ha in Neo and $581/ha in RGT Planet was made by shifting from 'Low' to 'High' input.*

Treatments:

Six cultivars (RGT Planet, Rosalind, Laureate, Minotaur, Neo and Pixel) were tested under four different management programs;

1. Low Input- Two units of fungicide based on Tilt 500EC (propiconazole) applied at 500mL/ha (250g ai/ha) and Folicur 430SC (tebuconazole) applied at 290mL/ha (125g ai/ha) and 150kg N/ha.
2. High Input- Four units of fungicide (Systiva seed treatment plus foliar fungicides GS31, GS39, GS59), 225kg N/ha, PGR.
3. HYC Strategic Input – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 10.

Table 1. Influence of management strategy and cultivar on grain yield (t/ha).

		Yield (t/ha)									
		Low Input		High Input		Strategic		Tactical		Mean	
1.	**RGT Planet**	5.19	-	7.68	-	5.85	-	7.07	-	**5.96**	**c**
2.	**Rosalind**	6.08	-	7.36	-	6.27	-	7.19	-	**7.19**	**a**
3.	**Laureate**	5.97	-	6.28	-	6.75	-	5.66	-	**6.98**	**a**
4.	**Minotaur**	6.61	-	7.05	-	6.14	-	6.46	-	**6.25**	**bc**
5.	**Neo**	6.31	-	7.48	-	6.65	-	6.92	-	**6.25**	**bc**
6.	**Pixel**	7.40	-	7.10	-	7.05	-	6.91	-	**6.49**	**b**
Mean		**5.99**	**b**	**6.72**	**a**	**6.98**	**a**	**6.88**	**a**	**6.64**	
LSD Cultivar P=0.05				0.31		**P Value**				<0.001	
LSD Management P=0.05				0.40		**P Value**				<0.001	
LSD Cultivar X Man. P=0.05				ns		**P Value**				0.283	

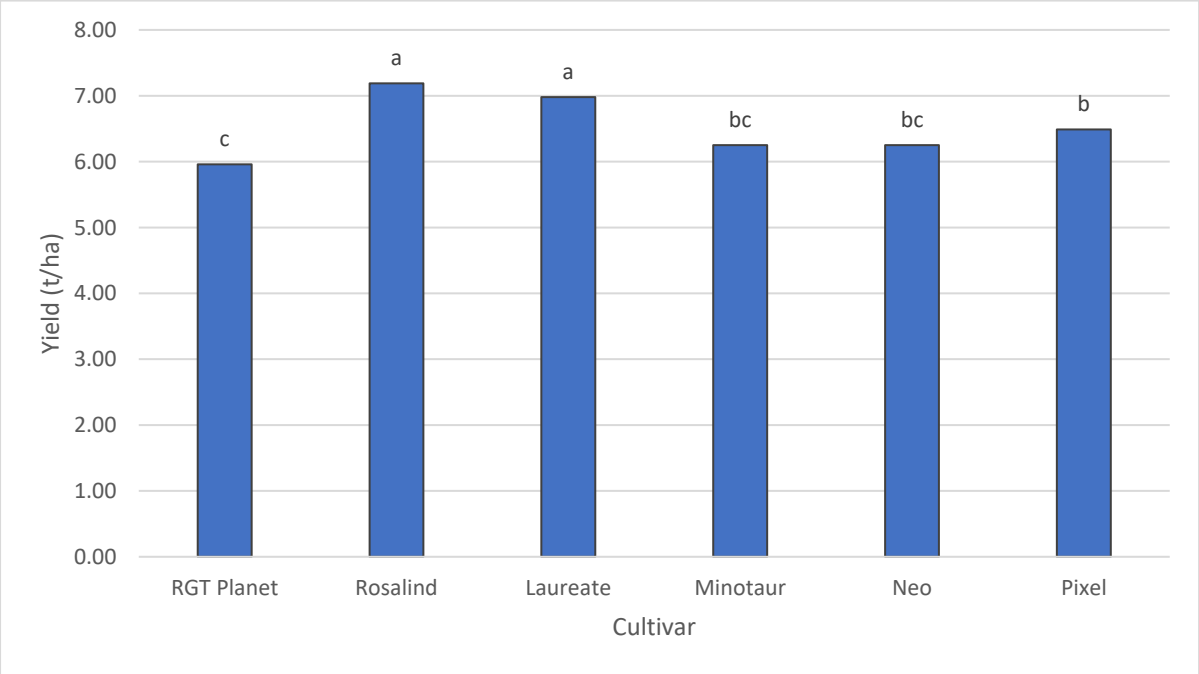

Figure 1. Influence of cultivar on grain yield (t/ha).

Table 2. Influence of management strategy and cultivar on harvest index (%).

		Harvest Index (%)									
		Low Input		High Input		Strategic		Tactical		Mean	
1.	**RGT Planet**	32.4	-	42.2	-	33.7	-	43.6	-	**37.6**	**a**
2.	**Rosalind**	35.6	-	37.4	-	33.6	-	40.1	-	**40.5**	**a**
3.	**Laureate**	42.0	-	32.5	-	30.2	-	30.4	-	**38.8**	**a**
4.	**Minotaur**	40.3	-	38.0	-	32.7	-	33.1	-	**32.6**	**b**
5.	**Neo**	43.0	-	43.4	-	38.7	-	35.6	-	**41.0**	**a**
6.	**Pixel**	39.2	-	41.1	-	41.4	-	32.5	-	**32.9**	**b**
Mean		**35.1**	**-**	**36.8**	**-**	**39.5**	**-**	**37.4**	**-**	**37.2**	
LSD Cultivar P=0.05				3.8		**P Value**				<0.001	
LSD Management P=0.05				ns		**P Value**				0.164	
LSD Cultivar X Man. P=0.05				ns		**P Value**				0.353	

Table 3. Influence of management strategy and cultivar on harvest protein (%).

		Protein (%)									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**RGT Planet**	12.6	-	13.3	-	13.5	-	12.2	-	**12.9**	**d**
2.	**Rosalind**	13.5	-	13.3	-	14.3	-	12.3	-	**13.4**	**b**
3.	**Laureate**	12.6	-	12.8	-	13.3	-	13.3	-	**13.1**	**cd**
4.	**Minotaur**	12.9	-	13.7	-	13.6	-	13.6	-	**13.7**	**a**
5.	**Neo**	13.2	-	12.8	-	12.2	-	12.7	-	**12.4**	**e**
6.	**Pixel**	13.9	-	13.0	-	12.7	-	13.2	-	**13.2**	**bc**
Mean		**13.0**	**b**	**13.6**	**a**	**12.8**	**b**	**13.0**	**b**	**13.1**	
LSD Cultivar P=0.05				0.2			**P Value**			<0.001	
LSD Management P=0.05				0.3			**P Value**			<0.001	
LSD Cultivar x Man. P=0.05				ns			**P Value**			0.898	

Table 4. Influence of management strategy and cultivar on harvest test weights (kg/hL).

		Test Weights (kg/hL)									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**RGT Planet**	65.5	-	66.9	-	67.3	-	67.4	-	**66.0**	**c**
2.	**Rosalind**	65.7	-	66.5	-	67.6	-	66.5	-	**66.5**	**b**
3.	**Laureate**	66.6	-	65.6	-	68.4	-	61.7	-	**65.2**	**d**
4.	**Minotaur**	66.3	-	65.0	-	67.6	-	61.7	-	**67.7**	**a**
5.	**Neo**	66.3	-	65.3	-	66.6	-	62.9	-	**66.8**	**b**
6.	**Pixel**	66.5	-	64.9	-	66.7	-	63.0	-	**62.3**	**e**
Mean		**65.5**	**c**	**65.5**	**bc**	**66.3**	**a**	**65.8**	**b**	**65.8**	
LSD Cultivar P=0.05				0.5			**P Value**			<0.001	
LSD Management P=0.05				0.3			**P Value**			<0.001	
LSD Cultivar X Man. P=0.05				ns			**P Value**			0.403	

Table 5. Influence of management strategy and cultivar on harvest retention (%).

		Retention (%)									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**RGT Planet**	90.2	-	93.8	-	95.0	-	95.9	-	92.6	b
2.	**Rosalind**	93.5	-	93.6	-	95.2	-	95.2	-	93.9	ab
3.	**Laureate**	93.8	-	95.0	-	95.2	-	73.3	-	94.8	ab
4.	**Minotaur**	93.1	-	94.4	-	95.3	-	69.5	-	95.2	ab
5.	**Neo**	94.7	-	94.7	-	95.6	-	76.7	-	95.7	a
6.	**Pixel**	93.6	-	95.1	-	96.0	-	74.2	-	73.4	c
Mean		**90.6**	**-**	**90.4**	**-**	**91.7**	**-**	**91.1**	**-**	**90.9**	
LSD Cultivar P=0.05				2.7			**P Value**			<0.001	
LSD Management P=0.05				ns			**P Value**			0.484	
LSD Cultivar x Man. P=0.05				ns			**P Value**			0.892	

Table 6. Influence of management strategy and cultivar on harvest screenings (%).

		Screenings (%)				
		Low Input	High Input	Strategic	Tactical	Mean
1.	**RGT Planet**	3.2 -	1.9 -	1.7 -	2.0 -	**2.8 b**
2.	**Rosalind**	2.6 -	2.3 -	1.8 -	2.0 -	**2.2 bc**
3.	**Laureate**	2.3 -	2.6 -	2.1 -	5.3 -	**2.3 bc**
4.	**Minotaur**	3.0 -	2.5 -	1.8 -	5.4 -	**1.9 c**
5.	**Neo**	2.2 -	2.4 -	2.1 -	4.6 -	**2.0 c**
6.	**Pixel**	2.4 -	1.9 -	1.8 -	5.5 -	**5.2 a**
Mean		**2.9 -**	**2.8 -**	**2.5 -**	**2.7 -**	**2.7**
LSD Cultivar P=0.05			0.6	**P Value**		<0.001
LSD Management P=0.05			ns	**P Value**		0.739
LSD Cultivar x Man. P=0.05			ns	**P Value**		0.915

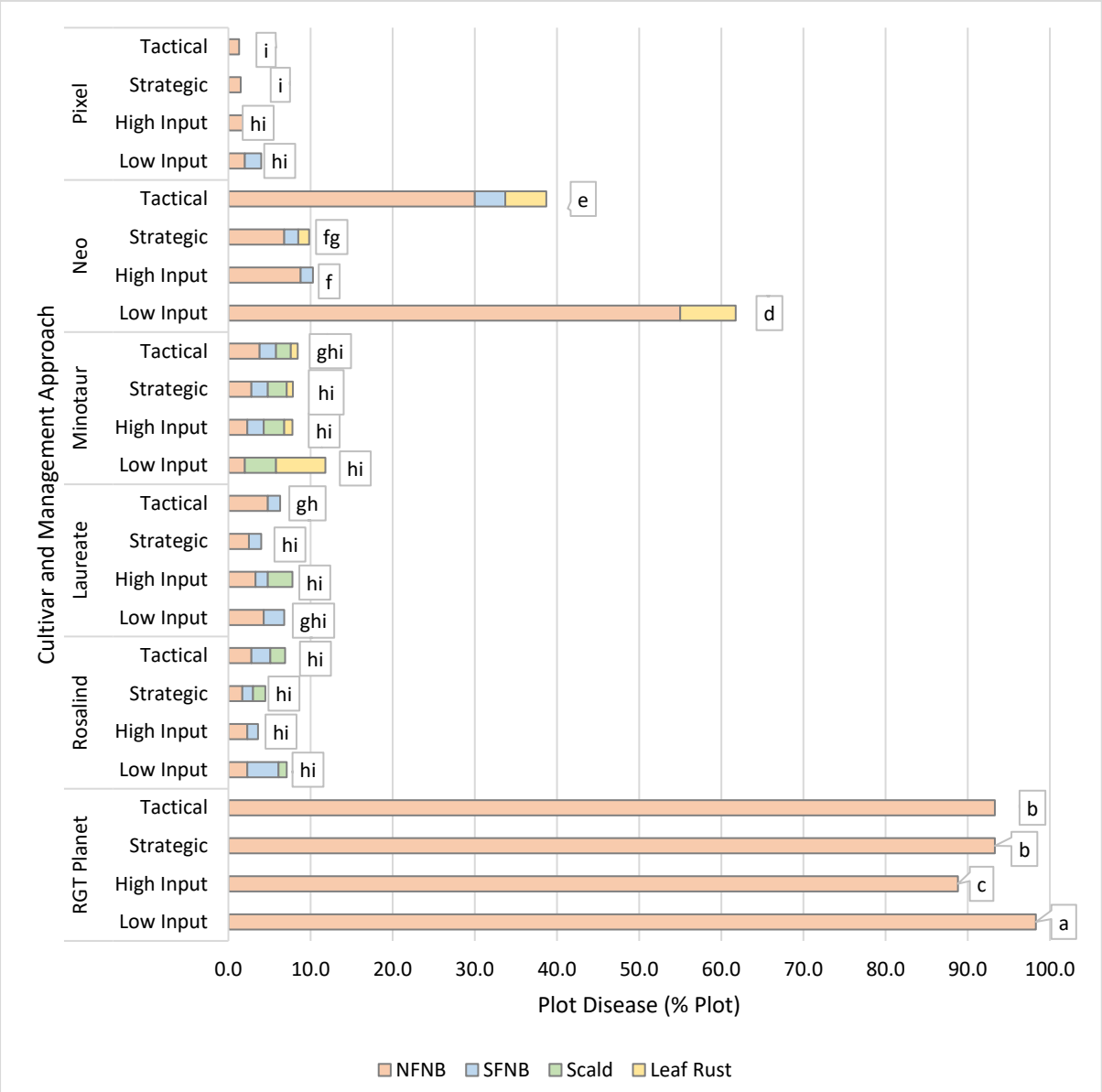

Figure 2. Influence of management strategy and cultivar on Net Form Net Blotch (NFNB), Spot Form Net Blotch (SFNB), Scald and Leaf Rust. Assessed 10 October 2023, GS75-80. Letters outside the end of bars refers to statistical difference for NFNB.

Table 7. Influence of management strategy (variable inputs only) and cultivar on system profitability Margin $/ha (after N, F & PGR costs).

Fungicide strategy	Chemical costs + Application costs	Fertiliser costs + Application costs	Total (N, F, PGR) costs & application	Yield	Income	Margin
	$/ha	$/ha	$/ha	t/ha	$/ha	$/ha
Laureate						
Low Input	$25.90	$215.65	$241.56	5.97	$1,893.44	$1,651.88
High Input	$127.62	$323.48	$451.10	6.28	$1,991.71	$1,540.61
Strategic	$127.62	$215.65	$343.27	6.75	$2,138.17	$1,794.89
Tactical	$100.09	$248.26	$348.35	5.66	$1,794.22	$1,445.87
Minotaur						
Low Input	$25.90	$215.65	$241.56	6.61	$2,095.37	$1,853.81
High Input	$127.62	$323.48	$451.10	7.05	$2,234.22	$1,783.12
Strategic	$127.62	$215.65	$343.27	6.14	$1,944.80	$1,601.52
Tactical	$50.82	$248.26	$299.08	6.46	$2,046.24	$1,747.16
Neo						
Low Input	$25.90	$215.65	$241.56	6.31	$1,999.64	$1,758.08
High Input	$127.62	$323.48	$451.10	7.48	$2,369.58	$1,918.48
Strategic	$127.62	$215.65	$343.27	6.65	$2,109.00	$1,765.73
Tactical	$59.88	$248.26	$308.15	6.92	$2,194.59	$1,886.45
Pixel						
Low Input	$25.90	$215.65	$241.56	7.40	$2,344.22	$2,102.66
High Input	$127.62	$323.48	$451.10	7.10	$2,249.12	$1,798.02
Strategic	$127.62	$215.65	$343.27	7.05	$2,233.27	$1,889.99
Tactical	$84.80	$248.26	$333.06	6.91	$2,191.42	$1,858.36
RGT Planet						
Low Input	$25.90	$215.65	$241.56	5.19	$1,645.23	$1,403.67
High Input	$127.62	$323.48	$451.10	7.68	$2,435.51	$1,984.41
Strategic	$127.62	$215.65	$343.27	5.85	$1,854.45	$1,511.18
Tactical	$100.09	$248.26	$348.35	7.07	$2,241.19	$1,892.84
Rosalind						
Low Input	$25.90	$215.65	$241.56	6.08	$1,926.73	$1,685.17
High Input	$127.62	$323.48	$451.10	7.36	$2,332.49	$1,881.39
Strategic	$127.62	$215.65	$343.27	6.27	$1,986.96	$1,643.69
Tactical	$100.09	$248.26	$348.35	7.19	$2,278.60	$1,930.25

Figures in green=most profitable approach, figure in red=least profitable approach. Refer to table 8 for pricing information.

Table 8. Input costs in economic analysis.

Product	Product type	Price
Opus	Fungicide	$35.06/L
Prosaro	Fungicide	$56.25/L
Aviator Xpro	Fungicide	$58.46/L
Tilt 500	Fungicide	$3.17/L
Folicur	Fungicide	$14.90/L
Moddus Evo	PGR	$84.95/L
Urea	Fertiliser	$0.60/Kg

Grain price (BAR1: $317.00) as of 16 February 2024 based off Geelong GrainCorp. Contractor rates factored in for application costs. Other costs such as seed sourcing and sowing, insurance, herbicides, insecticides, harvesting, insurance and MAP were not taken into consideration in this analysis as they were constant regardless of the management strategy used.

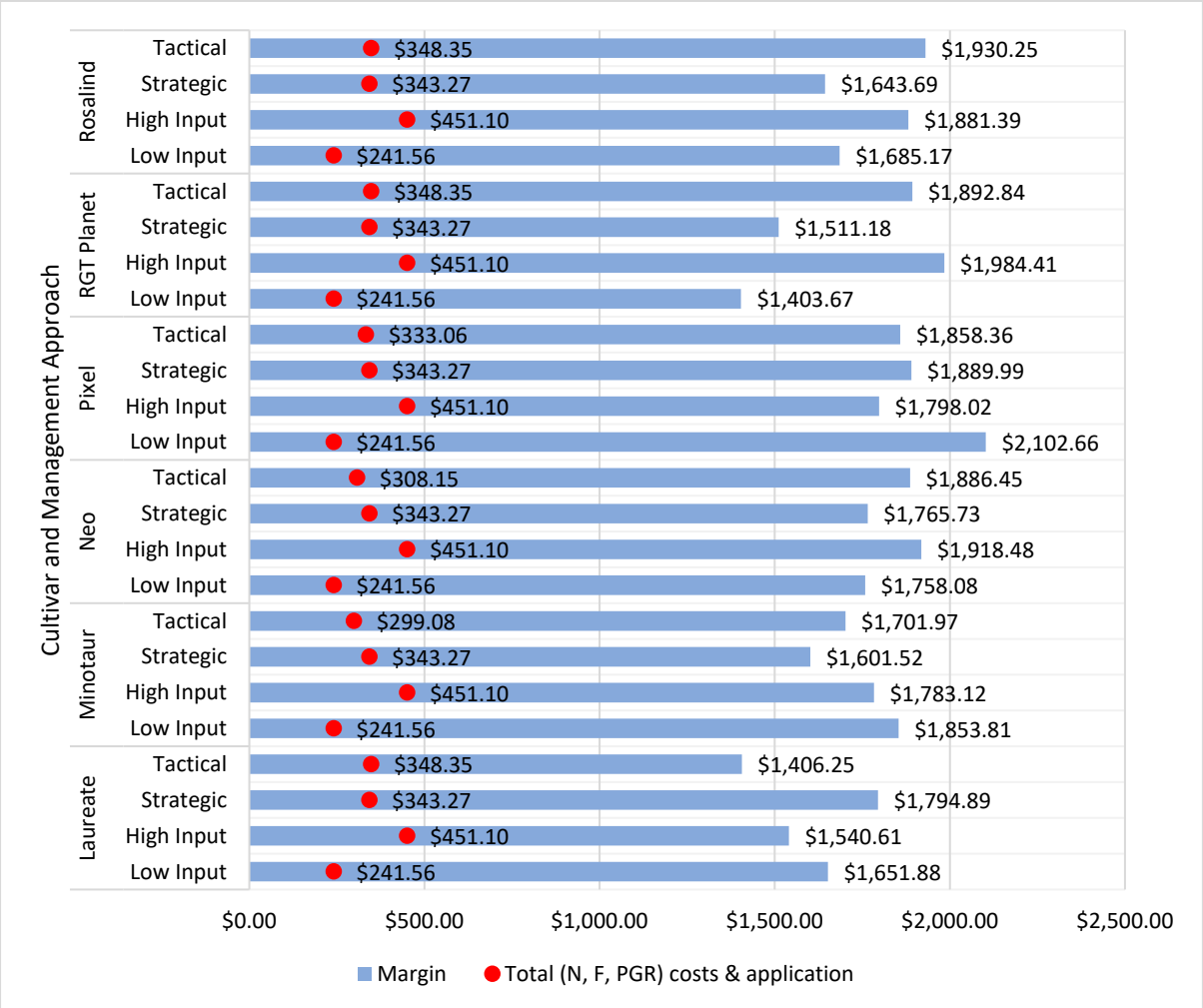

Figure 3. Influence of management strategy and cultivar on system profitability. Value outside the bar denotes margin ($/ha) after N, F & PGR costs.

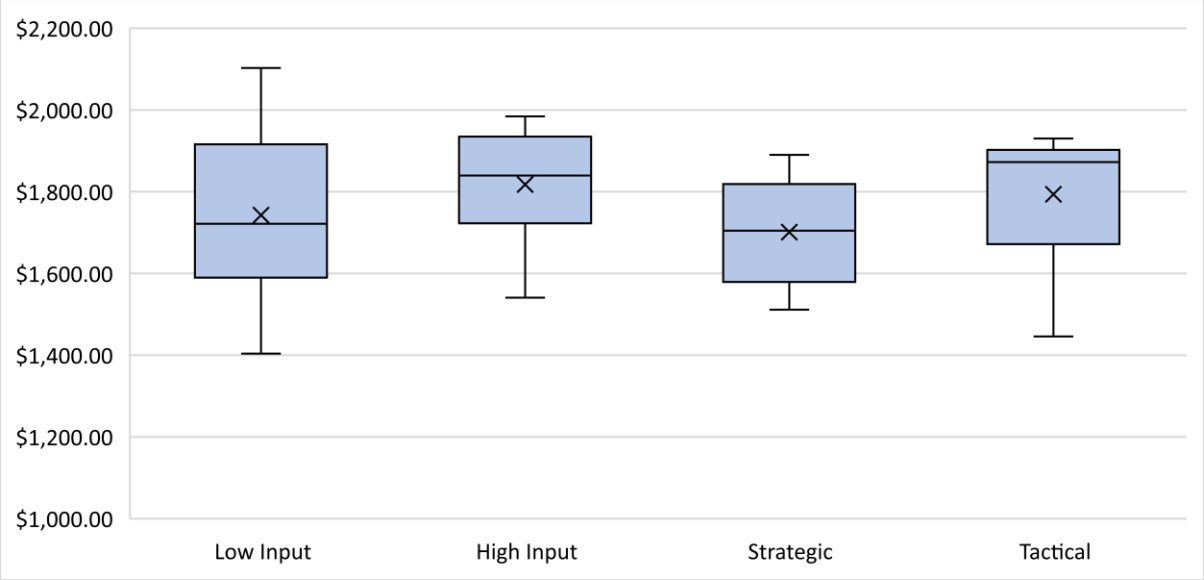

Figure 4. Graph representing the distribution of margin after N, F & PGR costs across the six varieties ($/ha) under low, high, strategic and tactical management strategies.

Table 9. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Systiva	Fluxapyroxad	333 g/L	---	---	FS
Tilt	Propiconazole	500 g/L	---	---	EC
Folicur	Tebuconazole	430 g/L	---	---	SC
PGR					
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Table 10. Trial input and management details.

Sowing date:		**29 April 2023**	
Harvest date:		**22 December 2023**	
Seed rate:		200 seeds/m^2	
Basal fertiliser:	29 Apr	100 kg/ha MAP	

Nitrogen:		**Low Input**	**Strategic**
		150kg N/ha	150kg N/ha
		High Input	**Tactical**
		225kg N/ha	175kg N/ha
PGR:		**Low Input**	**Strategic**
	GS30	----	Moddus Evo 0.20 L/ha
	GS33	----	Moddus Evo 0.20 L/ha
		High Input	**Tactical (except Minotaur)**
	GS30	Moddus Evo 0.20 L/ha	Moddus Evo 0.20 L/ha
	GS33	Moddus Evo 0.20 L/ha	Moddus Evo 0.20 L/ha

Fungicide:		**Low Input**	**High Input**
	GS00	----	Systiva
	GS31	Tilt (0.5L/ha)	Prosaro (0.3L/ha)
	GS39	Folicur (0.29L/ha)	Aviator Xpro (0.5 L/ha)
	GS59-61	----	Opus (0.5L/ha)

		Strategic	**Tactical**
	GS00	----	----
	GS31	Prosaro (0.3L/ha)	See below
	GS39	Aviator Xpro (0.5 L/ha)	See below
	GS59-61	Opus (0.5L/ha)	----

	Tactical fungicide					
	RGT Planet	**Rosalind**	**Laureate**	**Minotaur**	**Neo**	**Pixel**
GS31	Prosaro (0.3L/ha)	Prosaro (0.3L/ha)	Prosaro (0.3L/ha)	Tilt (0.5L/ha)	Tilt (0.5L/ha)	Tilt (0.5L/ha)
GS39	Aviator Xpro (0.5 L/ha)	Aviator Xpro (0.5 L/ha)	Aviator Xpro (0.5 L/ha)	Aviator Xpro (0.5 L/ha)	Folicur (0.29L/ha)	Aviator Xpro (0.5 L/ha)
GS59-61	----	----	----	----	----	----

Trial 2. HYC Barley G.E.M Trial Series- Time of Sowing 2 (FAR VIC B23-03-02)

Key Points:

- *The highest yielding treatment was with the quick developing Rosalind variety under strategic input (8.03t/ha) which compared to other managements received a lower amount of nitrogen (150kg N/ha) but relative robust fungicide and PGR management (Table 1).*
- *There was a significant interaction between variety and management with Neo being consistently the highest yielding variety with no difference in yield across the different managements, unlike Rosalind where management approach had a significant effect.*
- *Pixel, a slow developing 6 row winter barley variety also yielded best under strategic management, however it preformed poorer than the other spring barley varieties suggesting that the later time of sowing was not appropriate for this variety.*
- *RGT Planet and Laureate yielded best under the tactical management strategy and benefited from additional N (175kg N/ha) and robust PGR and fungicide inputs (Table 1).*
- *Net From Net Blotch was the dominant disease in this trial with lower levels of Spot Form Net Blotch (SFNB) and Scald also being found (Figure 3).*
- *Rosalind, Laureate, Pixel and Fandaga displayed strong disease resistance, showing low levels of NFNB (<6% plot infected) and no disease differences in response to changing fungicide inputs (Table 7).*
- *Neo showed low to moderate levels of NFNB infection and gave statistically significant decreases in infection with the higher fungicide inputs in 'High' and 'Strategic' managements. RGT Planet showed the highest level of disease with 81.3% plot infection when left untreated with fungicide. It required the highest level of fungicide input to significantly reduce infection from the levels recorded in the untreated however NFNB levels still remained above 70% of plot leaf area infected (Figure 3).*
- *Driven by high proteins, no treatment was able to meet malt standards for barley (Table 2).*
- *With the lack of improvement in quality and little yield change in response to agronomic inputs, the 'High" management approach was the least profitable scenario in 5 out of 6 varieties under a partial (based on variable inputs and applications only) gross margin analysis (Table 8).*
- *For Rosalind, Laureate, Pixel and Fandaga, the more tailored 'Strategic' or 'Tactical' managements were most profitable. In contrast the costs of management and resulting income in Neo and RGT Planet could not be offset which saw the 'Low' management option becoming the most profitable (Figure 4).*

Treatments:
Six cultivars (RGT Planet, Rosalind, Laureate, Fandaga, Neo and Pixel) were tested under four different management programs;

1. Low Input- Two units of fungicide based on Tilt 500EC (propiconazole) applied at 500mL/ha (250g ai/ha) and Folicur 430SC (tebuconazole) applied at 290mL/ha (125g ai/ha) and 150kg N/ha.
2. High Input- Four units of fungicide (Systiva seed treatment plus foliar fungicides GS31, GS39, GS59), 225kg N/ha, PGR.
3. HYC Strategic Input – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 12.

Table 1. Influence of management strategy and cultivar on grain yield (t/ha).

		Yield (t/ha)									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**RGT Planet**	6.50	jkl	6.67	i-l	6.37	kl	6.79	g-l	6.58	d
2.	**Rosalind**	6.76	h-l	7.39	c-f	8.03	a	7.41	c-f	7.40	b
3.	**Laureate**	6.42	kl	7.32	d-g	6.98	f-j	7.43	b-f	7.04	c
4.	**Neo**	7.76	a-e	7.92	abc	7.96	ab	7.84	a-d	7.87	a
5.	**Pixel**	5.22	m	5.25	m	6.33	l	5.57	m	5.59	e
6.	**Fandaga**	6.90	f-k	7.38	c-f	7.28	e-h	7.07	f-i	7.16	bc
Mean		**6.59**	**b**	**6.99**	**a**	**7.16**	**a**	**7.02**	**a**	**6.94**	
LSD Cultivar P=0.05				0.27		**P Value**				<0.001	
LSD Management P=0.05				0.37		**P Value**				0.039	
LSD Cultivar x Man. P=0.05				0.54		**P Value**				0.005	

Table 2. Influence of management strategy and cultivar on protein (%).

		Protein (%)									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**RGT Planet**	12.6	-	13.2	-	12.6	-	13.0	-	**12.8**	**b**
2.	**Rosalind**	12.5	-	13.1	-	12.5	-	12.6	-	**12.7**	**b**
3.	**Laureate**	13.0	-	14.1	-	13.1	-	13.1	-	**13.3**	**a**
4.	**Neo**	12.2	-	12.5	-	12.1	-	12.3	-	**12.3**	**c**
5.	**Pixel**	13.2	-	13.6	-	12.9	-	13.4	-	**13.3**	**a**
6.	**Fandaga**	12.9	-	13.6	-	12.9	-	13.1	-	**13.1**	**a**
Mean		**12.7**	**c**	**13.4**	**a**	**12.7**	**c**	**12.9**	**b**	**12.9**	
LSD Cultivar P=0.05				0.2		**P Value**				<0.001	
LSD Management P=0.05				0.2		**P Value**				<0.001	
LSD Cultivar x Man. P=0.05				ns		**P Value**				0.207	

Table 3. Influence of management strategy and cultivar on test weight (Kg/hL).

		Test Weight (Kg/hL)									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**RGT Planet**	65.8	abc	65.2	bcd	65.3	a-d	65.8	abc	**65.5**	**a**
2.	**Rosalind**	66.0	ab	64.8	cde	65.5	a-d	65.3	a-d	**65.4**	**a**
3.	**Laureate**	64.7	cde	65.5	a-d	66.2	ab	66.0	ab	**65.6**	**a**
4.	**Neo**	66.0	ab	64.6	de	66.3	a	65.4	a-d	**65.6**	**a**
5.	**Pixel**	61.6	h	60.5	i	60.8	hi	60.7	hi	**60.9**	**c**
6.	**Fandaga**	62.8	g	64.1	ef	63.7	efg	63.5	fg	**63.5**	**b**
Mean		**64.5**	**-**	**64.1**	**-**	**64.6**	**-**	**64.4**	**-**	**64.4**	
LSD Cultivar P=0.05				0.6		**P Value**				<0.001	
LSD Management P=0.05				ns		**P Value**				0.089	
LSD Cultivar x Man. P=0.05				1.1		**P Value**				0.025	

Table 4. Influence of management strategy and cultivar on retention (%).

		Retention (%)									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**RGT Planet**	92.2	-	91.9	-	93.0	-	91.4	-	**92.1**	**b**
2.	**Rosalind**	94.5	-	93.9	-	94.6	-	93.9	-	**94.2**	**ab**
3.	**Laureate**	96.1	-	95.6	-	96.1	-	96.4	-	**96.1**	**a**
4.	**Neo**	94.9	-	94.9	-	95.7	-	95.3	-	**95.2**	**a**
5.	**Pixel**	71.7	-	66.0	-	73.9	-	68.0	-	**69.9**	**c**
6.	**Fandaga**	93.3	-	91.5	-	93.6	-	92.7	-	**92.8**	**b**
Mean		**90.4**	**-**	**89.0**	**-**	**91.2**	**-**	**89.6**	**-**	**90.0**	
LSD Cultivar P=0.05				2.2		**P Value**				<0.001	
LSD Management P=0.05				ns		**P Value**				0.120	
LSD Cultivar x Man. P=0.05				ns		**P Value**				0.729	

Table 5. Influence of management strategy and cultivar on screenings (%).

		Screenings (%)									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**RGT Planet**	1.8	-	2.1	-	1.8	-	2.2	-	**2.0**	**bc**
2.	**Rosalind**	1.7	-	1.9	-	1.6	-	1.6	-	**1.7**	**bc**
3.	**Laureate**	1.5	-	1.7	-	1.5	-	1.6	-	**1.6**	**c**
4.	**Neo**	2.2	-	1.9	-	1.7	-	1.8	-	**1.9**	**bc**
5.	**Pixel**	4.4	-	5.4	-	4.0	-	4.8	-	**4.6**	**a**
6.	**Fandaga**	2.2	-	2.4	-	1.7	-	2.0	-	**2.1**	**b**
Mean		**2.3**	**b**	**2.6**	**a**	**2.1**	**c**	**2.3**	**b**	**2.3**	
LSD Cultivar P=0.05				0.4		**P Value**				<0.001	
LSD Management P=0.05				0.2		**P Value**				0.003	
LSD Cultivar x Man. P=0.05				ns		**P Value**				0.887	

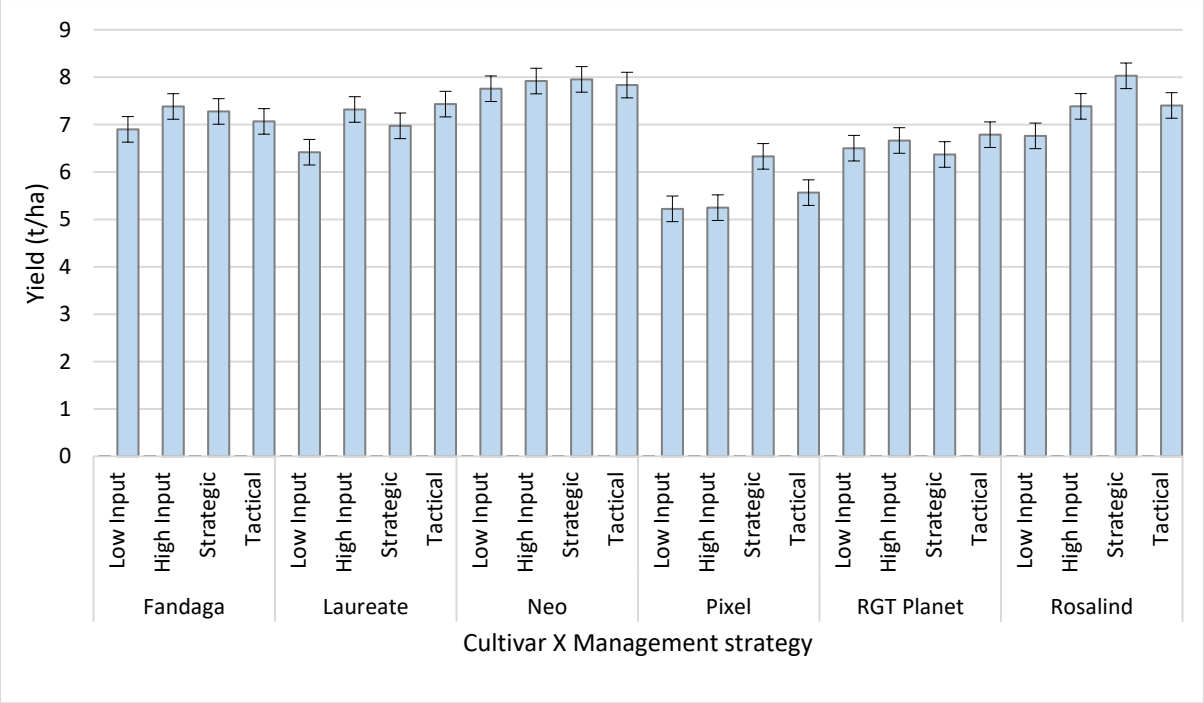

Figure 1. Influence of management strategy and cultivar on grain yield (t/ha) (Statistically significant differences at P Value=0.005; LSD=0.54).

Table 6. Influence of management strategy and cultivar on harvest index (%).

		Harvest Index (%)									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**Planet**	40.7	b-e	40.3	b-e	36.8	efg	47.8	a	**41.4**	**b**
2.	**Rosalind**	36.8	efg	40.4	b-e	48.5	a	41.3	b-e	**41.8**	**b**
3.	**Laureate**	41.2	b-e	40.5	b-e	39.6	c-f	43.9	a-d	**41.3**	**bc**
4.	**Neo**	49.2	a	45.8	ab	45.1	abc	45.2	abc	**46.3**	**a**
5.	**Pixel**	31.7	gh	30.5	h	34.2	fgh	29.5	h	**31.5**	**d**
6.	**Fandaga**	40.0	c-f	37.7	ef	38.2	def	38.1	def	**38.5**	**c**
Mean		**39.9**	**-**	**39.2**	**-**	**40.4**	**-**	**41.0**	**-**	**40.1**	
LSD Cultivar P=0.05				2.9		**P Value**				<0.001	
LSD Management P=0.05				ns		**P Value**				0.217	
LSD Cultivar x Man. P=0.05				5.8		**P Value**				0.005	

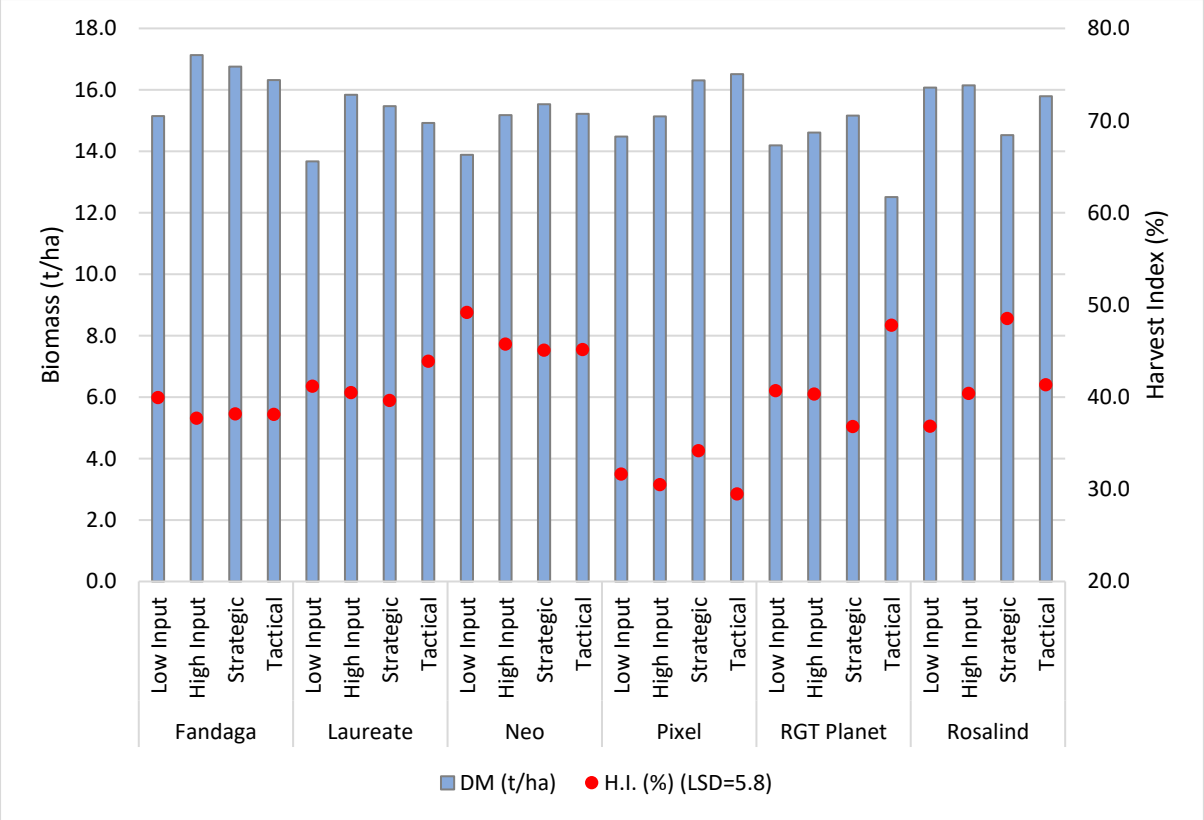

Figure 2. Influence of management strategy and cultivar on dry matter production (t/ha) and harvest index (%). Assessed on 28 November 2023. No statistical difference in dry matter production (t/ha) (P-value=0.102). Refer to table 6 for harvest index (%).

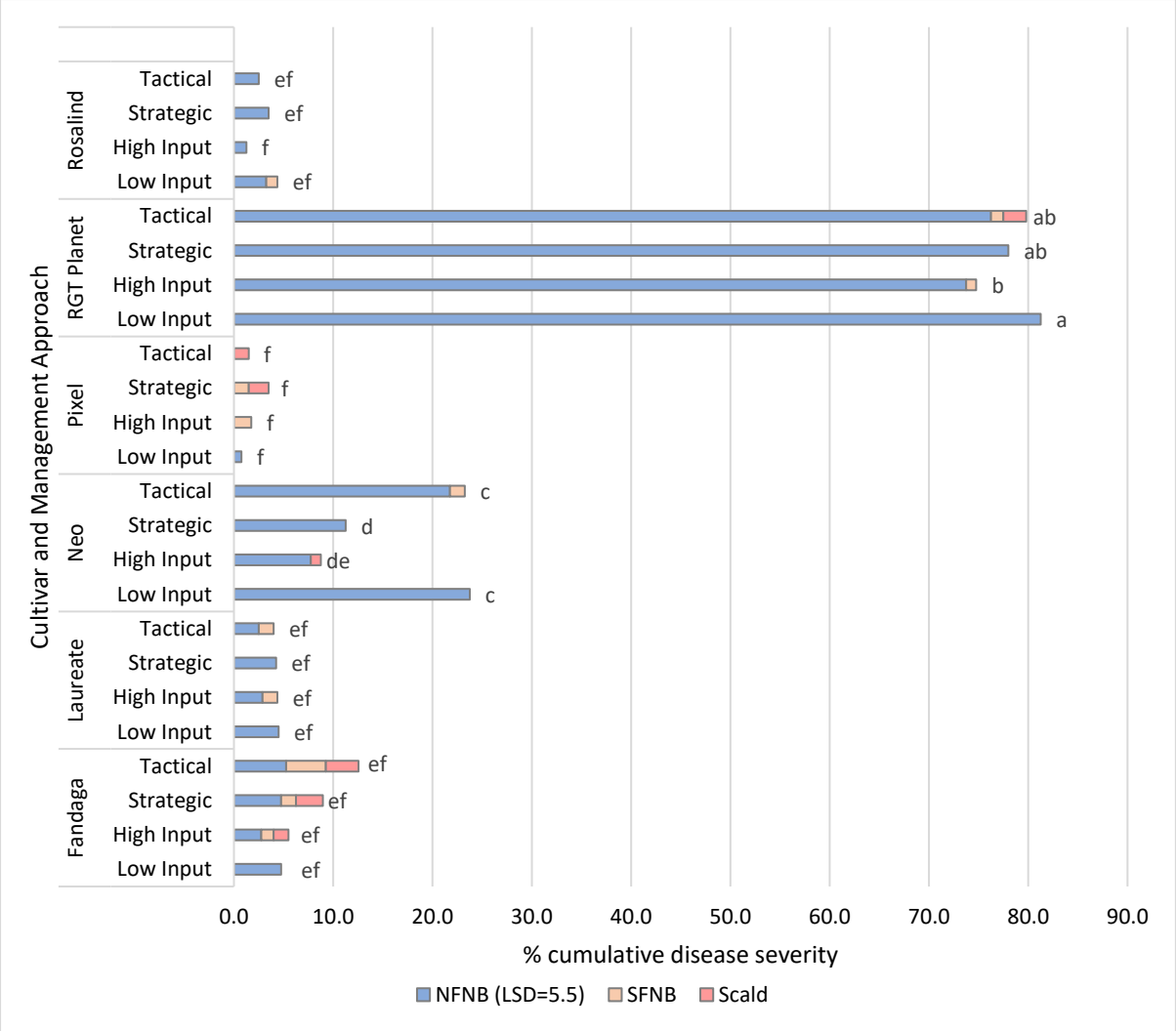

Figure 3. Influence of management strategy and cultivar on Net Form Net Blotch (NFNB), Spot Form Net Blotch (SFNB) and Scald. Assessed 31 October 2023, GS75-80. Letters outside the end of bars refers to statistical difference for NFNB. *Refer to table 7 for values.*

Table 7. Influence of fungicide strategy and cultivar on Net Form Net Blotch. Assessed 31 October 2023, GS75-80.

		NFNB % severity									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**RGT Planet**	81.3	a	73.8	b	78.0	ab	76.3	ab	**77.3**	**a**
2.	**Rosalind**	3.3	ef	1.3	f	3.5	ef	2.5	ef	**2.6**	**cd**
3.	**Laureate**	4.5	ef	2.9	ef	4.3	ef	2.5	ef	**3.5**	**c**
4.	**Neo**	23.8	c	7.8	de	11.3	d	21.8	c	**16.1**	**b**
5.	**Pixel**	0.8	f	0.0	f	0.0	f	0.0	f	**0.2**	**d**
6.	**Fandaga**	4.8	ef	2.8	ef	4.8	ef	5.3	ef	**4.4**	**c**
Mean		**19.7**	**a**	**14.7**	**c**	**17.0**	**b**	**18.0**	**ab**	**17.4**	
LSD Cultivar P=0.05				2.8			**P Value**			<0.001	
LSD Management P=0.05				1.9			**P Value**			0.001	
LSD Cultivar x Man. P=0.05				5.5			**P Value**			0.006	

Table 8. Influence of management strategy and cultivar on system profitability - margin ($/ha) after N, F & PGR costs (all treatments based on bin grade 'BAR1'- $317.00 $/t).

Fungicide strategy	Chemical costs + Application costs	Fertiliser costs + Application costs	Total (N, F, PGR) costs & application	Yield	Income	Margin
	$/ha	$/ha	$/ha	t/ha	$/ha	$/ha
RGT Planet						
Low Input	$25.90	$215.65	$241.56	6.50	$2,061.45	$1,819.89
High Input	$122.94	$323.48	$446.42	6.67	$2,112.81	$1,666.39
Strategic	$122.94	$215.65	$338.59	6.37	$2,019.29	$1,680.70
Tactical	$122.94	$248.26	$371.20	6.79	$2,151.80	$1,780.59
Rosalind						
Low Input	$25.90	$215.65	$241.56	6.76	$2,143.87	$1,902.31
High Input	$122.94	$323.48	$446.42	7.39	$2,341.05	$1,894.63
Strategic	$122.94	$215.65	$338.59	8.03	$2,545.51	$2,206.92
Tactical	$122.94	$248.26	$371.20	7.41	$2,347.39	$1,976.18
Laureate						
Low Input	$25.90	$215.65	$241.56	6.42	$2,034.51	$1,792.95
High Input	$122.94	$323.48	$446.42	7.32	$2,320.44	$1,874.02
Strategic	$122.94	$215.65	$338.59	6.98	$2,211.08	$1,872.48
Tactical	$122.94	$248.26	$371.20	7.43	$2,356.26	$1,985.06
Neo						
Low Input	$25.90	$215.65	$241.56	7.76	$2,459.29	$2,217.73
High Input	$122.94	$323.48	$446.42	7.92	$2,510.64	$2,064.22
Strategic	$122.94	$215.65	$338.59	7.96	$2,521.74	$2,183.14
Tactical	$80.12	$248.26	$328.38	7.84	$2,483.70	$2,155.32
Pixel						
Low Input	$25.90	$215.65	$241.56	5.22	$1,655.69	$1,414.13
High Input	$122.94	$323.48	$446.42	5.25	$1,663.62	$1,217.20
Strategic	$122.94	$215.65	$338.59	6.33	$2,006.61	$1,668.02
Tactical	$59.88	$248.26	$308.15	5.57	$1,764.11	$1,455.96
Fandaga						
Low Input	$25.90	$215.65	$241.56	6.90	$2,187.30	$1,945.74
High Input	$122.94	$323.48	$446.42	7.38	$2,340.41	$1,893.99
Strategic	$122.94	$215.65	$338.59	7.28	$2,307.13	$1,968.53
Tactical	$59.88	$248.26	$308.15	7.07	$2,240.56	$1,932.41

Figures in green=most profitable approach, figure in red=least profitable approach
See Table 9-11 for complete pricing information.

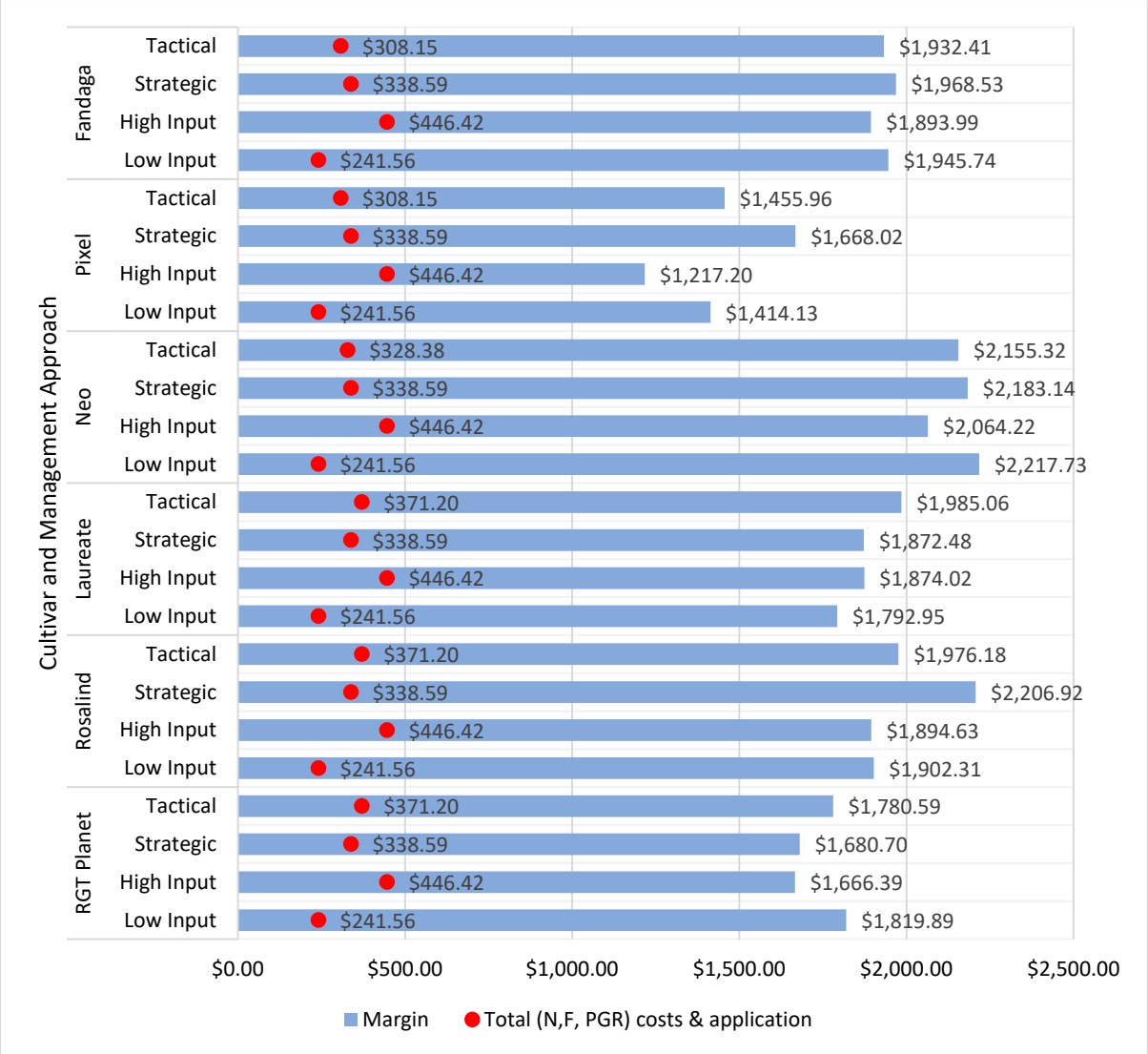

Figure 4. Influence of management strategy and cultivar on system profitability - margin after N, F & PGR costs $/ha. Value outside the bar denotes margin.

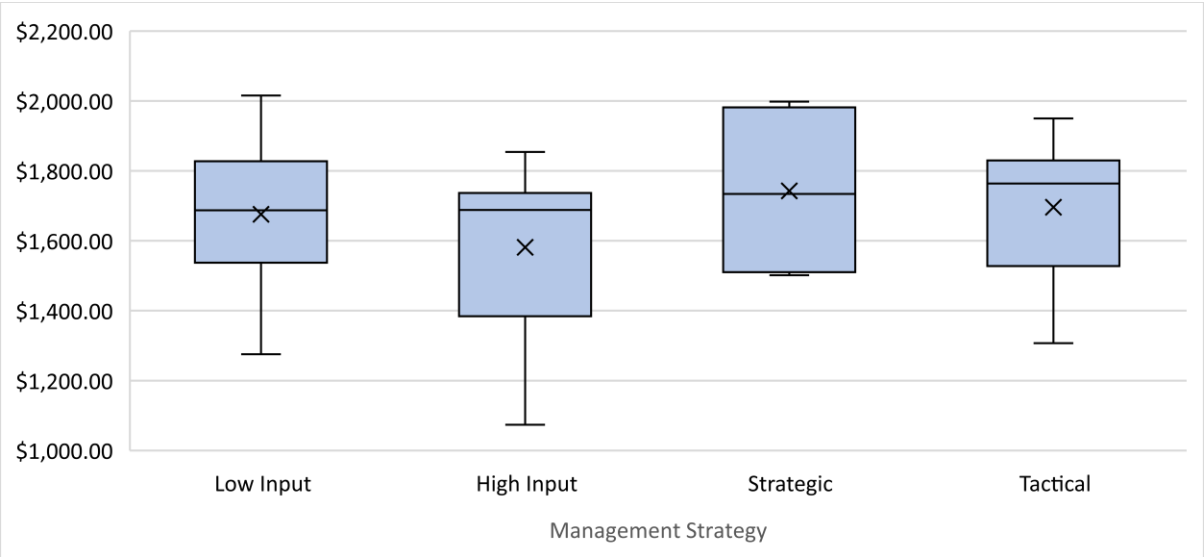

Figure 5. Graph representing the distribution of margin after N, F & PGR costs for the 6 varieties ($/ha) under low, high, strategic and tactical management strategies.

Table 9. Input costs in economic analysis.

Product	Product type	Price
Opus	Fungicide	$35.06/L
Prosaro	Fungicide	$56.25/L
Aviator Xpro	Fungicide	$58.46/L
Tilt 500	Fungicide	$3.17/L
Folicur	Fungicide	$14.90/L
Moddus Evo	PGR	$84.95/L
Urea	Fertiliser	$0.60/Kg

Table 10. Foliar spray application costs in economic analysis.

Management strategy	Product type	Number of applications	Application cost ($/ha)
Low Input	Fungicide	2	20.00
High Input	Fungicide + PGR	3	20.00
Strategic	Fungicide	3	20.00
Tactical	Fungicide	2-3	20-30

Table 11. Nutrition application costs in economic analysis.

Management strategy	Product type	Number of applications	Application cost ($/ha)
Low Input	Urea	2	20.00
High Input	Urea	3	30.00
Strategic	Urea	2	20.00
Tactical	Urea	2	20.00

Grain price (BAR1: $317.00) as of 16 February 2024 based off Geelong GrainCorp. Contractor rates factored in for analysis. Other costs such as seed sourcing and sowing, insurance, herbicides, insecticides, harvesting, insurance and MAP were not taken into consideration in this analysis as they were constant regardless of the management strategy used.

Table 12. Trial Input and management details.

Sowing date:		**22 May 2023**	
Harvest date:		**23 December 2023**	
Seed rate:		200 seeds/m^2	
Basal fertiliser:	22 May	100 kg/ha MAP	
Nitrogen:		**Low Input**	**Strategic**
		150kg N/ha	150kg N/ha
		High Input	**Tactical**
		225kg N/ha	175kg N/ha
PGR:		**Low Input**	**Strategic**
	GS30	----	Moddus Evo 0.20 L/ha
	GS33	----	Moddus Evo 0.20 L/ha
		High Input	**Tactical**
	GS30	Moddus Evo 0.20 L/ha	Moddus Evo 0.20 L/ha
	GS33	Moddus Evo 0.20 L/ha	Moddus Evo 0.20 L/ha
Fungicide:		**Low Input**	**High Input**
	GS00	----	Systiva
	GS31	Tilt (0.5L/ha)	Prosaro (0.3L/ha)
	GS39	Folicur (0.29L/ha)	Aviator Xpro (0.5 L/ha)
	GS59-61	----	Opus (0.5L/ha)
		Strategic	**Tactical**
	GS00	----	----
	GS31	Prosaro (0.3L/ha)	See below
	GS39	Aviator Xpro (0.5 L/ha)	See below
	GS59-61	Opus (0.5L/ha)	See below

	Tactical fungicide					
	RGT Planet	**Rosalind**	**Laureate**	**Neo**	**Fandaga**	**Pixel**
GS31	Prosaro (0.3L/ha)	Prosaro (0.3L/ha)	Prosaro (0.3L/ha)	Tilt (0.5L/ha)	Tilt (0.5L/ha)	Tilt (0.5L/ha)
GS39	Aviator Xpro (0.5 L/ha)	Aviator Xpro (0.5 L/ha)	Aviator Xpro (0.5 L/ha)	Aviator Xpro (0.5 L/ha)	Folicur (0.29L/ha)	Folicur (0.29L/ha)
GS59-61	Opus (0.5L/ha)	Opus (0.5L/ha)	Opus (0.5L/ha)	----	----	----

Table 13. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Systiva	Fluxapyroxad	333 g/L	---	---	FS
Tilt	Propiconazole	500 g/L	---	---	EC
Folicur	Tebuconazole	430 g/L	---	---	SC
PGR					
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Trial 3. HYC Barley Disease Management (FAR VIC B23-04-02)

Key Points:

- *Conducted in RGT Planet (SVS to Net Form Net Blotch (NFNB)), untreated plots saw infection levels of NFNB of 96.5% leaf area infected (%LAI) on flag-2 and 66.9 %LAI on flag-1 when assessed at early grain fill (Figure 2).*
- *The best treatments in terms of controlling diseases were ones that used a combination of group 3, group 7 and group 11 fungicides at multiple spray timings. These treatments gave between 67-77% control on the flag-1 leaf layer (Figure 2).*
- *Systiva alone (treatment 2), or Systiva with a late follow up fungicide application (treatment 11) gave poor control of NFNB with only 3% and 41% control respectively on flag-1 at early grain fill.*
- *With low disease pressure early in the season, there were no statistical differences between untreated plots and Systiva treated plots when assessed at stem elongation (GS32) (Table 3).*
- *Despite high levels of Net form Net Blotch (NFNB) assessed in the trial, there was no yield response to fungicides with generally poor control across the trial (Table 2).*
- *Fungicides did influence grain quality with untreated plots having lower test weight and retention scores and higher screenings (Table 2).*

Treatments:

Table 1. Fungicide management strategy treatment list.

	Treatment			
	GS00	**GS31**	**GS39-49**	**GS59**
1.	---	---	---	---
2.	Systiva	---	---	---
3.	---	Prosaro 300 mL/ha	---	---
4.	---	---	Aviator Xpro 420 mL/ha	---
5.	---	Prosaro 150 mL/ha	Radial 420 mL/ha	---
6.	---	Prosaro 300 mL/ha	Radial 840 mL/ha	---
7.	---	Prosaro 300 mL/ha	Revystar 750 mL/ha	---
8.	---	Revystar 750 mL/ha	Radial 840 mL/ha	---
9.	---	Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	---
10.	---	Aviator Xpro 420 mL/ha	Radial 840 mL/ha	---
11.	Systiva	---	Radial 840 mL/ha	---
12.	Systiva	Prosaro 300 mL/ha	Radial 840 mL/ha	---
13.	---	Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	Opus 500 mL/ha
14.	Systiva	Prosaro 300 mL/ha	Radial 840 mL/ha	Opus 500 mL/ha
15.	Systiva	Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	Opus 500 mL/ha

Table 2. Influence of management strategy on barley grain yield (t/ha) and quality (% & kg/hL).

Trt.	Yield	Protein	Test weight	Retention	Screenings
	t/ha	%	kg/hL	(%)	(%)
1.	5.98 -	12.5 ab	64.7 b	82.5 d	4.1 ab
2.	6.08 -	12.7 a	64.8 b	86.7 bc	3.0 bc
3.	6.18 -	12.5 ab	65.1 ab	85.8 c	3.3 bc
4.	6.55 -	12.3 ab	65.7 ab	89.7 abc	2.5 bc
5.	6.60 -	12.2 b	65.6 ab	90.0 abc	2.8 bc
6.	6.28 -	12.3 ab	65.2 ab	89.7 abc	2.4 bc
7.	6.54 -	12.5 ab	66.3 a	86.1 c	5.1 a
8.	6.72 -	12.2 b	65.7 ab	90.9 ab	2.2 bc
9.	6.39 -	12.3 ab	65.7 ab	91.6 a	2.2 bc
10.	6.70 -	12.4 ab	65.5 ab	91.7 a	2.0 bc
11.	6.47 -	12.2 b	65.4 ab	89.7 abc	2.5 bc
12.	6.62 -	12.1 b	65.6 ab	92.6 a	1.8 c
13.	6.59 -	12.5 ab	65.9 ab	89.6 abc	2.6 bc
14.	6.99 -	12.2 b	66.1 a	92.3 a	2.1 bc
15.	6.85 -	12.4 ab	65.6 ab	91.0 ab	2.2 bc
Mean	**6.50**	**12.4**	**65.5**	**89.3**	**2.7**
LSD P=0.05	ns	0.2	0.7	2.9	1.2
P Value	0.313	0.001	0.005	<0.001	<0.001

Table 3. Net Form Net Blotch (NFNB) and Spot Form Net Blotch (SFNB) severity (%) on Flag-2, Flag-3 and Flag-4 in treatments 1 and 2 at GS32.

	NFNB			SFNB		
Treatment	**FL-2**	**FL-3**	**FL-4**	**FL-2**	**FL-3**	**FL-4**
1. Untreated	0.2 -	0.0 -	1.0 -	0.1 -	1.0 -	0.1 -
2. Systiva	0.1 -	0.0 -	0.2 -	0.0 -	0.1 -	0.0 -
Mean	**0.1**	**0.0**	**0.6**	**0.0**	**0.6**	**0.1**
LSD P=0.05	ns	ns	ns	ns	ns	ns
P Value	0.353	1.000	0.308	0.391	0.165	0.278

Table 4. Net Form Net Blotch (NFNB) severity (%) on Flag-1, Flag-2, Flag-3 and Flag-4 at GS39.

Treatment	FL-1	FL-2	FL-3	FL-4
1	0.3 -	1.9 a	5.0 a	4.7 a
2	0.2 -	0.9 ab	1.9 b	2.9 ab
4	0.0 -	1.3 ab	2.4 b	3.5 ab
8	0.2 -	0.5 b	0.9 b	0.8 b
10	0.1 -	0.5 b	0.8 b	0.9 b
12	0.0 -	0.4 b	1.0 b	1.6 b
Mean	**0.1**	**0.9**	**2.0**	**2.4**
LSD P=0.05	ns	0.9	2.2	2.0
P Value	0.128	0.025	0.006	0.006

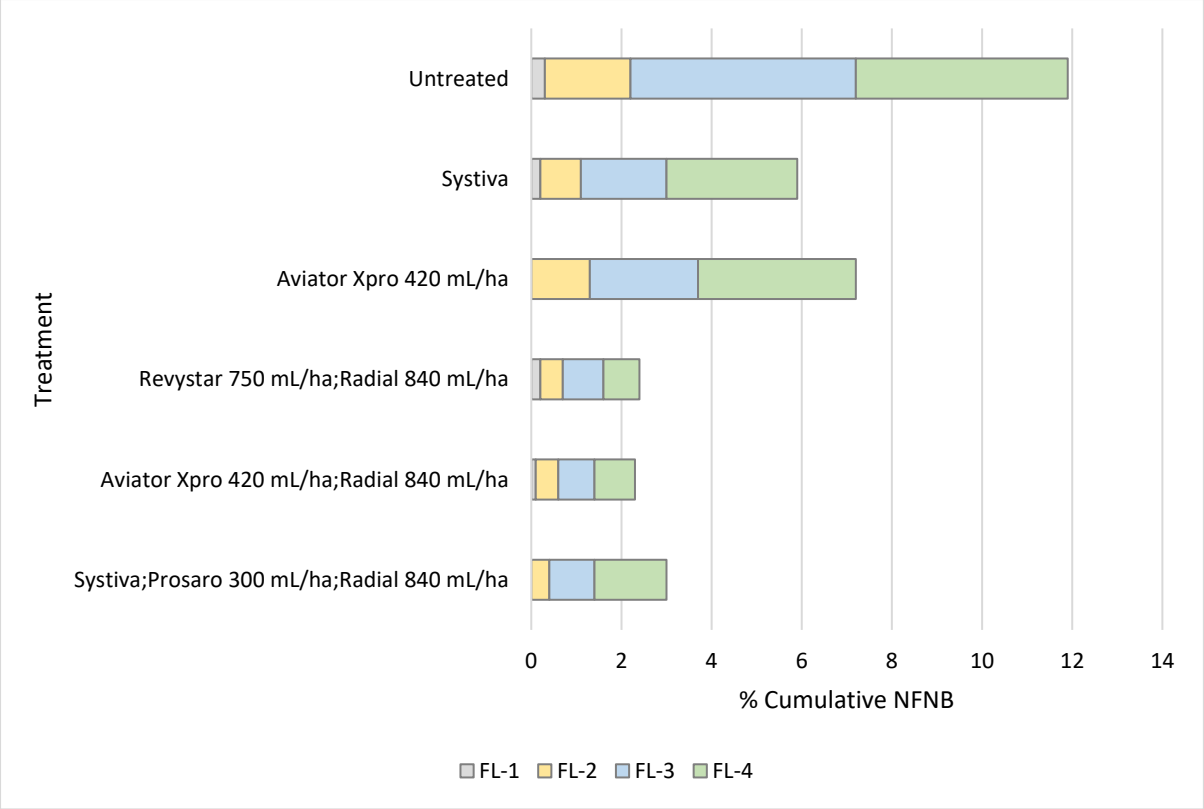

Figure 1. Influence of management strategy on Net Form Net Blotch (NFNB) on Flag-1, Flag-2, Flag-3 and Flag-4 in select treatments (1, 2, 4, 8, 10 & 12) at GS39. Refer to table 4 for statistical analysis.

Image 1. Net Form Net Blotch (NFNB) infection in untreated RGT Planet plot. Taken 3 November 2023.

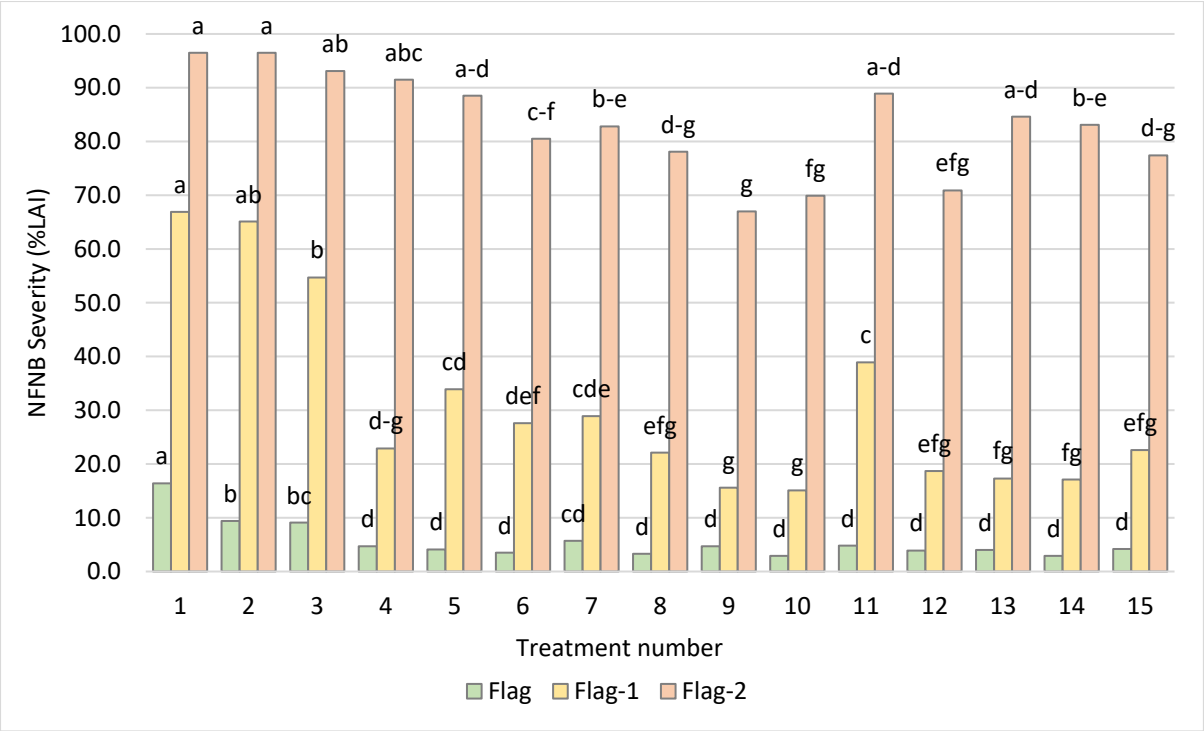

Figure 2. Influence of fungicide treatment on Net Form Net Blotch (NFNB) severity on flag, flag-1 and flag-2 when assessed at the start of grain fill (GS71) on 27 October. Treatments as per table 1.

Table 5. Trial input and management details.

Sowing date:		**22 May 2023**
Harvest date:		**23 December 2023**
Seed Rate:		200 seeds/m^2
Basal fertiliser:	22 May	100 Kg/ha MAP
Nitrogen:	6 Jul	50kg N/ha
	28 Aug	100kg N/ha
Fungicide:	At sowing (GS00)	As per treatment list
	23 Aug (GS31)	As per treatment list
	14 Sep(GS37-39)	As per treatment list
	17 Oct (GS59)	As per treatment list

Table 6. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC
Systiva	Fluxapyroxad	333 g/L	---	---	FS

Trial 4. HYC Barley PGR x Harvest Date Interaction- Time of Sowing 1 (FAR VIC B23-05-01)

Key points:

- *Sown in late April this trial aimed to look at the effects of PGR management and harvest date on the winter barley Pixel.*
- *Demonstrating potential head loss issues in previous seasons, Pixel benefited from PGR management with all interventions yielding higher than the untreated plots (Table 1).*
- *There was also a significant decrease in yield when harvest was delayed by a month which coincided with an increase in head-loss between the two harvest dates (Table 6).*
- *PGRs were successful at reducing the crop height with the trinexapac ethyl-based treatments reducing height by up to 6.5cm and the trinexapac ethyl/Ethephon based treatment by 15.9cm. However, there was no observed change in peduncle length in any treatment (Table 7).*
- *Lodging in this trial was minimal and was not affected by PGR management or harvest date (Table 7).*

Treatments:

4 PGR management approaches applied to late April sown Pixel barley and harvested at two harvest dates.

Harvest dates:

1. On time harvested on the 22 December 2023.
2. Delayed harvested on the 23 January 2023.

Plant growth regulators (PGR) treatments:

5. Untreated.
6. GS31 PGR trinexapac ethyl based (Single Moddus Evo @ 200 mL/ha (50g ai/ha).
7. GS31 + GS37 PGR trinexapac ethyl based (Double Moddus Evo @ 200mL/ha (100g ai/ha).
8. European approach based on GS31 trinexapac ethyl (Moddus Evo @ 200 mL/ha) (50g ai/ha) and at GS37 of Ethephon 720 @500 mL/ha (360g ai/ha).

Table 1. Influence of PGR and harvest date on grain yield (t/ha).

	Yield (t/ha)				
	Untreated	**Single**	**Split**	**European**	**Mean**
On Time	5.34 -	6.19 -	6.28 -	6.29 -	**6.02 a**
Delayed	3.34 -	4.25 -	3.97 -	4.52 -	**4.02 b**
Mean	**4.34 b**	**5.22 a**	**5.12 a**	**5.41 a**	**5.02**
LSD PGR P=0.05		0.61	**P Value**		0.009
LSD Harvest Date P=0.05		0.28	**P Value**		<0.001
LSD PGR X Harvest Date P=0.05		ns	**P Value**		0.822

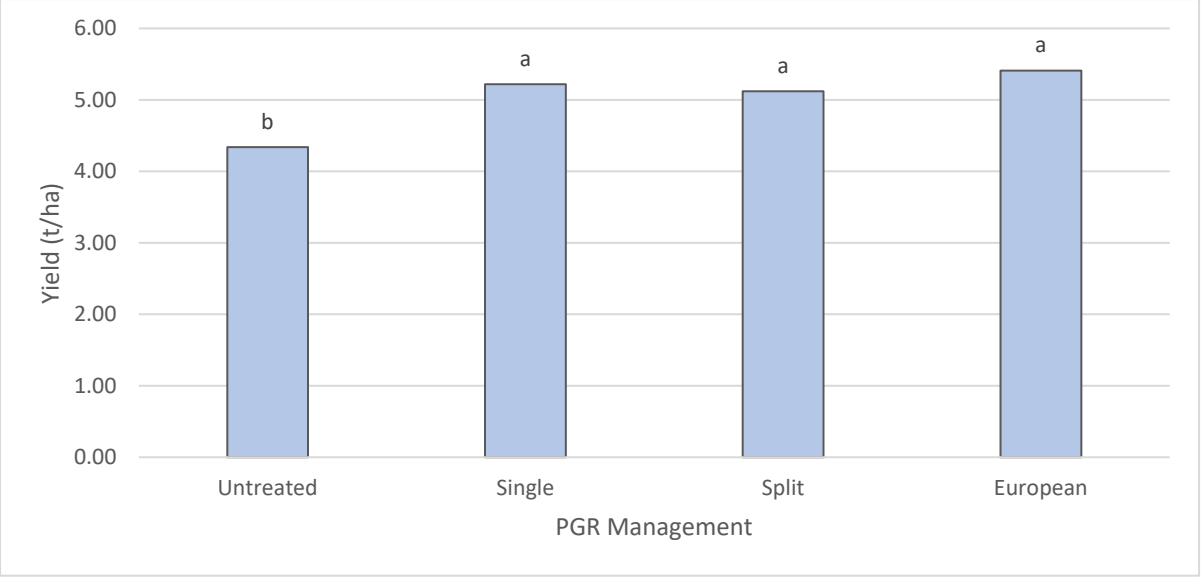

Figure 1. Influence of PGR management grain yield (t/ha).

Table 2. Influence of PGR and harvest date on grain protein (%).

	Protein (%)									
	Untreated		**Single**		**Split**		**European**		**Mean**	
On Time	13.2	-	12.8	-	12.8	-	13.1	-	**13.0**	-
Delayed	12.9	-	13.4	-	13.3	-	13.2	-	**13.2**	-
Mean	**13.0**	-	**13.1**	-	**13.0**	-	**13.2**	-	**13.1**	
LSD PGR P=0.05			ns			**P Value**			0.898	
LSD Harvest Date P=0.05			ns			**P Value**			0.095	
LSD PGR X Harvest Date P=0.05			ns			**P Value**			0.244	

Table 3. Influence of PGR and harvest date on test weight (Kg/hL).

	Test weight (Kg/hL)									
	Untreated		**Single**		**Split**		**European**		**Mean**	
On Time	61.7	-	60.8	-	60.8	-	61.3	-	**61.1**	-
Delayed	61.3	-	60.7	-	60.8	-	62.6	-	**61.3**	-
Mean	**61.5**	**ab**	**60.7**	**b**	**60.8**	**b**	**61.9**	**a**	**61.2**	
LSD PGR P=0.05			0.9			**P Value**			0.042	
LSD Harvest Date P=0.05			ns			**P Value**			0.173	
LSD PGR X Harvest Date P=0.05			ns			**P Value**			0.228	

Table 4. Influence of PGR and harvest date on retention (%).

	Retention (%)									
	Untreated		**Single**		**Split**		**European**		**Mean**	
On Time	73.7	-	74.1	-	73.3	-	85.1	-	**76.6**	-
Delayed	80.5	-	75.0	-	73.7	-	89.3	-	**79.6**	-
Mean	**77.1**	**b**	**74.5**	**b**	**73.5**	**b**	**87.2**	**a**	**78.1**	
LSD PGR P=0.05			3.9			**P Value**			<0.001	
LSD Harvest Date P=0.05			ns			**P Value**			0.073	
LSD PGR X Harvest Date P=0.05			ns			**P Value**			0.303	

Table 5. Influence of PGR and harvest date on screenings (%).

	Screenings (%)									
	Untreated		**Single**		**Split**		**European**		**Mean**	
On Time	4.4	-	4.2	-	4.2	-	3.0	-	4.0	-
Delayed	3.6	-	4.1	-	4.5	-	2.4	-	3.6	-
Mean	**4.0**	**a**	**4.1**	**a**	**4.3**	**a**	**2.7**	**b**	**3.8**	
LSD PGR P=0.05			0.8			**P Value**			0.002	
LSD Harvest Date P=0.05			ns			**P Value**			0.225	
LSD PGR X Harvest Date P=0.05			ns			**P Value**			0.490	

Table 6. Influence of PGR and Harvest Date on plot head loss (heads/m^2– heads on ground post-harvest).

	Head Loss (heads/m^2)									
	Untreated		**Single**		**Split**		**European**		**Mean**	
On Time	115.0	-	87.8	-	80.5	-	46.7	-	**82.5**	**b**
Delayed	110.0	-	116.7	-	102.2	-	91.7	-	**105.1**	**a**
Mean	**112.5**	**a**	**102.2**	**a**	**91.4**	**ab**	**69.2**	**b**	**93.8**	
LSD PGR P=0.05			24.5			**P Value**			0.010	
LSD Harvest Date P=0.05			10.7			**P Value**			0.007	
LSD PGR X Harvest Date P=0.05			ns			**P Value**			0.224	

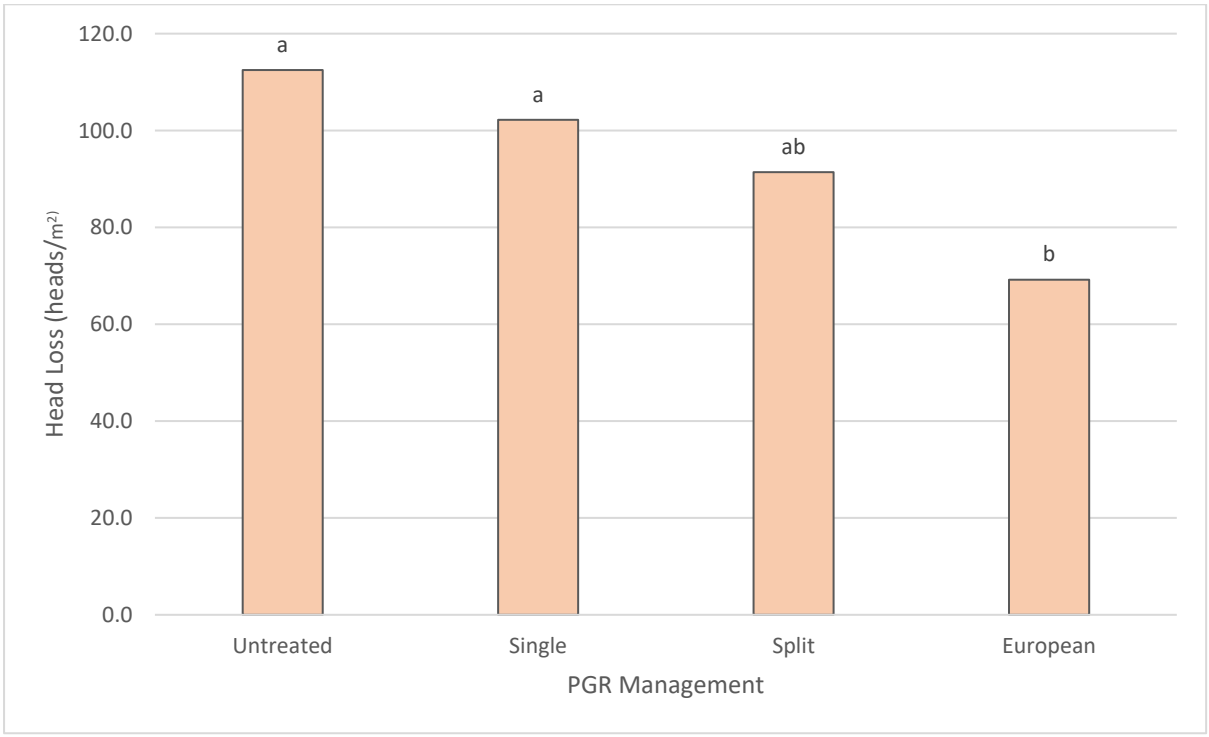

Figure 2. Influence of PGR management on head loss (heads/m^2).

Table 7. Influence of PGR treatment on plant height (cm), peduncle length (cm), head count (heads/m^2) and lodging index (0-500).

	Plant Height (cm)		Peduncle Length (mm)		Head Count (heads/m^2)		Lodging Index (0-500)	
Untreated	97.8	a	186.8	-	440.6	-	1.3	-
Single	92.5	b	180.4	-	449.4	-	0.0	-
Split	91.3	b	160.4	-	430.6	-	18.8	-
European	81.9	c	163.4	-	409.4	-	0.0	-
Mean	**90.8**		**172.7**		**432.5**		**5.0**	
LSD P=0.05	6.1		ns		ns		ns	
P Value	<0.001		0.100		0.375		0.565	

*Lodging index definition in 'Appendix. HYC Barley VIC Crop Technology Centre'.

Table 8. Trial input and management details.

Sowing date:		**29 April 2023**	
Harvest date:		**22 December 2023 and 23 January 2024**	
Variety:		Pixel	
Seed rate:		200 seeds/m^2	
Basal fertiliser:	29 Apr	100 kg/ha MAP	
Nitrogen:	06 Jul	108 kg/ha	
	28 Aug	217 Kg/ha	
Fungicide:	GS31	Radial 0.84 L/ha	
	GS39	Aviator Xpro 0.42 L/ha	
PGR:		**Untreated**	**Single PGR**
	GS31	---	Moddus 0.2 L/ha
	GS37	---	---
		Split PGR	**European approach**
	GS31	Moddus 0.2 L/ha	Moddus 0.2 L/ha
	GS37	Moddus 0.2 L/ha	Ethephon 720 0.5 L/ha

Table 9. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Ethephon 720	Ethephon	720 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Trial 5. HYC Barley PGR x Harvest Date Interaction - Time of Sowing 2 (FAR VIC B23-05-02)

Key points:

- *The barley PGR x harvest date trial conducted in RGT Planet and sown on 22 May experienced a higher degree of lodging (Table 7) compared to the earlier sown Pixel, however experienced less head loss (Figure 2). Lodging was still considered to be low- moderate on the 0-500 scale for lodging index with no recorded score over 140.*
- *RGT Planet gave no response in yield to PGR management however similarly to the TOS 1 Pixel, a delayed harvest caused a statistically significant reduction in yield (Table 1).*
- *Despite more lodging being recorded in this trial, the 'European' PGR approach remained standing and was the only treatment statistically different from the untreated in terms of lodging control, however there was no positive effects on yield (Figure 3).*
- *PGRs were successful in reducing crop height with the spilt Moddus Evo application being significantly shorter than the untreated, and the 'European' approach being significantly shorter than the Moddus Evo based treatments. Similar results were measured with peduncle length where a 46mm reduction was recorded with the 'European' PGR management (Table 7).*

Treatments:
4 PGR management approaches applied to late May sown RGT Planet barley and harvested at two harvest dates.

Harvest dates:

1. On Time harvested on the 3 January 2023.
2. Delayed harvested on the 2 February 2023.

Plant growth regulators (PGR) treatments:

1. Untreated.
2. GS31 PGR trinexapac ethyl based (Single Moddus Evo @ 200 mL/ha (50g ai/ha).
3. GS31 + GS37 PGR trinexapac ethyl based (Double Moddus Evo @ 200mL/ha (100g ai/ha).
4. European approach based on GS31 trinexapac ethyl (Moddus Evo @ 200 mL/ha) (50g ai/ha) and at GS37 of Ethephon 720 @500 mL/ha (360g ai/ha).

Table 1. Influence of PGR and Harvest Date on grain yield (t/ha).

	Yield (t/ha)				
	Untreated	**Single**	**Split**	**European**	**Mean**
On Time	7.51 -	7.67 -	7.44 -	6.91 -	**7.38 a**
Delayed	4.54 -	4.92 -	5.19 -	5.53 -	**5.04 b**
Mean	**6.02 -**	**6.29 -**	**6.32 -**	**6.22 -**	**6.21**
LSD PGR P=0.05		ns	**P Value**		0.727
LSD Harvest Date P=0.05		0.63	**P Value**		0.001
LSD PGR X Harvest Date P=0.05		ns	**P Value**		0.054

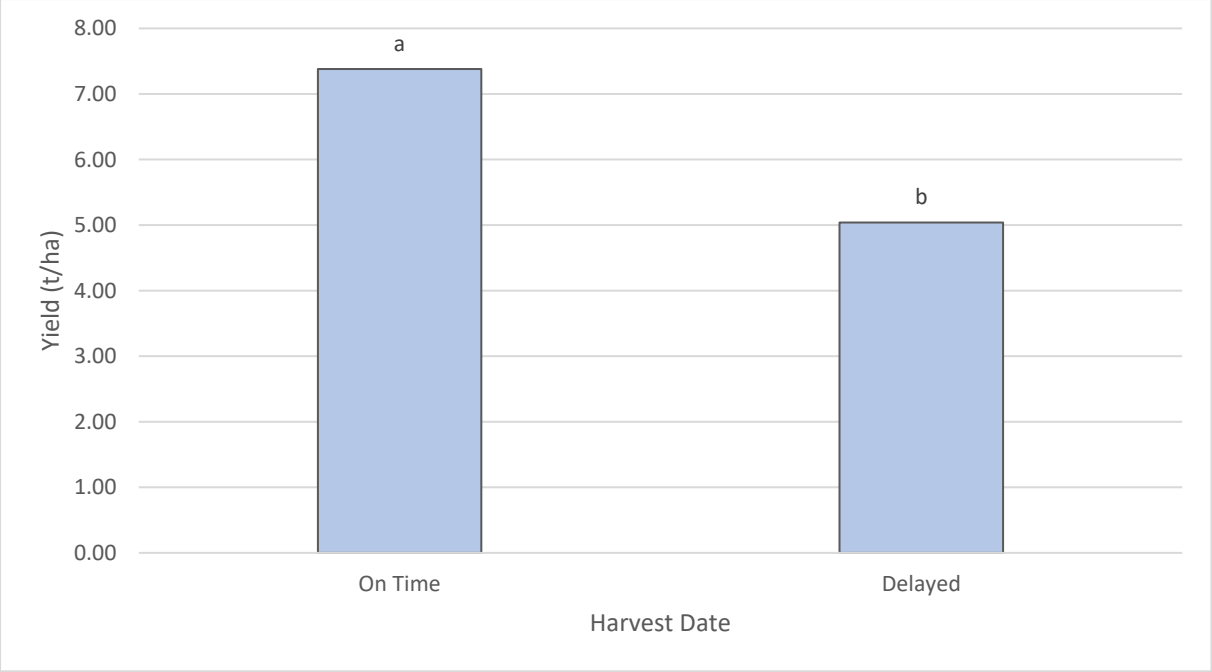

Figure 1. Influence of harvest date on grain yield (t/ha).

Table 2. Influence of PGR and harvest date on grain protein (%).

	Protein (%)									
	Untreated		**Single**		**Split**		**European**		**Mean**	
On Time	12.6	-	12.6	-	12.6	-	13.0	-	**12.7**	**-**
Delayed	12.8	-	12.5	-	12.8	-	13.2	-	**12.8**	**-**
Mean	**12.7**	**b**	**12.6**	**b**	**12.7**	**b**	**13.1**	**a**	**12.8**	
LSD PGR P=0.05			0.19			**P Value**			<0.001	
LSD Harvest Date P=0.05			ns			**P Value**			0.166	
LSD PGR X Harvest Date P=0.05			ns			**P Value**			0.318	

Table 3. Influence of PGR and harvest date on test weight (Kg/hL).

	Test weight (Kg/hL)									
	Untreated		**Single**		**Split**		**European**		**Mean**	
On Time	64.9	-	64.6	-	64.7	-	65.4	-	**64.9**	**a**
Delayed	60.7	-	60.1	-	61.4	-	62.6	-	**61.2**	**b**
Mean	**62.8**	**b**	**62.4**	**b**	**63.0**	**b**	**64.0**	**a**	**63.0**	
LSD PGR P=0.05			0.8			**P Value**			0.005	
LSD Harvest Date P=0.05			0.7			**P Value**			0.001	
LSD PGR X Harvest Date P=0.05			ns			**P Value**			0.170	

Table 4. Influence of PGR and harvest date on retention (%).

	Retention (%)									
	Untreated		**Single**		**Split**		**European**		**Mean**	
On Time	94.3	-	92.9	-	94.4	-	96.7	-	**94.5**	**-**
Delayed	92.1	-	93.2	-	93.9	-	96.6	-	**93.9**	**-**
Mean	**93.2**	**b**	**93.0**	**b**	**94.1**	**b**	**96.6**	**a**	**94.2**	
LSD PGR P=0.05			1.2			**P Value**			<0.001	
LSD Harvest Date P=0.05			ns			**P Value**			0.329	
LSD PGR X Harvest Date P=0.05			ns			**P Value**			0.180	

Table 5. Influence of PGR and harvest date on screenings (%).

	Screenings (%)									
	Untreated		**Single**		**Split**		**European**		**Mean**	
On Time	1.8	-	2.3	-	1.7	-	1.6	-	**1.8**	**-**
Delayed	3.4	-	2.7	-	2.4	-	1.9	-	**2.6**	**-**
Mean	**2.6**	**a**	**2.5**	**ab**	**2.1**	**bc**	**1.7**	**c**	**2.2**	
LSD PGR P=0.05			0.5			**P Value**			0.007	
LSD Harvest Date P=0.05			ns			**P Value**			0.065	
LSD PGR X Harvest Date P=0.05			ns			**P Value**			0.056	

Table 6. Influence of PGR and harvest date on head loss (heads/m^2– heads on ground post-harvest).

	Head Loss (heads/m^2)									
	Untreated		**Single**		**Split**		**European**		**Mean**	
On Time	62.2	-	31.7	-	37.2	-	20.6	-	**37.9**	**b**
Delayed	130.6	-	93.9	-	58.5	-	103.3	-	**96.6**	**a**
Mean	**96.4**	**-**	**62.8**	**-**	**47.9**	**-**	**61.9**	**-**	**67.2**	
LSD PGR P=0.05			ns			**P Value**			0.074	
LSD Harvest Date P=0.05			31.6			**P Value**			0.009	
LSD PGR X Harvest Date P=0.05			ns			**P Value**			0.368	

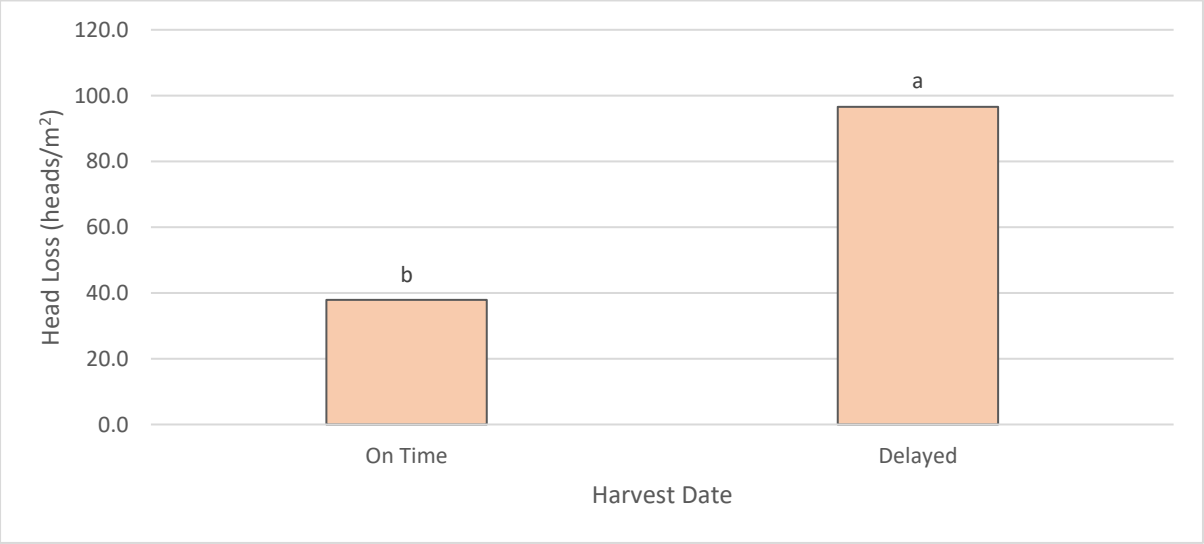

Figure 2. Influence of Harvest Date on head loss (heads/m^2). P value = 0.009, LSD (P=0.05) = 31.6.

Table 7. Influence of PGR treatment on plant height (cm), peduncle length (cm), head count (heads/m^2) and lodging index (0-500).

	Plant Height (cm)	Peduncle Length (mm)	Head Count (heads/m^2)	Lodging Index (0-500)
Untreated	87.8 a	184.1 a	582.5 -	72.5 a
Single	85.9 ab	179.3 a	610.5 -	137.5 a
Split	83.8 b	160.1 b	626.8 -	130.0 a
European	72.4 c	138.4 c	622.3 -	0.0 b
Mean	**82.4**	**165.5**	**610.5**	**68.0**
LSD P=0.05	4.8	11.0	ns	54.9
P Value	<0.001	<0.001	0.160	0.001

*Lodging index definition in 'Appendix. HYC Barley VIC Crop Technology Centre'.

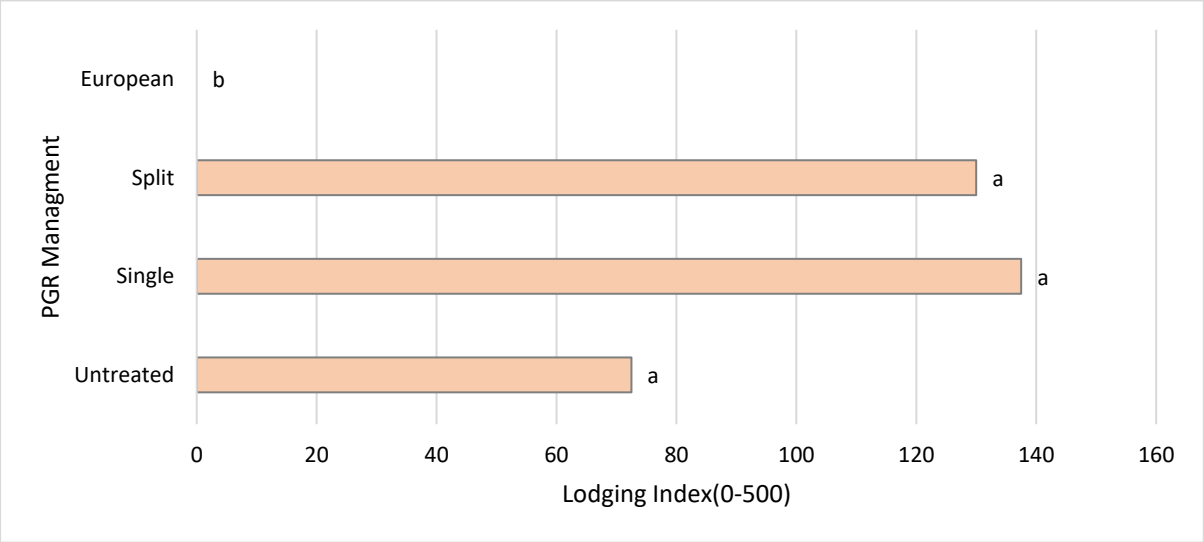

Figure 3. Influence of PGR management on plot lodging index (0-500).

Table 8. Trial input and management details.

Sowing date:		**22 May 2023**	
Harvest date:		**22 December 2023 and 23 January 2024**	
Variety:		RGT Planet	
Seed rate:		200 seeds/m^2	
Basal fertiliser:	29 Apr	100 kg/ha MAP	
Nitrogen:	06 Jul	108 kg/ha	
	28 Aug	217 Kg/ha	
Fungicide:	GS31	Radial 0.84 L/ha	
	GS39	Aviator Xpro 0.42 L/ha	
PGR:		**Untreated**	**Single PGR**
	GS31	---	Moddus 0.2 L/ha
	GS37	---	---
		Split PGR	**European approach**
	GS31	Moddus 0.2 L/ha	Moddus 0.2 L/ha
	GS37	Moddus 0.2 L/ha	Ethephon 720 0.50 L/ha

Table 9. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Ethephon 720	Ethephon	720 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Appendix. HYC Barley VIC Crop Technology Centre

The following details apply to all Victorian barley trials unless specified differently.

Table 1. Overall inputs

	Date applied	Product
Herbicide:	21 May	Treflan 2 L/ha
		Overwatch 1.25 L/ha
		Paraquat 2.4
	29 Jun	Mateno complete
		LVE MCPA 570
		Lontrel advanced

Table 2. Active ingredients and chemical loading (g/L) for products used.

Herbicide	Active 1		Active 2		Active 3		Type
Treflan	Trifluralin	480 g/L					EC
Overwatch	Bixlozone	400 g/L					SC
Paraquat	Paraquat	250 g/L					SL
Mateno complete	Aclonifen	400 g/L	Diflufenican	66 g/L	Pyroxasulfone	100 g/L	SC
LVE MCPA 570	MCPA	570 g/L					EC
Lontrel advanced	Clopyralid	600 g/L					SC

Lodging Index

Lodging index is derived from % area of the plot lodged on a scale of 0-100 multiplied by the degree of lodging on a scale of 0 – 5 scale with 0 being upright and 5 being completely flat. For example a plot with 100% of the plot standing upright would have a lodging index of 0. If 84% of the plot was lodged to a severity degree of 3 (halfway lodged to the ground), the lodging index would be 252. If 100% of the plot was completely flat on the ground, the lodging index would be 500.

WA Crop Technology Centre

Frankland River, Western Australia

Sown: 29 April 2023
Harvested: 20 Nov 23 (B23-03, B23-04); 20 Nov 23 (on-time)/ 13 Dec 23 (delayed) (B23-05)
Rotation position: 2022 Canola
Soil type: Forest gravel loam
Nitrogen 0-60cm: 83kg N/ha
Colwell P (ppm) 0-10cm: 43 mg/kg
pH ($CaCl_2$) 0-10cm: 5.9
Organic Carbon (%) 0-10cm: 2.7 %

Trial 1. HYC Barley G.E.M Trial Series (FAR WAA B23-03)

Key points:

- *The 2023 G.E.M trial looked to investigate the agronomic and economic influence of four management approaches- 'low' input (minimalist approach), 'high' input (no expenses spared), 'strategic' input (tailored approach based on pre-season forecasts/expectations) and 'tactical' (tailored approach based on strategic with in-season adjustment guided by climate and in-season triggers) on 5 varieties (details in table 6).*
- *Drier conditions in September and October reduced yield potential and grain quality particularly in crops flowering later in the season. On average the longer season spring barley Laureate was lower yielding (5.91t/ha) than the other varieties. While the best performing, quicker developing cultivars Rosalind and Neo yielded on average 6.66t/ha (Table 1).*
- *In contrast to 2022, barley varieties in 2023 that developed quicker were the ones that eventually went on to yield higher. With higher-than-average maximum temperatures in August, September and October and higher-than average minimum temperatures in September and October, photothermal quotient (PTQ) yield potential based on solar radiation and temperature was reduced.*
- *Grain yields of the highest yielding barleys (approx. 6t/ha) were almost 1t/ha higher than highest yielding wheats (5t/ha) sown at the same time, on the same site.*
- *There was significant interaction between cultivar and management level on final grain yields. Both Neo and Rosalind yielded higher under high input where extra nitrogen, PGR and fungicide input was used. Rosalind performed best under tactical input, where seasonal triggers were used to determine inputs and Neo performed best under strategic input where the initial tailored input plan was adhered to. (Table 1).*
- *Economic analysis of the GEM trial showed that the 2023 season on average better suited a strategic or tactical management approach in barley. Malt quality was not necessarily achieved where more inputs were used and therefore did not justify additional spending if similar yields were achieved under strategic or tactical inputs (Figure 1).*

Treatments:

Five cultivars (RGT Planet, Rosalind, Laureate, Minotaur and Neo) were tested under four different management programs:

1. Low Input- Two units of fungicide based on Tilt 500EC (propiconazole) applied at 500mL/ha (250g ai/ha) and Opus 125 SC (epoxiconazole 125g/L) applied at 500mL/ha (62.5 g ai/ha) and 125kg N/ha.
2. High Input- Four units of fungicide (Systiva seed treatment plus foliar fungicides GS31, GS39, GS59), 175kg N/ha, PGR.
3. HYC Strategic Input – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 6.

Table 1. Influence of management strategy and cultivar on grain yield (t/ha). Management inputs outlined in Table 6.

		Yield (t/ha)									
		Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1.	**RGT Planet**	5.75	k	6.13	ghi	6.25	f-i	6.21	ghi	**6.09**	**c**
2.	**Rosalind**	6.31	e-h	6.76	abc	6.63	bcd	6.92	a	**6.66**	**a**
3.	**Laureate**	5.83	jk	6.08	hij	5.99	ijk	5.74	k	**5.91**	**d**
4.	**Minotaur**	6.39	d-g	6.05	hij	6.89	ab	6.54	cde	**6.47**	**b**
5.	**Neo**	6.52	c-f	6.77	abc	6.83	ab	6.51	c-f	**6.66**	**a**
Mean		**6.16**	**b**	**6.36**	**ab**	**6.52**	**a**	**6.38**	**a**	**6.35**	
LSD Cultivar P=0.05				0.137			**P Value**			<0.001	
LSD Management P=0.05				0.217			**P Value**			0.030	
LSD Cultivar x Man. P=0.05				0.274			**P Value**			<0.001	

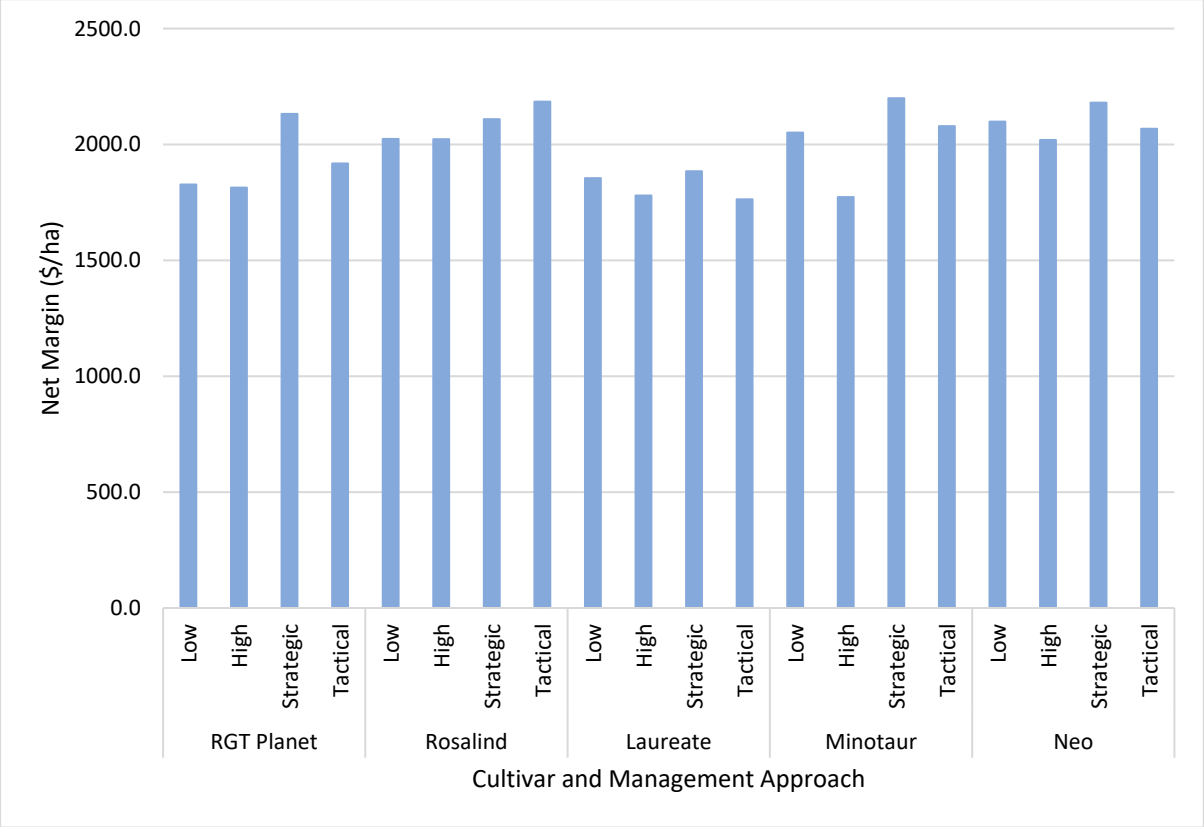

Figure 1. Influence of management and cultivar on net margin ($/ha, total income from grain minus variable cost of fungicides, nitrogen, PGRs and application costs). Costings based on Urea- $468/ t, Systiva- $32.02/ha, Tilt- $1.58/ha, Prosaro- $16.88/ha, Opus- $17.53/ha, Aviator Xpro- $29.23/ha, Moddus Evo- $16.99/ha, Spreader application- $9.18/ha, boom application- $16.20/ha, Pl1- $357/t & BAR1- $347/t. Other costs such as seed sourcing and sowing, insurance, herbicides, insecticides, harvesting, insurance and MAP were not taken into consideration in this analysis as they were constant regardless of the management strategy used.

Table 2. Influence of management strategy and cultivar on protein (%).

	Protein (%)			
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
1. RGT Planet	12.1 -	12.5 -	11.7 -	12.6 -	**12.2 -**
2. Rosalind	12.2 -	13.1 -	12.2 -	12.7 -	**12.6 -**
3. Laureate	12.5 -	12.6 -	12.1 -	12.7 -	**12.5 -**
4. Minotaur	12.0 -	13.5 -	11.9 -	12.4 -	**12.5 -**
5. Neo	11.6 -	12.6 -	11.9 -	12.6 -	**12.1 -**
Mean	**12.1 bc**	**12.9 a**	**11.9 c**	**12.6 a**	**12.4**
LSD Cultivar P=0.05	ns	**P Value**	0.081		
LSD Management P=0.05	0.6	**P Value**	0.015		
LSD Cultivar x Man. P=0.05	ns	**P Value**	0.199		

Table 3. Influence of management strategy and cultivar on test weight (kg/hL).

	Test Weight (kg/hL)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
1. RGT Planet	60.6 -	61.0 -	66.1 -	61.8 -	**62.4 bc**
2. Rosalind	63.4 -	62.4 -	63.8 -	62.7 -	**63.1 b**
3. Laureate	56.3 -	59.1 -	59.9 -	57.6 -	**58.2 d**
4. Minotaur	65.4 -	63.8 -	65.7 -	65.5 -	**65.1 a**
5. Neo	61.6 -	60.6 -	62.7 -	60.9 -	**61.4 c**
Mean	**61.5 -**	**61.4 -**	**63.6 -**	**61.7 -**	**62.0**
LSD Cultivar P=0.05	1.5	**P Value**	<0.001		
LSD Management P=0.05	ns	**P Value**	0.085		
LSD Cultivar x Man. P=0.05	ns	**P Value**	0.329		

Table 4. Influence of management strategy and cultivar on retentions (%).

	Retentions (%)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
1. RGT Planet	79.7 a-d	75.5 cde	80.9 a-d	77.3 b-e	**78.4 b**
2. Rosalind	87.7 abc	82.8 abc	84.9 abc	75.6 cde	**82.8 ab**
3. Laureate	65.8 e	69.2 de	84.4 abc	52.6 f	**68.0 c**
4. Minotaur	88.4 abc	75.8 cde	89.7 ab	83.2 abc	**84.3 ab**
5. Neo	87.8 abc	90.0 ab	86.2 abc	91.0 a	**88.7 a**
Mean	**81.9 ab**	**78.7 bc**	**85.2 a**	**75.9 c**	**80.4**
LSD Cultivar P=0.05	6.47	**P Value**	<0.001		
LSD Management P=0.05	5.12	**P Value**	0.014		
LSD Cultivar x Man. P=0.05	12.95	**P Value**	0.043		

Table 5. Influence of management strategy and cultivar on screenings (%).

	Screenings (%)									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
1. RGT Planet	4.7	bcd	5.1	bc	3.0	cd	4.4	bcd	**4.3**	**b**
2. Rosalind	3.0	cd	4.4	bcd	2.6	cd	4.8	bcd	**3.7**	**bc**
3. Laureate	7.1	b	6.4	b	3.3	cd	11.4	a	**7.1**	**a**
4. Minotaur	2.1	cd	5.2	bc	2.3	cd	3.1	cd	**3.2**	**bc**
5. Neo	3.1	cd	3.1	cd	2.5	cd	1.8	d	**2.6**	**c**
Mean	**4.0**	**a**	**4.8**	**a**	**2.7**	**b**	**5.1**	**a**	**4.2**	
LSD Cultivar P=0.05			1.57			**P Value**			<0.001	
LSD Management P=0.05			1.10			**P Value**			0.004	
LSD Cultivar x Man. P=0.05			3.14			**P Value**			0.042	

Table 6. Trial input and management details.

Sowing date:		**21 April 2023**	
Harvest date:		**20 November 2023**	
Seed rate:		200 seeds/m^2	
Basal fertiliser:	21 Apr	169 kg/ha MAP/MOP (66/33 divide)	
Nitrogen:		**Low Input**	**High Input**
		125kg N/ha	175kg N/ha
		Strategic	**Tactical**
		125kg N/ha	150kg N/ha
PGR:		**Low Input**	**High Input**
	GS31	----	Moddus Evo 0.20 L/ha
		Strategic	**Tactical**
	GS31	----	Laureate Only (High Input)
Fungicide:		**Low Input**	**High Input**
	GS00	----	Systiva
	GS31	Tilt 0.50 L/ha	Prosaro 0.30 L/ha
	GS39	Opus 0.50 L/ha	Aviator Xpro 0.50 L/ha
	GS59	----	Opus 0.50 L/ha
		Strategic	**Tactical**
	GS00	----	See below
	GS31	Prosaro 0.30 L/ha	See below
	GS39	Aviator Xpro 0.50 L/ha	See below
	GS59	----	See below

Tactical Fungicide:

	RGT Planet	**Rosalind**	**Laureate**	**Minotaur**	**Neo**
GS00	Systiva	----	----	----	----
GS31	Prosaro 0.30 L/ha	Prosaro 0.30 L/ha	Tilt 0.50 L/ha	Tilt 0.50 L/ha	Tilt 0.50 L/ha
GS39	Aviator Xpro 0.50 L/ha	Aviator Xpro 0.50 L/ha	Opus 0.50 L/ha	Opus 0.50 L/ha	Opus 0.50 L/ha
GS59	----	----	----	----	----

Table 7. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Systiva	Fluxapyroxad	333 g/L	---	---	FS
Tilt	Propiconazole	500 g/L	---	---	EC
PGR					
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Trial 2. HYC Barley Disease Management (FAR WAA B23-04)

Key points:

- *With wheat disease only found at very low levels across the site, much of the disease story developed in the barley trials at the Frankland River CTC.*
- *Increased areas of the high yielding barley RGT Planet have been sown in the HRZ of WA in recent times and in turn the prevalence of Net Form Net Blotch (NFNB) has increased. RGT Planet is rated SVS to the Oxford virulent strain of NFNB, which is the most common variant of the disease in the Frankland River region.*
- *NFNB, now widespread in both the west and eastern states of Australia, has reduced sensitivity and resistance to DMI and SDHI fungicide chemistry in WA.*
- *Despite the susceptibility of RGT Planet, the dry spring kept levels of the disease to a minimum with just over 10% infection in the untreated on Flag-2 when assessed on the 20 September at early grain fill (Table 2).*
- *Most two, three and four fungicide unit programs were sufficient to control the disease although control only averaged 50%.*
- *Single applications of fungicides showed poorer control, especially in the case of a single application of Tilt 500EC (propiconazole) applied at 250mL/ha (125g ai/ha) which showed no significant difference in severity or incidence when compared to the untreated (Figure 1).*
- *Due to the low levels of disease experienced, there was no yield response to fungicides (Table 1).*

Table 1. Influence of management strategy of barley grain yield (t/ha) and protein (%).

	Treatment				Yield	Protein
	GS00	**GS31**	**GS39-49**	**GS59**	**t/ha**	**%**
1.	---	---	---	---	5.66 -	12.5 -
2.	Systiva	---	---	---	5.59 -	12.0 -
3.	---	Prosaro 300 mL/ha	---	---	5.62 -	12.4 -
4.	---	---	Aviator Xpro 420 mL/ha	---	5.96 -	12.1 -
5.	---	Prosaro 150 mL/ha	Radial 420 mL/ha	---	5.81 -	12.2 -
6.	---	Prosaro 300 mL/ha	Radial 840 mL/ha	---	5.94 -	12.2 -
7.	---	Prosaro 300 mL/ha	Revystar 750 mL/ha	---	6.03 -	12.0 -
8.	---	Revystar 750 mL/ha	Radial 840 mL/ha	---	5.94 -	12.2 -
9.	---	Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	---	6.11 -	12.3 -
10.	---	Aviator Xpro 420 mL/ha	Radial 840 mL/ha	---	6.00 -	12.4 -
11.	Systiva	---	Radial 840 mL/ha	---	5.95 -	12.1 -
12.	Systiva	Prosaro 300 mL/ha	Radial 840 mL/ha	---	6.04 -	12.1 -
13.		Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	Opus 500 mL/ha	6.10 -	11.9 -
14.	Systiva	Prosaro 300 mL/ha	Radial 840 mL/ha	Opus 500 mL/ha	5.98 -	12.5 -
15.	Systiva	Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	Opus 500 mL/ha	6.09 -	12.1 -
16.	--	Tilt 500 250 mL/ha	----	---	5.75 -	12.2 -
				Mean	**5.91**	**12.2**
				LSD P=0.05	ns	ns
				P Value	0.469	0.195

Table 2. Net Form Net Blotch (NFNB) and Spot Form Net Blotch (SFNB) severity (%) and incidence (%) on Flag-2 along with the Green Leaf Retention (GLR), 20 September, GS73.

Treatment	NFNB		SFNB		GLR
	Severity (%)	Incidence (%)	Severity (%)	Incidence (%)	Area (%)
1.	10.5 a	95.0 ab	0.7 a	37.5 a	68.9 f
2.	8.8 abc	100.0 a	0.1 de	5.0 cde	72.8 ef
3.	7.5 a-e	95.0 ab	0.5 b	20.0 b	81.6 cde
4.	6.2 b-f	95.0 ab	0.2 cde	12.5 b-e	88.8 abc
5.	6.5 a-f	95.0 ab	0.3 bcd	22.5 b	83.6 bcd
6.	4.2 def	100.0 a	0.2 de	15.0 bcd	85.6 bcd
7.	5.6 b-f	100.0 a	0.1 de	5.0 cde	88.7 abc
8.	8.3 a-d	100.0 a	0.0 e	2.5 de	83.5 bcd
9.	3.1 f	95.0 ab	0.1 de	10.0 b-e	95.6 a
10.	4.4 def	90.0 abc	0.1 de	5.0 cde	90.6 abc
11.	7.4 a-e	100.0 a	0.1 de	2.5 de	83.1 cd
12.	4.1 ef	90.0 abc	0.0 e	0.0 e	90.5 abc
13.	4.8 c-f	80.0 c	0.3 bcd	17.5 bc	89.8 abc
14.	4.3 def	95.0 ab	0.1 de	10.0 b-e	90.0 abc
15.	4.0 ef	87.5 bc	0.1 de	5.0 cde	92.9 ab
16.	9.6 ab	97.5 ab	0.4 bc	22.5 b	76.2 def
Mean	**6.2**	**94.7**	**0.2**	**12.0**	**85.1**
LSD P=0.05	4.2	10.5	0.2	14.2	9.7
P Value	0.014	0.017	<0.001	<0.001	<0.001

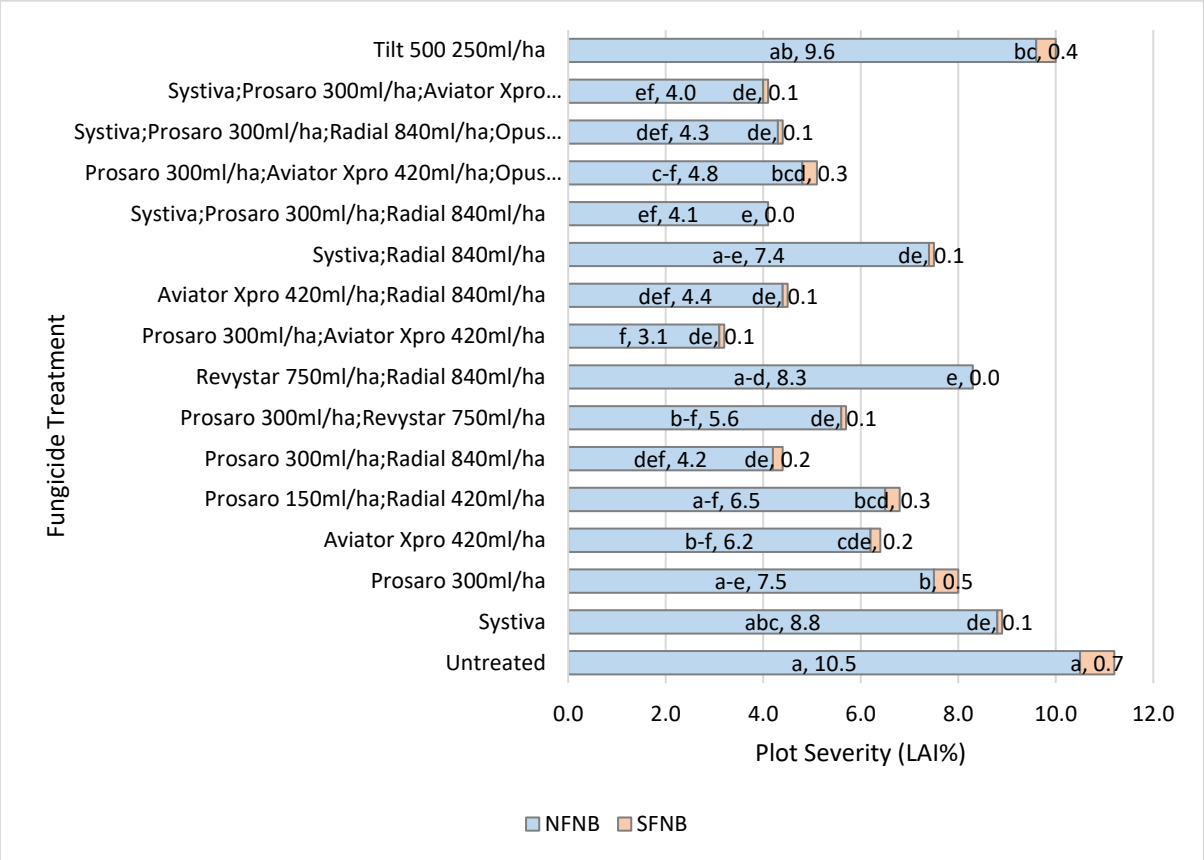

Figure 1. Influence of fungicide treatment on Net Form Net Blotch (NFNB) and Spot Form Net Blotch (SFNB) severity (%LAI) when assessed on Flag-2 at early grain fill (GS73) on 20 September.

Table 3. Net Form Net Blotch (NFNB) and Spot Form Net Blotch (SFNB) severity (%) and incidence (%) on Flag-2 along with the Green Leaf Retention (GLR), 31 August, GS65.

Treatment	NFNB		SFNB		GLR
	Severity (%)	Incidence (%)	Severity (%)	Incidence (%)	Area (%)
1.	4.8 a	96.7 a	0.3 -	20.0 -	93.8 e
2.	2.6 b	90.0 ab	0.1 -	6.7 -	96.1 d
3.	1.5 bcd	70.0 bcd	0.1 -	13.3 -	97.7 abc
4.	2.0 bcd	76.7 abc	0.3 -	20.0 -	97.2 bcd
5.	1.3 bcd	73.3 a-d	0.1 -	10.0 -	97.8 abc
6.	0.6 d	40.0 e	0.1 -	10.0 -	98.9 a
7.	1.4 bcd	73.3 a-d	0.2 -	10.0 -	98.0 abc
8.	1.0 cd	53.3 cde	0.1 -	6.7 -	98.6 ab
9.	0.9 cd	40.0 e	0.3 -	26.7 -	98.4 ab
10.	0.6 d	50.0 de	0.1 -	6.7 -	99.1 a
11.	1.2 bcd	66.7 bcd	0.0 -	3.3 -	98.4 ab
12.	0.8 d	53.3 cde	0.0 -	3.3 -	98.5 ab
13.	0.9 cd	50.0 de	0.2 -	16.7 -	98.5 ab
14.	1.0 cd	60.0 cde	0.0 -	0.0 -	98.4 ab
15.	1.0 cd	60.0 cde	0.1 -	6.7 -	98.7 a
16.	2.3 bc	73.3 a-d	0.1 -	6.7 -	96.7 cd
Mean	**1.5**	**64.2**	**0.1**	**10.4**	**97.8**
LSD P=0.05	1.5	26.0	ns	ns	1.4
P Value	<0.001	0.003	0.060	0.213	<0.001

Table 4. Details of the management levels.

Sowing date:		**29 April 2023**
Harvest date:		**20 November 2023**
Seed Rate:		200 seeds/m^2
Basal Fertiliser:	29 Apr	139 kg/ha MAP/MOP
Seed Treatment:		Vibrance / Cruiser
Nitrogen:	12 Jun	55kg N/ha (20K)
	13 Jul	32kg N/ha
	2 Aug	23kg N/ha
Fungicide:	24 Jul (GS31)	As per treatment list
	13 Aug (GS39-49)	As per treatment list
	31 Aug (GS59)	As per treatment list

Table 5. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC
Systiva	Fluxapyroxad	333 g/L	---	---	FS
Tilt	Propiconazole	500 g/L	---	---	EC

Trial 3. HYC Barley PGR x Harvest Date Interaction (FAR WAA B23-05)

Key points:

- *On average, a delayed harvest led to higher head loss, a higher lodging index and lower yield (Table 1).*
- *There was a significant interaction in yield between variety and PGR management with a negative response to the addition of Ethephon in RGT Planet management, whereas treatments that were solely trinexapac ethyl (Moddus Evo) based gave no response over the untreated. In contrast, PGR management in Leabrook saw the split application of Moddus Evo yield significantly more than the other PGR treatments, however this still did not yield more than the untreated plots (Table 1).*
- *Although not translating to yield, the 'European' approach was the most successful at reducing lodging, with a significantly lower lodging index to the double Moddus Evo, single Moddus Evo and nil PGR treatments (Table 6).*
- *Grain quality differences were largely influenced by variety and harvest date, although on average the 'European' PGR approach did have a statistically negative effect on test weight (Table 3) and retentions (Table 4).*

Treatments:

4 PGR management approaches applied to two cultivars (RGT Planet and Leabrook) and harvested at two harvest dates.

Harvest dates:

1. On Time harvested on the 20 November 2023.
2. Delayed harvested on the 13 December 2023.

Plant growth regulators (PGR) treatments:

1. Untreated.
2. GS31 PGR trinexapac ethyl based (Single Moddus Evo @ 200 mL/ha (50g ai/ha).
3. GS31 + GS37 PGR trinexapac ethyl based (Double Moddus Evo @ 200mL/ha (100g ai/ha).
4. European approach based on GS31 trinexapac ethyl (Moddus Evo @ 200 mL/ha) (50g ai/ha) and at GS37 of Ethephon 720 @500 mL/ha (360g ai/ha).

Table 1. Influence of PGR management strategy, variety and canopy management regime on grain yield (t/ha).

	RGT Planet		Leabrook		Mean	
Variety	5.76	b	6.65	a	6.20	
LSD Variety P=0.05	0.16		**P Value**		<0.001	
Harvest Date x variety						
On time	5.94	-	6.89	-	6.42	a
Delayed (28 days delay)	5.57	-	6.41	-	5.99	b
LSD Harvest Date P=0.05	0.12		**P Value**		0.002	
LSD Harvest Date x Variety P=0.05	ns		**P Value**		0.432	
Canopy Management Regime x Variety						
Untreated	5.99	c	6.66	ab	6.32	ab
GS31 PGR	5.90	c	6.54	b	6.22	b
GS31 + GS37 PGR	6.09	c	6.87	a	6.48	a
GS31 + GS37 PGR (Europe style)	5.05	d	6.52	b	5.79	c
LSD Canopy Management P=0.05	0.18		**P Value**		<0.001	
LSD Variety x Canopy Mgmt P=0.05	0.25		**P Value**		<0.001	
Harvest Date. x Canopy Mgmt. x Variety						
On Time						
Untreated	6.13	-	6.91	-	6.52	-
GS31 PGR	6.15	-	6.88	-	6.51	-
GS31 + GS37 PGR	6.37	-	7.01	-	6.69	-
GS31 + GS37 PGR (Europe style)	5.13	-	6.75	-	5.94	-
Delayed						
Untreated	5.85	-	6.41	-	6.13	-
GS31 PGR	5.65	-	6.20	-	5.92	-
GS31 + GS37 PGR	5.81	-	6.72	-	6.27	-
GS31 + GS37PGR (Europe style)	4.98	-	6.29	-	5.63	-
LSD Harvest Date x Canopy Mgmt P=0.05	ns		**P Value**		0.452	
LSD Harvest Date x Canopy Mgmt x Var. P=0.05	ns		**P Value**		0.388	

Table 2. Influence of PGR management strategy, variety and canopy management regime on protein (%).

	RGT Planet		Leabrook		Mean	
Variety	12.3	a	11.9	b	12.1	
LSD Variety P=0.05	0.3		**P Value**		0.029	
Harvest Date x variety						
On time	12.7	a	11.8	b	12.3	a
Delayed (28 days delay)	11.9	b	12.0	b	12.0	b
LSD Harvest Date P=0.05	0.1		**P Value**		0.002	
LSD Harvest Date x Variety P=0.05	0.4		**P Value**		0.006	
Canopy Management Regime x Variety						
Untreated	11.8	-	11.8	-	11.8	-
GS31 PGR	12.4	-	11.9	-	12.1	-
GS31 + GS37 PGR	12.3	-	11.9	-	12.1	-
GS31 + GS37 PGR (Europe style)	12.6	-	12.2	-	12.4	-
LSD Canopy Management P=0.05	ns		**P Value**		0.053	
LSD Variety x Canopy Mgmt P=0.05	ns		**P Value**		0.437	
Harvest Date. x Canopy Mgmt. x Variety						
On Time						
Untreated	12.2	-	11.8	-	12.0	-
GS31 PGR	13.0	-	11.6	-	12.3	-
GS31 + GS37 PGR	12.8	-	11.8	-	12.3	-
GS31 + GS37 PGR (Europe style)	12.8	-	12.2	-	12.5	-
Delayed						
Untreated	11.4	-	11.9	-	11.6	-
GS31 PGR	11.8	-	12.1	-	12.0	-
GS31 + GS37 PGR	11.9	-	12.0	-	12.0	-
GS31 + GS37PGR (Europe style)	12.5	-	12.2	-	12.3	-
LSD Harvest Date x Canopy Mgmt P=0.05	ns		**P Value**		0.955	
LSD Harvest Date x Canopy Mgmt x Var. P=0.05	ns		**P Value**		0.423	

Table 3. Influence of PGR management strategy, variety and canopy management regime on test weight (Kg/hL).

	RGT Planet	Leabrook	Mean
Variety	57.6 b	60.7 a	59.2
LSD Variety P=0.05	1.4	**P Value**	0.002
Harvest Date x variety			
On time	57.2 -	61.3 -	59.2 -
Delayed (28 days delay)	58.0 -	60.1 -	59.1 -
LSD Harvest Date P=0.05	ns	**P Value**	0.353
LSD Harvest Date x Variety P=0.05	ns	**P Value**	0.160
Canopy Management Regime x Variety			
Untreated	58.5 -	61.8 -	60.1 a
GS31 PGR	57.7 -	61.1 -	59.4 ab
GS31 + GS37 PGR	57.6 -	60.4 -	59.0 bc
GS31 + GS37 PGR (Europe style)	56.7 -	59.6 -	58.1 c
LSD Canopy Management P=0.05	1.0	**P Value**	0.002
LSD Variety x Canopy Mgmt P=0.05	ns	**P Value**	0.906
Harvest Date. x Canopy Mgmt. x Variety			
On Time			
Untreated	57.9 -	62.3 -	60.1 -
GS31 PGR	57.5 -	61.6 -	59.6 -
GS31 + GS37 PGR	57.1 -	60.8 -	58.9 -
GS31 + GS37 PGR (Europe style)	56.4 -	60.4 -	58.4 -
Delayed			
Untreated	59.0 -	61.3 -	60.1 -
GS31 PGR	58.0 -	60.6 -	59.3 -
GS31 + GS37 PGR	58.0 -	60.0 -	59.0 -
GS31 + GS37PGR (Europe style)	57.0 -	58.7 -	57.9 -
LSD Harvest Date x Canopy Mgmt P=0.05	ns	**P Value**	0.895
LSD Harvest Date x Canopy Mgmt x Var. P=0.05	ns	**P Value**	0.980

Table 4. Influence of PGR management strategy, variety and canopy management regime on retention (%).

	RGT Planet	Leabrook	Mean
Variety	75.9 b	94.7 a	85.3
LSD Variety P=0.05	4.2	**P Value**	<0.001
Harvest Date x variety			
On time	72.9 -	95.4 -	84.2 b
Delayed (28 days delay)	78.9 -	94.0 -	86.4 a
LSD Harvest Date P=0.05	1.0	**P Value**	0.007
LSD Harvest Date x Variety P=0.05	ns	**P Value**	0.073
Canopy Management Regime x Variety			
Untreated	77.8 -	94.7 -	86.3 a
GS31 PGR	76.3 -	95.1 -	85.7 a
GS31 + GS37 PGR	80.9 -	94.8 -	87.9 a
GS31 + GS37 PGR (Europe style)	68.6 -	94.1 -	81.3 b
LSD Canopy Management P=0.05	4.3	**P Value**	0.024
LSD Variety x Canopy Mgmt P=0.05	ns	**P Value**	0.063
Harvest Date. x Canopy Mgmt. x Variety			
On Time			
Untreated	73.2 -	95.8 -	84.5 -
GS31 PGR	73.7 -	95.3 -	84.5 -
GS31 + GS37 PGR	79.6 -	94.7 -	87.1 -
GS31 + GS37 PGR (Europe style)	65.4 -	96.0 -	80.7 -
Delayed			
Untreated	82.4 -	93.7 -	88.1 -
GS31 PGR	79.0 -	95.0 -	87.0 -
GS31 + GS37 PGR	82.2 -	95.0 -	88.6 -
GS31 + GS37PGR (Europe style)	71.9 -	92.2 -	82.0 -
LSD Harvest Date x Canopy Mgmt P=0.05	ns	**P Value**	0.942
LSD Harvest Date x Canopy Mgmt x Var. P=0.05	ns	**P Value**	0.697

Table 5. Influence of PGR management strategy, variety and canopy management regime on screenings (%).

	RGT Planet	Leabrook	Mean
Variety	5.3 a	1.4 b	3.4
LSD Variety P=0.05	0.8	**P Value**	<0.001
Harvest Date x variety			
On time	6.1 a	1.4 c	3.7 a
Delayed (28 days delay)	4.5 b	1.4 c	2.9 b
LSD Harvest Date P=0.05	0.3	**P Value**	0.003
LSD Harvest Date x Variety P=0.05	1.1	**P Value**	0.050
Canopy Management Regime x Variety			
Untreated	5.1 -	1.4 -	3.2 -
GS31 PGR	5.1 -	1.4 -	3.2 -
GS31 + GS37 PGR	4.0 -	1.6 -	2.8 -
GS31 + GS37 PGR (Europe style)	6.9 -	1.4 -	4.1 -
LSD Canopy Management P=0.05	ns	**P Value**	0.128
LSD Variety x Canopy Mgmt P=0.05	ns	**P Value**	0.069
Harvest Date. x Canopy Mgmt. x Variety			
On Time			
Untreated	6.5 -	1.4 -	4.0 -
GS31 PGR	5.7 -	1.4 -	3.6 -
GS31 + GS37 PGR	4.5 -	1.5 -	3.0 -
GS31 + GS37 PGR (Europe style)	7.5 -	1.3 -	4.4 -
Delayed			
Untreated	3.6 -	1.4 -	2.5 -
GS31 PGR	4.5 -	1.3 -	2.9 -
GS31 + GS37 PGR	3.5 -	1.6 -	2.6 -
GS31 + GS37PGR (Europe style)	6.2 -	1.4 -	3.8 -
LSD Harvest Date x Canopy Mgmt P=0.05	ns	**P Value**	0.770
LSD Harvest Date x Canopy Mgmt x Var. P=0.05	ns	**P Value**	0.820

Table 6. Canopy management and harvest date effect on lodging index (0-500) and brackling (%) across two varieties (RGT Planet and Leabrook).

	Treatment	Lodging Index (0-500)		Brackling %	
		RGT Planet	Leabrook	RGT Planet	Leabrook
On Time	Untreated	22.5 -	105.0 -	0.0 -	0.0 -
	GS31	21.3 -	60.0 -	0.0 -	0.0 -
	GS31 + GS37	5.0 -	32.5 -	0.0 -	0.0 -
	European GS31	0.0 -	0.0 -	0.0 -	0.0 -
	Cul. x man. Mean	**12.2 d**	**49.4 c**	**0.0 -**	**0.0 -**
Delayed	Untreated	125.0 -	275.0 -	15.0 -	15.0 -
	GS31	160.0 -	250.0 -	7.5 -	4.3 -
	GS31 + GS37	130.0 -	225.0 -	1.3 -	0.0 -
	European GS31	70.0 -	175.0 -	0.0 -	0.0 -
	Cul. x man. Mean	**121.3 b**	**231.3 a**	**5.9 -**	**4.8 -**
	Cultivar Mean	**66.7 b**	**140.3 a**	**3.0 -**	**2.4 -**
Grand Mean		**103.5**		**2.7**	
LSD P=0.05		ns		ns	
P Value		0.054		0.989	

*Lodging index definition in 'Appendix. HYC Barley WA Crop Technology Centre'.

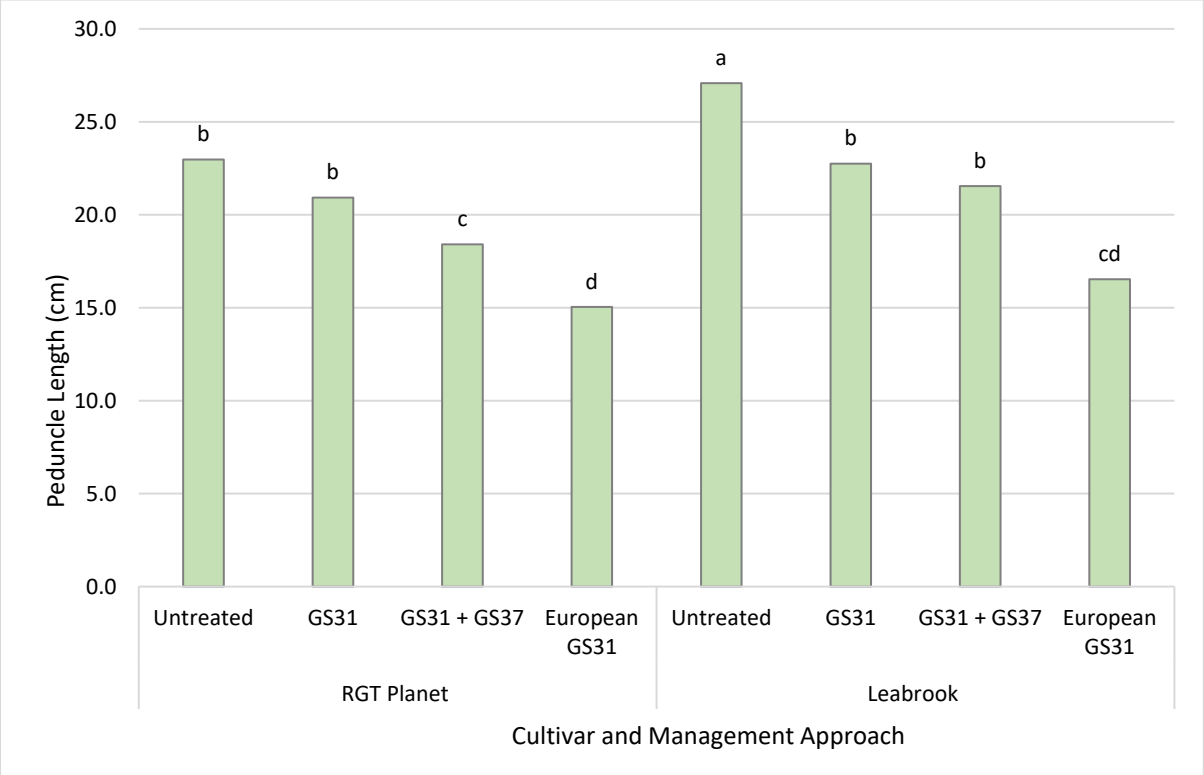

Figure 1. Canopy management and harvest date effect on peduncle length across two varieties (RGT Planet and Leabrook). (P Value = <0.001, LSD = 2.5).

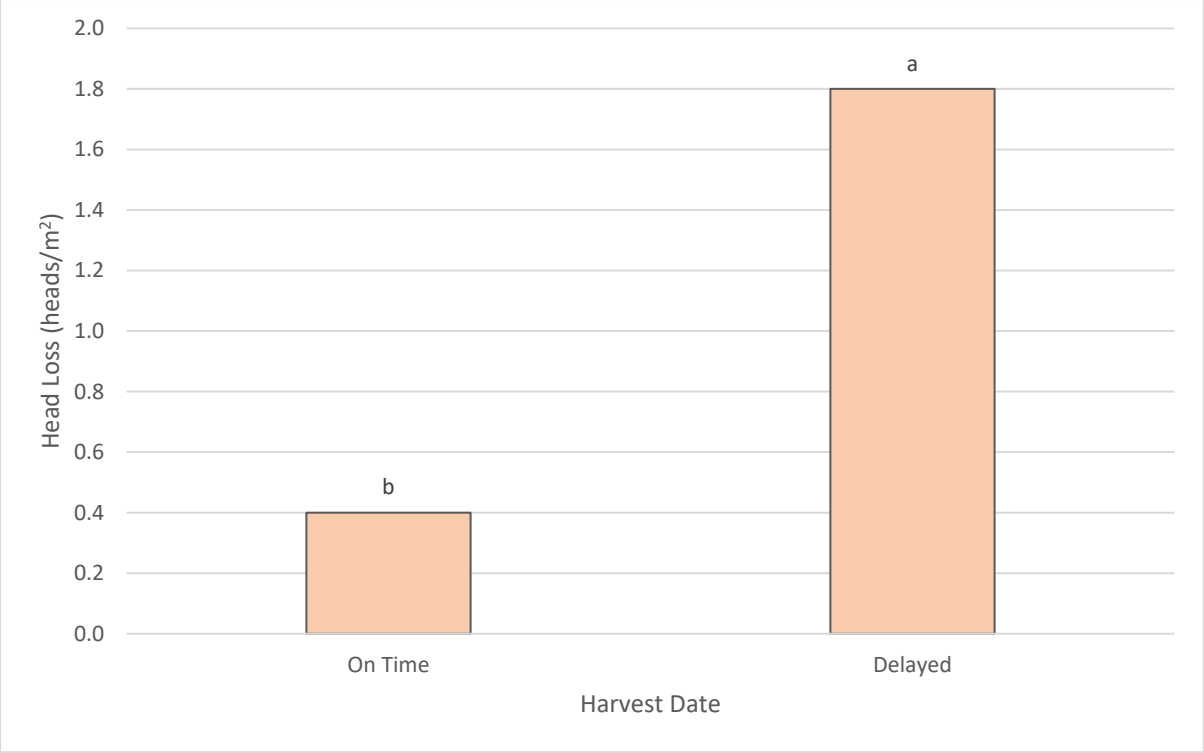

Figure 2. Harvest date effect on head loss (heads/m^2– heads on ground post-harvest) across two varieties. All differences are non-significant. (P Value = <0.001, LSD = 0.7).

Table 7. Trial input and management details.

Sowing date:		**29 April 2023**	
Harvest date:		**20 November 2023 / 13 December 2023**	
Seed rate:		200 seeds/m^2	
Basal fertiliser:	29 Apr	139 kg/ha MAP and MOP	
Fungicide:	24 Jul	Prosaro 300 mL/ha	
	GS39	Aviator Xpro 500 mL/ha	
	31 Aug	Radial 840 mL/ha	
PGR:		**Untreated**	**Single PGR**
	GS31	---	Moddus Evo 0.2 L/ha
	GS37	---	---
		Split PGR	**European approach**
	GS31	Moddus Evo 0.2 L/ha	Moddus 0.2 L/ha
	GS37	Moddus Evo 0.2 L/ha	Ethephon 720 0.50 L/ha

Table 8. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Ethephon 720	Ethephon	720 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Appendix. HYC Barley WA Crop Technology Centre

The following details apply to all Western Australian barley trials unless specified differently.

Table 1. Overall inputs

	Date applied	Product
Herbicide:	29 Apr	Triflurex 2L/ha
		Overwatch 1.25L/ha
Nitrogen:	12 Jun	55kg N/ha (20K)
	13 Jul	32kg N/ha
	2 Aug	23kg N/ha

Table 2. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Type
Herbicide			
TriflurX	Trifluralin	480 g/L	EC
Overwatch	Bixlozone	400 g/L	SC

Lodging Index

Lodging index is derived from % area of the plot lodged on a scale of 0-100 multiplied by the degree of lodging on a scale of 0 – 5 scale with 0 being upright and 5 being completely flat. For example a plot with 100% of the plot standing upright would have a lodging index of 0. If 84% of the plot was lodged to a severity degree of 3 (halfway lodged to the ground), the lodging index would be 252. If 100% of the plot was completely flat on the ground, the lodging index would be 500.

Tasmania Crop Technology Centre

Hagley, Tasmania

Sown: 6 September 2023
Harvested: 25 Jan 24 (B23-03); 24 Jan 24 (B23-04); 24 Jan 24 (on-time)/28 Feb 24 (delayed) (B23-05)
Rotation position: 2022 poppies
Soil type: Chromosol
Nitrogen 0 – 60cm: 110.4kg N/ha
Colwell P (ppm) 0-10cm: 225.9
pH ($CaCl^2$) 0-10cm: 6.31
Organic Carbon (%) 0-10cm: 1.87
Irrigation: 94mm

Trial 1. HYC Barley G.E.M Trial Series (FAR TAS B23-03)

Key points:

- *In contrast to HYC trials conducted on the mainland, this trial (and the entire HYC Tasmanian barley trial series) were spring sown and irrigated.*
- *The 2023 G.E.M trial looked to investigate the agronomic and economic influence of four management approaches- 'low' input (minimalist approach), 'high' input (no expenses spared), 'strategic' input (tailored approach based on pre-season forecasts/expectations) and 'tactical' (tailored approach based on strategic with in-season adjustment guided by climate and in-season triggers) on 5 barley varieties and 1 spring wheat comparison (details in table 10).*
- *Given the minimal disease pressure recorded in previous seasons, and seen again in 2023 (Figure 2), 'low' input was grown without any fungicides.*
- *There was an interaction between variety and management however this is only likely to have been due to the inclusion of RockStar wheat into the trial. No barley variety responded differently to a change in management approach, although there were significant increases in yield for RockStar where higher inputs (likely fungicides) were used in the presence of high stripe rust infection (Figure 3).*
- *The highest yielding cultivars were Neo, Laureate and RGT Planet, which in this spring environment are considered slower developing varieties due to their photoperiod insensitivity. Quicker developing cultivars Rosalind and Minotaur yielded less in comparison however still achieved an average of 10.96t/ha and 9.77t/ha respectively (Table 1).*
- *Spring sown barley varieties consistently produced harvest index (HI) figures of over 50%, with Laureate and Neo producing HI results over 60% (Figure 6). These figures a well over HI averages achieved at any of the mainland autumn sown HYC barley trials.*
- *Unlike the equivalent trials on the mainland, several treatments achieved malt standard grain quality. Both RGT Planet and Neo under low, tactical and strategic managements, as well as Laureate under low, all achieved grain quality parameters to go malting quality. Where extra nitrogen had been applied to high input plots, protein levels became too high. The quicker developing Minotaur, which is currently undergoing Barley Australia malt accreditation, also did not produce proteins within malt range (Table 2).*
- *The wheat comparison treatment RockStar saw the highest partial net margin from the high input treatment, where increased investment in fungicide input was justified. In stark contrast the low input treatment, with low operational costs and average yields only 0.2t/ha or less lower than other managements, was the most profitable for Neo, RGT Planet and Rosalind (Table 7).*

Treatments:

Six cultivars (RGT Planet, Rosalind, Laureate, Minotaur, Neo and RockStar (wheat)) were tested under four different management programs;

1. Low Input- no fungicide, no PGR and 92kgN/ha.
2. High Input- Four units of fungicide (Systiva seed treatment plus foliar fungicides GS31, GS39, GS59), 232kg N/ha, PGR.
3. HYC Strategic Input – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 8.

Table 1. Influence of management strategy and cultivar on grain yield (t/ha).

	Yield (t/ha)									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT Planet	11.50	abc	11.62	abc	11.26	a-d	11.28	a-d	**11.41**	**bc**
Rosalind	10.99	b-e	10.87	cde	11.03	b-e	10.97	b-e	**10.96**	**c**
Laureate	11.59	abc	11.32	a-d	11.91	ab	12.09	a	**11.73**	**ab**
Minotaur	9.58	fgh	9.67	fgh	10.09	efg	9.73	fgh	**9.77**	**d**
Neo	11.79	abc	12.06	a	12.16	a	12.25	a	**12.06**	**a**
RockStar (Wheat)	4.72	i	10.31	def	9.11	gh	8.84	h	**8.24**	**e**
Mean	**10.03**	**b**	**10.97**	**a**	**10.93**	**a**	**10.86**	**a**	**10.70**	
LSD Cultivar P=0.05				0.51			**P Value**		<0.001	
LSD Management P=0.05				0.64			**P Value**		0.026	
LSD Cultivar x Man. P=0.05				1.01			**P Value**		<0.001	

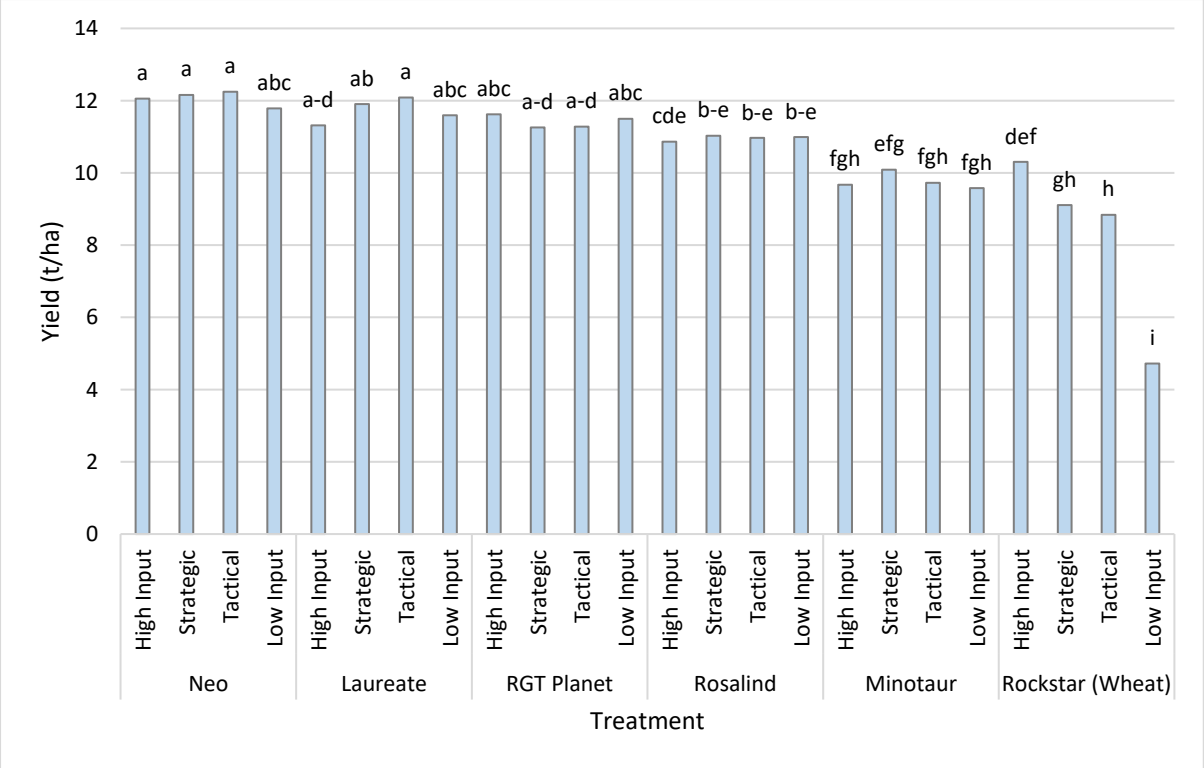

Figure 1. Influence of management strategy and cultivar on grain yield (t/ha).

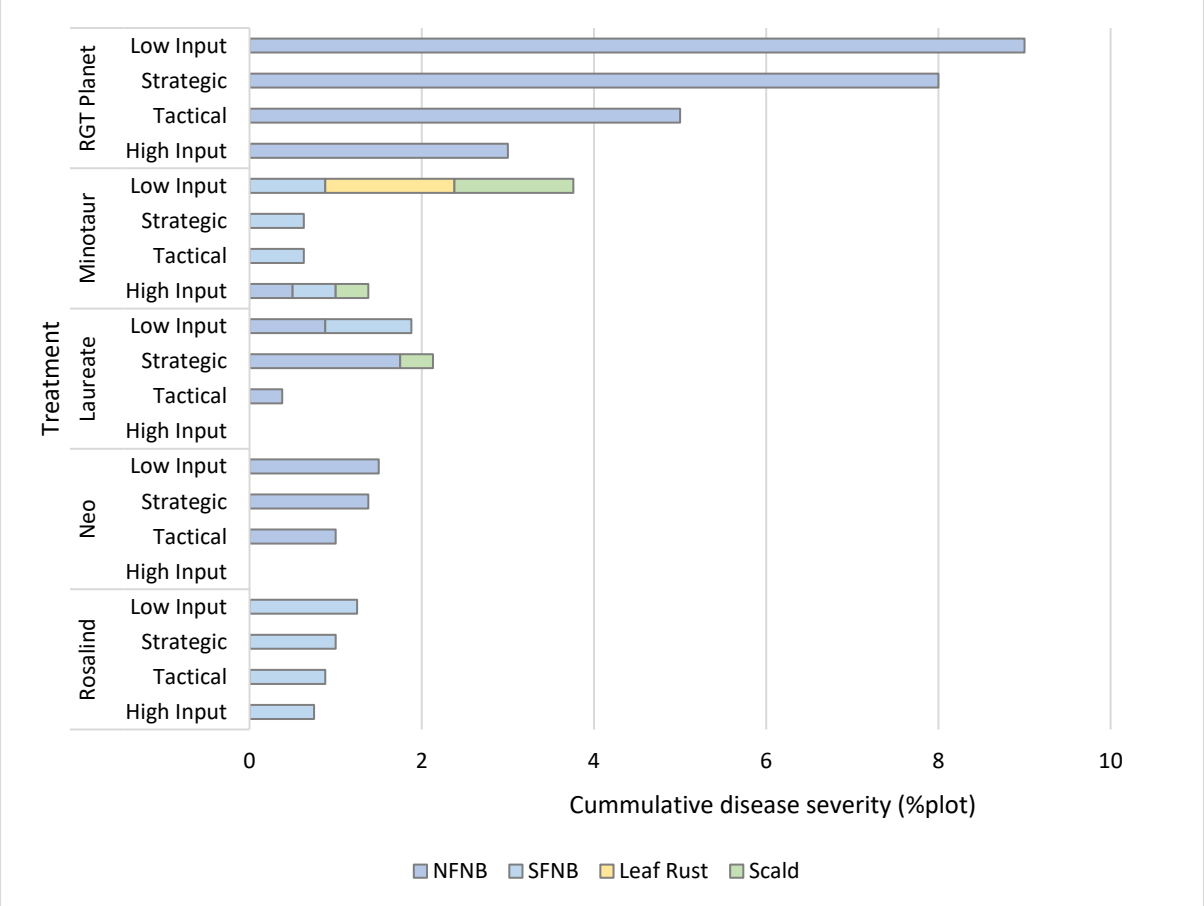

Figure 2. Influence of management strategy and cultivar on disease severity (%) of net form net blotch (NFNB), spot form net blotch (SFNB), leaf rust and scald at GS71 with attached yields, 6 December.

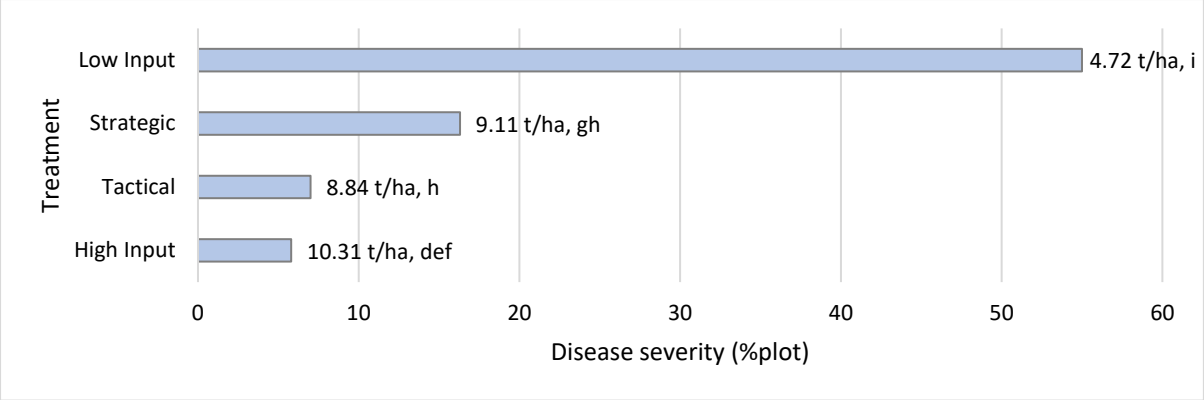

Figure 3. Influence of management strategy on disease severity (%) of stripe rust on wheat variety RockStar with attached yields, GS71, 6 December.

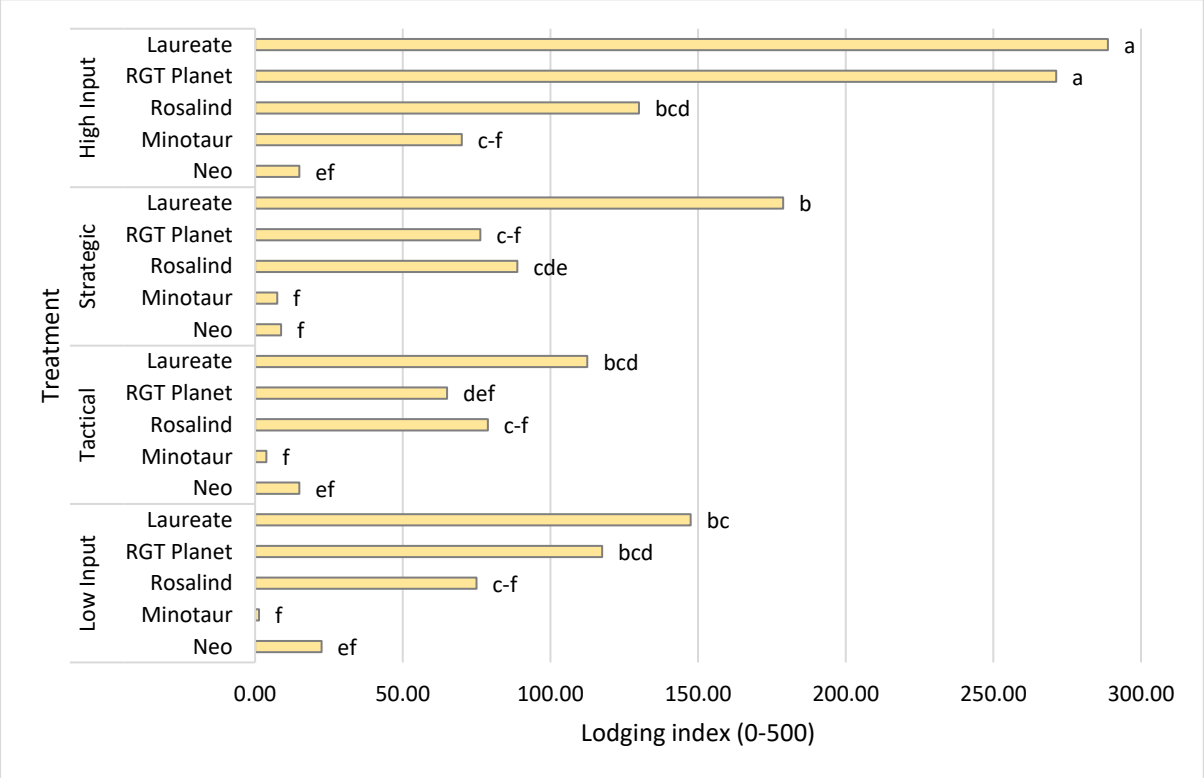

Figure 4. Influence of management strategy and barley variety on lodging index, GS99, 24 January. *Lodging index definition in 'Appendix. HYC Barley TAS Crop Technology Centre'.

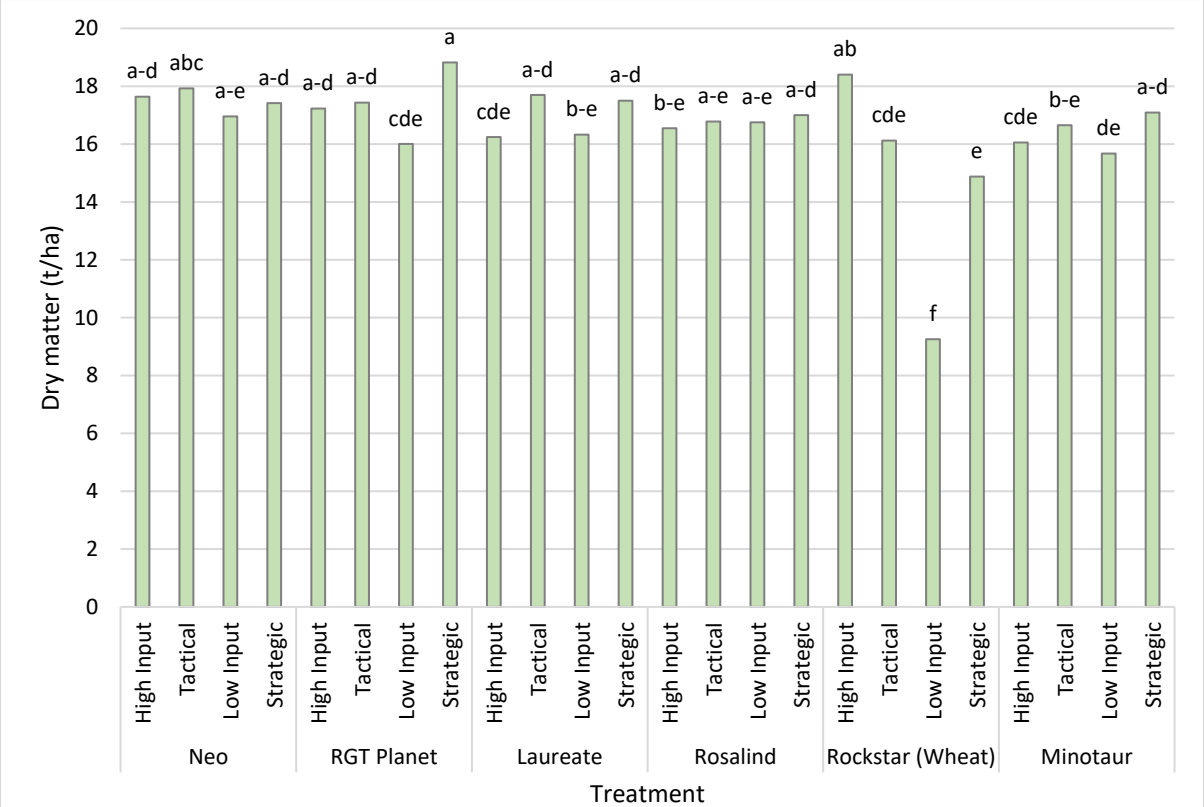

Figure 5. Influence of management strategy and variety on dry matter (t/ha) calculated with outsiders excluded, GS99, 24 January.

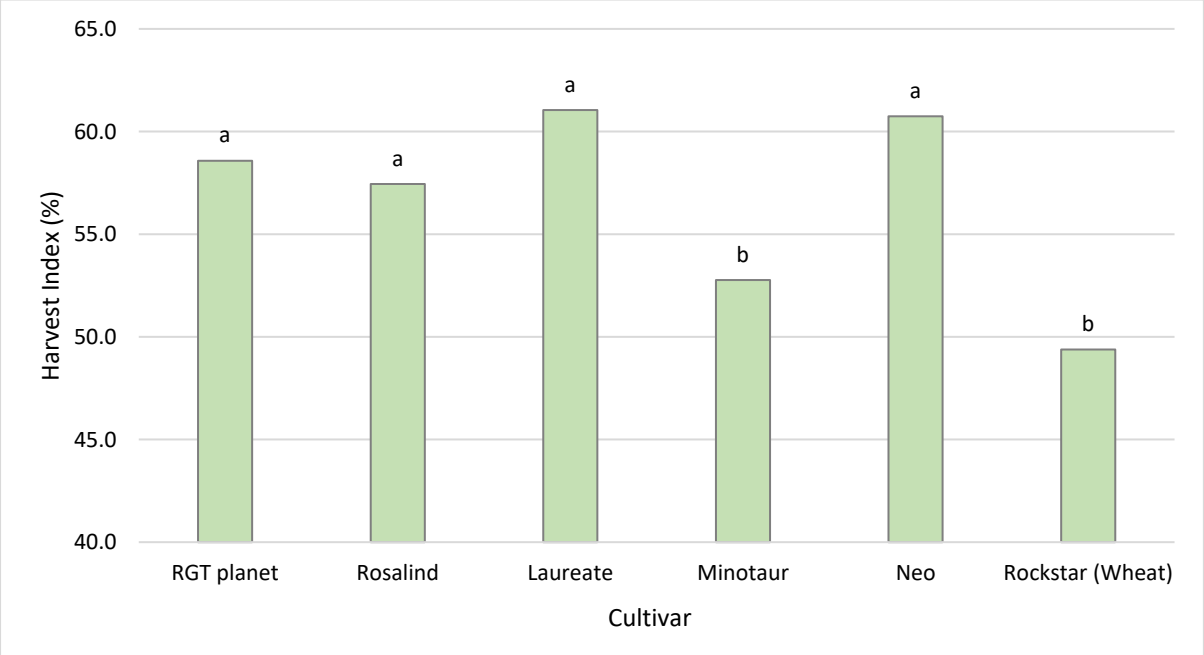

Figure 6. Influence of variety on harvest index (%).

Table 2. Influence of management strategy and cultivar on grain protein (%).

	Protein (%)									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT planet	11.1	-	12.2	-	11.1	-	11.2	-	**11.4**	**e**
Rosalind	11.9	-	12.7	-	12.0	-	12.1	-	**12.2**	**b**
Laureate	11.6	-	12.2	-	11.8	-	11.6	-	**11.8**	**c**
Minotaur	12.3	-	13.1	-	12.7	-	12.2	-	**12.6**	**a**
Neo	11.4	-	12.2	-	11.4	-	11.4	-	**11.6**	**cd**
RockStar (Wheat)	11.3	-	12.2	-	11.4	-	11.3	-	**11.5**	**de**
Mean	**11.6**	**b**	**12.4**	**a**	**11.7**	**b**	**11.6**	**b**	**11.8**	
LSD Cultivar P=0.05			0.2			**P Value**			<0.001	
LSD Management P=0.05			0.2			**P Value**			<0.001	
LSD Cultivar x Man. P=0.05			ns			**P Value**			0.779	

Table 3. Influence of management strategy and cultivar on test weight (kg/hL).

	Test Weight (kg/hL)									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT planet	66.3	d-g	66.2	d-g	66.9	de	66.5	def	**66.5**	**bc**
Rosalind	66.5	def	66.4	d-g	66.0	d-g	66.2	d-g	**66.3**	**bc**
Laureate	65.6	d-g	65.7	d-g	64.9	fg	64.6	g	**65.2**	**d**
Minotaur	66.0	d-g	65.5	efg	65.4	efg	66.1	d-g	**65.7**	**cd**
Neo	66.7	def	67.0	de	66.8	de	67.3	d	**66.9**	**b**
RockStar (Wheat)	70.4	c	78.0	a	75.7	b	79.1	a	**75.8**	**a**
Mean	**66.9**	**b**	**68.1**	**a**	**67.6**	**a**	**68.3**	**a**	**67.7**	
LSD Cultivar P=0.05			0.9			**P Value**			<0.001	
LSD Management P=0.05			0.7			**P Value**			0.006	
LSD Cultivar x Man. P=0.05			1.9			**P Value**			<0.001	

Table 4. Influence of management strategy and cultivar on grain retention (%).

	Retentions (%)									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT planet	94.4	-	94.9	-	95.6	-	95.4	-	**95.1**	**c**
Rosalind	93.0	-	91.6	-	93.7	-	93.3	-	**92.9**	**d**
Laureate	96.5	-	96.3	-	95.6	-	95.7	-	**96.0**	**b**
Minotaur	94.7	-	94.0	-	94.8	-	95.2	-	**94.7**	**c**
Neo	96.8	-	97.1	-	96.9	-	97.2	-	**97.0**	**a**
Mean	**95.1**	**-**	**94.8**	**-**	**95.3**	**-**	**95.4**	**-**	**95.1**	
LSD Cultivar P=0.05			0.6			**P Value**			<0.001	
LSD Management P=0.05			ns			**P Value**			0.726	
LSD Cultivar x Man. P=0.05			ns			**P Value**			0.159	

Table 5. Influence of management strategy and cultivar on grain screenings (%).

	Screenings (%)									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT planet	1.3	e-h	1.4	d-g	1.1	fgh	1.3	e-h	**1.3**	**c**
Rosalind	1.9	bcd	2.2	b	1.6	cde	1.9	bcd	**1.9**	**b**
Laureate	1.1	fgh	1.3	e-h	1.3	e-h	1.4	d-g	**1.3**	**c**
Minotaur	1.7	cde	2.2	b	1.9	bcd	1.7	cde	**1.9**	**b**
Neo	1.1	fgh	0.9	gh	0.9	gh	0.9	h	**0.9**	**d**
RockStar (Wheat)	4.4	a	1.6	def	2.1	bc	1.7	cde	**2.4**	**a**
Mean	**1.9**	**-**	**1.6**	**-**	**1.5**	**-**	**1.5**	**-**	**1.6**	
LSD Cultivar P=0.05			0.3			**P Value**			<0.001	
LSD Management P=0.05			ns			**P Value**			0.083	
LSD Cultivar x Man. P=0.05			0.5			**P Value**			<0.001	

Table 6. Influence of management strategy and cultivar on crop parameters at harvest – harvested 25 January.

Cultivar	**Dry Matter* (t/ha)**		**Lodging (0-500)**		**Brackling (%)**	
RGT planet	17.37	ab	132.5	b	17.2	a
Rosalind	16.77	ab	93.1	b	11.9	b
Laureate	16.94	ab	181.9	a	10.0	bc
Minotaur	16.37	b	20.6	c	8.4	bc
Neo	17.48	a	15.3	c	5.6	c
RockStar (Wheat)	14.66	c	0.0	c	-	-
LSD P=0.05	1.05		39.6		4.8	
P Value	<0.001		<0.001		<0.001	
Management						
Low Input	15.16	b	60.6	-	15.5	-
High Input	17.02	a	129.2	-	9.8	-
Strategic	17.12	a	60.0	-	9.3	-
Tactical	17.10	a	45.8	-	8.0	-
LSD P=0.05	1.5		ns		ns	
P Value	0.048		0.091		0.072	
Cultivar x Management						
LSD P=0.05	2.10		79.3		9.6	
P Value	<0.001		0.023		0.137	

**outliers excluded in dry matter results.*

Table 7. Influence of management strategy and cultivar on system profitability.

Fungicide strategy	Chemical costs + Application costs	Fertiliser costs + Application costs	Total (N, F, PGR) costs & application	Yield	Bin Grade	Price	Income	Margin
	$/ha	$/ha	$/ha	t/ha		$/t	$/ha	$/ha
Laureate								
Low Input	$0.00	$130.00	$130.00	11.59	BAR1	$347.00	$3,674.98	$3,544.98
High Input	$115.71	$322.61	$438.32	11.32	BAR1	$317.00	$3,586.86	$3,148.54
Strategic	$41.75	$231.30	$273.06	11.91	BAR1	$317.00	$3,773.89	$3,500.83
Tactical	$69.98	$130.00	$199.98	12.09	BAR1	$317.00	$3,831.90	$3,631.92
Minotaur								
Low Input	$0.00	$130.00	$130.00	9.58	BAR1	$317.00	$3,036.23	$2,906.23
High Input	$115.71	$322.61	$438.32	9.67	BAR1	$317.00	$3,066.34	$2,628.02
Strategic	$41.75	$231.30	$273.06	10.09	BAR1	$317.00	$3,197.90	$2,924.84
Tactical	$62.09	$231.30	$293.39	9.73	BAR1	$317.00	$3,082.83	$2,789.44
Neo								
Low Input	$0.00	$130.00	$130.00	11.79	BAR1	$347.00	$3,735.85	$3,605.85
High Input	$115.71	$322.61	$438.32	12.06	BAR1	$317.00	$3,821.44	$3,383.12
Strategic	$41.75	$231.30	$273.06	12.16	BAR1	$347.00	$3,854.72	$3,581.66
Tactical	$52.99	$231.30	$284.30	12.25	BAR1	$347.00	$3,882.62	$3,598.32
RGT Planet								
Low Input	$0.00	$130.00	$130.00	11.50	MALT	$347.00	$3,989.81	$3,859.81
High Input	$115.71	$322.61	$438.32	11.62	BAR1	$317.00	$3,684.49	$3,246.17
Strategic	$41.75	$231.30	$273.06	11.26	MALT	$347.00	$3,906.53	$3,633.47
Tactical	$62.09	$231.30	$293.39	11.28	MALT	$347.00	$3,914.16	$3,620.77
Rosalind								
Low Input	$0.00	$130.00	$130.00	10.99	BAR1	$317.00	$3,484.78	$3,354.78
High Input	$115.71	$322.61	$438.32	10.87	BAR1	$317.00	$3,444.21	$3,005.89
Strategic	$41.75	$231.30	$273.06	11.03	BAR1	$317.00	$3,495.88	$3,222.82
Tactical	$52.99	$231.30	$284.30	10.97	BAR1	$317.00	$3,476.86	$3,192.56
RockStar (wheat)								
Low Input	$0.00	$130.00	$130.00	4.72	FEED	$307.00	$1,449.04	$1,319.04
High Input	$115.71	$322.61	$438.32	10.31	APW1	$376.00	$3,874.68	$3,436.36
Strategic	$41.75	$231.30	$273.06	9.11	APG1	$327.00	$2,978.97	$2,705.91
Tactical	$98.72	$231.30	$330.03	8.84	APW1	$376.00	$3,323.84	$2,993.81

Figure in green = most profitable, figures in red= least profitable. See table 8 for complete pricing information. Other costs such as seed sourcing and sowing, insurance, herbicides, insecticides, harvesting, insurance and MAP were not taken into consideration in this analysis as they were constant regardless of the management strategy used.

Table 8. Input costs in economic analysis.

Product	Product type	Price
Radial	Fungicide	$31.71/L
Opus	Fungicide	$35.06/L
Prosaro	Fungicide	$56.25/L
Aviator Xpro	Fungicide	$58.46/L
Moddus Evo	PGR	$84.95/L
Urea	Fertiliser	$0.60/Kg

Barley price (BAR1: $317.00) as of 16 February 2024 based off Geelong GrainCorp and wheat price (FEED: $307/t) as of 1 February 2024 based off Geelong GrainCorp Contractor rates factored in for analysis. Other costs such as seed sourcing and sowing, harvesting, insurance and MAP were not taken into consideration in this analysis as they were constant regardless of the management strategy used.

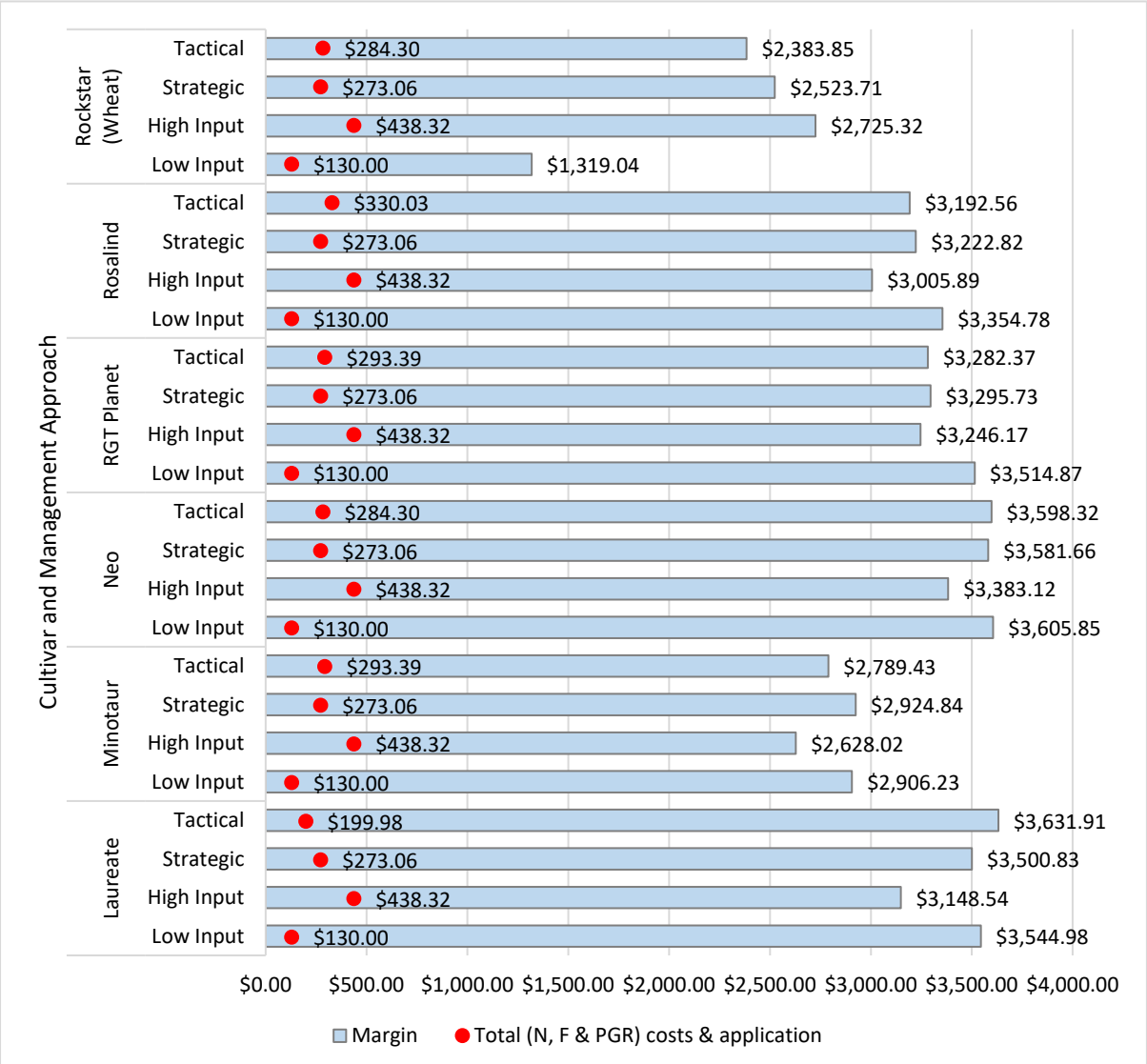

Figure 7. Influence of management strategy and cultivar on system profitability. Value outside the bar denotes margin.

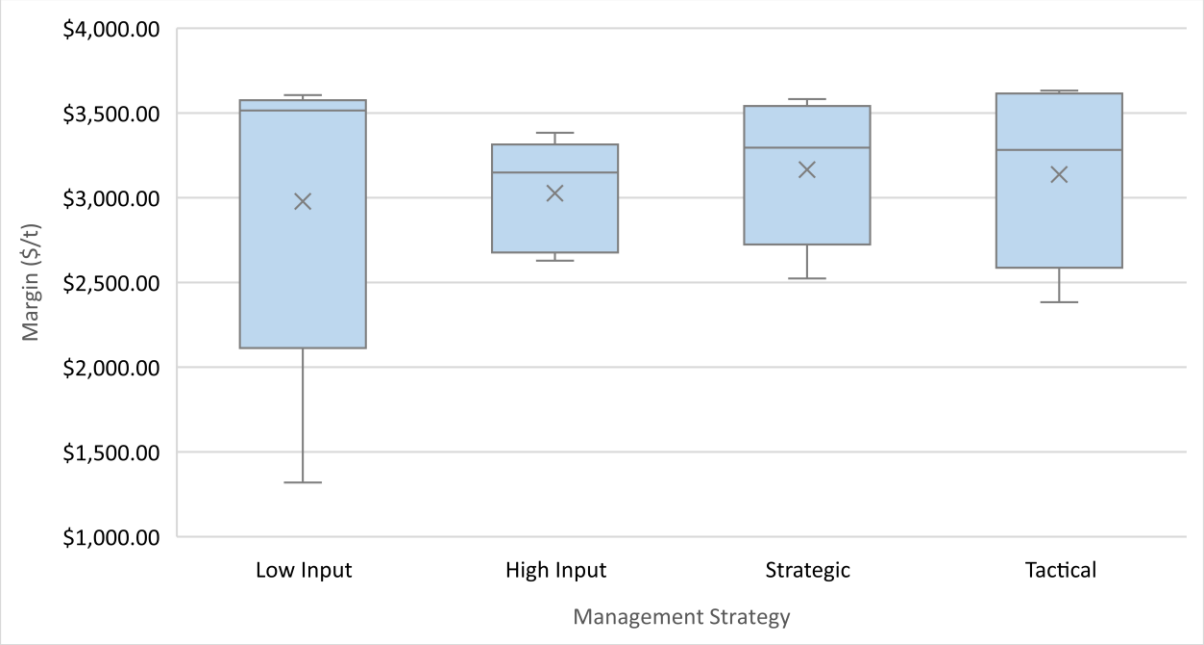

Figure 8. Graph representing the distribution of margin ($/t) across low, high, strategic and tactical management strategies (excluded RockStar wheat).

Table 9. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
Systiva	Fluxapyroxad	333 g/L	---	---	FS
PGR					
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Table 10. Trial input and management details.

Sowing date:			**6 September 2023**			
Harvest date:			**25 January 2024**			
Seed rate:			300 seeds/m^2			
Basal fertiliser:	6 Sep		100 kg/ha MAP			
Nitrogen:	17 Oct		92kg N/ha (Standard N)			
Additional nitrogen:			**Low Input**	**High Input**		
	Tillering		---	70kg N/ha		
	GS32		---	70kg N/ha		
			Strategic	**Tactical**		
	GS32		70kg N/ha	70kg N/ha (all except Laureate)		
PGR:			**Low Input**	**High Input**		
	GS31		----	Moddus Evo 0.20 L/ha		
			Strategic	**Tactical**		
	GS31		----	Moddus Evo 0.20 L/ha (only Laureate)		
Fungicide:			**Low Input**	**High Input**		
	GS00		----	Systiva		
	GS31		----	Radial 0.84 L/ha		
	GS39		----	Aviator Xpro 0.42 L/ha		
	GS59		----	Opus 0.50 L/ha		
			Strategic	**Tactical**		
	GS00		----	----		
	GS31		Prosaro 0.150 L/ha	See below		
	GS39		Radial 0.42 L/ha	See below		
	GS59		---	See below		
			Tactical Fungicide:			
	RGT planet	**Rosalind**	**Laureate**	**Minotaur**	**Neo**	**RockStar (Wheat)**
GS31	Opus 0.50 L/ha	Prosaro 0.150 L/ha	Prosaro 0.150 L/ha	Opus 0.50 L/ha	Prosaro 0.150 L/ha	Radial 0.84 L/ha
GS39	Aviator Xpro 0.42 L/ha	Aviator Xpro 0.42 L/ha	Aviator Xpro 0.42 L/ha	Aviator Xpro 0.42 L/ha	Aviator Xpro 0.42 L/ha	Aviator Xpro 0.42 L/ha
GS59	**---**	**---**	**---**	**---**	**---**	Opus 0.50 L/ha

The HYC strategic management approach was based on previous results from the Hyper Yielding Program

Trial 2. HYC Barley Disease Management (FAR TAS B23-04)

Key points:

- *Trials conducted between 2020 and 2023 in Hagley have not shown any response to fungicide in spring sown barley.*
- *These results suggest that the management needed to combat barley disease in a susceptible variety when autumn sown, are not required in a spring sown scenario where pressure is much lower.*
- *Although there were statistical differences in the Net Form Net Blotch (NFNB) disease assessment conducted at early grain fill, levels of disease were minimal with severity levels under 5% leaf area infected and less than 1% incidence on Flag-1 (Table 2).*
- *Fungicides had no influence on grain quality.*

Table 1. Influence of fungicide management on grain yield (t/ha).

	Treatments				Yield	
	GS00	**GS31**	**GS39-49**	**GS59**	**t/ha**	
1	---	---	---	---	11.10	-
2	Systiva	---	---	---	11.60	-
3	---	Prosaro 300 mL/ha	---	---	11.28	-
4	---	---	Aviator Xpro 420 mL/ha	---	11.54	-
5	---	Prosaro 150 mL/ha	Radial 420 mL/ha	---	11.29	-
6	---	Prosaro 300 mL/ha	Radial 840 mL/ha	---	11.66	-
7	---	Prosaro 300 mL/ha	Revystar 750 mL/ha	---	11.44	-
8	---	Revystar 750 mL/ha	Radial 840 mL/ha	---	11.48	-
9	---	Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	---	11.55	-
10	---	Aviator Xpro 420 mL/ha	Radial 840 mL/ha	---	11.54	-
11	Systiva		Radial 840 mL/ha	---	11.69	-
12	Systiva	Prosaro 300 mL/ha	Radial 840 mL/ha	---	12.04	-
13	---	Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	Opus 500 mL/ha	11.67	-
14	Systiva	Prosaro 300 mL/ha	Radial 840 mL/ha	Opus 500 mL/ha	11.86	-
15	Systiva	Prosaro 300 mL/ha	Aviator Xpro 420 mL/ha	Opus 500 mL/ha	11.51	-
				Mean	**11.55**	
				LSD P=0.05	ns	
				P Value	0.292	

Table 2. Influence of fungicide management on Net Form Net Blotch (NFNB) severity (%) on Flag, Flag-1 and Flag-2, 6 December, GS71.

	Treatment	NFNB severity (%LAI)					
		Flag		Flag-1		Flag-2	
1	Untreated	0.6	a	4.6	a	11.7	a
2	Systiva	0.0	c	1.3	bc	3.3	b-e
3	Prosaro 300 mL/ha	0.0	c	2.6	bc	7.8	a-d
4	Aviator Xpro 420 mL/ha	0.0	c	1.6	bc	8.1	abc
5	Prosaro 150 mL/ha; Radial 420 mL/ha	0.2	bc	3.2	ab	8.7	ab
6	Prosaro 300 mL/ha; Radial 840 mL/ha	0.2	bc	1.3	bc	3.8	b-e
7	Prosaro 300 mL/ha; Revystar 750 mL/ha	0.0	c	0.8	bc	5.3	b-e
8	Revystar 750 mL/ha; Radial 840 mL/ha	0.0	c	1.3	bc	3.3	b-e
9	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha	0.0	c	0.4	c	3.7	b-e
10	Aviator Xpro 420 mL/ha; Radial 840 mL/ha	0.0	c	1.2	bc	4.2	b-e
11	Systiva; Radial 840 mL/ha	0.0	c	0.8	bc	5.4	b-e
12	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha	0.5	ab	0.6	c	2.8	cde
13	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	0.1	c	0.6	c	4.0	b-e
14	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha; Opus 500 mL/ha	0.2	bc	0.8	bc	2.5	de
15	Systiva; Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	0.0	c	0.4	c	2.0	e
Mean		**0.1**		**1.4**		**5.1**	
LSD P=0.05		0.2		1.5		3.3	
P Value		<0.001		<0.001		<0.001	

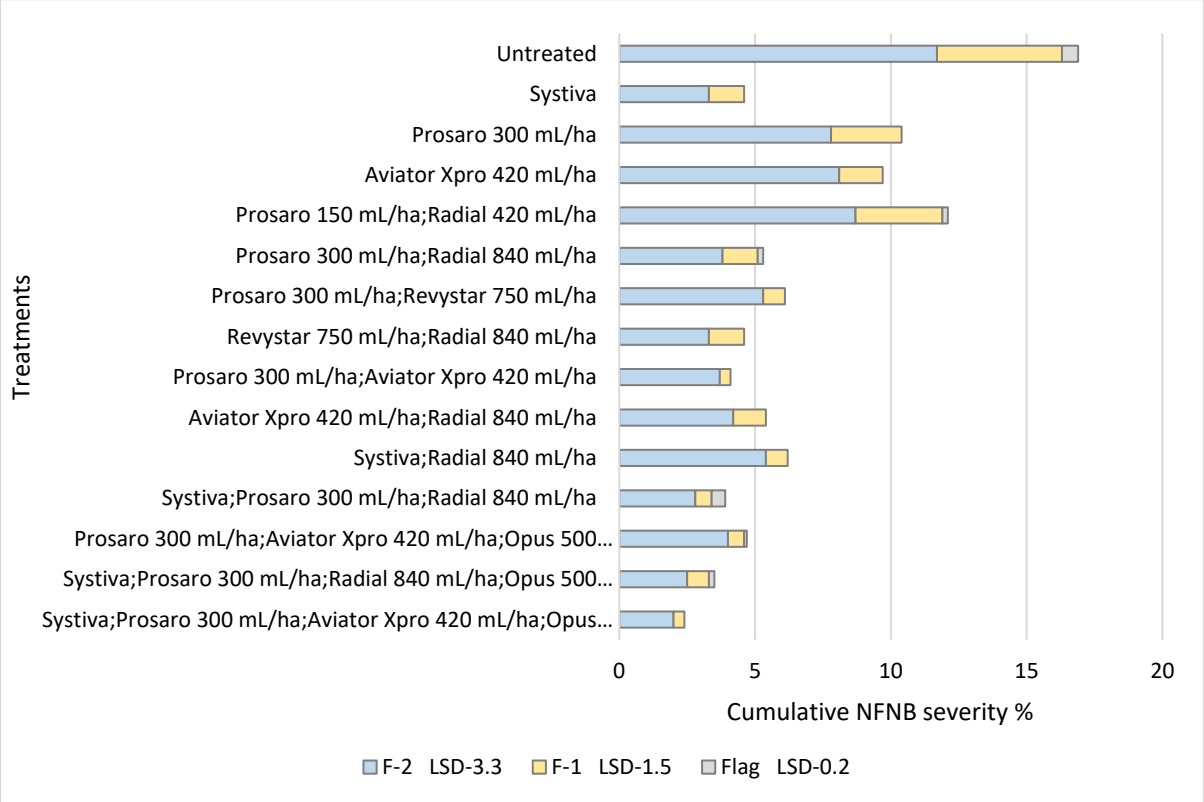

Figure 1. Cumulative Net Form Net Blotch severity (%LAI) on flag, flag-1 and flag-2, 6 December, GS71.

Table 3. Influence of fungicide management on Scald severity (%) on flag-1 and flag-2 and on Green Leaf Retention (GLR) (flag-3), 6 December, GS71.

	Treatment	Scald severity (%LAI)		GLR (%LAI)
		Flag-1	Flag-2	Flag-3
1	Untreated	0.0 -	0.4 -	13.6 -
2	Systiva	0.0 -	0.1 -	34.6 -
3	Prosaro 300 mL/ha	0.0 -	0.3 -	29.2 -
4	Aviator Xpro 420 mL/ha	0.0 -	0.0 -	31.5 -
5	Prosaro 150 mL/ha; Radial 420 mL/ha	0.0 -	0.0 -	17.9 -
6	Prosaro 300 mL/ha; Radial 840 mL/ha	0.0 -	0.0 -	32.6 -
7	Prosaro 300 mL/ha; Revystar 750 mL/ha	0.0 -	0.4 -	36.8 -
8	Revystar 750 mL/ha; Radial 840 mL/ha	0.0 -	0.0 -	42.5 -
9	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha	0.0 -	0.3 -	43.4 -
10	Aviator Xpro 420 mL/ha; Radial 840 mL/ha	0.0 -	0.1 -	31.0 -
11	Systiva; Radial 840 mL/ha	0.0 -	0.0 -	33.3 -
12	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha	0.0 -	0.0 -	41.4 -
13	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	0.0 -	0.0 -	33.9 -
14	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha; Opus 500 mL/ha	0.3 -	0.3 -	37.4 -
15	Systiva; Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	0.0 -	0.0 -	40.8 -
Mean		**0.0**	**0.1**	**33.3**
LSD P=0.05		ns	ns	ns
P Value		0.471	0.766	0.183

Table 4. Influence of fungicide management on Net Form Net Blotch incidence (%) on flag, flag-1 and flag-2, 6 December, GS71.

	Treatment	NFNB incidence (%)					
		Flag		Flag-1		Flag-2	
1	Untreated	0.2	a	0.8	a	1.0	a
2	Systiva	0.0	c	0.5	bcd	0.8	abc
3	Prosaro 300 mL/ha	0.0	c	0.8	ab	0.9	a
4	Aviator Xpro 420 mL/ha	0.0	c	0.5	bcd	0.9	a
5	Prosaro 150 mL/ha; Radial 420 mL/ha	0.1	bc	0.6	abc	0.9	ab
6	Prosaro 300 mL/ha; Radial 840 mL/ha	0.0	c	0.5	bcd	0.7	abc
7	Prosaro 300 mL/ha; Revystar 750 mL/ha	0.0	c	0.4	cde	0.8	abc
8	Revystar 750 mL/ha; Radial 840 mL/ha	0.0	c	0.5	bcd	0.8	abc
9	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha	0.0	c	0.1	e	0.9	abc
10	Aviator Xpro 420 mL/ha; Radial 840 mL/ha	0.0	c	0.5	bcd	0.9	abc
11	Systiva; Radial 840 mL/ha	0.0	c	0.3	cde	0.8	abc
12	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha	0.1	ab	0.3	de	0.6	bc
13	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	0.1	bc	0.3	cde	0.8	abc
14	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha; Opus 500 mL/ha	0.1	bc	0.3	cde	0.6	c
15	Systiva; Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	0.0	c	0.2	de	0.6	c
Mean		**0.0**		**0.4**		**0.8**	
LSD P=0.05		0.1		0.2		0.2	
P Value		<0.001		<0.001		<0.001	

Table 5. Influence of fungicide management on Scald incidence (%) on flag-1 and flag-2, 6 December, GS71.

	Treatment	Scald incidence (%)			
		Flag-1		Flag-2	
1	Untreated	0.0	-	0.1	-
2	Systiva	0.0	-	0.0	-
3	Prosaro 300 mL/ha	0.0	-	0.0	-
4	Aviator Xpro 420 mL/ha	0.0	-	0.0	-
5	Prosaro 150 mL/ha; Radial 420 mL/ha	0.0	-	0.0	-
6	Prosaro 300 mL/ha; Radial 840 mL/ha	0.0	-	0.0	-
7	Prosaro 300 mL/ha; Revystar 750 mL/ha	0.0	-	0.0	-
8	Revystar 750 mL/ha; Radial 840 mL/ha	0.0	-	0.0	-
9	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha	0.0	-	0.0	-
10	Aviator Xpro 420 mL/ha; Radial 840 mL/ha	0.0	-	0.0	-
11	Systiva; Radial 840 mL/ha	0.0	-	0.0	-
12	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha	0.0	-	0.0	-
13	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	0.0	-	0.0	-
14	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha; Opus 500 mL/ha	0.0	-	0.0	-
15	Systiva; Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	0.0	-	0.0	-
Mean		**0.0**		**0.0**	
LSD P=0.05		ns		ns	
P Value		0.471		0.778	

Table 6. Influence of fungicide management on plot condition, 24 January, GS99.

	Treatment	Lodging (0-500)	
1	Untreated	141.3	-
2	Systiva	93.8	-
3	Prosaro 300 mL/ha	63.8	-
4	Aviator Xpro 420 mL/ha	163.8	-
5	Prosaro 150 mL/ha; Radial 420 mL/ha	110.0	-
6	Prosaro 300 mL/ha; Radial 840 mL/ha	81.3	-
7	Prosaro 300 mL/ha; Revystar 750 mL/ha	130.0	-
8	Revystar 750 mL/ha; Radial 840 mL/ha	83.8	-
9	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha	138.8	-
10	Aviator Xpro 420 mL/ha; Radial 840 mL/ha	110.0	-
11	Systiva; Radial 840 mL/ha	97.5	-
12	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha	126.3	-
13	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	103.8	-
14	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha; Opus 500 mL/ha	116.3	-
15	Systiva; Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	106.3	-
Mean		**111.1**	
LSD P=0.05		ns	
P Value		0.715	

*Lodging index definition in 'Appendix. HYC Barley SA Crop Technology Centre'.

Table 7: Influence of fungicide management on grain quality.

	Treatment	Protein (%)	Test weight (kg/hL)	Retention (%)	Screenings (%)
1	Untreated	11.0 -	64.1 -	89.8 -	2.8 -
2	Systiva	11.4 -	64.9 -	91.2 -	2.2 -
3	Prosaro 300 mL/ha	11.3 -	64.6 -	90.1 -	2.8 -
4	Aviator Xpro 420 mL/ha	11.2 -	64.2 -	90.3 -	2.7 -
5	Prosaro 150 mL/ha; Radial 420 mL/ha	11.2 -	64.9 -	90.8 -	2.6 -
6	Prosaro 300 mL/ha; Radial 840 mL/ha	11.0 -	65.1 -	92.6 -	1.9 -
7	Prosaro 300 mL/ha; Revystar 750 mL/ha	11.2 -	65.1 -	91.6 -	2.4 -
8	Revystar 750 mL/ha; Radial 840 mL/ha	11.0 -	65.3 -	92.8 -	1.9 -
9	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha	11.1 -	64.6 -	90.6 -	2.8 -
10	Aviator Xpro 420 mL/ha; Radial 840 mL/ha	11.1 -	65.1 -	91.9 -	2.1 -
11	Systiva; Radial 840 mL/ha	11.1 -	64.5 -	91.9 -	2.2 -
12	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha	11.1 -	65.5 -	92.0 -	2.3 -
13	Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	11.1 -	65.0 -	91.7 -	2.2 -
14	Systiva; Prosaro 300 mL/ha; Radial 840 mL/ha; Opus 500 mL/ha	11.2 -	64.9 -	91.0 -	2.5 -
15	Systiva; Prosaro 300 mL/ha; Aviator Xpro 420 mL/ha; Opus 500 mL/ha	11.0 -	65.0 -	91.2 -	2.4 -
Mean		**11.1**	**64.9**	**91.3**	**2.4**
LSD P=0.05		ns	ns	ns	ns
P Value		0.543	0.934	0.906	0.776

Table 8: Details of the management levels.

Varieties:		**RGT Planet**
Sowing date:		**6 September 2023**
Harvest date:		**24 January 2024**
Seed Rate:		300 seeds/m^2
Basal Fertiliser:	6 Sep	100 kg MAP/ha
Seed Treatment:		As per treatment list
Nitrogen:	17 Oct	92kg N/ha
Fungicide:		As per treatment list

Table 9. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC
Systiva	Fluxapyroxad	333 g/L	---	---	FS

Trial 3. HYC Barley PGR x Harvest Date Interaction (FAR TAS B23-05)

Key points:

- *Higher levels of lodging were recorded in this trial (Figure 2) compared to the 2020- 2022 seasons where very limited lodging was observed.*
- *The highest barley yields on site, and the highest recorded in the HYC project, were achieved under the harvested on-time 'European' approach. Laureate under this management yielded 13.68t/ha and RGT Planet yielded 13.21t/ha. These plots were the only plots in this trial not to have experienced high levels of lodging and brackling (Table 1).*
- *There was no yield interaction between PGR, variety and harvest date however on average the European approach was highest yielding followed by the split Moddus Evo approach which was statistically higher than the untreated. Harvesting on time was also higher yielding, especially for Laureate which yielded 1.19t/ha more than delayed harvest, compared to RGT Planet which gave a 0.61t/ha response (Figure 1).*
- *Despite harvest dates only falling 4 days apart (due to logistical constraints) extreme weather conditions between harvest timings likely caused differences in yield, lodging and brackling, particularly weather conditions on 27 January where wind gusts reached 74 km/h.*

Treatments:

4 PGR management approaches applied to two cultivars (RGT Planet and Laureate) and harvested at two harvest dates.

Harvest dates:

1. Ontime harvested on the 24 January 2024.
2. Delayed harvested on the 28 January 2024.

Plant growth regulators (PGR) treatments:

1. Untreated.
2. GS31 PGR trinexapac ethyl based (Single Moddus Evo @ 200 mL/ha (50g ai/ha).
3. GS31 + GS37 PGR trinexapac ethyl based (Double Moddus Evo @ 200mL/ha (100g ai/ha).
4. European approach based on GS31 trinexapac ethyl (Moddus Evo @ 200 mL/ha) (50g ai/ha) and at GS37 of Ethephon 720 @500 mL/ha (360g ai/ha).

Table 1. Influence of PGR management strategy, variety and canopy management regime on grain yield (t/ha).

	RGT Planet	Laureate	Mean
Variety	12.23 -	12.24 -	**12.23**
LSD Variety P=0.05	ns	**P Value**	0.919
Harvest Date			
On time	12.53 b	12.83 a	**12.68 a**
Delayed	11.92 c	11.64 c	**11.78 b**
LSD Harvest Date Management P=0.05	0.23	**P Value**	0.001
LSD Harvest Date x Variety P=0.05	0.28	**P Value**	0.013
Canopy Management Regime			
Untreated	11.89 -	11.55 -	**11.72 c**
GS31 PGR	11.87 -	12.04 -	**11.96 bc**
GS31 + GS37 PGR	12.20 -	12.18 -	**12.19 b**
GS31 + GS49 PGR (Europe style)	12.96 -	13.17 -	**13.06 a**
LSD Canopy Management Regime P=0.05	0.31	**P Value**	<0.001
LSD Variety x Canopy Mgmt Regime P=0.05	ns	**P Value**	0.274
Harvest Date. x Canopy Mgmt. Regime			
On Time			
Untreated	12.19 -	12.11 -	**12.15 -**
GS31 PGR	12.28 -	12.65 -	**12.46 -**
GS31 + GS37 PGR	12.46 -	12.88 -	**12.67 -**
GS31 + GS49 PGR (Europe style)	13.21 -	13.68 -	**13.44 -**
Delayed			
Untreated	11.59 -	10.99 -	**11.29 -**
GS31 PGR	11.46 -	11.44 -	**11.45 -**
GS31 + GS37 PGR	11.94 -	11.48 -	**11.71 -**
GS31 + GS49 PGR (Europe style)	12.70 -	12.67 -	**12.69 -**
LSD Harvest Date x Canopy Mgmt P=0.05	ns	**P Value**	0.853
LSD Harvest Date x Canopy Mgmt x Variety P=0.05	ns	**P Value**	0.868

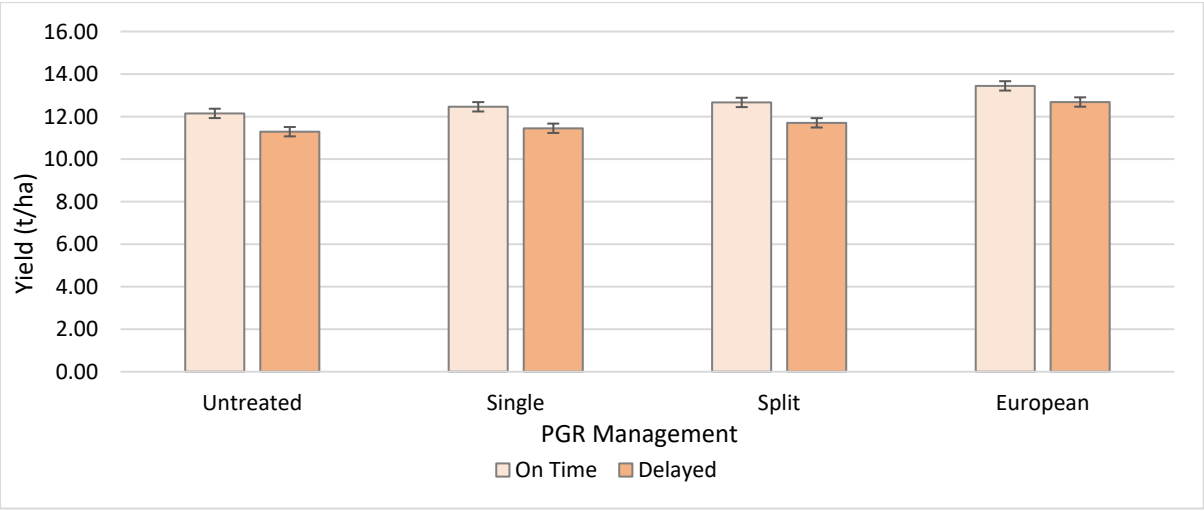

Figure 1. Influence of PGR management and harvest date on yields (t/ha) when assessed at each harvest date.

Table 2. Influence of PGR management strategy, variety and canopy management regime on protein (%).

	RGT Planet	Laureate	Mean
Variety	11.3 b	11.6 a	**11.5**
LSD Variety P=0.05	0.1	**P Value**	0.001
Harvest Date			
On time	11.4 -	11.7 -	11.5 -
Delayed (28 days delay)	11.3 -	11.6 -	11.5 -
LSD Harvest Date Management P=0.05	ns	**P Value**	0.412
LSD Harvest Date x Variety P=0.05	ns	**P Value**	0.805
Canopy Management Regime			
Untreated	11.3 -	11.7 -	11.5 -
GS31 PGR	11.5 -	11.7 -	11.6 -
GS31 + GS37 PGR	11.4 -	11.7 -	11.5 -
GS31 + GS49 PGR (Europe style)	11.2 -	11.5 -	11.3 -
LSD Canopy Management Regime P=0.05	ns	**P Value**	0.161
LSD Variety x Canopy Mgmt Regime P=0.05	ns	**P Value**	0.895
Harvest Date. x Canopy Mgmt. Regime			
On Time			
Untreated	11.3 -	11.9 -	11.6 -
GS31 PGR	11.5 -	11.7 -	11.6 -
GS31 + GS37 PGR	11.4 -	11.5 -	11.5 -
GS31 + GS49 PGR (Europe style)	11.3 -	11.5 -	11.4 -
Delayed			
Untreated	11.3 -	11.4 -	11.4 -
GS31 PGR	11.4 -	11.7 -	11.6 -
GS31 + GS37 PGR	11.4 -	11.8 -	11.6 -
GS31 + GS49 PGR (Europe style)	11.1 -	11.5 -	11.3 -
LSD Harvest Date x Canopy Mgmt P=0.05	ns	**P Value**	0.501
LSD Harvest Date x Canopy Mgmt x Variety P=0.05	ns	**P Value**	0.279

Table 3. Influence of PGR management strategy, variety and canopy management regime on test weight (Kg/hL).

	RGT Planet	Laureate	Mean
Variety	65.6 a	64.2 b	**64.9**
LSD Variety P=0.05	0.5	**P Value**	<0.001
Harvest Date			
On time	65.4 -	64.1 -	64.8 -
Delayed (28 days delay)	65.8 -	64.2 -	65.0 -
LSD Harvest Date Management P=0.05	ns	**P Value**	0.437
LSD Harvest Date x Variety P=0.05	ns	**P Value**	0.527
Canopy Management Regime			
Untreated	65.1 -	63.7 -	64.4 b
GS31 PGR	65.3 -	63.8 -	64.5 b
GS31 + GS37 PGR	65.2 -	63.9 -	64.6 b
GS31 + GS49 PGR (Europe style)	66.9 -	65.4 -	66.1 a
LSD Canopy Management Regime P=0.05	0.7	**P Value**	<0.001
LSD Variety x Canopy Mgmt Regime P=0.05	ns	**P Value**	0.987
Harvest Date. x Canopy Mgmt. Regime			
On Time			
Untreated	64.5 -	63.4 -	63.9 -
GS31 PGR	65.3 -	64.0 -	64.6 -
GS31 + GS37 PGR	65.2 -	64.2 -	64.7 -
GS31 + GS49 PGR (Europe style)	66.9 -	65.1 -	66.0 -
Delayed			
Untreated	65.7 -	64.0 -	64.8 -
GS31 PGR	65.3 -	63.6 -	64.4 -
GS31 + GS37 PGR	65.3 -	63.7 -	64.5 -
GS31 + GS49 PGR (Europe style)	66.9 -	65.7 -	66.3 -
LSD Harvest Date x Canopy Mgmt P=0.05	ns	**P Value**	0.287
LSD Harvest Date x Canopy Mgmt x Variety P=0.05	ns	**P Value**	0.792

Table 4. Influence of PGR management strategy, variety and canopy management regime on retention (%).

	RGT Planet	Laureate	Mean
Variety	92.6 b	94.8 a	**93.7**
LSD Variety P=0.05	1.4	**P Value**	0.010
Harvest Date			
On time	92.5 -	94.6 -	93.5 -
Delayed (28 days delay)	92.6 -	94.9 -	93.8 -
LSD Harvest Date Management P=0.05	ns	**P Value**	0.489
LSD Harvest Date x Variety P=0.05	ns	**P Value**	0.824
Canopy Management Regime			
Untreated	91.3 -	93.8 -	92.6 b
GS31 PGR	91.3 -	94.3 -	92.8 b
GS31 + GS37 PGR	92.3 -	95.0 -	93.7 b
GS31 + GS49 PGR (Europe style)	95.3 -	95.9 -	95.6 a
LSD Canopy Management Regime P=0.05	1.2	**P Value**	<0.001
LSD Variety x Canopy Mgmt Regime P=0.05	ns	**P Value**	0.178
Harvest Date. x Canopy Mgmt. Regime			
On Time			
Untreated	90.9 -	93.1 -	92.0 -
GS31 PGR	91.1 -	94.7 -	92.9 -
GS31 + GS37 PGR	92.7 -	95.0 -	93.8 -
GS31 + GS49 PGR (Europe style)	95.4 -	95.5 -	95.5 -
Delayed			
Untreated	91.8 -	94.4 -	93.1 -
GS31 PGR	91.5 -	93.9 -	92.7 -
GS31 + GS37 PGR	91.9 -	95.0 -	93.5 -
GS31 + GS49 PGR (Europe style)	95.2 -	96.3 -	95.8 -
LSD Harvest Date x Canopy Mgmt P=0.05	ns	**P Value**	0.569
LSD Harvest Date x Canopy Mgmt x Variety P=0.05	ns	**P Value**	0.819

Table 5. Influence of PGR management strategy, variety and canopy management regime on screenings (%).

	RGT Planet	Laureate	Mean
Variety	1.9 a	1.5 b	**1.7**
LSD Variety P=0.05	0.4	**P Value**	0.047
Harvest Date			
On time	2.0 -	1.6 -	1.8 -
Delayed (28 days delay)	1.9 -	1.4 -	1.6 -
LSD Harvest Date Management P=0.05	ns	**P Value**	0.352
LSD Harvest Date x Variety P=0.05	ns	**P Value**	0.914
Canopy Management Regime			
Untreated	2.2 -	1.8 -	2.0 a
GS31 PGR	2.3 -	1.7 -	2.0 a
GS31 + GS37 PGR	2.1 -	1.5 -	1.8 a
GS31 + GS49 PGR (Europe style)	1.2 -	1.1 -	1.1 b
LSD Canopy Management Regime P=0.05	0.4	**P Value**	<0.001
LSD Variety x Canopy Mgmt Regime P=0.05	ns	**P Value**	0.467
Harvest Date. x Canopy Mgmt. Regime			
On Time			
Untreated	2.5 -	1.9 -	2.2 -
GS31 PGR	2.3 -	1.6 -	1.9 -
GS31 + GS37 PGR	2.1 -	1.6 -	1.8 -
GS31 + GS49 PGR (Europe style)	1.1 -	1.3 -	1.2 -
Delayed			
Untreated	1.9 -	1.6 -	1.7 -
GS31 PGR	2.3 -	1.7 -	2.0 -
GS31 + GS37 PGR	2.1 -	1.4 -	1.7 -
GS31 + GS49 PGR (Europe style)	1.2 -	0.9 -	1.1 -
LSD Harvest Date x Canopy Mgmt P=0.05	ns	**P Value**	0.470
LSD Harvest Date x Canopy Mgmt x Variety P=0.05	ns	**P Value**	0.731

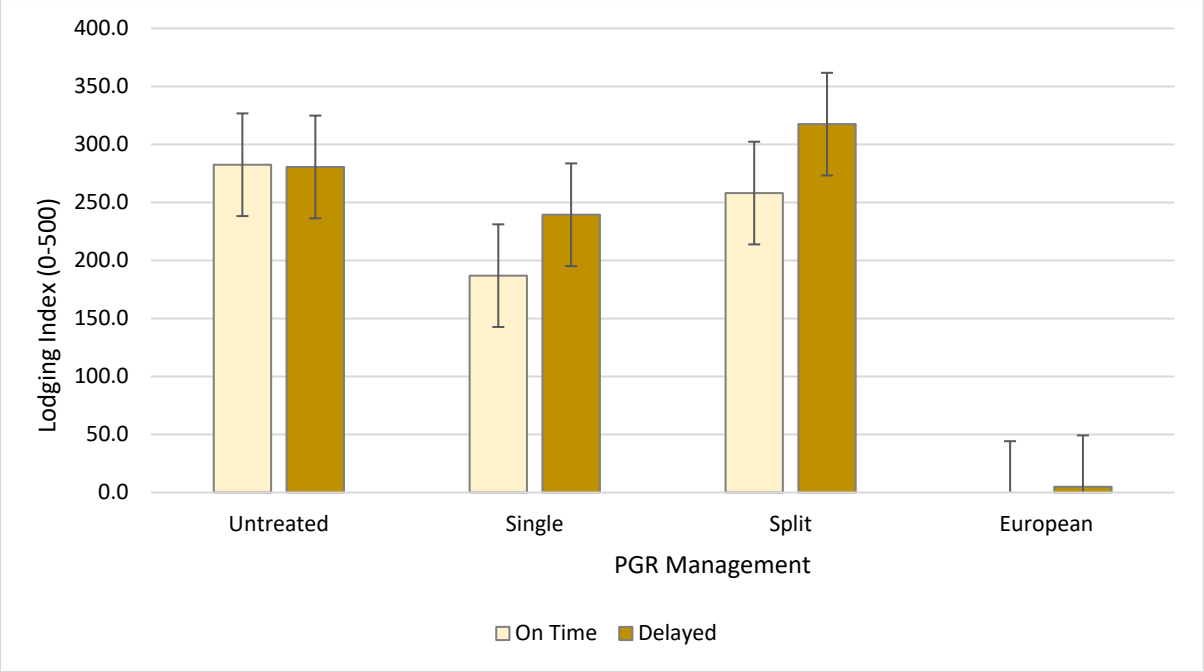

Figure 2. Influence of PGR management and harvest date on lodging index (0-500) when assessed at each harvest date.
*Lodging index definition in 'Appendix. HYC Barley VIC Crop Technology Centre'.

Image 1. Laureate untreated (left plot) vs 'European' approach (trinexapac ethyl 50g ai/ha f.b. Ethephon 720 360g ai/ha) (right plot). Taken on 24 January 2024.

Image 2. Laureate split trinexapac ethyl (100g ai/ha) (left plot) vs single early trinexapac ethyl (50g ai/ha) (right plot). Taken on 24 January 2024.

Table 6. Trial input and management details**.**

Sowing date:		**6 September 2023**	
Harvest date:		**24 January and 28 February 2024**	
Seed rate:		300 seeds/m^2	
Basal fertiliser:	6 Sep	100 kg/ha MAP	
Nitrogen:	17 Oct	92kg N/ha	
Fungicide:	GS31	Radial 0.84 L/ha	
	GS39	Aviator Xpro 0.42 L/ha	
PGR:		**Untreated**	**Single PGR**
	GS31	---	Moddus 0.2 L/ha
	GS37	---	---
		Split PGR	**European approach**
	GS31	Moddus 0.2 L/ha	Moddus 0.2 L/ha
	GS37	Moddus 0.2 L/ha	Ethephon 720 0.5 L/ha

Table 7. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Ethephon 720	Ethephon	720 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Appendix. HYC Barley TAS Crop Technology Centre

The following details apply to all Tasmanian barley trials unless specified differently.

Table 1. Overall inputs

	Date applied	Product
Herbicide:	07 Jun	Mateno complete
	20 Jun	Paradigm 37.5 g
		LVE Polo 0.9L
		Clop 750 90g
		Hasten 2.25L
	15 Aug	Cropmaster 450 3.3L
		Agritone 750 1.35L
		Cropsurf 700 0.45L
	19 Oct	LVE Polo 1.4L
		Kamba 750 0.19L
Irrigation:	27-Oct	15mm
	9-Nov	27mm
	25-Nov	25mm
	9-Dec	25mm

Table 2. Active ingredients and chemical loading (g/L) for products used.

	Active 1		Active 2		Active 3		Type
Herbicide							
Paradigm	Arylex active	200 g/kg	florasulam	200 g/kg	---	---	GC
LVE Polo	MCPA	570 g/L	---	---	---	---	EC
Clop 750	Clopyralid	750 g/L	---	---	---	---	SG
Mateno complete	Aclonifen	400 g/L	Diflufenican	66 g/L	Pyroxasul-fone	100 g/L	SC
Cropmaster 450	Glyphosate	450 g/L	---	---	---	---	SC
Agritone 750	MCPA	750 g/L	---	---	---	---	SL
Kamba 750	Dicamba	750 g/L	---	---	---	---	SL
Adjuvant							
Cropsurf 700	Soyal Phospholipids	350 g/L	Propionic Acid	350 g/L	---	---	
Hasten	Ethyl and Methyl Esters of Canola Oil Fatty Acids	704 g/L	Non-ionic Surfactants	196 g/L	---	---	

Lodging Index

Lodging index is derived from % area of the plot lodged on a scale of 0-100 multiplied by the degree of lodging on a scale of 0 – 5 scale with 0 being upright and 5 being completely flat. For example a plot with 100% of the plot standing upright would have a lodging index of 0. If 84% of the plot was lodged to a severity degree of 3 (halfway lodged to the ground), the lodging index would be 252. If 100% of the plot was completely flat on the ground, the lodging index would be 500.

2023 HYC Canola Results

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NSW Crop Technology Centre

Wallendbeen, New South Wales

Sowing Date: 27 April 2023
Harvest Date: 27 November 2023
Rotation position: Wheat 2022, Canola 2021, Pasture 2020
Soil type: Silty loam
Available Nitrogen (kg/ha) 0-100 cm: 119
Colwell P 0-10 cm: 34 mg/kg
pH ($CaCl_2$) 0-10 cm: 5.3
Organic Carbon 0-10 cm: 2.1

Trial 1. Canola nutrition trial (FAR NSW C23-01)

Objectives: To determine the canola yield response to N, P, K & S in HYC environments, and to determine the factors driving the positive yield response observed from applying chicken manure to canola in HYC trials in previous seasons.

Key points:

- *Canola yield response to N application plateaued at 3.7 t/ha with 150 kg N/ha applied, 0.6 t/ha higher than where nil N was applied.*
- *The addition of 3 t/ha (dry basis) Chicken Manure (see analysis Table 3) with nil N had no impact on grain yield but did increase yield when applied with the 225 kg N/ha rate, yielding 0.4 t/ha more than 225 kg N/ha alone.*
- *Although the manure supplied ~105 kg N/ha, the lack of response where no N as urea was applied suggests that this N may not be readily available to the crop.*
- *The Inorganic Nutrient treatment (NPKS in inorganic fertiliser equivalent to 3 t/ha chicken manure) applied with 225 kg N/ha yielded similarly to where Chicken Manure was applied with 225 kg N/ha.*
- *Where the macro-nutrients N, P, K & S were sequentially dropped out of the Inorganic Nutrition treatment, the only one that affected yield was the subtraction of P. Dropping P out reduced yield by 0.4 t/ha compared with where both 3 t/ha Chicken Manure and the Inorganic Nutrient equivalent were applied with 225 kg N/ha.*
- *This response to P comes even where there was 15 kg P/ha applied pre-sowing (as single super) and 28 kg /ha P applied at sowing (as MAP).*
- *Further work determining optimum P levels is required for canola yields > 4 t/ha. Potentially growers should aim to increase their soil P reserves gradually over time (similar to N bank approach) to increase yield potential in high yielding situations.*

Treatments (12):

- Nitrogen application rates from nil to 300 kg N/ha (5 treatments). Nitrogen application split between 6 leaf and bud visible stage.
- 3 t/ha Chicken manure applied at the Nil N and 225 kg N/ha rate (2 treatments). Chicken manure broadcast immediately before sowing.
- Inorganic Nutrients (equivalent NPKS as Chicken Manure) applied with the 225 kg N/ha rate (1 treatment). Inorganic Nutrients (as MAP, Urea, Single Super and Potash) broadcast immediately pre-sowing.
- Subtraction of the N, P, K & S components from the Inorganic Nutrients treatment, to determine the nutrient driving yield response (4 treatments).

Table 1. Grain yield, oil and protein concentration of 45Y95 CL canola with 12 different nutrition levels at Wallendbeen NSW, 2023.

Treatment		Grain yield (t/ha)	Oil (%)	Protein (%)
1	Nil N	3.1	47.7	16.5
2	75 kg N/ha	3.5	46.8	17.5
3	150 kg N/ha	3.7	45.8	18.8
4	225 kg N/ha	3.8	45.5	19.5
5	300 kg N/ha	3.8	44.9	20.2
6	Nil N + 3 t/ha Chicken Manure*	3.2	47.7	16.5
7	225 kg N/ha + 3 t/ha Chicken Manure*	4.2	45.2	19.8
8	225 kg N/ha + Inorganic Nutrients	4.2	44.8	20.6
9	225 kg N/ha + Inorganic Nutrients – K	4.1	45.6	19.4
10	225 kg N/ha + Inorganic Nutrients – N	4.2	45.2	19.8
11	225 kg N/ha + Inorganic Nutrients – P	3.8	44.6	20.6
12	225 kg N/ha + Inorganic Nutrients – S	4.3	44.7	20.6
LSD (P=0.05)		0.22	0.60	0.80
P Value		<0.001	0.002	<0.001

*Dry basis. See 'Appendix. HYC Canola NSW Crop Technology Centre' for detailed nutrient analysis of chicken manure.

Inorganic Nutrients: Application of inorganic fertiliser (Urea, single super, potash, MAP) to the equivalent NPKS rates supplied by 3 t/ha chicken manure.

Table 2. Nutrition treatments applied to 45Y95 CL canola at Wallendbeen, NSW 2023

		27-Apr				3-Jun	18-Aug
Treatments	**Manure***	**K**	**N**	**P**	**S**	**6-Leaf N**	**Bud Visible N**
Nil	0	0	13	43	20	0	0
75 kg N/ha	0	0	13	43	20	37.5	37.5
150 kg N/ha	0	0	13	43	20	75	75
225 kg N/ha	0	0	13	43	20	112.5	112.5
300 kg N/ha	0	0	13	43	20	150	150
Nil N + 3 t/ha Chicken Manure	3 t/ha	0	13	43	20	0	0
225 kg N/ha + 3 t/ha Chicken Manure	3 t/ha	0	13	43	20	112.5	112.5
225 kg N/ha + Inorganic Nutrients†	0	54	118	97	35	112.5	112.5
225 kg N/ha + Inorganic Nutrients – K	0	*0*	118	97	35	112.5	112.5
225 kg N/ha + Inorganic Nutrients – N	0	54	*13*	97	35	112.5	112.5
225 kg N/ha + Inorganic Nutrients – P	0	54	118	*43*	35	112.5	112.5
225 kg N/ha + Inorganic Nutrients – S	0	54	118	97	*20*	112.5	112.5

*Manure rate reported on a dry matter basis.

†Inorganic nutrients were broadcast pre-sowing.

Table 3. Trial management details of Canola nutrition trial at Wallendbeen, 2023

Sowing Date		**27 April 2023**
Variety		45Y95 CL
Sowing Rate:		Target 40 plants/m²
Seed Treatment:		Saltro Duo
Basal Fertiliser:	27 Apr	170 kg/ha Single Super (Broadcast pre-sow)
		130 kg/ha MAP (1 cm below seed)
		(13 kg N/ha, 28 kg P/ha)
Nitrogen:	3 Jun	112.5 kg N/ha (245 kg/ha urea)
	18 Aug	112.5 kg N/ha (245 kg/ha urea)
Fungicide:	1 Jun	Prosaro 0.45 L/ha
	4 Sep	Aviator Xpro 0.8 L/ha

Table 4. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS

Trial 2. Canola YieldMax trial (FAR NSW C23-02)

Objectives: To determine the response to nutrient input across nine hybrid canola varieties.

Key points:

- *Crop biomass of three hybrids was measured at early flowering (100°C.days after the start of flowering), late flowering (500°C.days after the start of flowering) and again at maturity.*
- *Differences between varieties and nutrition were observed at the early flowering assessment, with 6.5 t/ha of biomass for the high input nutrition treatment and 5.1 t/ha for the low input treatment. 45Y28 RR and 45Y95 CL both had higher biomass than the TT variety HyTTec Trifecta.*
- *Growth of these treatments remained consistent across the treatments for the two subsequent assessments, with final biomass rankings similar at crop maturity to the rankings observed at early flowering.*
- *A 0-10 cm soil test was completed on the high and low input treatments at the early flowering biomass assessment. Despite the large differences in N rate applied, mineral N was the same across the two treatments (~63 kg N/ha in 0-10 cm), but there were large differences in Colwell P between treatments, with high input at 58 mg/kg and low input at 31 mg/kg.*
- *Grain yield was measured on these three hybrids plus a further six hybrids that did not have biomass assessments. InVigor R4520P was the fastest variety in the trial and had the highest grain yield in a warm and relatively dry spring. Other varieties with relatively high yield included 45Y28 RR, 45Y95 CL and Nuseed Eagle TF.*
- *The High Input treatment (45 kg P/ha, 225 kg N/ha + 3 t/ha chicken manure) yielded 0.76 t/ha more than the Low Input treatment (15 kg P/ha, 75 kg N/ha).*
- *Oil concentration was highest in NCH22K902 and 45Y28 RR. The high input treatment reduced oil (down 1.7%) and increased protein (up 2%) across all varieties.*
- *Detailed yield component assessment including harvest index, seeds/pod and pods/m² was completed on two input levels of 45Y28 RR, 45Y95 CL and HyTTec Trifecta. The High Input treatment increased final biomass of all varieties, but also increased harvest index i.e. more biomass was converted to grain, even at higher biomass levels. The High Input treatment increased seeds/pod, pods/m² and seed size.*
- *The warm and dry finish to the season combined with good early growth was the conditions where it could be expected to see a crop 'hay-off', but these trials show that the opposite, where higher nutrition gave higher biomass, better conversion of biomass to grain and higher yield.*

Treatments

Eight canola varieties were subjected to two levels of management described as high and low input. The details of these two management approaches are described in Table 5.

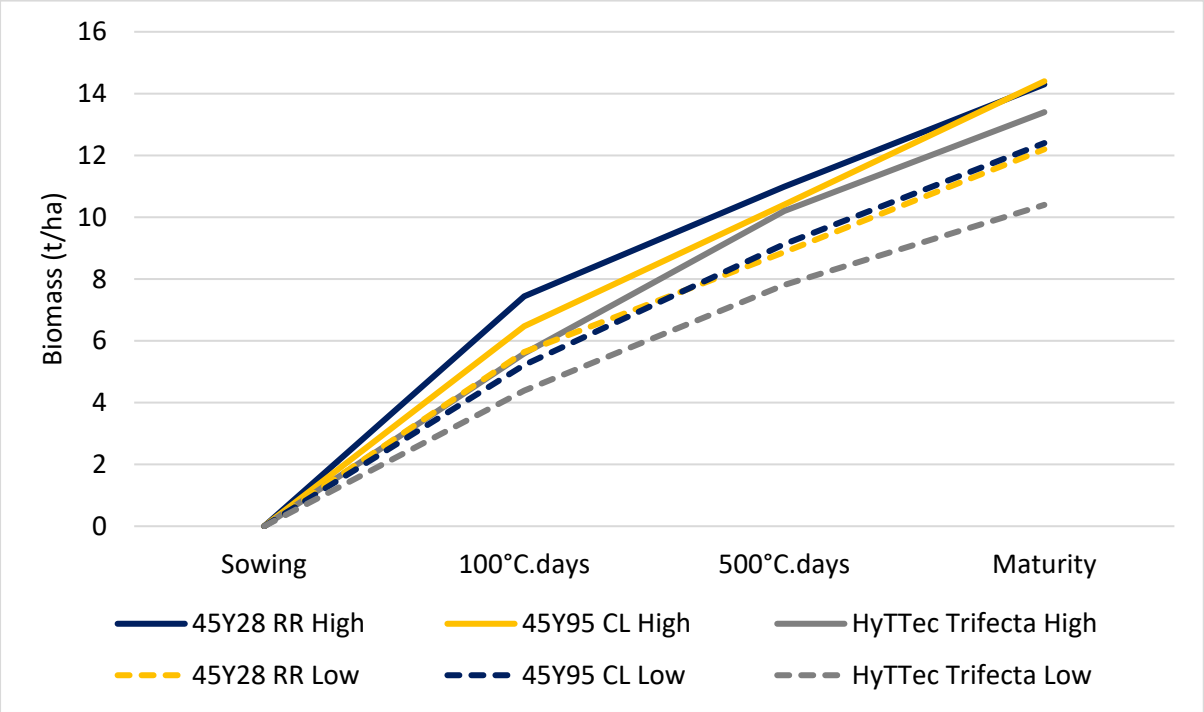

Figure 1. Biomass of three canola varieties with two nutrient input treatments, measured at 100°C.days (11 days) and 500°C.days (46 days) after the start of flowering, and again at crop maturity.

Table 1. Grain yield of nine canola hybrids sown with two levels of nutrient input at Wallendbeen 2023.

		Grain Yield (t/ha)			
Cultivar		**Low Input**	**High Input**	**Mean**	**Flowering* Date**
1	45Y28 RR	3.24	3.97	**3.60**	27 August
2	Eagle TF	3.33	4.01	**3.67**	23 August
3	InVigor R4520P	3.33	4.18	**3.76**	12 August
4	HyTTec Trifecta	2.87	3.93	**3.40**	24 August
5	Hyola Blazer TT	2.71	3.68	**3.20**	20 August
6	RGT Baseline	2.88	3.58	**3.23**	27 August
7	45Y95 CL	3.22	4.02	**3.62**	25 August
8	Hyola Solstice CL	3.10	3.71	**3.41**	20 August
9	NCH22K902	3.11	3.60	**3.35**	25 August
Mean		**3.09**	**3.85**	**3.47**	
LSD Cultivar p = 0.05		0.20	**P value**	<0.001	
LSD Management p=0.05		0.18	**P value**	<0.001	
LSD Cultivar x Man. P=0.05		ns	**P value**	0.219	

* 50% of plants with one open flower

Table 2. Grain oil and protein concentrations of nine canola varieties with two levels of nutrient input at Wallendbeen, 2023.

		Oil concentration (%)			Protein concentration (%)		
Cultivar		**Low Input**	**High Input**	**Mean**	**Low Input**	**High Input**	**Mean**
1	45Y28 RR	51.5	49.6	**50.5**	15.2	17.2	**16.2**
2	Eagle TF	49.5	47.8	**48.7**	17.0	19.3	**18.2**
3	InVigor R4520P	46.9	45.5	**46.2**	17.7	19.4	**18.6**
4	HyTTec Trifecta	49.4	47.9	**48.6**	18.3	19.9	**19.1**
5	Hyola Blazer TT	47.7	46.1	**46.9**	18.8	20.9	**19.9**
6	RGT Baseline	49.9	48.8	**49.3**	17.7	19.0	**18.4**
7	45Y95 CL	46.9	45.4	**46.1**	17.5	19.4	**18.4**
8	Hyola Solstice CL	49.3	47.1	**48.2**	15.9	18.8	**17.3**
9	NCH22K902	52.6	50.2	**51.4**	15.7	18.0	**16.9**
Mean		**49.3**	**47.6**	**48.4**	**17.1**	**19.1**	**18.1**
LSD Cultivar p = 0.05		0.45	**P value**	<0.001	0.49	**P value**	<0.001
LSD Management p=0.05		0.25	**P value**	<0.001	0.26	**P value**	<0.001
LSD Cultivar x Man. P=0.05		ns	**P value**	0.166	0.72	**P value**	0.014

Table 3. Harvest Index and yield components of three canola varieties and two Input levels at Wallendbeen in 2023.

Variety		**Harvest Index**	**Seeds/m²**	**Pods/m²**	**Seeds/pod**	**TGW Seed**
1	45Y28 RR	0.34	105329	5024	21.3	3.42
2	45Y95 CL	0.31	108248	5204	20.5	3.38
3	HyTTec Trifecta	0.32	93104	4807	19.3	3.63
LSD P=0.05		0.08	8546	ns	0.9	ns
Input						
1	High	0.33	111919	5335	20.9	3.57
2	Low	0.31	92534	4680	19.7	3.38
LSD P=0.05		0.05	5136	246	0.6	0.15

Table 4: Soil characteristics across two nutrient input treatments, measured 100°C.days after the start of flowering.

	Low Input (0-10 cm)	**High Input (0-10 cm)**
Total Mineral N	60.8 kg/ha	66.8 kg/ha
Phosphorus (Colwell)	31.2 mg/kg	58.0 mg/kg
Potassium (Colwell)	118 mg/kg	224 mg/kg
KCl Sulfur	15.5 mg/kg	11.8 mg/kg
Organic Carbon	1.75 %	1.65 %
pH ($CaCl_2$)	5.0 pH	5.1 pH

Table 5. Trial management details for Canola YieldMax trial at Wallendbeen 2023

Sowing Date		**27 April 2023**
Sowing Rate:		Target 40 plants/m²
Seed Treatment:		Saltro Duo
Basal Fertiliser:		
Low input	27 April	170 kg/ha Single Super (Broadcast pre-sow) 15 kg/ha P + 20 kg/ha S
High input	27 April	170 kg/ha Single Super (Broadcast pre-sow) 130 kg/ha MAP 43 kg/ha P + 20 kg/ha S
		3 t/ha chicken manure
Nitrogen:		
Low input	3 June	37.5 kg N/ha (82 kg/ha urea)
		37.5 kg N/ha (82 kg/ha urea)
High input	18 August	112.5 kg N/ha (245 kg/ha urea)
		112.5 kg N/ha (245 kg/ha urea)
Fungicide:	1 June	Prosaro 0.45 L/ha
	4 September	Aviator Xpro 0.8 L/ha

*Refer to 'Appendix. HYC Canola NSW Crop Technology Centre' for manure analysis.

Table 6. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS

Appendix. HYC Canola NSW Crop Technology Centre

Table 1. Analysis of chicken manure used in Wallendbeen canola nutrition trial 2023. Nutrient content reported on a dry basis.

Nutrient	Concentration in chicken manure	Quantity applied 3 t/ha manure
Nitrogen	3.5%	105 kg/ha
Phosphorus	1.8%	54 kg/ha
Potassium	1.8%	54 kg/ha
Sulfur	0.5%	15 kg/ha
Calcium	3.2%	96 kg/ha
Magnesium	0.09%	2.7 kg/ha
Silicon	0.021%	0.063 kg/ha
Carbon	34%	1.02 t/ha
Iron	0.2%	6 kg/ha
Manganese	0.05%	1.5 kg/ha
Copper	0.009%	270 g/ha
Zinc	0.04%	1.2 kg/ha
Boron	0.003%	90 g/ha
Molybdenum	0.0008%	24 g/ha
Cobalt	0.0004%	12 g/ha

SA Crop Technology Centre

Millicent, South Australia

Sown: 9 May 2023
Harvested: 20 December 2023 (Spring); 16 January 2024 (Winter)
Rotation position: Barley 2022, Persian clover 2021
Soil type: Neutral-slightly alkaline Organosol (Peat soil)
Available mineral N (0-30cm): 162 kg/ha
Colwell P (ppm) 0-10cm: 39 mg/kg
pH ($CaCl_2$) 0-10cm: 7.6
Organic Carbon (%) 0-10cm: 7.

Trial 1. HYC Canola Winter Screen Grazed (FAR SAC C23-01 (G))

Key Points:

- *Four winter canola varieties were sown in early May and were lightly grazed on 25 July. The canola was allowed to regrow and was taken through to grain harvest.*
- *Captain CL had higher yield (5.7 t/ha) and oil (44.7%) than the three other varieties.*
- *Average protein was 19.1% (lower where yields were high), so nitrogen removal averaged ~30 kg N/tonne of grain yield.*
- *Protein levels below 20% have been common in Hyper yielding Canola trials over the past 4 years. Growers may be able to use an N removal figure of 30 kg N/tonne when calculating N input requirements.*

Table 1. Impact of variety on yield (t/ha), grain quality (protein (%), oil (%) and test weight (kg/hL)) and crop lodging – harvested 16 January.

	Cultivar	Yield (t/ha)	Protein (%)	Oil (%)	Test Weight (kg/hL)	Crop Lodging (0-500) index*
1.	**Hyola Feast CL**	4.68 b	19.4 a	40.8 c	64.0 c	65.0 -
2.	**Hyola 970CL**	4.16 b	20.1 a	39.9 d	66.2 a	106.3 -
3.	**Phoenix CL**	4.52 b	18.5 b	41.7 b	66.2 a	40.0 -
4.	**Captain CL**	5.70 a	18.3 b	43.2 a	65.2 b	2.5 -
Mean		4.76	19.1	43.2	65.4	53.4
LSD P=0.05		0.88	0.4	0.4	0.6	ns
P value		0.019	<0.001	<0.001	<0.001	0.328

Crop lodging index (0 – 500) based on % plot lodged (0-100 scale) multiplied by lodging severity (0-5 scale 5 = flat crop).

Table 2. Impact of variety on dry matter (DM) (t/ha) at grazing (25 July) at Millicent 2023.

	Cultivar	DM pre-grazing (t/ha)	DM removed (t/ha)
1.	**Hyola Feast CL**	0.5 -	0.1 -
2.	**Hyola 970CL**	0.8 -	0.4 -
3.	**Phoenix CL**	0.4 -	0.1 -
4.	**Captain CL**	0.6 -	0.3 -
Mean		0.6	0.2
LSD P=0.05		ns	ns
P value		0.120	0.115

Table 3. Trial input and management details.

Sowing date:		**9 May 2023**
Harvest date:		**16-January 2024**
Plant population target:		60 plants/m²
Basal Fertiliser:		145 kg/ha MAP (30 kg/ha P) (15 kg/ha N)
Nitrogen:	3-4-Leaf (30 May)	83.3 kg/ha ammonium sulfate (17 kg N + 20 kg S)
	6-leaf (25 July)	100 kg N/ha applied as urea
	Stem elongation (19 Sept)	112.5 kg N/ha applied as urea
Total N Applied:		**250 kg N/ha**
Herbicides:	6-leaf (18 July)	Intervix 750 mL/ha Ammonium sulphate 800 g/ha Platinum Xtra (clethodim 360) 0.33 L/ha Lontrel Advanced 0.1 L/ha Expedient (adjuvant) 1%
Fungicide:	Seed treatment	Saltro Duo
	6-Leaf (18 July)	Prosaro 450mL/ha
	20% Bloom (2 Oct)	Aviator Xpro 800mL/ha
Crop Protection:	Pre-emergent	Metarex 10 Kg/ha
		Lorsban 500 mL/ha

Table 4. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS
Crop Protection					
Metarex	Metaldehyde	50 g/kg	---	---	
Lorsban	Chlorpyrifos	500 g/L	---	---	EC

Trial 2. HYC Canola Winter Screen Ungrazed (FAR SAC C23-01)

Key Points:

- *Eight winter canola varieties were sown in the ungrazed canola screen. Captain CL was again the highest yielding canola variety and had equal highest oil concentration.*
- *Yield of Captain CL was the same in the grazed trial as the ungrazed trial.*
- *Varieties commenced flowering in a narrow window from 29 September to 4 October. On average the winter varieties flowered ~6 weeks after the spring varieties at the same site.*
- *Despite being very tall (~2 metres) there was minimal lodging in the winter canola varieties.*

Table 1. Cultivar assessment- yield (t/ha), establishment (0-9), lodging index (0-500), and estimated flowering date (50% of plants with one flower).

	Cultivar	Yield (t/ha)	Establishment (0-9)	Lodging Index (0-500)	Flowering date (BBCH 60)
1	**Hyola Feast CL**	5.07 bc	7.3 -	18.8 -	29/09/2023
2	**Hyola 970CL**	4.71 cd	6.5 -	16.3 -	29/09/2023
3	**Phoenix CL**	4.51 d	7.5 -	21.3 -	30/09/2023
4	**Captain CL**	5.70 a	7.3 -	0.0 -	29/09/2023
5	**CL222167**	5.29 ab	7.3 -	28.8 -	4/10/2023
6	**RGT Nizza CL**	3.19 f	6.5 -	0.0 -	1/10/2023
7	**RGT Clavier CL**	3.98 e	7.3 -	0.0 -	30/09/2023
8	**AGFCA014820**	5.32 ab	6.8 -	0.0 -	29/09/2023
Mean		4.72	7.0	10.6	.
LSD P=0.05		0.43	ns	ns	.
P Value		<0.001	0.352	0.101	.

Table 2. Grain quality assessment- protein (%), oil (%) and test weight (kg/hL).

	Cultivar	Protein (%)	Oil (%)	Test Weight (kg/hL)
1	**Hyola Feast CL**	19.6 bc	42.8 c	63.7 d
2	**Hyola 970CL**	20.6 a	41.3 d	66.4 b
3	**Phoenix CL**	18.8 d	43.2 c	66.1 b
4	**Captain CL**	18.2 e	44.6 a	64.6 c
5	**CL222167**	19.6 bc	41.2 d	67.4 a
6	**RGT Nizza CL**	19.1 cd	43.9 b	64.6 c
7	**RGT Clavier CL**	19.8 b	41.3 d	67.4 a
8	**AGFCA014820**	18.7 de	45.2 a	64.9 c
Mean		19.3	42.9	65.6
LSD P=0.05		0.5	0.6	0.4
P Value		<0.001	<0.001	<0.001

Table 3. Trial input and management details.

Sowing date:		**9 May 2023**
Harvest date:		**16-January 2024**
Plant population:		60 plants/m²
Basal Fertiliser:		145 kg/ha MAP (30 kg/ha P) (15 kg/ha N)
Nitrogen:	3-4-Leaf (30 May)	83.3 kg/ha ammonium sulphate (17 kg N + 20 kg S)
	6-leaf (25 July)	100 kg N/ha as urea
	Stem elongation (19 Sept)	112.5 kg N/ha as urea
Total N Applied:		**250 kg N/ha**
Herbicides:	6-leaf (18 July)	Ammonium sulphate 800 g/ha Platinum Xtra (clethodim 360) 0.33 L/ha Lontrel Advanced 0.1 L/ha Expedient (adjuvant) 1%
Fungicide:	Seed treatment	Saltro Duo
	6-Leaf (18 July)	Prosaro 450mL/ha
	20% Bloom (2 Oct)	Aviator Xpro 800mL/ha
Crop Protection:	Pre-emergent	Metarex 10 Kg/ha
		Lorsban 500 mL/ha

Table 4. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Herbicide					
Platinum Xtra	Clethodim	360 g/L	---	---	EC
Lontrel Advanced	Clopyralid	600 g/L	---	---	SC
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS
Crop Protection					
Metarex	Metaldehyde	50 g/kg	---	---	
Lorsban	Chlorpyrifos	500 g/L	---	---	EC
Adjuvant					
Ammonium sulphate	Ammonium sulphate	980 g/L	---	---	
Expedient	Ethyl and Methyl Esters of Canola Oil Fatty Acids	704 g/L	Non-ionic Surfactants	196 g/L	

Trial 3. HYC Canola YieldMax (FAR SAC C23-02)

Key Points:

- *Yield of the spring canola trials was lower than yield of the winter trials at this site. The spring canola varieties suffered from a major wind event in spring when winter canola varieties were still elongating.*
- *45Y95 CL was the standout variety for grain yield, averaging 3.35 t/ha across input treatments. This was ~0.4 t/ha higher yielding than the second ranked variety.*
- *45Y28 RR had the highest oil concentration, 1.3% oil above the second ranked variety (which is approximately 2% more value per tonne).*
- *Increasing crop nutrition input (including N, P and manure) resulted in higher biomass at three assessment timings, early flowering, end of flowering and maturity. The High Input treatment yielded 0.3 t/ha higher than the low input treatment but was taller and lodged more as a results of a major wind event mid-spring.*
- *Yield components were assessed on three varieties at crop maturity. Pods/m² was well below target for high yielding canola crops, at ~3000 average across treatments (versus a target of 6-7000 pods/m²). Seeds/pod and seed size were above average and partly compensated for the low pod number, but the low number of pods set in spring limited overall yield potential.*
- *The large seed harvested in this trial indicates that climatic conditions post -flowering were good, and conditions post-flowering may have been better than pre-flowering.*

Table 1. Influence of management strategy and variety on grain yield (t/ha).

	Management Level		
	Low Input 150 kg/ha N	**High Input 225 kg/ha N + M**	**Mean**
Cultivar	**Yield t/ha**	**Yield t/ha**	**Yield t/ha**
1. 45Y28 RR	2.56 -	3.21 -	**2.88 b**
2. Eagle TF	2.63 -	2.83 -	**2.73 b**
3. HyTTec Trifecta	2.84 -	2.99 -	**2.92 b**
4. Hyola Blazer TT	2.88 -	3.02 -	**2.95 b**
5. 45Y95 CL	3.18 -	3.53 -	**3.35 a**
6. Hyola Solstice CL	2.56 -	2.81 -	**2.68 b**
Mean	**2.77 b**	**3.07 a**	**2.92**
LSD P=0.05 Cultivar	0.33	**P value**	0.010
LSD P=0.05 Management	0.18	**P value**	0.011
LSD P=0.05 Cultivar x Man.	ns	**P value**	0.689

Table 2. Crop biomass (t/ha) assessment 100 & 500°C.days post-flowering, crop height (cm), and crop lodging (0-500).

		Crop Assessments				
	Cultivar	31 Aug 100°C.days post flowering (t/ha)	3 Oct 500°C days post flowering (t/ha)	18 Dec Harvest DM (t/ha)	18 Dec Crop Height (cm)	18 Dec Crop Lodging (0-500)*
1	45Y28 RR	4.4 b	8.6 -	13.9 a	134 c	123 c
2	Eagle TF				145 ab	174 b
3	HyTTec Trifecta	3.7 c	8.0 -	11.1 b	135 c	228 a
4	Hyola Blazer TT				131 c	112 c
5	45Y95 CL	5.4 a	8.6 -	14.5 a	151 a	133 c
6	Hyola Solstice CL				137 bc	143 bc
LSD P=0.05		0.4	ns	1.7	9	38
P value		<0.001	0.263	0.005	0.002	<0.001
	Nutrition					
1	Low Input	4.2 b	8.2 b	12.6 b	135 b	139 b
2	High Input	4.8 a	8.7 a	13.8 a	143 a	164 a
LSD P=0.05		0.3	0.28	0.6	2	20
P value		0.013	0.0497	0.035	<0.001	0.048

*Crop lodging is the product of lodging % (0-100) and lodging severity (0-5).

Table 3. Cultivar start of flowering date and harvest grain quality assessment- oil (%), and test weight (kg/hL).

			Grain Quality Assessments	
	Cultivar	Flowering Date (BBCH 60)	Oil (%)	Test Weight (kg/hL)
1.	45Y28 RR	22/08/23	48.2 a	64.4 b
2.	Eagle TF	15/08/23	46.4 c	62.5 c
3.	HyTTec Trifecta	22/08/23	45.8 d	65.2 a
4.	Hyola Blazer TT	14/08/23	45.3 e	65.2 a
5.	45Y95 CL	25/08/23	46.0 cd	62.7 c
6.	Hyola Solstice CL	21/08/23	46.9 b	64.8 ab
LSD P=0.05		-	0.5	0.4
P value		-	<0.001	<0.001
	Nutrition			
1.	Low Input	-	46.8 a	64.2 -
2.	High Input	-	46.0 b	64.1 -
LSD P=0.05		-	0.2	ns
P value		-	<0.001	0.269

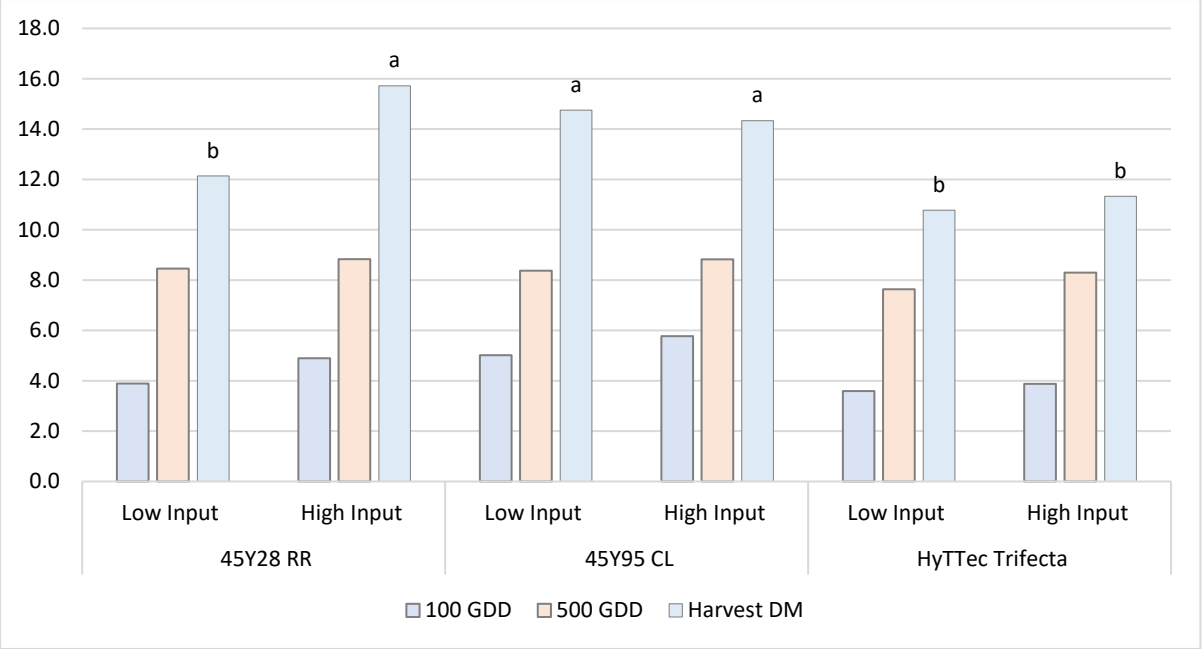

Figure 1. Dry matter (t/ha) 100 Growing Degree Days (GDD), 500 GDD and physiological maturity across three cultivars and two management strategies.

Table 4. Influence of variety on yield components 1000 seed weight (g), pods/m^2, and seeds/pod.

	1000 seed weight (g)	Pods/m^2	Seeds/pod
High Input - 45Y28 RR	4.70 -	2841 -	22.8 -
High Input - HyTTec Trifecta	4.63 -	2993 -	22.3 -
High Input - 45Y95 CL	4.88 -	3083 -	21.9 -
Mean	4.74	2972	22.3
LSD P=0.05	ns	ns	ns
P value	0.780	0.581	0.801

Table 5. High and low input soil test after flowering – sampled 27 September.

	Low Input	High Input
Total Mineral N	29 kg	45 kg
ECEC	1.1 dS/m	1.1 dS/m
Organic Carbon W&B	5.8 %	6.3 %
pH 1:5 water	8.5 pH	8.5 pH
Colwell Phosphorus	35 ppm	36 ppm
Available Potassium	140 ppm	120 ppm
KCl Sulfur	6 ppm	5 ppm
pH $CaCl_2$	7.8 pH	7.8 pH

Table 6. Trial input and management details.

Sowing date:		**9 May 2023**		
Harvest date:		**20 December 2024**		
Plant population:		60 plants/m²		
		Low Input		**High Input**
Basal Fertiliser:		145 kg/ha MAP (30 kg/ha P) (15 kg/ha N)		204 kg/ha MAP (45 kg/ha P) (22 kg/ha N)
				5 t/ha pig manure*
Nitrogen:	Basal			
	3-4-Leaf (30 May)	83.3 kg/ha ammonium sulphate (17 kg N + 20 kg S)		83.3 kg/ha ammonium sulphate (17 kg N + 20 kg S)
	6-leaf (18 Jul)	37.5 kg N/ha as urea		104 kg N/ha as urea
	Stem elongation (8 Aug)	37.5 kg N/ha as urea		104 kg N/ha as urea
Total N Applied:		**107 kg N /ha**		**247 kg N/ha + Manure**
Herbicides:	IBS (8 May)	TriflurX 2 L/ha Tenet 500 SC 1.5 L/ha		
	6-leaf (18 Jul)	**CL**	**TT**	**RR**
		Ammonium sulphate 800 g/ha Platinum Xtra 0.33 L/ha Lontrel Advanced 0.1 L/ha Expedient 1%	Intervix 750 mL/ha Expedient 1%	Weedmaster DST 1.3 L/ha Expedient 1%
Fungicide:	Seed treatment	Saltro Duo		
	6-Leaf (18 Jul)	Prosaro 450mL/ha		
	20% Bloom (19 Sept)	Aviator Xpro 800mL/ha		
Crop Protection	Pre-emergent	5kg/ha Metarex		
		Pyrinex Super 500ml/ha		

*Refer to 'Appendix. HYC Canola SA Crop Technology Centre' for manure analysis.

Table 7. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Herbicide					
TriflurX	Trifluralin	480 g/L	---	---	EC
Tenet 500	Metazachlor	500 g/L	---	---	SC
Platinum Xtra	Clethodim	360 g/L	---	---	EC
Lontrel Advanced	Clopyralid	600 g/L	---	---	SC
Intervix 750	Imazamox	33 g/L	Imazapyr	15 g/L	SL
Weedmaster DST	Glyphosate	470 g/L	---	---	SL
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS
Crop Protection					
Metarex	Metaldehyde	50 g/kg	---	---	
Pyrinex Super	Bifenthrin	20 g/L	Chlorpyrifos	400 g/L	EC
Adjuvant					
Ammonium sulphate	Ammonium sulphate	980 g/L	---	---	
Expedient	Ethyl and Methyl Esters of Canola Oil Fatty Acids	704 g/L	Non-ionic Surfactants	196 g/L	

Trial 4. HYC Canola Nutrition (FAR SAC C23-03)

Key Points:

- *Previous HYC canola research had shown a benefit from the application of animal manure for grain yield, even where inputs of N & P fertiliser were high.*
- *Treatments were implemented in 2023 where the nutrient equivalent of manure was matched with inorganic fertiliser inputs of N, P, K & S. Then further treatments were included that removed one of these nutrients at a time to determine which could be the major component driving yield response from animal manure.*
- *Increasing crop nutrient input increased the level of crop lodging, as the canola was exposed to major wind events in mid-spring. Lodging increased as nitrogen rate was increased, with no added effect on lodging where manure or inorganic treatments were added.*
- *Despite visual differences in plots there was no difference in grain yield across the treatments.*
- *Oil concentration was highest with the lowest nutrient input. This is consistent with past research that often shows that nitrogen especially can reduce oil concentration. The negative effect of nitrogen on oil concentration are usually offset by yield gains from N.*

Table 1. Yield (t/ha) and grain quality assessment- protein (%), oil (%), test weight (Kg/hL).

		Grain Quality Assessments		
Treatment	**Yield (t/ha)**	**Protein (%)**	**Oil (%)**	**Test Weight (Kg/hL)**
Nil	3.27 -	18.9 -	46.3 a	62.7 -
75 N	3.64 -	19.2 -	46.1 a	62.4 -
150 N	3.59 -	19.4 -	45.5 c	62.5 -
225 N	3.75 -	20.0 -	45.6 bc	62.3 -
300 N	3.79 -	19.4 -	45.5 bc	62.2 -
Nil + Manure*	3.63 -	19.2 -	46.0 ab	62.4 -
225 + Manure	3.77 -	19.5 -	45.6 bc	62.2 -
225 + Inorganic	3.81 -	19.7 -	45.7 bc	62.5 -
225 + Inorganic -N	3.65 -	19.1 -	45.6 bc	62.4 -
225 + Inorganic -K	3.58 -	19.5 -	45.6 bc	62.7 -
225 + Inorganic -P	3.70 -	19.6 -	45.3 c	62.5 -
225 + Inorganic -S	3.62 -	19.6 -	45.4 c	62.6 -
Mean	3.65	19.4	45.7	62.4
LSD P=0.05	ns	ns	0.4	ns
P value	0.086	0.060	<0.001	0.941

*Refer to 'Appendix. HYC Canola SA Crop Technology Centre' for manure analysis.

Table 2. Nutrition trial establishment score, height (cm), and lodging index (0-500).

		In Season Assessments		
		28 June	18 Dec	18 Dec
	Treatment	Establishment (0-9)	Height (cm)	Lodging Index (0-500)
1	Nil	7.0 -	146.7 d	1.3 c
2	75 N	7.0 -	148.0 cd	71.3 c
3	150 N	7.0 -	154.8 a	167.5 b
4	225 N	7.0 -	151.1 a-d	221.3 ab
5	300 N	6.0 -	153.4 abc	192.5 ab
6	Nil + Manure	7.3 -	148.5 bcd	12.5 c
7	225 + Manure	7.5 -	153.0 abc	275.0 a
8	225 + Inorganic	6.7 -	146.1 d	233.3 ab
9	225 + Inorganic -N	7.0 -	154.0 ab	247.5 ab
10	225 + Inorganic -K	7.0 -	148.3 bcd	174.4 b
11	225 + Inorganic -P	6.5 -	150.5 a-d	237.5 ab
12	225 + Inorganic -S	6.5 -	151.4 a-d	237.5 ab
Mean		6.9	150.5	172.6
LSD P=0.05		ns	5.9	88.4
P Value		0.184	0.049	<0.001

*Crop lodging is the product of lodging % (0-100) and lodging severity (0-5).

Table 3. List of nutrition treatments.

	Application date		9-May			18-July	8-Aug
	Treatments	Sowing Manure	Sowing P	Sowing K	Sowing S	6-Leaf N	Bud Visible N
1	Nil	0	30	0	20	0	0
2	75 N	0	30	0	20	37.5	37.5
3	150 N	0	30	0	20	75	75
4	225 N	0	30	0	20	112.5	112.5
5	300 N	0	30	0	20	150	150
6	Nil + Manure	5 t/ha	30	0	20	0	0
7	225 + Manure	5 t/ha	30	0	20	112.5	112.5
8	225 + Inorganic	0	65	120	48	195	195
9	225 + Inorganic -N	0	65	120	48	112.5	112.5
10	225 + Inorganic -K	0	30	120	48	195	195
11	225 + Inorganic -P	0	65	0	48	195	195
12	225 + Inorganic -S	0	65	120	20	195	195

Table 4. Trial input and management details.

Sowing date:		**9 May**
Harvest date:		**20-December**
Plant population:	**45Y95**	60 plants/m²
Basal Fertiliser:		145 kg/ha MAP (30 kg/ha P) (15 kg/ha N)
		Manure as per treatment list
Nitrogen:	3-4-Leaf (30 May)	83.3 kg/ha ammonium sulphate (17 kg N + 20 kg S)
	6-leaf (18 Jul)	As per treatment list
	Stem elongation (8 Aug)	As per treatment list
Fungicide:	Seed treatment	Saltro Duo
	6-Leaf (18 July)	Prosaro 450mL/ha
	20% Bloom (19 Sept)	Aviator Xpro 800mL/ha
Crop Protection	Pre-emergent	5kg/ha Metarex
		Pyrinex Super 500ml/ha

Table 5. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS
Crop Protection					
Metarex	Metaldehyde	50 g/kg	---	---	
Pyrinex Super	Bifenthrin	20 g/L	Chlorpyrifos	400 g/L	EC

Appendix. HYC Canola SA Crop Technology Centre

Table 1. Analysis of chicken manure used at Millicent 2023 (rates and nutrients reported on a dry basis except moisture).

Nutrient	Concentration in chicken manure
pH 1:5 water	5.7
Nitrate Nitrogen	960 mg/kg
Ammonium Nitrogen	8,900 mg/kg
Phosphorus	10,000 mg/kg
Potassium	24,000 mg/kg
Sulfur	6,600 mg/kg
Calcium	14,000 mg/kg
Magnesium	6,200 mg/kg
Carbon	39%
Iron	7,100 mg/kg
Manganese	530 mg/kg
Copper	74 mg/kg
Zinc	350 mg/kg
Boron	44 mg/kg
Moisture	30.8%

VIC Crop Technology Centre

Gnarwarre, Victoria

Sown: 20 April 2023
Harvested: 5 December 2023 (Spring); 23 January 2024 (Winter)
Rotation position: Wheat 2022, Faba Beans 2021
Soil type: Grey clay loam
Available mineral N (0-30cm): 39 kg/ha
Colwell P (ppm) 0-10cm: 62 mg/kg
pH ($CaCl_2$) 0-10cm: 5.0
Organic Carbon (%) 0-10cm: 2.5

Trial 1. HYC Canola Winter Screen Grazed (FAR VIC C23-01 (G))

Key Points:

- *Four winter canola varieties were grazed lightly in July then allowed to recover for grain yield. Hyola Feast CL had the most biomass at grazing and the most forage removed at this time.*
- *The four varieties flowered in a tight window, with only one week between the fastest and slowest varieties.*
- *Captain CL was the standout variety for grain yield, just under 4 t/ha. Captain CL was also the standout variety for oil concentration, being 1.5% oil above the next best variety.*

Table 1. Impact of variety on yield (t/ha) and grain quality (protein (%), oil (%) and test weight (kg/hL) – harvested 16 January.

	Yield (t/ha)	Protein (%)	Oil (%)	Test Weight (kg/hl)
1. Hyola Feast CL	3.62 ab	21.0 a	40.8 c	62.7 bc
2. Hyola 970CL	3.41 b	21.5 a	39.9 d	63.0 ab
3. Phoenix CL	3.47 b	19.8 b	41.7 b	63.6 a
4. Captain CL	3.93 a	19.3 b	43.2 a	62.1 c
Mean	3.61	20.4	41.4	62.8
LSD P=0.05	0.32	0.8	0.6	0.6
P value	0.023	<0.001	<0.001	0.003

Table 2. Impact on variety on dry matter (DM) (t/ha) at grazing (5 July) and start of flowering date for canola at Gnarwarre 2023.

Cultivar	DM pre-grazing (t/ha)	DM removed (t/ha)	Flowering date (BBCH 60)
1. Hyola Feast CL	2.6 -	1.5 -	30/09/2023
2. Hyola 970CL	1.5 -	0.5 -	02/10/2023
3. Phoenix CL	1.8 -	0.8 -	25/09/2023
4. Captain CL	1.6 -	0.8 -	02/10/2023
Mean	0.6	0.9	-
LSD P=0.05	0.3	1.6	-
P value	0.120	0.557	-

Table 3. Trial input and management details.

Sowing date:		**20 April**
Harvest date:		**23 January**
Plant population:		60 plants/m²
Basal Fertiliser:		145 kg/ha MAP (30 kg/ha P) (15 kg/ha N)
Nitrogen:	3-4-Leaf (31 May)	83.3 kg/ha ammonium sulphate (17 kg N + 20 kg S)
	6-leaf (14 June)	112 kg N/ha as urea
	Stem elongation (28 Aug)	112 kg N/ha as urea
Total N Applied:		**260 kg N/ha**
Herbicides:	IBS	TriflurX 2 L/ha Tenet 500 SC 1.5 L/ha Spreadwet 0.2 L/ha
	6-leaf (2 June)	Ammonium sulphate 800 g/ha Platinum Xtra (clethodim 360) 0.33 L/ha Lontrel Advanced 0.1 L/ha Expedient (adjuvant) 1%
Fungicide:	Seed treatment	Saltro Duo
	6-Leaf (2 June)	Prosaro 450mL/ha
	20% Bloom (4 Sept)	Aviator Xpro 800mL/ha
Crop Protection:	Pre-emergent	Metarex 5 kg/ha
		Pyrinex Super 500 mL/ha

Table 4. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Herbicide					
TriflurX	Trifluralin	480 g/L	---	---	EC
Tenet 500	Metazachlor	500 g/L	---	---	SC
Platinum Xtra	Clethodim	360 g/L	---	---	EC
Lontrel Advanced	Clopyralid	600 g/L	---	---	SC
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS
Crop Protection					
Metarex	Metaldehyde	50 g/kg	---	---	
Pyrinex Super	Bifenthrin	20 g/L	Chlorpyrifos	400 g/L	EC
Adjuvant					
Ammonium sulphate	Ammonium sulphate	980 g/L	---	---	
Spreadwet	Alkoxylated Alcohols	1000 g/L	---	---	
Expedient	Ethyl and Methyl Esters of Canola Oil Fatty Acids	704 g/L	Non-ionic Surfactants	196 g/L	

Trial 2. HYC Canola Winter Screen Ungrazed (FAR VIC C23-01)

Key Points:

- *Eight winter canola varieties were sown in an ungrazed trial. Flowering date was similar to the grazed trial and although there were some differences between varieties (nine days from Phoenix CL to RGT Nizza CL), there was still a much larger difference between flowering of the winter varieties and the much faster spring varieties.*
- *Captain CL was again one of the highest yielding varieties but Hyola 970CL and CL222167 also yielded above 4 t/ha in this trial. The yield of Captain CL was lower than in the grazed trial which may have been due to site variation rather than an effect of grazing.*
- *Captain CL was again the standout for oil concentration, being more than 2% oil (3% price) above the other varieties that achieved a similar yield.*
- *While Hyola 970CL has been a benchmark for winter canola in the past 5-10 years, Captain CL has shown over the past 2-3 years that it is well suited to HYC canola environments and worthy of consideration.*

Table 1. Cultivar assessments- yield (kg/ha), establishment (0-9), and estimated flowering date (BBCH 60).

		Cultivar Assessments		
	Cultivar	**Yield (kg/ha)**	**Establishment (0-9)**	**Flowering date (BBCH 60)**
1	**Hyola Feast CL**	3.93 ab	6.8 -	26/09/2023
2	**Hyola 970CL**	4.11 a	6.0 -	03/10/2023
3	**Phoenix CL**	3.65 bc	6.3 -	25/09/2023
4	**Captain CL**	4.19 a	7.0 -	29/09/2023
5	**CL222167**	4.25 a	7.5 -	30/09/2023
6	**RGT Nizza CL**	3.50 c	7.3 -	04/10/2023
7	**RGT Clavier CL**	3.91 ab	6.8 -	23/09/2023
8	**AGFCA014820**	3.55 bc	6.3 -	29/09/2023
Mean		3.88	6.7	-
LSD P=0.05		0.40	ns	-
P Value		0.003	0.620	-

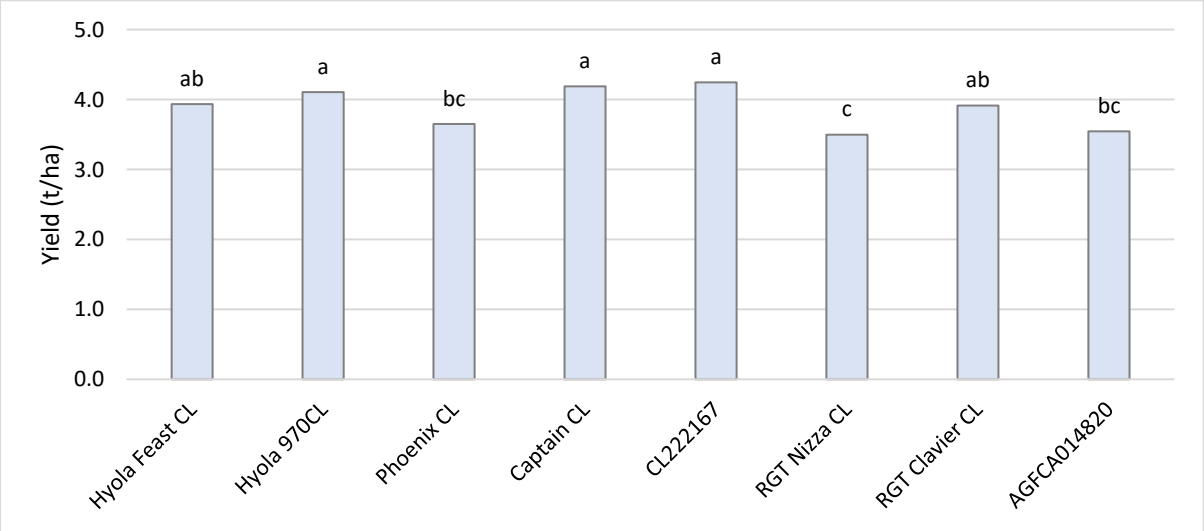

Figure 1. Influence of cultivar on yield (t/ha) (P Value=0.003, LSD (P=0.05) = 0.40).

Table 2. Grain quality assessment- protein (%), oil (%) and test weight (kg/hL).

		Grain Quality Assessments		
	Cultivar	**Protein (%)**	**Oil (%)**	**Test Weight (kg/hL)**
1	**Hyola Feast CL**	22.0 a	40.8 c	63.0 cde
2	**Hyola 970CL**	21.6 ab	41.1 c	63.6 bc
3	**Phoenix CL**	20.4 cd	42.2 b	63.3 bcd
4	**Captain CL**	19.7 d	43.2 a	62.5 de
5	**CL222167**	20.8 bc	40.9 c	64.9 a
6	**RGT Nizza CL**	20.6 c	42.2 b	63.0 cde
7	**RGT Clavier CL**	21.0 bc	41.0 c	64.3 ab
8	**AGFCA014820**	20.3 cd	42.4 ab	62.2 e
Mean		20.8	41.7	63.3
LSD P=0.05		0.8	1	1.1
P Value		<0.001	<0.001	0.001

Table 3. Trial management details.

Sowing date:		**20 April 2023**
Harvest date:		**23 January 2024**
Plant population:		60 plants/m²
Basal Fertiliser:		145 kg/ha MAP (30 kg/ha P) (15 kg/ha N)
Nitrogen:	3-4-Leaf (31 May)	83.3 kg/ha ammonium sulphate **(17 kg N + 20 kg S)**
	6-leaf (14 June)	112 kg N/ha as urea
	Stem elongation (28 Aug)	112 kg N/ha as urea
Total N Applied:		**260 kg N/ha**
Herbicides:	IBS	TriflurX 2 L/ha Tenet 500 SC 1.5 L/ha Spreadwet 0.2 L/ha
	6-leaf (2 June)	Ammonium sulphate 800 g/ha Platinum Xtra (clethodim 360) 0.33 L/ha Lontrel Advanced 0.1 L/ha Expedient (adjuvant) 1%
Fungicide:	Seed treatment	Saltro Duo
	6-Leaf (2 June)	Prosaro 450mL/ha
	20% Bloom (4 Sept)	Aviator Xpro 800mL/ha
Crop Protection:	Pre-emergent	Metarex 5 kg/ha
		Pyrinex Super 500 mL/ha

Table 4. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Herbicide					
TriflurX	Trifluralin	480 g/L	---	---	EC
Tenet 500	Metazachlor	500 g/L	---	---	SC
Platinum Xtra	Clethodim	360 g/L	---	---	EC
Lontrel Advanced	Clopyralid	600 g/L	---	---	SC
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS
Crop Protection					
Metarex	Metaldehyde	50 g/kg	---	---	
Pyrinex Super	Bifenthrin	20 g/L	Chlorpyrifos	400 g/L	EC
Adjuvant					
Ammonium sulphate	Ammonium sulphate	980 g/L	---	---	
Spreadwet	Alkoxylated Alcohols	1000 g/L	---	---	
Expedient	Ethyl and Methyl Esters of Canola Oil Fatty Acids	704 g/L	Non-ionic Surfactants	196 g/L	

Trial 3. HYC Canola YieldMax (FAR VIC C23-02)

Key Points:

- *Six spring canola varieties were sown with two levels of nutrient input, aiming to reach 5 t/ha grain yield.*
- *45Y95 CL was the standout variety for grain yield, and with the High input nutrient treatment, yielded 5.1 t/ha.*
- *The trial demonstrated the importance of fertility to drive canola yield, with the High input nutrient treatment yielding 1.06 t/ha more than the low input (close to grower standard). In a farming systems context, these one-off high input levels should be replaced with building the level of soil fertility over time (especially N & P).*
- *The trial also highlighted the importance of variety choice for high yielding canola. 45Y95 CL has been a consistent standout for grain yield in the past three seasons. It yielded ~0.3 t/ha higher than glyphosate tolerant varieties in this trial and ~0.8 t/ha higher than triazine tolerant varieties.*
- *45Y28 RR had the highest oil concentration, 1.5% above the next best varieties. Oil dropped by 3% (from 48.1 to 45.1%) with the application of High inputs compared to low which partially offset some of the yield gains observed.*
- *Yield components (pods/m², seeds/pod and seed weight) were assessed in three varieties. There was no one component appearing to drive higher grain yield of 45Y95 CL. It was average to above average for all components, which multiplied out to be higher yielding. Yield components (especially pods/m² and seeds/pod) are often negatively correlated, but high yielding varieties often are above average (not necessarily the highest) for both components.*

Table 1. Influence of management strategy and variety on grain yield (t/ha) - refer to Table 7 for input details.

	Management Level		
	Low Input 150 kg/ha N	**High Input 225 kg/ha N + M**	**Mean**
Cultivar	**Yield t/ha**	**Yield t/ha**	**Yield t/ha**
1. 45Y95 CL	3.78 -	5.10 -	**4.44 a**
2. Hyola Solstice	3.12 -	4.18 -	**3.65 c**
3. 45Y28 RR	3.55 -	4.74 -	**4.14 b**
4. Eagle TF	3.66 -	4.59 -	**4.13 b**
5. Hyola Blazer	3.21 -	4.26 -	**3.73 c**
6. HyTTec Trifecta	3.16 -	3.95 -	**3.55 c**
Mean	**3.41 b**	**4.47 a**	**3.94**
LSD P=0.05 Cultivar	0.23	**P value**	0.001
LSD P=0.05 Management	0.19	**P value**	<0.001
LSD P=0.05 Cultivar x Man.	ns	**P value**	0.099

Table 2. Crop biomass assessment 100°C.days & 500°C.days DM after the start of flowering, harvest DM (t/ha), and crop height (cm).

	Crop Dry Matter Assessments		
	16-Aug	27-Sept	10 Nov
Cultivar	100 °C.days after flowering (t/ha)	500°C.days after flowering (t/ha)	Harvest DM (t/ha)
1. 45Y95 CL	5.4 -	10.4 a	12.1 a
2. Hyola Solstice			
3. 45Y28 RR	5.0 -	10.6 a	12.4 a
4. Eagle TF			
5. Hyola Blazer	4.7 -	8.3 b	10.7 b
6. HyTTec Trifecta			
LSD P=0.05	ns	1.3	4.4
P value	0.103	0.004	<0.001
Nutrition			
1. Low Input	4.8 -	9.7 -	10.4 b
2. High Input	5.3 -	9.8 -	13.1 a
LSD P=0.05	ns	ns	1.4
P value	0.193	0.908	<0.001

Table 3. Estimated start of flowering (BBCH 60) date by cultivar and crop height (cm).

	Crop Characteristics	
Cultivar	Flowering Date (BBCH 60)	Crop Height (cm) at harvest
1. 45Y95 CL	07/08/2023	146.3 bc
2. Hyola Solstice	07/08/2023	141.2 de
3. 45Y28 RR	07/08/2023	149.6 ab
4. Eagle TF	05/08/2023	151.0 a
5. Hyola Blazer	05/08/2023	139.6 e
6. HyTTec Trifecta	08/08/2023	144.8 cd
LSD P=0.05	-	4.4
P value	-	<0.001
Nutrition		
1. Low Input	-	139.5 b
2. High Input	-	151.6 a
LSD P=0.05	-	1.4
P value	-	<0.001

Table 4. Yield component assessments- thousand seed weight (TSW) (g), pods/m^2, seeds/pod.

	Grain Quality Assessments		
Cultivar	**TSW (g)**	**Pods/m^2**	**Seeds/pod**
1. 45Y95 CL	4.3 -	4506 a	21.9 b
2. 45Y28 RR	3.9 -	4404 a	24.3 a
3. HyTTec Trifecta	4.2 -	4095 b	20.5 b
LSD P=0.05	ns	301	2.1
P value	0.092	0.030	0.007
Nutrition			
1. Low Input	4.1 -	4020 b	20.9 b
2. High Input	4.2 -	4649 a	23.6 a
LSD P=0.05	ns	139	1.3
P value	0.172	0.004	0.032

Table 5. Influence of management strategy and variety on oil content (%) - refer to Table 7 for input details.

	Management Level		
	Low Input 150 kg/ha N	**High Input 225 kg/ha N + M**	**Mean**
Cultivar	**Oil %**	**Oil %**	**Oil %**
1. 45Y95 CL	47.9 b	44.2 g	**46.1 d**
2. Hyola Solstice	48.0 b	45.8 e	**46.9 b**
3. 45Y28 RR	50.0 a	46.9 d	**48.4 a**
4. Eagle TF	47.9 b	45.0 f	**46.5 c**
5. Hyola Blazer	47.5 bc	44.5 fg	**46.0 d**
6. HyTTec Trifecta	47.3 cd	44.3 g	**45.8 d**
Mean	**48.1 a**	**45.1 b**	**46.6**
LSD P=0.05 Cultivar	0.4	**P value**	<0.001
LSD P=0.05 Management	0.2	**P value**	<0.001
LSD P=0.05 Cultivar x Man.	0.6	**P value**	0.027

Table 6. Influence of management strategy and variety on test weight (kg/hL) - refer to Table 7 for input details.

	Management Level		
	Low Input 150 kg/ha N	**High Input 225 kg/ha N + M**	**Mean**
Cultivar	**Test Weight (kg/hL)**	**Test Weight (kg/hL)**	**Test Weight (kg/hL)**
1. 45Y95 CL	63.0 -	64.2 -	**63.6 c**
2. Hyola Solstice	63.1 -	64.7 -	**63.9 bc**
3. 45Y28 RR	63.2 -	64.6 -	**63.9 bc**
4. Eagle TF	63.2 -	64.6 -	**63.9 bc**
5. Hyola Blazer	63.5 -	64.9 -	**64.2 b**
6. HyTTec Trifecta	64.1 -	65.1 -	**64.6 a**
Mean	**63.3 b**	**64.7 a**	**64.0**
LSD P=0.05 Cultivar	0.4	**P value**	<0.001
LSD P=0.05 Management	0.3	**P value**	0.016
LSD P=0.05 Cultivar x Man.	ns	**P value**	0.644

Table 7. Trial input and management details.

Sowing date:		**20 April 2023**		
Harvest date:		**6 December 2023**		
Plant population:		60 plants/m²		
		Low Input		**High Input**
Basal Fertiliser:		145 kg/ha MAP (30 kg/ha P) (15 kg/ha N)		204 kg/ha MAP (45 kg/ha P) (22 kg/ha N)
				5 t/ha pig manure*
Nitrogen:				
	2-3-leaf (24 May)	83.3 kg/ha ammonium sulphate **(17 kg N + 20 kg S)**		83.3 kg/ha ammonium sulphate **(17 kg N + 20 kg S)**
	6-leaf (23 June)	37.5 kg N/ha as urea		104 kg N/ha as urea
	Stem elongation (12 July)	37.5 kg N/ha as urea		104 kg N/ha as urea
Total N Applied:		**107 kg N /ha**		**247 kg N/ha + Manure**
Herbicides:	IBS	TriflurX 2 L/ha Tenet 500 SC 1.5 L/ha Spreadwet 0.2 L/ha		
	6-leaf (2 June)	**CL**	**TT**	**RR**
		Ammonium sulphate 800 g/ha Platinum Xtra 0.33 L/ha Lontrel Advanced 0.1 L/ha Expedient 1%	Intervix 750 mL/ha Expedient 1%	Weedmaster DST 1.3 L/ha Expedient 1%
Fungicides:	Seed treatment	Saltro Duo		
	6-Leaf (2 June)	Prosaro 450mL/ha		
	20% Bloom (15 Aug)	Aviator Xpro 800mL/ha		
Crop Protection:	Pre-emergent	Metrex 10 kg/ha		
		Pyrinex Super 500 mL/ha		

***Refer to 'Appendix. HYC Canola VIC Crop Technology Centre' for manure analysis.

Table 8. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Herbicide					
TriflurX	Trifluralin	480 g/L	---	---	EC
Tenet 500	Metazachlor	500 g/L	---	---	SC
Platinum Xtra	Clethodim	360 g/L	---	---	EC
Lontrel Advanced	Clopyralid	600 g/L	---	---	SC
Intervix 750	Imazamox	33 g/L	Imazapyr	15 g/L	SL
Weedmaster DST	Glyphosate	470 g/L	---	---	SL
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS
Crop Protection					
Metarex	Metaldehyde	50 g/kg	---	---	
Pyrinex Super	Bifenthrin	20 g/L	Chlorpyrifos	400 g/L	EC
Adjuvant					
Ammonium sulphate	Ammonium sulphate	980 g/L	---	---	
Expedient	Ethyl and Methyl Esters of Canola Oil Fatty Acids	704 g/L	Non-ionic Surfactants	196 g/L	

Table 9. Yield max mid-season soil test results for both low and high input treatments (0-10 cm) sampled – 9 October.

	Low Input (0-10 cm)	High Input (0-10 cm)
Total Mineral N	10 kg/ha	39 kg/ha
ECEC	0.4 dS/m	1.1 dS/m
Organic Carbon W&B	2.4 %	2.7 %
pH 1:5 water	5.9 pH	6.3 pH
pH $CaCl_2$	4.8 pH	6.0 pH
Total Mineral N	10 kg/ha	39 kg/ha
Colwell Phosphorus	68ppm	97ppm
Available Potassium	170ppm	210ppm
KCl Sulfur	5 ppm	11 ppm

Trial 4. HYC Canola Nutrition (FAR VIC C23-03)

Key Points:

- *Previous HYC canola research had shown a benefit from the application of animal manure for grain yield, even where inputs of N & P fertiliser were high.*
- *Treatments were implemented in 2023 where the nutrient equivalent of manure was matched with inorganic fertiliser inputs of N, P, K & S. Then further treatments were included that removed one of these nutrients at a time to determine which could be the major component driving yield response from animal manure.*
- *With an intensive cropping history and low starting nitrogen, the site was strongly response to nutrient input. Grain yield from N application increased right up to where 300 kg N/ha was applied (~650 kg urea), from 2.81 to 4.79 t/ha.*
- *The application of 5 t/ha pig manure increased yield with both nil N and 225 kg N/ha. The yield of manure with nil N was still less than where the lowest rate (75 kg) of nitrogen was applied, showing that manure is unlikely to replace the need for inorganic fertiliser input.*
- *Manure application (with 225 kg N/ha) yielded more than where the equivalent rates of Inorganic Fertiliser (N, P, K & S) were applied. Given total macronutrients were the same in these treatments, the benefit of the manure may have been the steady release of nutrition versus the relative feast or famine provided by N fertiliser.*
- *As is often observed, the higher rate of nutrient (especially N) input reduced oil concentration in canola.*
- *At the highest N rate applied in this trial (300 kg N/ha), input cost was ~$450/ha. Gross income from the highest N rate was (4.79 t/ha * $629/tonne) $3102/ha, and from the lowest N rate was (2.81 t/ha * $660/tonne) $1854/ha. The extra income generated from the high N rate comfortably covered the cost of input.*
- *This level of N response has not been common in HYC canola trials, but it shows that canola has a strong N demand and that it is a safe crop to apply high rates of N to so that overall system fertility can be built up. This should be done in conjunction with growing legumes and with other organic (e.g. manure) fertilisers where available.*

Table 1. Grain quality assessment- yield (t/ha), oil (%) and test weight (Kg/hL).

		Grain Quality Assessments		
	Treatment	**Yield (t/ha)**	**Oil (%)**	**Test Weight (Kg/hL)**
1	Nil	2.81 g	48.7 a	62.7 b
2	75 N	3.86 e	47.1 b	63.0 b
3	150 N	4.35 d	46.4 c	63.7 a
4	225 N	4.48 cd	45.4 d	63.9 a
5	300 N	4.79 ab	45.2 def	64.0 a
6	Nil + Manure	3.48 f	48.6 a	62.9 b
7	225 + Manure	4.87 a	44.8 f	63.8 a
8	225 + Inorganic	4.56 bcd	45.0 ef	64.1 a
9	225 + Inorganic -N	4.68 abc	45.3 de	63.8 a
10	225 + Inorganic -K	4.62 a-d	45.1 def	64.0 a
11	225 + Inorganic -P	4.67 abc	45.2 def	64.0 a
12	225 + Inorganic -S	4.58 a-d	45.1 def	64.1 a
Mean		4.31	46.0	63.7
LSD P=0.05		0.31	0.5	0.6
P Value		<0.001	<0.001	<0.001

Table 2. List of nutrition treatments.

	Application date	**20-Apr**				**24-May**	**12-Jul**
	Treatments	**Sowing Manure**	**Sowing P**	**Sowing K**	**2-3 Leaf Sulphur**	**6-Leaf N**	**Bud Visible N**
1	Nil	0	30	0	20	0	0
2	75	0	30	0	20	37.5	37.5
3	150	0	30	0	20	75	75
4	225	0	30	0	20	112.5	112.5
5	300	0	30	0	20	150	150
6	0 + Manure*	5 t/ha	30	0	20	0	0
7	225 + Manure	5 t/ha	30	0	20	112.5	112.5
8	225 + Inorganic**	0	65	120	48	195	195
9	225 + (Inorganic – N)	0	65	120	48	112.5	112.5
10	225 + (Inorganic – P)	0	30	120	48	195	195
11	225 + (Inorganic – K)	0	65	0	48	195	195
12	225 + (Inorganic – S)	0	65	120	20	195	195

***Refer to 'Appendix. HYC Canola VIC Crop Technology Centre' for manure analysis.

Table 3. Nutrition trial establishment score, NDVI and plant height.

		In Season Assessments	
		10-Nov	10-Nov
	Treatment	Lodging (0-500)	Height (cm)
1	Nil	0 d	135.7 f
2	75 N	34 bcd	147.0 de
3	150 N	25 bcd	155.6 bc
4	225 N	25 bcd	158.4 abc
5	300 N	38 bcd	154.4 cd
6	Nil + Manure	18 cd	144.8 e
7	225 + Manure	58 ab	160.4 abc
8	225 + Inorganic	90 a	162.3 ab
9	225 + Inorganic -N	40 bc	165.4 a
10	225 + Inorganic -K	58 ab	163.8 a
11	225 + Inorganic -P	49 bc	166.0 a
12	225 + Inorganic -S	29 bcd	161.8 abc
Mean		38	156.3
LSD P=0.05		38	7.8
P Value		0.006	<0.001

*Crop lodging is the product of lodging % (0-100) and lodging severity (0-5).

Table 4. Trial management details.

Sowing date:		**20-April**
Harvest date:		**5-December**
Plant population:	**45Y95 CL**	60 plants/m²
Basal fertiliser:		145 kg/ha MAP (30 kg/ha P) (15 kg/ha N)
		Manure as per treatment list
Nitrogen:	2-3-Leaf (24 May)	83.3 kg/ha ammonium sulphate (17 kg N + 20 kg S)
	6-leaf (20 June)	As per treatment list
	Stem elongation (12 July)	As per treatment list
Herbicides:	IBS	TriflurX 2 L/ha Tenet 500 SC 1.5 L/ha Spreadwet 0.2 L/ha
	6-leaf (2 June)	Ammonium sulphate 800 g/ha Platinum Xtra (clethodim 360) 0.33 L/ha Lontrel Advanced 0.1 L/ha Expedient (adjuvant) 1%
Fungicides:	6-Leaf (2 June)	Prosaro 450mL/ha
	20% Bloom (15 Aug)	Aviator Xpro 800mL/ha
Crop Protection:	PSPE	Metarex 10 Kg/ha
		Pyrinex Super 500 mL/ha

Table 5. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Herbicide					
TriflurX	Trifluralin	480 g/L	---	---	EC
Tenet 500	Metazachlor	500 g/L	---	---	SC
Platinum Xtra	Clethodim	360 g/L	---	---	EC
Lontrel Advanced	Clopyralid	600 g/L	---	---	SC
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS
Crop Protection					
Metarex	Metaldehyde	50 g/kg	---	---	
Pyrinex Super	Bifenthrin	20 g/L	Chlorpyrifos	400 g/L	EC
Adjuvant					
Ammonium sulphate	Ammonium sulphate	980 g/L	---	---	
Spreadwet	Alkoxylated Alcohols	1000 g/L	---	---	
Expedient	Ethyl and Methyl Esters of Canola Oil Fatty Acids	704 g/L	Non-ionic Surfactants	196 g/L	

Appendix. HYC Canola VIC Crop Technology Centre

Table 1. Analysis of chicken manure used at Gnarwarre 2023 (rates and nutrients reported on a dry basis except moisture).

Nutrient	Concentration in chicken manure
pH 1:5 water	5.7
Nitrate Nitrogen	960 mg/kg
Ammonium Nitrogen	8,900 mg/kg
Phosphorus	10,000 mg/kg
Potassium	24,000 mg/kg
Sulfur	6,600 mg/kg
Calcium	14,000 mg/kg
Magnesium	6,200 mg/kg
Carbon	39%
Iron	7,100 mg/kg
Manganese	530 mg/kg
Copper	74 mg/kg
Zinc	350 mg/kg
Boron	44 mg/kg
Moisture	30.8%

Table 2. Gnarwarre, Victoria soil test results for canola – sampled 26 April.

	0-10 cm	10-20 cm	20-30 cm	30-60 cm	60-100 cm
Total Mineral N	45 kg/ha	21 kg/ha	13 kg/ha	8 kg/ha	4 kg/ha
ECEC	0.9 dS/m	0.8 dS/m	0.9 dS/m	1.1 dS/m	2.5 dS/m
Organic Carbon W&B	2.5 %	N/A	N/A	N/A	N/A
pH 1:5 water	5.9 pH	7.0 pH	7.9 pH	8.7 pH	9.2 pH
pH $CaCl_2$	5.0 pH	5.9 pH	6.5 pH	7.1 pH	7.8 pH
Colwell Phosphorus	62 ppm	N/A	N/A	N/A	N/A
Available Potassium	410 ppm	N/A	N/A	N/A	N/A
KCl Sulfur	7 ppm	5 ppm	6 ppm	15 ppm	53 ppm

WA Crop Technology Centre

Kojonup, Western Australia

Sown: April 29, 2023
Harvested: 29 November 2023
2022 Crop: Barley
Soil type & management: Sandy loam duplex
Available Nitrogen 0-40 cm: 67 kg/ha
Colwell P 0-10 cm: 28 mg/kg
pH ($CaCl_2$) 0-20 cm: 5.6
Organic Carbon 0-20 cm: 2.8%

Trial 1. HYC Spring canola YieldMax Trial (FAR WAK C23-02)

Objectives: To assess the impact of increased crop inputs, specifically nitrogen, phosphorus and manure, across various spring canola variety types.

Key points:

- *The high-input management strategy (225 kg/ha N + 30 kg/ha P + 5 t/ha chicken manure) resulted in yields 0.69 t/ha higher than the low-input approach (150 kg/ha N + 15 kg P/ha), reflecting a substantial 26% increase in yield.*
- *Yield differences within herbicide tolerance groups was greater than differences between herbicide tolerance groups.*
- *For oil concentration, the Glyphosate Tolerant (GT) varieties had higher oil than Clearfield (CLF) and Triazine Tolerant (TT) varieties.*
- *Hybrid Clearfield canola 45Y95 CL achieved the highest yield at 3.35 t/ha. This was 19% higher than the lowest yielding variety Hyola Blazer TT.*
- *Dry matter assessments were taken at 100°C.days and 500°C.days after the start of flowering and again at crop maturity. 45Y95 CL and 45Y28 RR had more biomass than HyTTec Trifecta by the second biomass assessment. This higher biomass was maintained through to maturity but resulted in lower harvest index (HI).*
- *Growth through the crop critical period (between 100 and 500°C.days after the start of flowering) was > 4 t/ha for 45Y95 CL and 45Y28 RR, but < 3 t/ha for HyTTec Trifecta. The difference in growth during the crop critical period likely drove the higher yield of these two varieties. Similarly, there was > 4 t/ha growth through the critical period with the High input nutrition strategy compared with < 3 t/ha for the low input strategy.*
- *Applying the extra nutrition and selecting the best hybrids were additive factors in achieving the highest yields in this trial.*
- *No significant interaction between variety and management strategy was observed for yield and biomass.*

Treatments: Six spring varieties (two glyphosate-tolerant, two Clearfield and two Triazine tolerant) with low and high input management levels.

Table 1. Yield, oil concentration and protein concentration in spring canola YieldMax trial at Kojonup in 2023.

Treatment	Yield (t/ha)	Oil (%)	Protein (%)
Herbicide groups			
Clearfield Tolerant	3.12 -	45.6 b	19.9 b
Glyphosate Tolerant	3.01 -	46.9 a	19.8 b
Triazine Tolerant	2.82 -	45.8 b	21.8 a
LSD P=0.05	ns	0.73	0.89
P Value	0.25	0.05	0.05
Management			
150 kg N/ha +15 kg P/ha	3.33 a	45.5 a	20.2 a
225 kg N/ha +30 kg P/ha + 5 t/ha Chicken manure	2.64 b	46.8 b	20.8 b
LSD P=0.05	0.48	0.76	0.62
P Value	<0.05	<0.05	<0.001
Variety			
45Y95 CL	3.35	44.6	20.0
Hyola Solstice CL	2.91	46.6	19.8
45Y28 RR	3.15	47.3	19.7
NS Eagle TF	2.86	46.6	20.0
HyTTec Trifecta	2.83	46.0	20.9
Blazer	2.81	45.6	22.6
LSD 0.05	ns	1.2	1.1
P Value	0.41	0.01	<0.01

Table 2. Biomass (t/ha) at 100°C.days (Biom100) and 500°C days (Biom500) after flowering and maturity and harvest index of 3 varieties with high and low input at Kojonup in 2023.

Factor	Flowering date	Biom100	Biom500	Biomass Maturity	Harvest index
		t/ha	t/ha	t/ha	
Variety					
45Y95 CL	19/8/2023	6.59 -	10.83 a	10.86 a	0.33 b
45Y28 RR	19/8/2023	6.18 -	10.02 a	10.57 a	0.33 b
HyTTec Trifecta	22/8/2023	5.49 -	8.26 b	9.03 b	0.36 a
LSD P=0.05		ns	1.05	1.22	0.008
P Value		0.20	0.01	0.01	<0.01
Management					
High input		6.54 -	10.98 a	10.92 a	0.34 -
Low input		5.63 -	8.43 b	9.38 b	0.34 -
LSD P=0.05		ns	0.86	0.99	ns
P Value		0.08	0.01	0.01	0.45

Table 3. Trial input and management details

Sowing date:		**20 April 2023**	
Varieties:		Glyphosate Tolerant (GT) - Eagle TF & 45Y28 RR Triazine Tolerant (TT) – HyTTec Trifecta and Hyola Blazer TT Clearfield Tolerant (CLF) –45Y95 CL and Hyola Solstice CL	
Target plant density		40 plants/m^2	
	Growth stage	**Low Input (75 kg N/ha+15 kg P/ha + 20 kg S/ha)**	**High Input (225 kg N/ha+30 kg P/ha +30 kg S/ha + 5t/ha manure*)**
Basal Fertiliser:	**Sowing**	70 kg/ha MAP + 72 L/ha UAN (30 kg N/ha, 15 kg P/ha)	140 kg/ha MAP + 50 L/ha UAN (30 kg N/ha, 31 kg P/ha) + 5t/ha manure
Chicken manure		**Nil**	**5 t/ha**
Nitrogen:	6-leaf	39 kg N/ha + 20 kg S/ha (UAN + SOA)	85 kg N/ha + 20 kg S/ha (UAN + SOA)
	Bud visible	37 kg N/ha (UAN)	140 kg N/ha (UAN)
Total N Applied:		**75 kg N/ha**	**225kg N/ha**
Fungicide:	Seed	Saltro Duo	Saltro Duo
	20% Bloom	Aviator Xpro 0.80 L/ha	Aviator Xpro 0.80 L/ha

***Chicken Manure expressed dry matter basis (3.0% Nitrogen, and 0.9% Phosphorus) = additional 100 kg N/ha and 27kg P/ha to replicate high fertility soils.

Table 4. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS

Trial 2. Spring canola nutrition trial for hyper-yielding canola (FAR WAK C23-03)

Objectives: To determine the optimal nutrient management strategy for achieving hyper-yielding spring canola.

Key points:

- *Yield responses to applied nitrogen fertilizer plateaued at 75 kg N/ha (all treatments had 30 kg/ha N basal application) and similar yields were achieved beyond that rate.*
- *The addition of 5 t/ha of manure with no N applied lifted grain yield by 0.61 t/ha. There was no benefit of manure where 225 kg N/ha was applied.*
- *Increasing rates of nutrition gradually reduced oil concentration and increased grain protein concentration.*

Treatments: Five nitrogen rates were applied using UAN and SOA. A sixth treatment had 5 t/ha of chicken manure applied. 30 kg N/ha and 15 kg P/ha using MAP and UAN was applied as the basal application for all treatments.

Table 1. Yield, protein, and oil of the Nutrition trial (t/ha) in Canola (45Y28RR) at Kojonup in 2023.

Applied Nitrogen (kg/ha) in Crop		Yield (t/ha)		Protein (%)		Oil (%)	
1	0	2.37	b	17.78	d	48.9	a
2	75	2.79	a	18.70	bc	48.4	ab
3	150	2.87	a	19.33	ab	48.1	b
4	225	2.81	a	19.53	a	47.8	c
5	300	2.76	a	19.65	a	47.8	bc
6	0 + 5 t/ha Manure*	2.98	a	18.12	cd	48.7	a
7	225 + Inorganic*	3.05	a	19.62	a	48.1	bc
8	225 + 5 t/ha Manure*	3.05	a	19.92	a	47.5	c
Mean		2.83		19.10		48.2	
LSD P=0.05		0.50		0.71		0.61	
P Value		<0.05		< 0.05		<0.05	

*****Chicken Manure expressed dry matter basis (3.0% Nitrogen, and 0.9% Phosphorus) = additional 100 kg N/ha and 27kg P/ha to replicate high fertility soils. Inorganic treatment applied mineral fertiliser equivalent of the N & P in manure.

Table 2. Trial input and management details

Sowing date:		**29 April 2023**
Target plant density:		40 plants/m²
Canola Variety		Pioneer 45Y28RR
Basal application:		70 kg/ha MAP +72 L/ha UAN (30 kg N/ha, 15 kg P/ha)
Nitrogen:	6 Leaf	50kg N/ha (UAN) +20 kg S/ha (SOA) (not for the Nil N)
	Bud Visible	The balance of nitrogen as per treatment (UAN).
Fungicide	6 - Leaf	Prosaro 450mL/ha
	20% Bloom	Aviator Xpro 800mL/ha

Table 3. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Saltro Duo	Pydiflumetofen	200 g/L	---	---	FS

2023 HYC Wheat Results

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NSW Crop Technology Centre

Wallendbeen, NSW

Time of Sowing: 21 April 2023
Harvested: 18 December 2023
Rotation position: 2022 Canola, 2021 Wheat, 2020 Canola, 2019 Legume Pasture
Soil type: Red clay loam
Nitrogen 0-60cm: 226kg N/ha
Colwell P (ppm) 0-10cm: 32mg/kg
pH ($CaCl_2$) 0-10cm: 5.0
Organic Carbon (%) 0-10cm: 2.6%

Trial 1. HYC Wheat G.E.M Trial Series (FAR NSW W23-03)

Key Points:

- *Grain yields of RGT Waugh were consistently higher yielding than other varieties, however the results indicated that there was a significant interaction (p=0.003) between management approach and variety.*
- *RGT Waugh, a white winter wheat stood out as having good harvest biomass (dry matter), low head numbers and relatively better harvest index, even though its phenology was relatively slow.*
- *The varieties that gave significantly greater yield responses to higher inputs (compared to the low input approach) were Scepter, Stockade and RGT Cesario, a result that coincided in with greater disease pressure.*
- *Gross income after crop inputs were taken into account and varied from approximately $300 to just over $500/ha depending on the variety tested.*
- *Growing Scepter with a higher input of N (additional 40N), PGR and four fungicide units (High Input approach) generated the highest gross income as result of a better bin grade and higher yields.*
- *Other varieties were in general more suited to lower input management approaches with a single flag leaf spray of Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai), no PGR and 150kg N/ha generating the most profitable crops with AGTW005, Longford (AGF4818) and RGT Waugh.*
- *Tactically cutting back on the level of later season fungicide input (reducing expenditure at flag leaf and removing the head wash fungicide) was generally a practical and cost-effective management adjustment for all the varieties during the season.*

Treatments:

Six cultivars (RGT Cesario, AGTW005, Stockade, Longford (formerly AGF4818), RGT Waugh and Scepter) were tested under four different management programs:

1. High Input – Four units of fungicides (flutriafol plus foliar fungicides GS31, GS39, GS59), 190kg N/ha, PGR.
2. Low Input – One unit of fungicide based on Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) & 150kg N/ha.
3. HYC Strategic Input – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 1.

Table 1. Trial input and management details

Sowing date:			**20 April 2023**			
Harvest date:			**18 December 2023**			
Seed rate:			180 seeds/m^2			
Basal fertiliser:	20-Apr		120 kg/ha MAP			
	2-Aug		217kg/ha Urea (100kg N)			
Nitrogen:			**Low Input**			**High Input**
	GS32					40kg N/ha
			Strategic			**Tactical**
	GS32		40kg N/ha			40kg N/ha Scepter only
PGR:			**High Input Only**			
	GS30		Moddus Evo 0.40 L/ha			
Fungicide:			**Low Input**			**High Input**
	GS00		**----**			Flutriafol 0.2 L/ha
	GS31/32					Prosaro 300mL/ha
	GS39		Prosaro 150mL/ha			Aviator Xpro 500mL/ha
	GS59		----			Radial 840mL/ha
			Tactical Fungicides:			
	RGT Cesario	**AGTW005**	**RGT Waugh**	**Stockdale**	**Longford**	**Scepter**
Sowing						Flutriafol 200mL/ha
GS31	Prosaro 300mL/ha	Prosaro 300mL/ha	Aviator Xpro 416mL/ha	Prosaro 300mL/ha	Prosaro 300mL/ha	Prosaro 300mL/ha
GS39	Opus 500mL/ha	Opus 500mL/ha	Opus 500mL/ha	Opus 500mL/ha	Opus 500mL/ha	Radial 840mL/ha
GS59						Prosaro 150mL/ha
			Strategic Fungicides:			
	RGT Cesario	**AGTW005**	**RGT Waugh**	**Stockdale**	**Longford**	**Scepter**
Sowing						Flutriafol 200mL/ha
GS31	Prosaro 300mL/ha	Prosaro 300mL/ha	Aviator Xpro 416mL/ha	Prosaro 300mL/ha	Prosaro 300mL/ha	Prosaro 300mL/ha
GS39	Opus 500mL/ha	Opus 500mL/ha	Opus 500mL/ha	Opus 500mL/ha	Opus 500mL/ha	Radial 840mL/ha
GS59	Prosaro 150mL/ha	Prosaro 150mL/ha	Prosaro 150mL/ha	Prosaro 150mL/ha	Prosaro 150mL/ha	Prosaro 150mL/ha

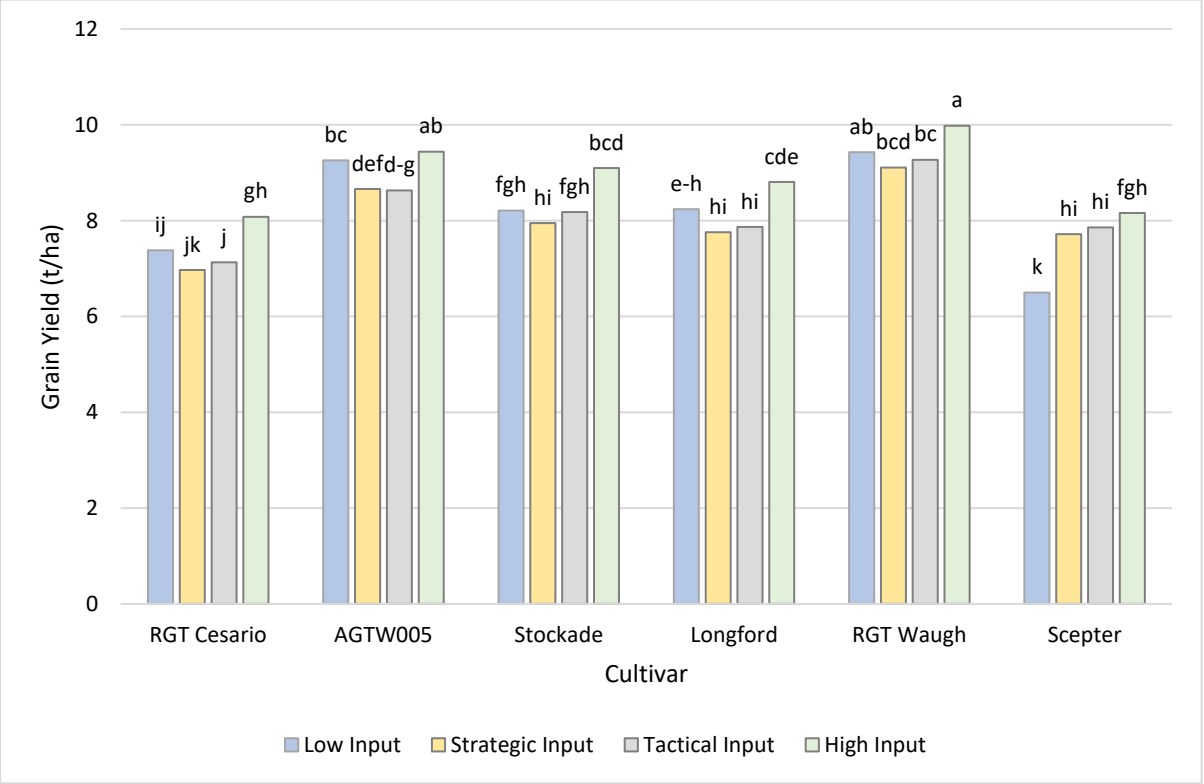

Figure 1. Influence of management strategy and cultivar on grain yield (t/ha). P value = 0.003, LSD (P=0.05)= 0.58.

Statistically there was a significant interaction with varieties responding differently to the inputs applied (p=0.003). The varieties that gave significantly greater yields to higher inputs (compared to the low input approach) were Scepter, Stockade and RGT Cesario, a result that coincided with increased Septoria tritici blotch (STB) infection in Stockade and Scepter, and stripe rust in RGT Cesario under lower input management. The generally higher crop inputs (N & fungicides) associated with the strategic and tactical management approaches were not statistically higher yielding than the low input, with the exception of Scepter. With AGTW005 which has been an exceptionally stiff strawed disease resistant variety applying more foliar fungicides in the tactical and strategic management approach was associated with a significant reduction in yield compared to the low input approach, although 4 units of fungicide (high input) incorporating at sowing protection with flutriafol gave similar yields to the low input.

Considering the drier nature of the season, the overall yields of RGT Waugh, which were higher than any other variety was impressive.

There was no interaction between variety and management when grain quality was considered (Table 2) with high inputs of applied nitrogen giving small increases in grain protein across the varieties tested. The main differences in grain quality were associated with variety with the white wheat Stockade showing poorer screenings and test weights than other varieties tested.

Table 2. Influence of management strategy and cultivar on grain yield (t/ha) and grain quality (protein (%), test weight (kg/hL), screening (%), and thousand grain weight (TSW g).

Treatment		Yield t/ha	Protein %	TSW g	Test Weight kg/hL	Screenings %
Management Strategy						
1	Low Input	8.17 b	11.8 c	38.1 -	75.7 b	5.4 -
2	High Input	8.93 a	12.0 ab	38.1 -	76.7 a	4.5 -
3	Strategic	8.03 b	12.1 a	38.1 -	75.7 b	5.2 -
4	Tactical	8.16 b	11.9 bc	38.0 -	75.7 b	5.2 -
Mean		**8.32**	**12.0**	**38.1**	**76.0**	**5.1**
P Value		0.001	0.006	0.996	0.007	0.169
LSD P=0.05		0.33	0.2	ns	0.6	ns
Cultivar						
1	RGT Cesario	7.39 d	12.5 a	35.7 c	75.5 d	5.5 b
2	AGTW005	9.00 b	12.5 a	36.0 c	76.9 a	3.6 d
3	Stockade	8.36 c	11.4 d	35.8 c	74.9 e	6.9 a
4	Longford	8.17 c	12.1 b	39.1 b	76.4 ab	5.5 b
5	RGT Waugh	9.45 a	11.6 c	41.9 a	76.2 bc	4.3 c
6	Scepter	7.56 d	11.6 cd	40.2 b	75.8 cd	4.7 c
Mean		**8.32**	**12.0**	**38.1**	**76.0**	**5.1**
P Value		<0.001	<0.001	<0.001	<0.001	<0.001
LSD P=0.05		0.29	0.2	1.5	0.6	0.6

The white winter wheat RGT Waugh was one of the later varieties to flower (Table 3) along with AGTW005 and Longford (AGF4818 and was notably different in crop dry matter make up at harvest (table 4). It was associated with high biomass (along with Longford (AGF4818), relatively low head numbers (average 463) compared to all other cultivars tested, but a relatively high harvest index (Table 4).

Table 3. Phenology of the cultivars in spring – Zadoks development stage.

Variety	Calendar date							
	22-Jul	2-Aug	9-Aug	24-Aug	4-Sep	19-Sep	5-Oct	24-Oct
RGT Cesario	29	30	31	32	33	41	65	73
AGTW005	29	29 - 30	31	32	33	41	61	73
Stockade	31	32	32	33	37	41-45	65	75
Longford	29	29	31	31	32	37-39	59	71
RGT Waugh	30	30	31	32	33	37-39	61	73
Scepter	32	33	37	45	51	65	81	85
Annapurna	29	29	30	31	33	39	63	75

Table 4. Influence of management strategy and cultivar on crop canopy components (heads/m^2, harvest dry matter (t/ha) and harvest index (%).

	Heads m^2		Dry matter t/ha		Harvest Index %	
RGT Cesario						
Low Input	622	-	19.82	c-h	32.9	-
High Input	658	-	20.73	b-f	34.1	-
Strategic	601	-	18.40	ghi	33.5	-
Tactical	631	-	19.64	c-h	31.9	-
Mean	**628**	**a**	**19.65**	**b**	**33.1**	**c**
AGTW005						
Low Input	514	-	21.33	bc	38.0	-
High Input	575	-	22.21	ab	37.2	-
Strategic	530	-	20.67	b-f	36.8	-
Tactical	526	-	20.80	b-e	36.4	-
Mean	**536**	**c**	**21.25**	**a**	**37.1**	**b**
Stockade						
Low Input	501	-	18.01	hi	40.3	-
High Input	547	-	18.93	d-i	42.0	-
Strategic	506	-	17.33	i	40.5	-
Tactical	560	-	18.18	hi	39.5	-
Mean	**529**	**c**	**18.11**	**c**	**40.6**	**a**
Longford						
Low Input	525	-	21.66	abc	33.3	-
High Input	556	-	23.51	a	32.9	-
Strategic	489	-	18.69	f-i	37.1	-
Tactical	524	-	20.73	b-f	33.7	-
Mean	**523**	**c**	**21.15**	**a**	**34.2**	**c**
RGT Waugh						
Low Input	428	-	18.75	e-i	44.1	-
High Input	489	-	22.51	ab	38.9	-
Strategic	468	-	20.45	b-g	39.5	-
Tactical	470	-	21.72	abc	37.9	-
Mean	**463**	**d**	**20.86**	**a**	**40.1**	**a**
Scepter						
Low Input	552	-	18.48	ghi	30.9	-
High Input	584	-	20.78	b-f	34.5	-
Strategic	586	-	21.28	bc	32.0	-
Tactical	570	-	20.97	bcd	32.9	-
Mean	**573**	**b**	**20.37**	**ab**	**32.6**	**c**
Grand Mean	**542**		**20.23**		**36.3**	
P Value (Cultivar)	<0.001		<0.001		<0.001	
LSD P=0.05 (Cultivar)	35		1.05		2.0	
P Value (Management x Cultivar)	0.947		0.033		0.186	
LSD P=0.05 (Management x Cultivar)	ns		2.11		ns	

Disease infection

STB infection was most evident in Stockade, Scepter and RGT Waugh (Figure 2) with RGT Cesario suffering stripe rust in low input fungicide approaches (data not shown).

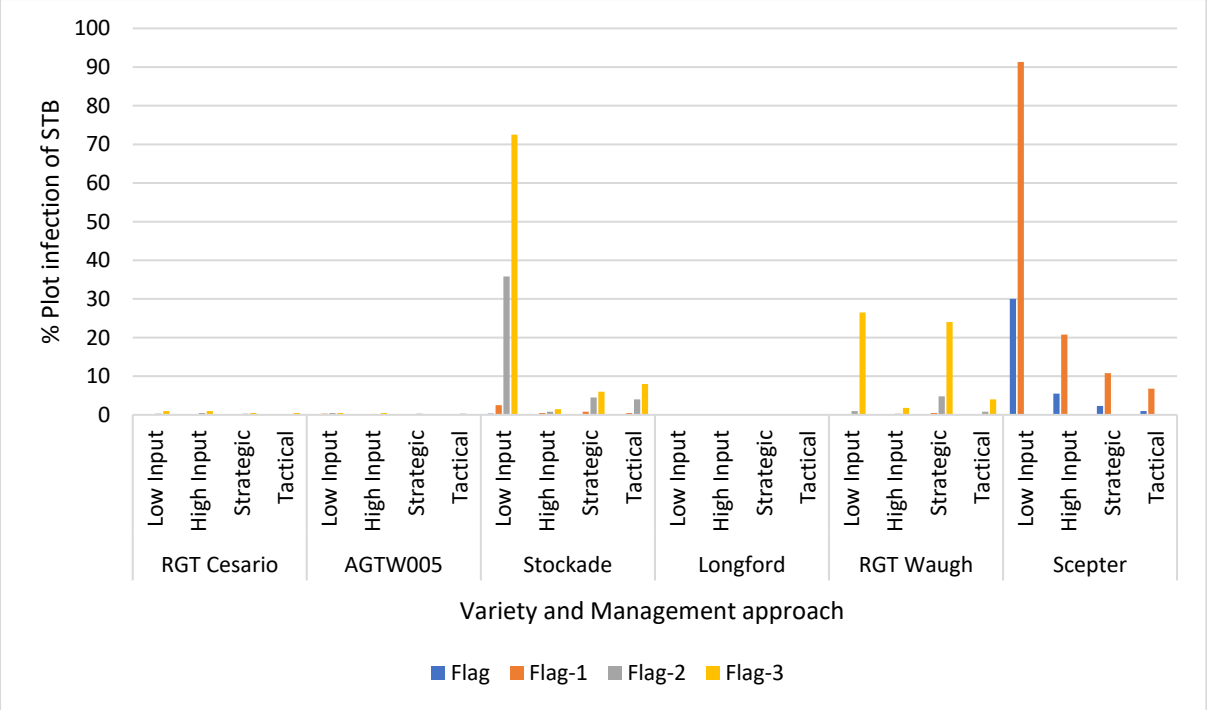

Figure 2. Influence of management strategy and cultivar on Septoria tritici blotch (STB) infection. Assessed 6 October.

What paid?

Gross income after crop inputs were taken into account and varied from approximately $300 to just over $500/ha depending on the cultivar tested. Scepter showed the largest range in profitability as a result of management approach with $526/ha covering the difference in margin between low input and high input, the latter being the more profitable (Table 5). Growing Scepter with a higher input of N (additional 40N), PGR and four fungicide units (High Input approach) generated the highest gross income as result of a better bin grade and higher yields. The yield improvement of 1.66t/ha was sufficient to pay for the higher input. It is arguable whether the PGR was required as there was no lodging, as the only difference between strategic and high input was the PGR, however the 0.44t/ha yield difference in favour of the PGR paid for the input in this fertile rotation.

Other varieties were in general more suited to lower input management approaches with a single flag leaf spray of Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 150mL/ha (31.5 g ai/ha of each ai), no PGR and 150kg N/ha. This makes sense in a relatively fertile farming system (pasture legume phase) where 150N was generating 11.4 – 12.5% grain protein, with cultivars that have good disease resistance and good standing power such as AGTW005, Longford (AGF4818) and to a lesser extent Stockade and RGT Waugh performing well under a low input system. With the two latter varieties, stripe rust and STB pressure was not as great as witnessed previously so the yield was not compromised to the same extent as in 2022 from reductions in fungicide input. The stripe rust susceptibility of RGT Cesario is such that one would not cut back on fungicide inputs, even though STB resistance is still excellent.

Tactically cutting back on the level of later season fungicide input (reducing expenditure at flag leaf and removing the head wash fungicide) was generally a practical and cost-effective management adjustment for all the varieties, although with Scepter these fungicide inputs were maintained because of higher disease risk evident in the crop. Interestingly either PGR application or flutriafol

were responsible for the yield lifts (not significant) that resulted in high input being the most profitable approach.

Table 5. Influence of management strategy and cultivar on system profitability – Gross income minus input costs of F, N & PGR only.

	Costs				Income				Margin
	Fungicide	Nitrogen	PGR	TOTAL	Yield	Bin Grade	Price	Income	
	$/ha	$/ha	$/ha	**$/ha**	t/ha		$/t	$/ha	$/ha
RGT Cesario									
Low Input	8.44	716.48	---	**725**	7.38	SFW1	295	2177	$1,452
High Input	82.97	871.34	33.98	**988**	8.08	SFW1	295	2384	$1,395
Strategic	42.84	871.34	---	**914**	6.97	SFW1	295	2056	$1,142
Tactical	34.41	716.48	---	**751**	7.13	SFW1	295	2103	$1,352
Mean									**$1,335**
AGTW005									
Low Input	8.44	716.48	---	**725**	9.26	SFW1	295	2732	$2,007
High Input	82.97	871.34	33.98	**988**	9.44	SFW1	295	2785	$1,797
Strategic	42.84	871.34	---	**914**	8.66	SFW1	295	2555	$1,641
Tactical	34.41	716.48	---	**751**	8.63	SFW1	295	2546	$1,795
Mean									**$1,810**
Stockade									
Low Input	8.44	716.48	---	**725**	8.21	AGP1	295	2422	$1,697
High Input	82.97	871.34	33.98	**988**	9.1	AGP1	295	2685	$1,696
Strategic	42.84	871.34	---	**914**	7.95	AUH2	340	2703	$1,789
Tactical	34.41	716.48	---	**751**	8.18	AUH2	340	2781	$2,030
Mean									**$1,803**
Longford									
Low Input	8.44	716.48	---	**725**	8.24	SFW1	295	2431	$1,706
High Input	82.97	871.34	33.98	**988**	8.81	SFW1	295	2599	$1,611
Strategic	42.84	871.34	---	**914**	7.76	SFW1	295	2289	$1,375
Tactical	34.41	716.48	---	**751**	7.87	SFW1	295	2322	$1,571
Mean									**$1,566**
RGT Waugh									
Low Input	8.44	716.48	---	**725**	9.43	SFW1	295	2782	$2,057
High Input	82.97	871.34	33.98	**988**	9.98	SFW1	295	2944	$1,956
Strategic	50.29	871.34	---	**922**	9.11	SFW1	295	2687	$1,766
Tactical	41.85	716.48	---	**758**	9.27	SFW1	295	2735	$1,976
Mean									**$1,939**
Scepter									
Low Input	8.44	716.48	---	**725**	6.5	AUH2	340	2210	$1,485
High Input	78.06	871.34	33.98	**983**	8.16	H2	367	2995	$2,011
Strategic	62.18	871.34	---	**934**	7.72	H2	367	2833	$1,900
Tactical	62.18	871.34	---	**934**	7.86	H2	367	2885	$1,951
Mean									**$1,837**

Note: Margin figures in green = most profitable, in red = least profitable

Table 6. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Trial 2. HYC Wheat Disease Management x Variety (FAR NSW W23-04a)

Key Points:

- *The highest yielding cultivars in the trial were Stockade and Scepter grown under the highest fungicide input (9.1 & 8.7t/ha).*
- *Scepter gave almost 2t/ha response to fungicide compared to AGTW005 that generated a 0.36t/ha yield increase comparing untreated to a four-unit fungicide approach.*
- *There were small but significant differences in grain quality due to fungicide management that were of most significance with the more susceptible milling wheats such as Scepter.*
- *The most profitable approach to fungicide management with three of the four varieties (Stockade, RGT Cesario & Scepter) was four units of fungicide input based on flutriafol followed by three foliar fungicides.*
- *With the most resistant cultivar AGTW005 a 0.36t/ha yield response to fungicide was not sufficient to pay for the full fungicide approach, and the nil fungicide approach was the most profitable, although with this variety margins were very similar irrespective of expenditure outlay.*

Treatments:

Four varieties were exposed to four levels of fungicide input in order to clarify how disease resistance of particular varieties and lines held up to lower fungicide input. The four varieties RGT Cesario, Stockade, AGTW005 and Scepter were tested with four programmes varying from no fungicide input, one fungicide unit at flag leaf (GS39), three units of fungicide based on flutriafol and a 2 spray "straddle" program (so called because the two fungicides are applied either side of the flag leaf). These three treatments were compared to a four-unit approach (full protection approach) based on flutriafol and three foliar fungicides at GS31, GS39/45 & GS55-63 (Table 1).

During the course of the season stripe rust was identified and sent to Sydney University for pathotyping. This confirmed the 238 and 239 rust pathotypes were present on NSW HYC site.

Table 1. Treatment details for fungicides strategies.

	Sowing	GS31	GS33/37	GS39/45	GS55-63
Nil	Standard	---	---	---	---
1 Unit	Standard	---	---	Revystar 750mL/ha	---
3 Units	Standard seed trt + Flutriafol fert trt	---	Revystar 750mL/ha	---	Radial 840mL/ha
4 Units	Standard seed trt + Flutriafol fert trt	Prosaro 300mL/ha	---	Revystar 750mL/ha	Opus 500mL/ha

Note: The final application date for Radial and Opus is GS59 not GS63, (poor weather delayed head wash sprays until early flowering)

The highest yielding cultivars in the trial were Stockade and Scepter grown under the highest fungicide input (9.1 & 8.7t/ha). Scepter gave almost 2t/ha response to fungicide compared to AGTW005 that generated a 0.36t/ha comparing untreated to a four-unit approach. With AGTW005 there was no statistical difference between nil fungicide applied and 3/4 units of fungicide (Figure 1).

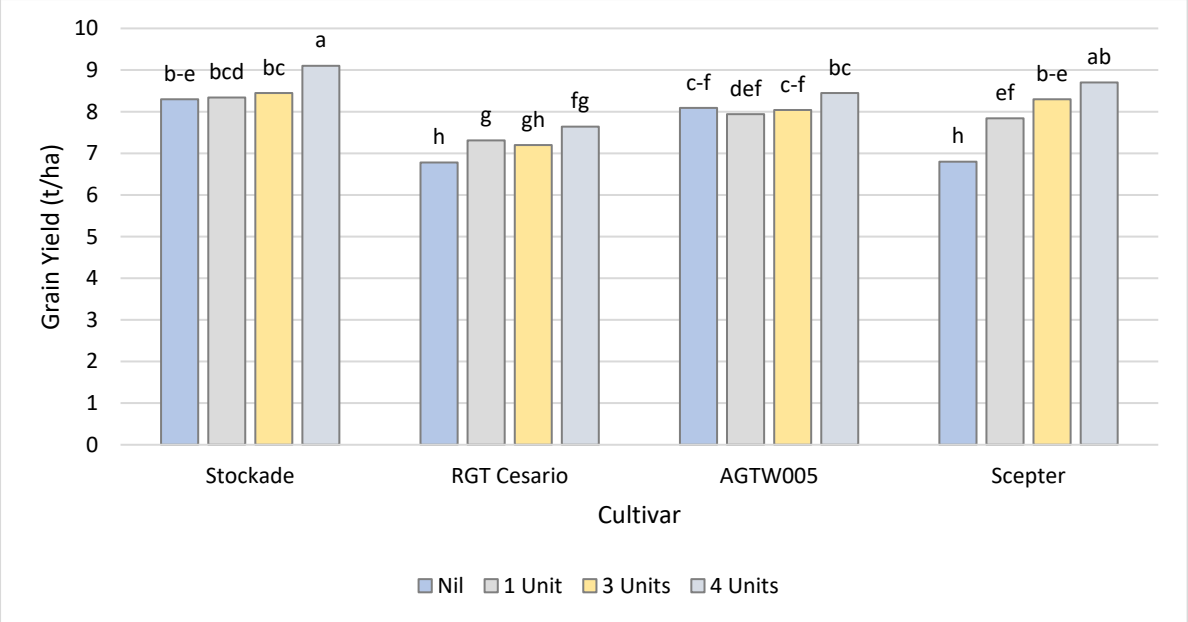

Figure 1. Influence of wheat cultivar and fungicide strategy on grain yield (t/ha) – P value=0.001, LSD (P=0.05)=0.47.

Grain quality again indicated slightly inferior test weight and screenings with Stockade, although higher fungicide did result in slight improvements in test weight (Table 2 & 3).

Table 2. Influence of wheat cultivar on grain quality (protein (%), test weight (kg/hL), screenings (%), and thousand seed weight (TSW g).

	Cultivar	Protein	Test Weight	Screenings	TSW
		%	kg/hL	%	g
1	Stockade	11.4 c	75.2 c	6.2 a	35.5 b
2	RGT Cesario	12.9 b	75.8 bc	4.5 b	35.7 b
3	AGTW005	13.4 a	76.2 ab	3 c	35.2 b
4	Scepter	11.4 c	76.9 a	4 b	42.7 a
Mean		**12.28**	**76.0**	**4.4**	**37.3**
P Value		<0.001	<0.001	<0.001	<0.001
LSD P=0.05		0.21	0.73	0.52	1.72

The most profitable approach to fungicide management with three of the four varieties was four units of fungicide input based on flutriafol followed by three foliar fungicides, this result related to yield increases that though not significantly better than three units of fungicide, were sufficient to pay for the extra input (Table 3).

Although flutriafol gave control of stripe rust and early STB and appears to be associated with higher yields in Scepter, in other cultivars it is the early GS31 fungicide that was important in the success of the four-unit approach, since the profitability of the three-unit approach was lower than the single flag leaf fungicide.

With the most resistant cultivar (AGT W005), 0.36t/ha yield response to fungicide was not sufficient to pay for the full fungicide approach and the nil approach was the best, although with this variety

margins are very similar irrespective of expenditure outlay (a result that might be expected with a more resistant variety such as AGT W005).

Table 3. Influence of fungicide strategy and cultivar on profitability – Margin ($/ha) (Gross income minus cost of fungicide units and application costed at $15/ha).

	Grain Yield (t/ha)	Protein (%)	Test Weight (kg/hL)	Screenings (%)	Grade	Price ($/t)	Income ($/ha)	Costs ($/ha)	Margin ($/ha)
Stockade									
Nil	8.30	11.3	74.4	6.5	AGP1	295	2449	0	2449
1 Unit	8.34	11.4	75.5	6.4	AGP1	295	2460	45	2415
3 Units	8.45	11.5	74.9	6.1	AGP1	295	2493	86	2407
4 Units	9.10	11.3	76.0	5.7	AGP1	295	2685	110	2575
RGT Cesario									
Nil	6.78	12.9	75.0	5.1	SFW1	295	2000	0	2000
1 Unit	7.31	12.9	75.6	4.4	SFW1	295	2156	45	2111
3 Units	7.20	13.1	75.7	4.4	SFW1	295	2124	86	2038
4 Units	7.64	12.8	76.9	4.1	SFW1	295	2254	110	2144
AGTW005									
Nil	8.09	13.4	76.1	3.6	SFW1	295	2387	0	2387
1 Unit	7.94	13.5	76.0	3.0	SFW1	295	2342	45	2297
3 Units	8.04	13.3	76.5	3.0	SFW1	295	2372	86	2286
4 Units	8.45	13.3	76.3	2.5	SFW1	295	2493	110	2383
Scepter									
Nil	6.80	11.4	75.1	5.1	AUH2	340	2312	0	2312
1 Unit	7.84	11.4	77.4	3.7	APW1	340	2666	45	2621
3 Units	8.30	11.5	77.1	3.8	APW1	340	2822	86	2736
4 Units	8.70	11.4	78.1	3.4	APW1	340	2958	110	2848

Note: Margin figures in green = most profitable, in red = least profitable

The responsiveness of Scepter to increasing fungicide input is clearly seen in the STB assessment conducted at mid flowering (Figure 3) where the lowest levels of infection were already evident in the four-unit approach that had only just had its head wash/flag leaf top. Note that unlike Stockade that had high level of STB infection the STB infection in Scepter was higher in the canopy, and as a consequence caused more damage (Figure 3).

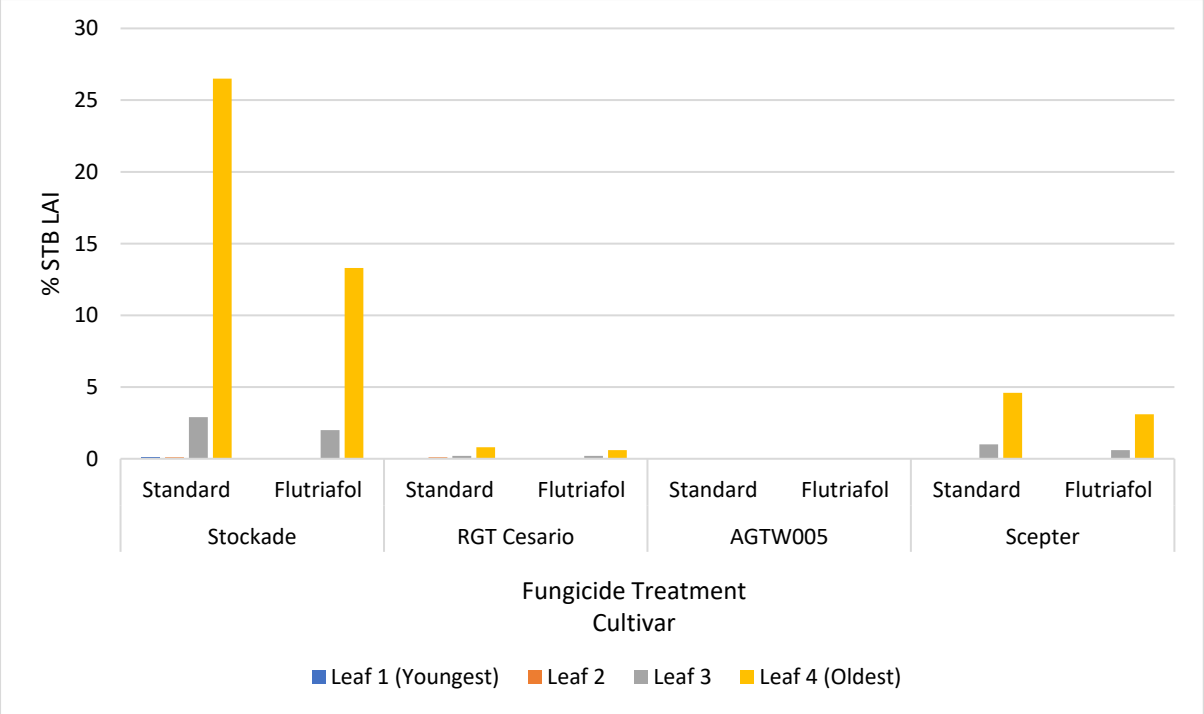

Figure 2. Influence of at sowing fungicide treatments on Septoria tritici blotch (STB) leaf area infection (%LAI) by leaf layer. Assessed at GS31 for each cultivar, calendar date various.

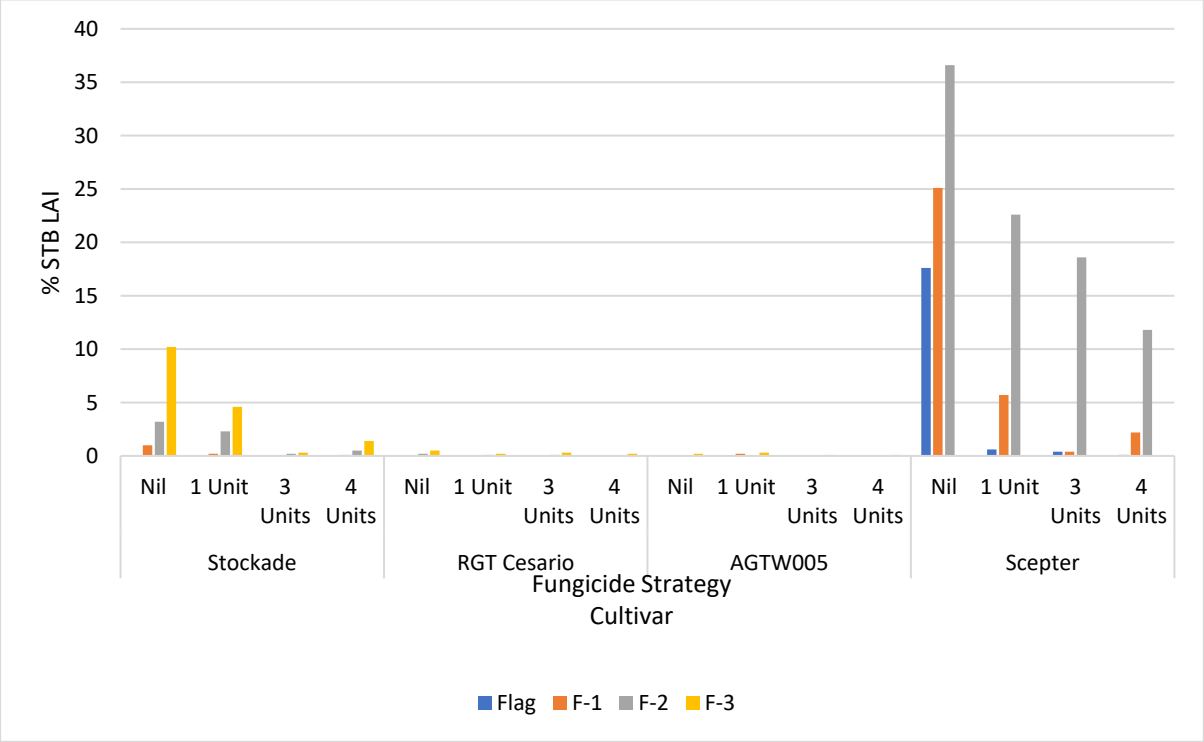

Figure 3. Influence of fungicide strategy and cultivar on Septoria tritici blotch (STB) leaf area infection (%LAI) by leaf layer. Assessed 19 September, growth stage 39-65 depending on cultivar.

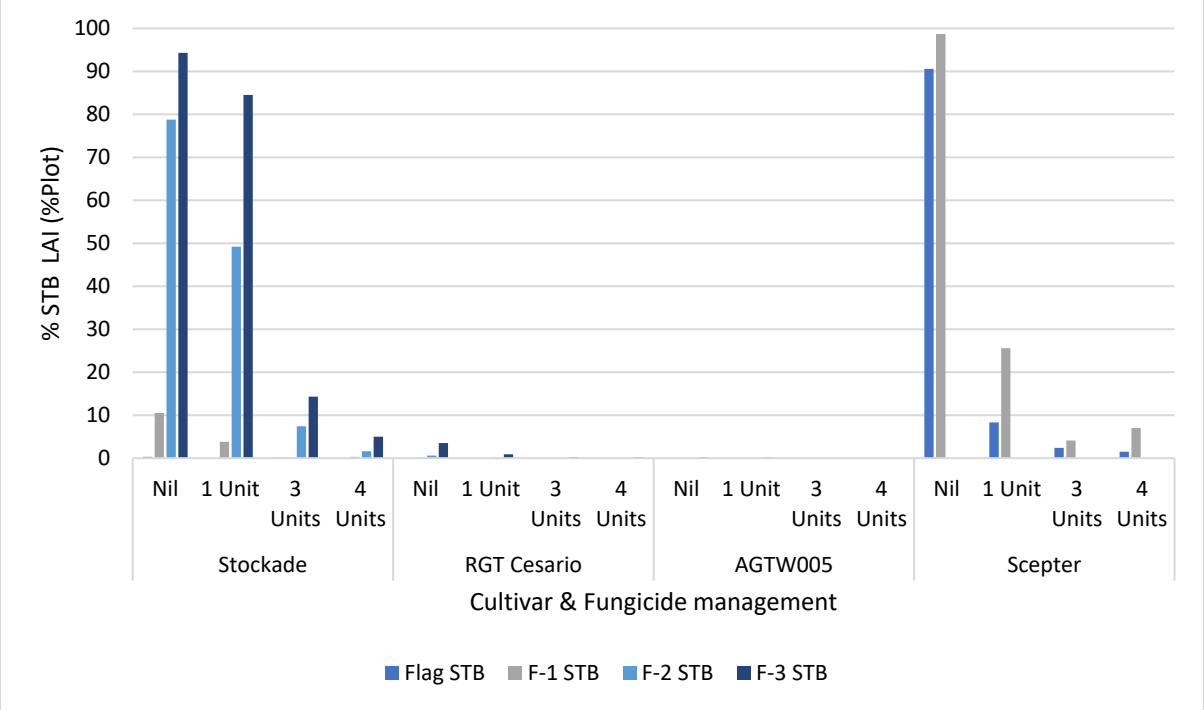

Figure 4. Influence of fungicide strategy and cultivar on Septoria tritici blotch infection (%LAI) on a whole plot basis. Assessed 24 October, growth stage 77-85 depending on cultivar.

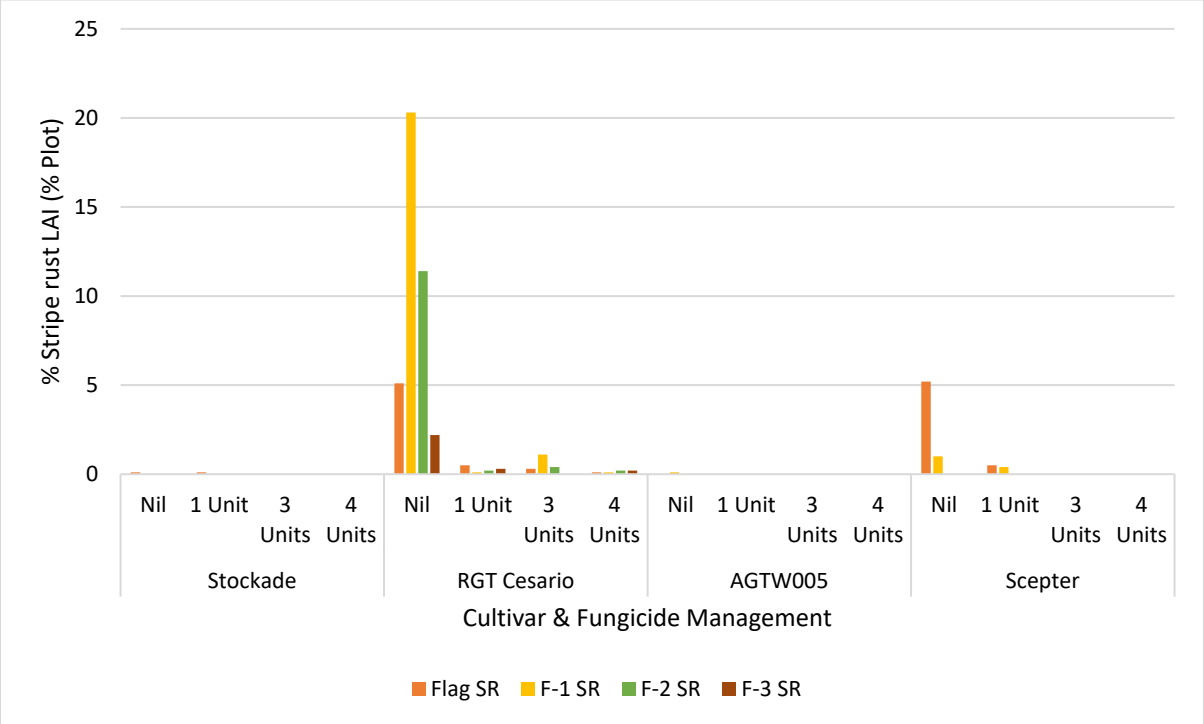

Figure 5. Influence of fungicide strategy and cultivar on Stripe rust leaf infection area (%LAI) on a whole plot basis. Assessed 24 October, growth stage 77-85 depending on cultivar.

Table 4. Trial input and management details**.**

Varieties:		RGT Cesario, Stockade, AGTW005 and Scepter
Sowing date:		21 April 2023
Harvest date:		18 December 2023
Seed rate:		180 seeds/m^2
Basal fertiliser:	21 Apr	120 kg/ha MAP (12kg N/ha)
Nitrogen:	2 Aug	Urea 217kg/ha (100kg N/ha)
	5 Sep	Urea 108kg/ha (50kg N/ha)
Fungicide:		As per treatment list

Table 5. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC

Trial 3. HYC Wheat Disease Management (FAR NSW W23-04) cv BigRed

Key Points:

- *Grain yield varied by less than 0.2t/ha, with the untreated crop of BigRed yielding 7.73t/ha, and the highest yield being 7.74t/ha recorded in the two-spray approach at GS31 and GS39.*
- *Despite very small improvements in Septoria tritici blotch (STB) control associated with the application of a GS31 (1st node) fungicide, the untreated crop was the most profitable.*
- *The four-unit strategy was the least cost effective, losing approximately $110/ha because of expenditure that was not warranted.*
- *Other fungicide programs lost similar amounts of money as the four-unit strategy relative to the untreated as a result of lower expenditure but slightly lower yields (0.05 – 0.18t/ha).*

Treatments:

Five levels of fungicide management (treatment 1-5) were investigated with the popular red feed wheat BigRed (Table 1).

Table 1. Fungicide management treatments

Treatment	
Treatment 1.	**Untreated control**
Treatment 2.	**1 Unit - A single flag leaf fungicide** applied at GS39 – Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha).
Treatment 3.	**Two-unit (straddle) approach** at GS33 (3rd node) Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha). & GS59 (head emergence) Opus 125 SC (epoxiconazole 125g/L) applied at 500mL/ha (62.5 g ai/ha).
Treatment 4.	**Four-unit approach** combining at sowing flutriafol on the MAP with three foliar sprays – GS31 Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai), GS39 and GS59 (as stated above).
Treatment 5.	**Two-unit (standard) approach** at GS31 Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63 g ai/ha of each ai) & GS39 Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha).

Results:

Fungicide management strategy had no impact on the grain yield or grain quality (Table 1) of BigRed at the Wallendbeen location, despite small improvements in lower canopy STB control and green leaf retention (Table 2). Small improvements in test weight and screenings were not statistically significant.

Table 2. Influence of fungicide strategy on grain yield (t/ha) and grain quality (protein (%), test weight (kg/hL), screenings (%), and thousand seed weight (TSW g)) – cv BigRed.

		Grain Yield and Quality				
Treatment		**Yield t/ha**	**Protein %**	**TSW g**	**Test Weight kg/hL**	**Screenings %**
1	Untreated	7.73 -	13.6 -	36.7 -	74.0 -	5.1 -
2	1 Unit	7.69 -	13.7 -	36.2 -	75.2 -	4.7 -
3	2 Units (Straddle)	7.55 -	13.9 -	34.7 -	75.2 -	4.5 -
4	4 Units	7.67 -	13.9 -	35.3 -	75.2 -	4.8 -
5	2 Units (Standard)	7.74 -	13.8 -	35.8 -	73.9 -	4.9 -
Mean		**7.68**	**13.8**	**35.8**	**74.7**	**4.8**
P Value		0.847	0.502	0.636	0.334	0.812
LSD P=0.05		ns	ns	ns	ns	ns

The largest differences in disease control associated with the fungicide management strategies were the effect of the GS31 fungicide which was absent from the straddle and single unit spray. In these approaches the level of STB infection was significantly higher than the standard 2 spray program based on GS31 & GS39 applications (Table 2).

Table 3. Influence of fungicide strategy on disease infection (Septoria tritici blotch (STB) and Stripe rust (SR) – 24 October GS77-80.

		Flag	**Flag-1**	**Flag-1**	**Flag-2**	**Flag-3**	**Flag-3**
Treatment		**STB %LAI**	**STB %LAI**	**SR %LAI**	**STB %LAI**	**STB %LAI**	**GLR %LA**
1	Untreated	0.0 -	0.1 ab	0.1 -	0.6 a	2.6 a	4.0 -
2	1 Unit	0.0 -	0.0 b	0.0 -	0.1 b	1.3 b	13.5 -
3	2 Units (Straddle)	0.0 -	0.2 a	0.0 -	0.4 a	2.4 a	7.5 -
4	4 Units	0.0 -	0.0 b	0.0 -	0.1 b	0.3 c	9.5 -
5	2 Units (Standard)	0.0 -	0.0 b	0.0 -	0.0 b	0.2 c	20.8 -
Mean		**0.0**	**0.1**	**0.0**	**0.2**	**1.4**	**11.1**
P Value		1.000	0.030	0.445	<0.001	<0.001	0.199
LSD P=0.05		ns	0.1	ns	0.2	0.9	ns

Table 4. Trial input and management details**.**

Variety:		BigRed
Sowing date:		21 April 2023
Harvest date:		18 December 2023
Seed rate:		180 seeds/m^2
Basal fertiliser:	21 Apr	120 kg/ha MAP (12kg N/ha)
Nitrogen:	2 Aug	Urea 217kg/ha (100kg N/ha)
	5 Sep	Urea 108kg/ha (50kg N/ha)
Fungicide:		As per treatment list

Table 5. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC

Trial 4. Nutrition for Hyper Yielding Wheat (FAR NSW W23-05) cv Stockade

Key Points:

- *Following six years of pasture legume 2014-19 (Fescue/Lucerne/Clover), and three years of cropping (canola 2020, grazing wheat 2021 and canola 2022), there was no significant yield response to applied nitrogen (80-280kg N/ha), although there was a trend for higher yield up to 160kg N/ha.*
- *With 226kg N/ha in the soil 0 – 60cm on 10 July the zero N treatment (only 12kg N/ha MAP applied) yielded 8.08t/ha with a protein of 9.5% indicating the presence of 154kg N/ha in grain at harvest.*
- *If 75% of the N is assumed to be in the grain, and 25% in the straw residue, then the total N uptake at harvest in zero N plots would be 169kg N/ha indicating approximately 57kg N/ha left over from what was measured at sowing, assuming no losses.*
- *All N applications applied as 2 or 3 split urea applications only served to increase protein, but the yield increases evident up to 160kg N/ha were not statistically significant.*
- *Applying N as a three split at 200 N gave a yield increase which in 2022 was also associated with lower lodging pressure than the equivalent two split approach, but the yield difference in both years was not significant.*
- *Applying manure or the equivalent macro nutrients carried in the manure on top of 120N gave no significant yield benefit, but the manure treatment did confer higher dry matter at flowering than the equivalent inorganic fertiliser treatment.*
- *There were no significant differences in harvest dry matter as a result of N application.*
- *The zero N treatment had the highest test weight and lowest screening as was the case in 2022.*

Treatments:

Stockade white wheat was subjected to 10 nutrition treatments of varying nitrogen (timing and rate) and manure rates (Table 1). The 5t/ha manure (chicken manure pellets) treatments were applied on top of 120kg N/ha applied as a two split 50% at GS30 (pseudo stem erect) and 50% at GS32 (2nd node). The manure pellets had an analysis of N 1.14%, P 0.68%, K 1.52% and S 0.38%. The total value (NPKS) of the 5t/ha application is detailed in Table 5. The available soil N was measured on 10 July with 0-10cm 43kg N/ha, 10-30cm 70kg N/ha and 30-60cm 113kg N/ha giving a total of 226kg N/ha in the 0 – 60cm horizon. Note soil tests were taken after 120kg/ha MAP was applied. The trial site had an organic carbon content of 2.6% in the 0 – 10cm.

Table 1. Treatment details and application timings.

		Sowing	GS30	GS32	GS39
		21 April	22 July	9 Aug	5 Sep
Treatment		**kg N/ha (MAP at sowing)**	**kg N/ha**	**kg N/ha**	**kg N/ha**
1	0N	12	-	-	-
2	80kg N/ha	12	40	40	-
3	120kg N/ha	12	60	60	-
4	160kg N/ha	12	80	80	-
5	200kg N/ha	12	100	100	-
6	240kg N/ha	12	120	120	-
7	280kg N/ha	12	140	140	-
8	200kg N/ha (3 split)	12	80	80	40
9	120kg N/ha + Manure	12+5t/ha Manure	60	60	-
10	120kg N/ha + Manure Equiv.	12+ NPKS Manure equivalent	60	60	-

*Manure nutrient analysis and equivalent nutrient rates detailed in table 12.

Although all treatments applying nutrition were higher yielding than the nil N control (MAP only) the yield differences were not statistically significant. With 226kg N/ha in the soil plus 12kg N with the MAP it was more than enough to supply the nil N treatment which took off approximately 127kg N/ha in the grain. If 25% of the N at harvest was assumed to be in the crop canopy then the total offtake (grain and straw) would be approximately 169kg N/ha, which is almost identical to the nutrient input achieving the highest yield (160 N plus 12 N with the MAP – total 172kg N/ha). The results mirrored those observed in previous seasons with only small responses in grain yield to applied N up to a maximum of 160kg N/ha and then reductions in yield relative to 160kg N/ha with higher levels of N application (200 – 280kg N/ha). Although the yield did not increase above 160kg N/ha the grain protein did continue to increase significantly along with increases in screenings and trend towards lower test weights.

Table 2. Influence of nutrition strategy on wheat grain yield (t/ha) and grain quality (Protein (%), thousand seed weight (TSW), test weight (kg/hL), and screenings (%)).

		Grain Yield and Quality									
Treatment		**Yield t/ha**		**Protein %**		**TSW g**		**Test Weight kg/hL**		**Screenings %**	
1	0N	8.03	-	9.0	f	38.8	-	77.1	-	5.9	c
2	80kg N/ha	8.35	-	10.2	e	36.5	-	76.1	-	6.3	bc
3	120kg N/ha	8.33	-	10.8	d	33.3	-	76.1	-	6.3	bc
4	160kg N/ha	8.70	-	10.9	d	34.6	-	76.4	-	6.0	c
5	200kg N/ha	8.08	-	11.8	ab	33.8	-	74.1	-	7.2	ab
6	240kg N/ha	8.08	-	12.0	a	33.4	-	75.1	-	7.4	a
7	280kg N/ha	8.48	-	12.0	a	33.8	-	75.1	-	7.2	ab
8	200kg N/ha (3 split)	8.62	-	11.6	bc	34.7	-	75.6	-	6.7	abc
9	120kg N/ha + Manure	8.51	-	11.2	cd	32.2	-	74.7	-	7.5	a
10	120kg N/ha + Manure Equiv.	8.57	-	11.6	bc	34.5	-	75.4	-	7.5	a
Mean		**8.38**		**11.1**		**34.5**		**75.6**		**6.8**	
P Value		0.142		<0.001		0.115		0.146		0.004	
LSD P=0.05		ns		0.4		ns		ns		1.0	

The manure treatments did significantly affect tiller number recorded at GS31, but there were no significant effects on head number, although there was a trend which suggested the nil N had fewer heads and manure treatments had more heads, along with some of the higher N treatment applications (Table 3). There was evidence at GS31, GS69 and at harvest that dry matter (biomass) was higher where manure had been incorporated with the seeder at sowing in April but none of the differences were statistically significant (Table 3).

Table 3. Influence of nutrition strategy on plant numbers, tiller numbers and head numbers (/m^2), harvest dry matter (t/ha) and harvest index (%).

Treatment		Plants/m^2		Tillers/m^2		Heads/m^2		Dry matter t/ha		Harvest Index %	
1	0N	119	-	575	cd	467	-	16.3	-	43.3	-
2	80kg N/ha	123	-	596	bcd	518	-	16.9	-	43.5	-
3	120kg N/ha	116	-	566	cd	485	-	16.8	-	43.8	-
4	160kg N/ha	121	-	602	bcd	527	-	17.3	-	44.2	-
5	200kg N/ha	105	-	544	d	490	-	16.5	-	43.2	-
6	240kg N/ha	135	-	626	abc	569	-	17.2	-	41.1	-
7	280kg N/ha	111	-	612	bc	516	-	17.6	-	42.3	-
8	200kg N/ha (3 split)	124	-	642	ab	566	-	18.1	-	41.9	-
9	120kg N/ha + Manure	129	-	684	a	565	-	18.3	-	40.8	-
10	120kg N/ha + Manure Equiv	117	-	654	ab	530	-	17.1	-	43.7	-
Mean		**120**		**610**		**523**		**17.2**		**42.8**	
P Value		0.215		0.002		0.105		0.477		0.792	
LSD P=0.05		ns		61		ns		ns		ns	

Table 4. Influence of nutrition strategy on dry matter production (t/ha) at three critical growth stages.

		GS31		GS69		GS89	
Treatment		**Dry matter t/ha**		**Dry matter t/ha**		**Dry matter t/ha**	
1	0N	1.85	-	11.47	-	16.27	-
2	80kg N/ha			11.48	-	16.89	-
3	120kg N/ha			11.82	-	16.75	-
4	160kg N/ha			12.79	-	17.31	-
5	200kg N/ha			12.29	-	16.50	-
6	240kg N/ha			12.10	-	17.19	-
7	280kg N/ha			12.41	-	17.62	-
8	200kg N/ha (3 split)			12.17	-	18.08	-
9	120kg N/ha + Manure	2.10	-	12.96	-	18.29	-
10	120kg N/ha + Manure Equiv	1.72	-	12.05	-	17.12	-
Mean		**1.89**		**12.15**		**17.20**	
P Value		0.092		0.713		0.477	
LSD P=0.05		ns		ns		ns	

As we have found previously, there was a trend for increased dry matter and N concentration (not shown) at flowering, that lead to significantly greater N content of the crop canopy in comparison to the equivalent treatment using inorganic fertiliser equivalents for the macro elements (Figure 1).

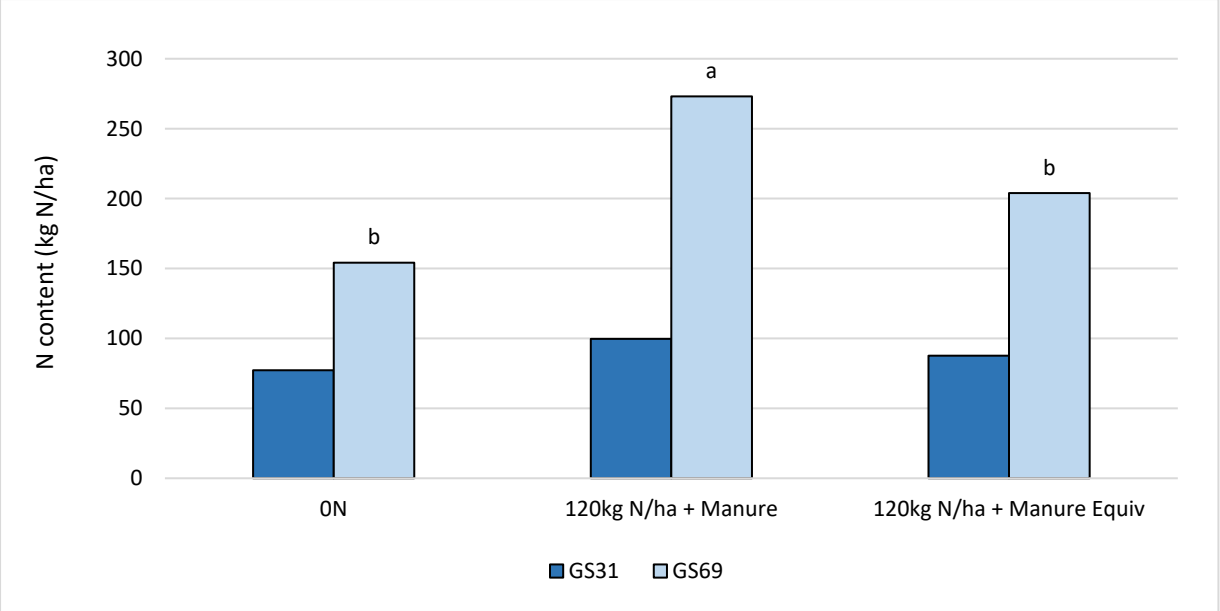

Figure 1. Nitrogen content (kg N/ha) of wheat crop based on dry matter and N concentration of tissue at 1st node (GS31) and end of flowering (GS69).

Table 5. Nutrient value of manure applied and products used in equivalent treatment.

Trt#	Product	Rate	Nutrient Value (kg/ha)			
		kg/ha	**N**	**P**	**K**	**S**
9	Manure	5000	57.1	34.2	76.1	19.5
10	Ammonium Sulphate	81	16.8			19.3
	Monopotassium Phosphate	123		28.1	35.2	
	MOP	82			41.0	
	Urea	83	37.5			
	MAP	28	2.8	6.1		0.4
	Total		**57.1**	**34.2**	**76.2**	**19.7**

Table 6. Trial input and management details**.**

Variety:		**Stockade**
Sowing date:		21 April 2023
Harvest date:		18 December 2023
Seed rate:		180 seeds/m^2
Basal fertiliser:	21 Apr	120 kg/ha MAP (12kg N/ha)
Nitrogen:		As per treatment list

Appendix. HYC NSW VIC Crop Technology Centre

The following details apply to all NSW wheat trials unless specified differently.

Table 1. Overall inputs

	Date Applied	Product
Herbicides:	19 Apr	Sakura 118g/ha
		Avadex Xtra 1.6L/ha
		Roundup 2.0 L/ha
	1 Jun	Lontrel 60g/ha
		LVE MCPA 570 440mL/ha
		Paradigm 25g/ha
		Wetter 1000 0.2%
	25 Aug	Paradigm 25g/ha
		Chemwet (0.2%)
Insecticide	25 Aug	Cyhella 18mL/ha (tank mixed with herbicide)

Table 2. Active ingredients and chemical loading (g/L) for products used.

	Active 1		Active 2		Type
Herbicide					
Sakura	Pyroxasulfone	850 g/kg	---	---	WG
Avadex Xtra	Tri-allate	500 g/L	---	---	EC
Roundup	Glyphosate	570 g/L	---	---	SC
Lontrel advanced	Clopyralid	600 g/L	---	---	SC
LVE MCPA 570	MCPA	570 g/L	---	---	EC
Paradigm	Arylex active	200 g/kg	florasulam	200 g/kg	GC
Insecticide					
Cyhella	lambda-cyhalothrin	250 g/L	---	---	CS
Adjuvant					
Wetter 1000	Non-Ionic Alcoholated Alkoxylate	1000 g/L	---	---	
Chemwet	Alcohol Alkoxylate	1000 g/L	---	---	

SA Crop Technology Centre

Millicent, South Australia

Sown: 10-11 May 2023
Harvested: 14 January 2023
Rotation position: 2022 Canola
Soil type: Organosol over grey clay
Nitrogen 0-30cm: 253kg N/ha
Colwell P (ppm) 0-10cm: 59 ppm
pH ($CaCl_2$) 0-10cm: 7.5
Organic Carbon (%) 0-10cm: 8.0%

Trial 1. HYC Wheat G.E.M Trial Series (FAR SAC W23-03)

Key Points:

- *Grain yields of Longford (tested as AGF4818) were consistently higher yielding than other varieties, with all varieties performing in a similar way to the different management levels (there was no significant interaction between variety and management on yield).*
- *Longford (AGF4818), a longer season European red winter wheat has stood out as having good standing power and good disease resistance. It has been one of the most disease resistant lines tested in HYC since first observed in 2020.*
- *Longford (AGF4818) had the highest harvest dry matter (average 19.5t/ha) but had a harvest index slightly lower (51%) than the popular variety RGT Accroc (54%), a reflection of its slightly later flowering date.*
- *With yields in the 10-12t/ha range, harvest indices were over 50% (proportion of harvest dry matter that is grain).*
- *Overall, the high input approach was statistically higher yielding than all the other managements tested. The yield advantage over the least expensive low input approach varied from 0.86t/ha in BigRed down to 0.46t/ha in Stockade.*
- *The tactical approach that reduced later season fungicide input (specifically the head wash spray) in response to drier conditions was significantly lower yielding than the strategic approach (0.19 t/ha).*
- *In terms of economics the most profitable management programme was the high input approach with red feed wheat, however the advantage over the low input programme was relatively small ($18-68/ha).*
- *Stockade was the exception where the low input resulted in a lower bin grade (AGP as opposed to APW1) $339/ha disadvantage to high input.*

Treatments:

Five cultivars (RGT Cesario, BigRed, Stockade, Longford (formerly AGF4818) and RGT Accroc) were tested under four different management programs;

1. **High Input** – 4 units of fungicides (flutriafol plus foliar fungicides GS31, GS39, GS59), 190kg N/ha, PGR.
2. **Low Input** – One unit of fungicide based on Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) & 150kg N/ha.
3. **HYC Strategic Input** – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. **HYC Tactical Input** – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in Table 8.

Table 1. Influence of management strategy and cultivar on grain yield (t/ha).

	Yield (t/ha)				
	Management Strategy				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
RGT Cesario	10.63 -	11.32 -	10.72 -	10.67 -	**10.83 b**
BigRed	10.43 -	11.29 -	10.49 -	10.20 -	**10.60 bc**
RGT Accroc	10.20 -	10.89 -	10.31 -	10.20 -	**10.40 c**
Stockade	9.81 -	10.27 -	9.94 -	9.80 -	**9.95 d**
Longford	10.93 -	11.63 -	11.23 -	10.88 -	**11.17 a**
Mean	**10.40 bc**	**11.08 a**	**10.54 b**	**10.35 c**	**10.59**
LSD Cultivar P=0.05	0.30		**P value**		<0.001
LSD Management P=0.05	0.25		**P value**		<0.001
LSD Cultivar x Man. P=0.05	ns		**P value**		0.995

Table 2. Influence of management strategy and cultivar on harvest index (%).

	Harvest Index (%)				
	Management Strategy				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
RGT Cesario	54 -	57 -	54 -	50 -	**54 bc**
BigRed	58 -	61 -	54 -	58 -	**58 a**
RGT Accroc	50 -	62 -	56 -	53 -	**55 ab**
Stockade	49 -	54 -	51 -	51 -	**51 c**
Longford	47 -	53 -	52 -	52 -	**51 c**
Mean	**51 b**	**57 a**	**53 b**	**53 b**	**54**
LSD Cultivar P=0.05	0.034		**P value**		<0.001
LSD Management P=0.05	0.026		**P value**		0.007
LSD Cultivar x Man. P=0.05	ns		**P value**		0.574

Table 3. Influence of management strategy and cultivar on harvest dry matter (t/ha).

	Harvest Dry matter (t/ha)				
	Management Strategy				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
RGT Cesario	17.5 -	18.1 -	17.7 -	18.9 -	**18.0 b**
BigRed	15.9 -	16.3 -	17.4 -	15.6 -	**16.3 c**
RGT Accroc	18.3 -	15.6 -	16.4 -	16.9 -	**16.8 c**
Stockade	17.7 -	16.8 -	17.5 -	16.9 -	**17.2 bc**
Longford	20.8 -	19.5 -	19.0 -	18.5 -	**19.5 a**
Mean	**18.0 -**	**17.3 -**	**17.6 -**	**17.4 -**	**17.6**
LSD Cultivar P=0.05	1.1		**P value**		<0.001
LSD Management P=0.05	ns		**P value**		0.100
LSD Cultivar x Man. P=0.05	ns		**P value**		0.226

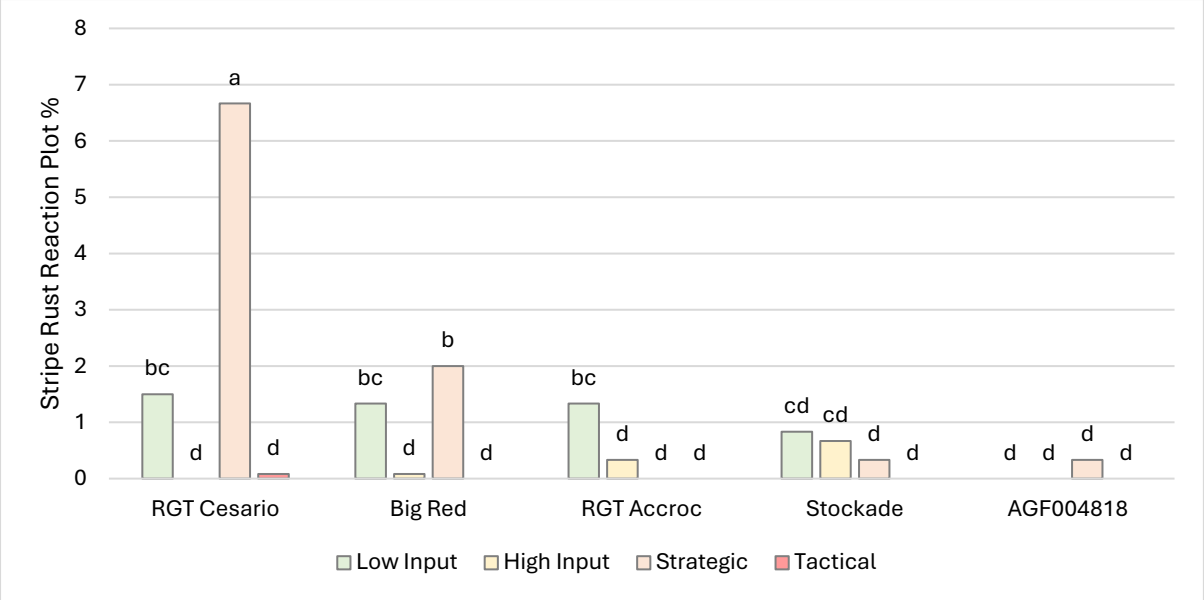

Figure 1. Influence of management strategy and cultivar on plot infection (%) of stripe rust reaction necrosis.

Effects on grain quality were inconsistent with a significant interaction in test weights as a result of variety and management, with Stockade and RGT Cesario illustrating management effects on test weight, but that was not the case with the other three varieties where management did not affect test weight (Table 4).

Table 4. Influence of management strategy and cultivar on harvest test weights (kg/hl).

	Test Weights (kg/hl)									
	Management Strategy									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT Cesario	77.1	b-g	76.1	fg	77.8	b	77.3	b-f	**77.0**	**b**
BigRed	79.8	a	80.6	a	80.2	a	79.7	a	**80.1**	**a**
RGT Accroc	75.9	gh	76.9	b-g	76.3	efg	76.1	fg	**76.3**	**c**
Stockade	74.7	h	77.6	bcd	76.4	d-g	76.5	c-g	**76.3**	**c**
Longford	76.7	b-g	77.7	bc	77.5	b-e	77.5	b-e	**77.3**	**b**
Mean	**76.8**	**-**	**77.8**	**-**	**77.6**	**-**	**77.4**	**-**	**77.4**	
LSD Cultivar P=0.05			0.6		**P value**				<0.001	
LSD Management P=0.05			ns		**P value**				0.165	
LSD Cultivar x Man. P=0.05			1.3		**P value**				0.033	

Table 5. Influence of management strategy and cultivar on harvest protein (%).

	Protein (%)									
	Management Strategy									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT Cesario	11.8	-	12.0	-	11.9	-	11.9	-	**11.9**	**b**
BigRed	11.2	-	11.5	-	11.6	-	11.8	-	**11.5**	**c**
RGT Accroc	11.2	-	11.4	-	11.5	-	11.6	-	**11.4**	**c**
Stockade	12.2	-	12.4	-	12.1	-	12.3	-	**12.2**	**a**
Longford	11.3	-	11.7	-	11.5	-	11.8	-	**11.5**	**c**
Mean	**11.5**	**b**	**11.8**	**a**	**11.7**	**a**	**11.9**	**a**	**11.7**	
LSD Cultivar P=0.05			0.2			**P value**			<0.001	
LSD Management P=0.05			0.2			**P value**			0.012	
LSD Cultivar x Man. P=0.05			ns			**P value**			0.867	

Table 6. Influence of management strategy and cultivar on harvest screenings (%).

	Screenings (%)									
	Management Strategy									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT Cesario	1.6	-	1.3	-	1.7	-	1.5	-	**1.5**	**cd**
BigRed	1.9	-	1.8	-	1.8	-	2.0	-	**1.9**	**c**
RGT Accroc	1.3	-	1.6	-	1.4	-	1.2	-	**1.4**	**d**
Stockade	3.5	-	2.7	-	3.1	-	2.9	-	**3.1**	**a**
Longford	2.5	-	2.2	-	2.9	-	2.2	-	**2.4**	**b**
Mean	**2.2**	**-**	**1.9**	**-**	**2.2**	**-**	**2.0**	**-**	**2.0**	
LSD Cultivar P=0.05			0.4			**P value**			<0.001	
LSD Management P=0.05			ns			**P value**			0.097	
LSD Cultivar x Man. P=0.05			ns			**P value**			0.706	

Table 7. Influence of variety and management on the partial gross margin (management specific) to inputs of and on the variable operational costs (N, fungicides and PGR).

Fungicide strategy	Chem + App costs	Fert + App costs	N,F, PGR costs & application	Yield	Bin Grade	Price	Income	Margin
	$/ha	$/ha	$/ha	t/ha		$/t	$/ha	$/ha
BigRed								
Low Input	$54.41	$215.60	$270.01	10.43	SFWR	$308.00	$3,212.44	$2,942.43
High Input	$128.52	$314.00	$442.52	11.29	SFWR	$308.00	$3,478.24	$3,035.72
Strategic	$81.95	$281.00	$362.95	10.49	SFWR	$308.00	$3,230.92	$2,867.97
Tactical	$63.51	$281.00	$344.51	10.20	SFWR	$308.00	$3,142.52	$2,798.01
Longford								
Low Input	$54.41	$215.60	$270.01	10.93	SFWR	$308.00	$3,365.82	$3,095.82
High Input	$128.52	$314.00	$442.52	11.63	SFWR	$308.00	$3,582.04	$3,139.52
Strategic	$81.95	$281.00	$362.95	11.23	SFWR	$308.00	$3,459.76	$3,096.82
Tactical	$63.51	$281.00	$344.51	10.88	SFWR	$308.00	$3,349.50	$3,004.99
RGT Accroc								
Low Input	$54.41	$215.60	$270.01	10.20	SFWR	$308.00	$3,142.52	$2,872.52
High Input	$128.52	$314.00	$442.52	10.89	SFWR	$308.00	$3,352.58	$2,910.06
Strategic	$89.39	$281.00	$370.39	10.31	SFWR	$308.00	$3,173.94	$2,803.55
Tactical	$70.96	$281.00	$351.96	10.20	SFWR	$308.00	$3,140.98	$2,789.03
RGT Cesario								
Low Input	$54.41	$215.60	$270.01	10.63	SFWR	$308.00	$3,274.04	$3,004.03
High Input	$128.52	$314.00	$442.52	11.32	SFWR	$308.00	$3,485.94	$3,043.42
Strategic	$81.95	$281.00	$362.95	10.72	SFWR	$308.00	$3,300.22	$2,937.27
Tactical	$63.51	$281.00	$344.51	10.67	SFWR	$308.00	$3,286.36	$2,941.85
Stockade								
Low Input	$54.41	$215.60	$270.01	9.81	AGP1	$308.00	$3,020.86	$2,750.86
High Input	$128.52	$314.00	$442.52	10.27	APW1	$344.00	$3,532.19	$3,089.67
Strategic	$81.95	$281.00	$362.95	9.94	APW1	$344.00	$3,419.36	$3,056.41
Tactical	$63.51	$281.00	$344.51	9.80	APW1	$344.00	$3,372.23	$3,027.72

Note: Figures in green = most profitable, figures in red = least profitable

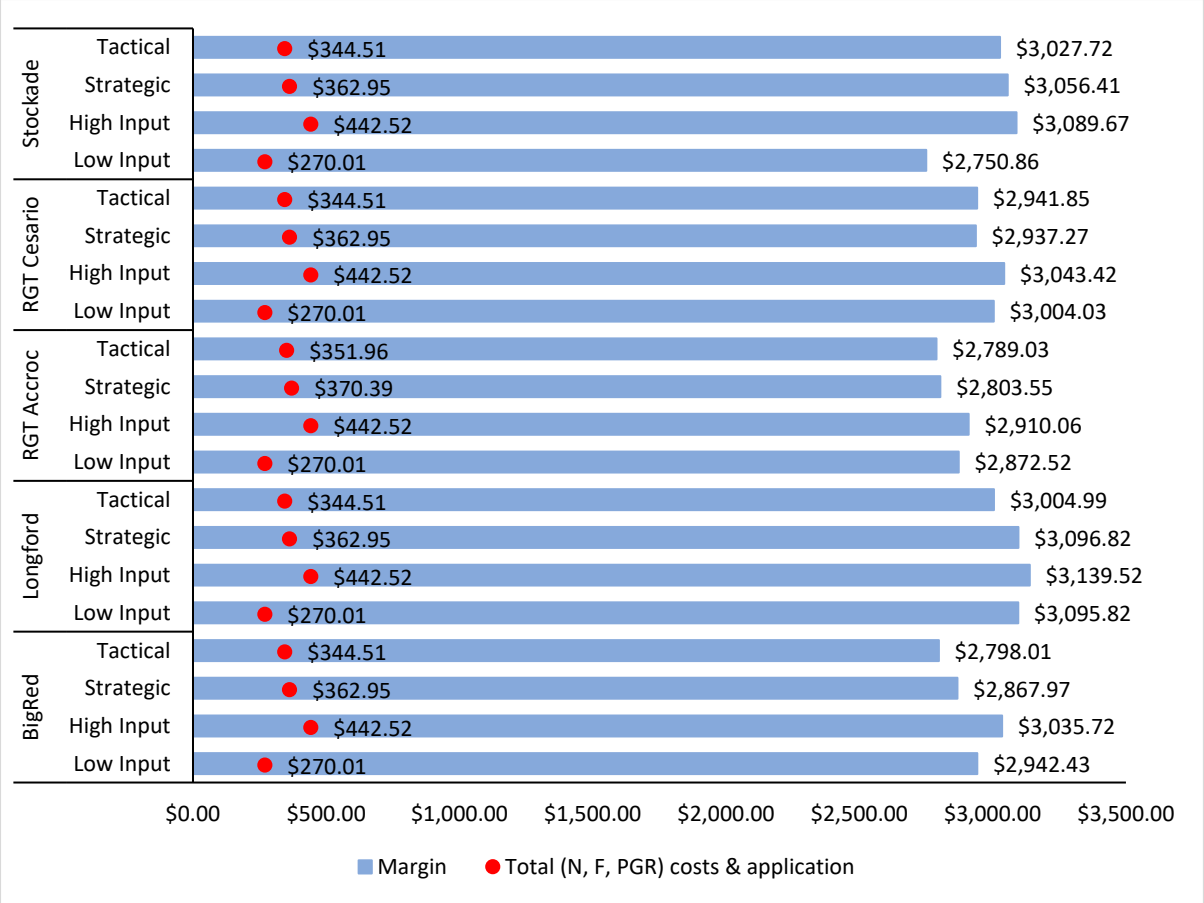

Figure 2. Influence of variety and management on the partial gross margin (management specific) to inputs of and on the variable operational costs (N, fungicides and PGR).

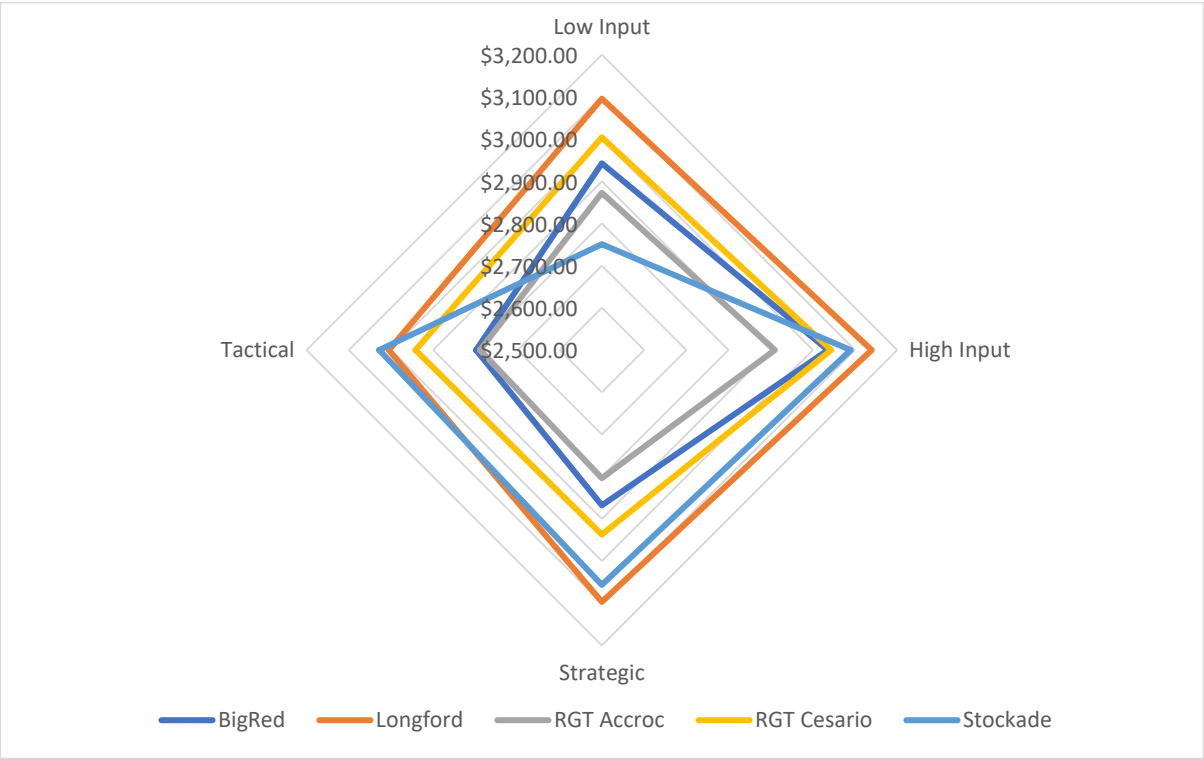

Figure 3. Influence of variety and management on the partial gross margin.

Table 8. Trial input and management details.

Sowing date:		**11 May**	
Harvest date:		14 January	
Seed date:		180 seeds/m^2	
Basal fertiliser:	11 May	100 kg/ha MAP	
Nitrogen:		**Low Input**	**High Input**
	GS30	50kg N/ha	75kg N/ha
	GS33	100kg N/ha	150kg N/ha
		Strategic	**Tactical**
	GS30	50kg N/ha	50kg N/ha
	GS33	150kg N/ha	150kg N/ha
PGR:		**High Input Only**	
	GS30	Moddus Evo 0.20 L/ha Errex 1.3 L/ha	
Fungicide:		**Low Input**	**High Input**
	GS00	**----**	Flutriafol 0.2 L/ha
	GS31/32	Opus 0.50 L/ha	Radial 0.84 L/ha
	GS39	Prosaro 0.3 L/ha	Aviator Xpro 0.416 L/ha
	GS59	----	Prosaro 0.15 L/ha
		Strategic	**Tactical**
	GS00	**----**	----
	GS31/32	See below	See below
	GS39	Radial 0.84 L/ha	Radial 0.84 L/ha
	GS59	Prosaro 0.15 L/ha	----

Tactical and Strategic Fungicide GS31/32:				
RGT Cesario	**BigRed**	**RGT Accroc**	**Stockdale**	**Longford**
Prosaro 0.3 L/ha	Prosaro 0.3 L/ha	Aviator Xpro 0.416 L/ha	Prosaro 0.3 L/ha	Prosaro 0.3 L/ha

Table 9. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Errex 750	Chlormequat	582 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Trial 2. HYC Wheat Disease Management x Variety (FAR SAC W23-04a)

Key Points:

- *There was a significant interaction between cultivar and fungicide management with cultivars responding differently to the number of fungicide units applied. Yields ranged from 7.34t/ha in untreated RGT Cesario, to 10.16t/ha in the newly released AGF cultivar Longford (AGF4818) with full fungicide protection.*
- *Stockade (white wheat – APW) was the only cultivar to give no significant response in yield to fungicide application, although there was a trend for higher yield under full protection.*
- *Red wheats Longford (AGF4818), RGT Cesario and AGTW005 gave significantly higher yields with full protection based on 4 units of fungicide, but only RGT Cesario gave a significant response when a single fungicide was applied at GS39 (8.21t/ha vs. untreated 7.34t/ha).*
- *The yield response to full protection over untreated was Stockade (0.29t/ha), Longford (AGF4818) (0.63t/ha), RGT Cesario (2.12t/ha) and AGTW005 (0.64t/ha).*
- *The dominant diseases were stripe rust in RGT Cesario and Septoria tritici blotch (STB) in Stockade, although drier spring conditions reduced upper canopy infection with STB.*
- *There was no obvious disease in Longford (AGF4818) and only traces of Wirrega blotch and stripe rust in AGTW005 during grain fill, so it is difficult to suggest where the additional yield came from in these two varieties.*
- *Longford (AGF4818) and AGTW005 retained their green leaf the longest, however four fungicide units were necessary to retain green leaf in RGT Cesario which is now very stripe rust susceptible.*
- *Higher senescence in Stockade was primarily related to a shorter growing season rather than the effect of more STB, which although less evident under four fungicides did not remove the senescence in the lower canopy.*
- *In terms of economics the most profitable approach in a dry spring with Stockade was based on four units of fungicide (despite lower yield response there was an improvement in bin grade through improved test weights), the same was the case with RGT Cesario where it was imperative to provide full protection against stripe rust. The net margin advantage of four fungicide units over one being almost over $300/ha.*
- *Grain quality parameters varied slightly with the different combinations of fungicide and cultivar, but all treatments had protein at least 11% or over with slightly, but significantly higher test weights under more intensive fungicide management.*

Treatments:

Three red feed winter wheats Longford (formerly AGF4818), RGT Cesario, AGTW005 and the white wheat Stockade (APW) were managed with three levels of fungicide, untreated, a single unit flag leaf spray and full protection based on 4 units of fungicide.

Table 1. Treatments

Treatment	
Treatment 1.	**Untreated**
Treatment 2.	**1 unit of Fungicide** -A single flag leaf spray Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha) (750 mL/ha) at GS39
Treatment 3.	**4 units of fungicide (Full protection)** – flutriafol-coated MAP in furrow at sowing (500 g ai/L at 200 mL/ha), Prosaro 300mL/ha at GS31, Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha) (750 mL/ha) at GS39 and Opus 125 SC (epoxiconazole 125g/L) applied at 500mL/ha (62.5 g ai/ha) at GS59

Stockade was the only variety not to give a statistically significant yield response to increased fungicide input based on four fungicides as opposed to one fungicide (Table 2), however four units of fungicide generated the better profitability as a result of yield with all varieties except Stockade, where bin grade improvement was the key (Table 3 & Figure 2).

Table 2. Influence of management strategy and cultivar on grain yield (t/ha).

	Yield (t/ha)			
	Management Strategy			
	Untreated	**1 Fungicide**	**4 Fungicides**	**Mean**
Stockade	8.68 ef	8.62 f	8.97 e	**8.76**
RGT Cesario	7.34 h	8.21 g	9.46 cd	**8.33**
AGTW005	9.34 d	9.55 cd	9.98 ab	**9.62**
Longford	9.53 cd	9.69 bc	10.16 a	**9.80**
Mean	**8.72**	**9.02**	**9.64**	**9.13**
LSD Cultivar P=0.05		0.18	**P value**	<0.001
LSD Management P=0.05		0.26	**P value**	<0.001
LSD Cultivar x Man. P=0.05		0.32	**P value**	<0.001

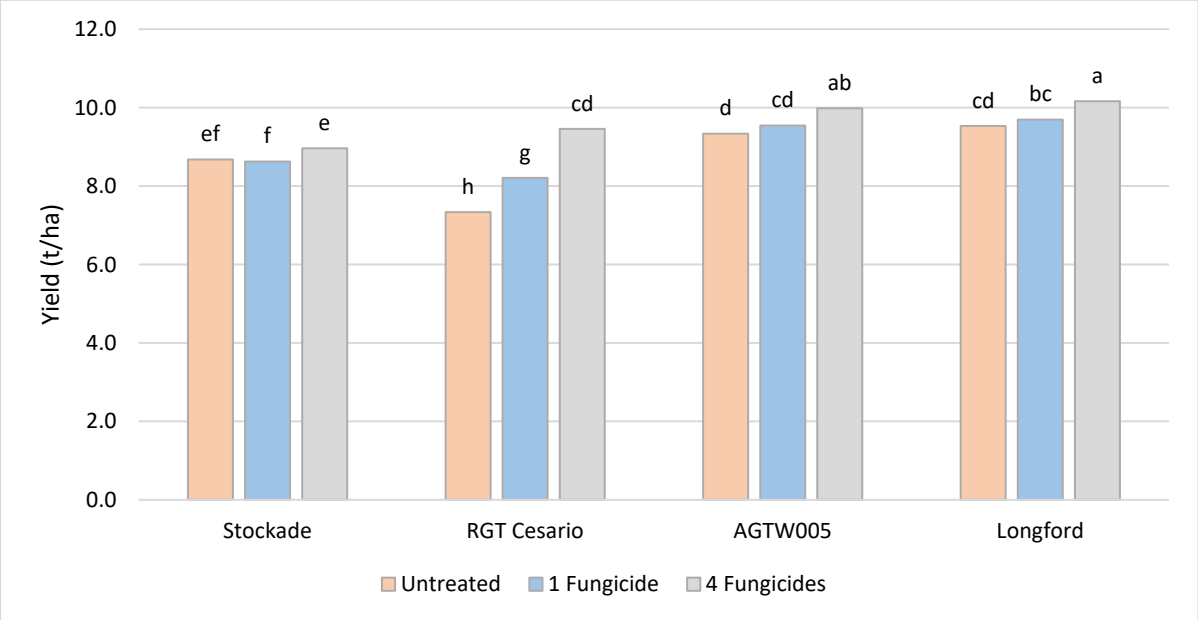

Figure 1. Interaction of cultivar and fungicide on grain yield (t/ha) (p <0.001, LSD = 0.32).

Table 3. Influence of cultivar and fungicide management on bin grade, net margin over the untreated and operational costs.

	Fungicide Management	Bin Grade	Margin after Fungicide Costs & application $/ha	Fungicide Costs & application $/ha	Net Margin over Untreated
Stockade	Untreated	AGP1	$2,672.82	$0.00	0
	1F	APW1	$2,931.99	$34.32	$259.17
	4F	APW1	$2,985.00	$98.96	$312.18
RGT Cesario	Untreated	SFWR	$2,259.18	$0.00	0
	1F	SFWR	$2,493.74	$34.32	$234.56
	4F	SFWR	$2,814.11	$98.96	$554.93
AGTW005	Untreated	SFWR	$2,875.18	$0.00	0
	1F	SFWR	$2,905.54	$34.32	$30.36
	4F	SFWR	$2,975.81	$98.96	$100.63
Longford	Untreated	SFWR	$2,935.24	$0.00	0
	1F	SFWR	$2,951.12	$34.32	$15.88
	4F	SFWR	$3,031.25	$98.96	$96.01

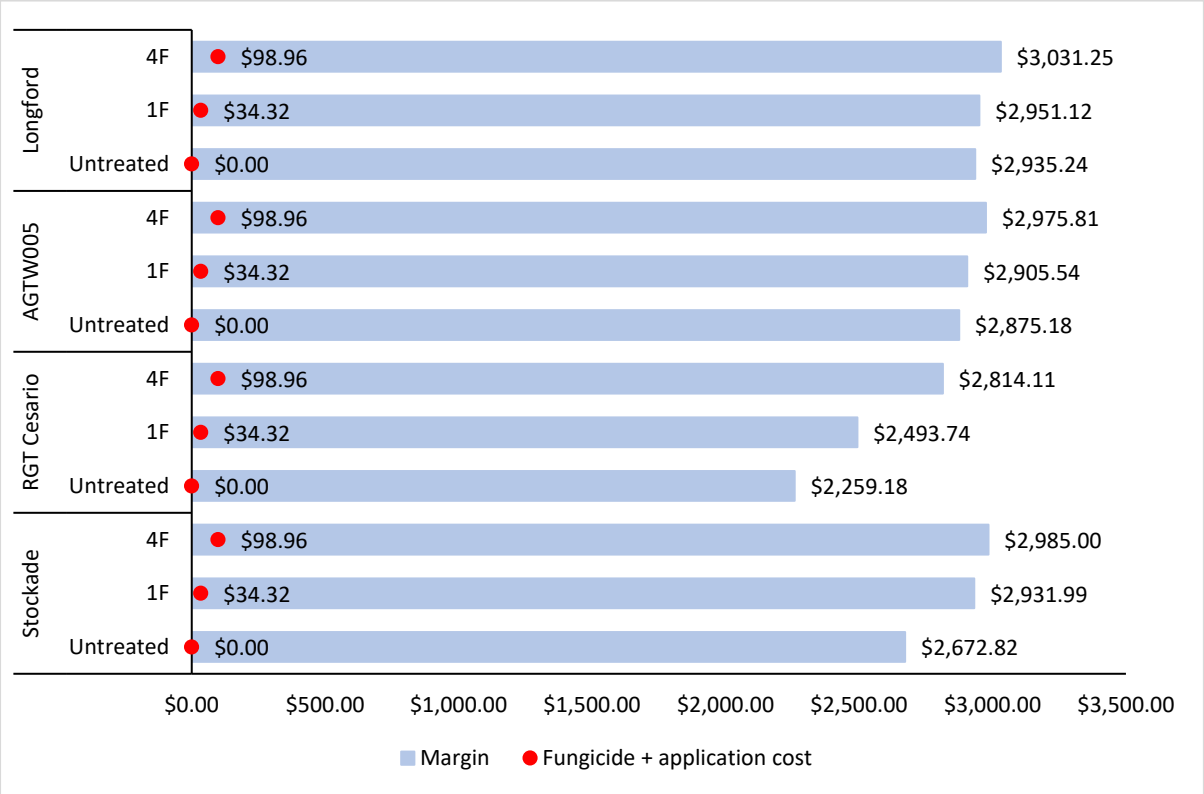

Figure 2. Influence of fungicide strategy and cultivar on system profitability. Value outside the bar denotes margin.

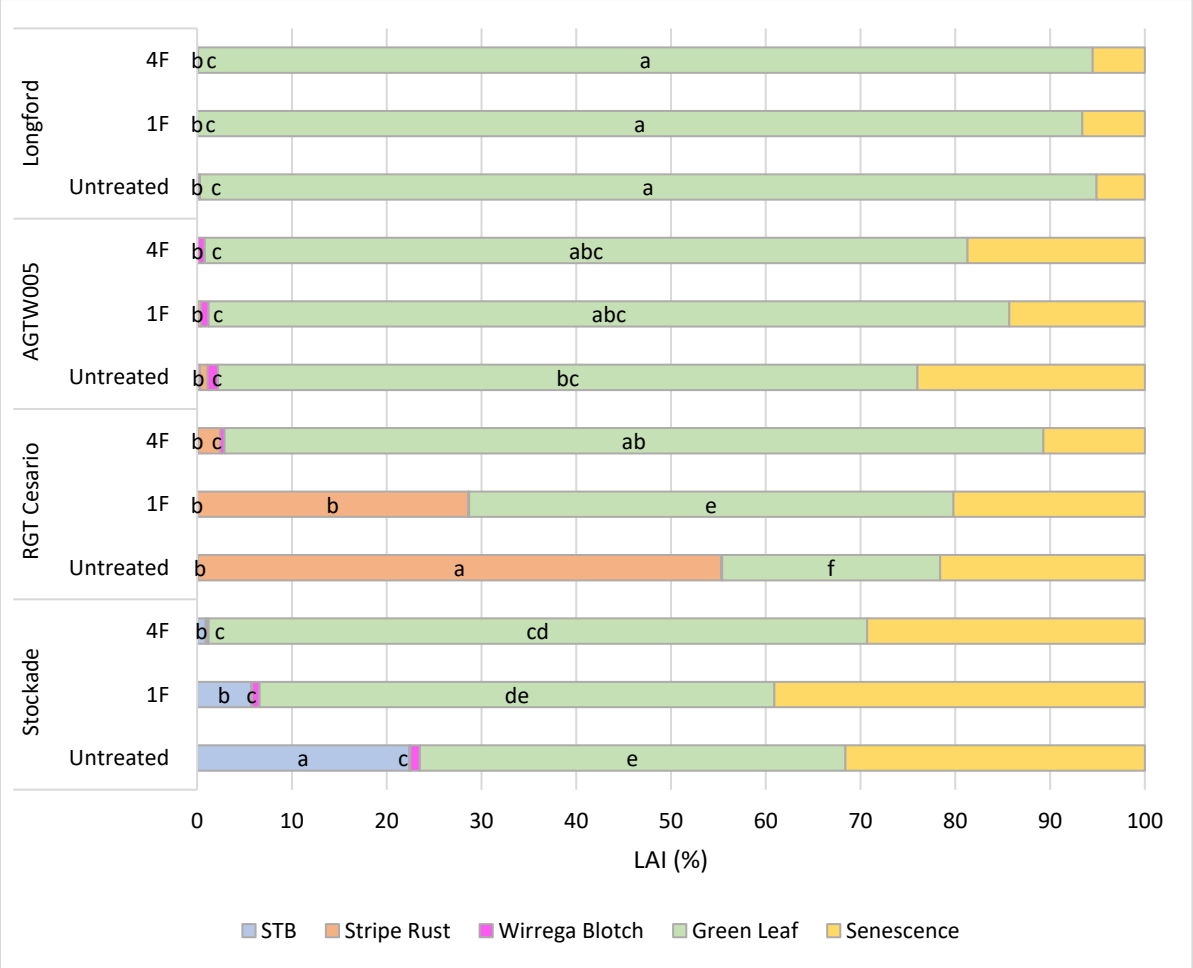

Figure 3. Influence of management strategy and cultivar on F-2 leaf area coverage (%) of septoria tritici blotch (STB), stripe rust, wirrega blotch, green leaf retention, and senescence assessed 17 November (GS71). Refer to Table 3 for statistical significance.

Table 4. Significance analysis of the influence of management strategy and cultivar on leaf area coverage (%) of septoria tritici blotch (STB), stripe rust, wirrega blotch, green leaf retention, and senescence.

		LSD P=0.05	P value
Septoria tritici blotch	**Cultivar**	5.8	0.004
	Management	ns	0.147
	Cultivar x Man.	10.0	0.037
Stripe rust	**Cultivar**	4.3	<0.001
	Management	2.9	<0.001
	Cultivar x Man.	7.5	<0.001
Wirrega blotch	**Cultivar**	0.6	0.039
	Management	ns	0.357
	Cultivar x Man.	ns	0.654
Green leaf retention	**Cultivar**	10.8	<0.001
	Management	9.5	0.005
	Cultivar x Man.	16.5	<0.001

Table 5. Influence of management strategy and cultivar on protein (%).

	Protein (%)					
	Management Strategy					
	Untreated		**1 Fungicide**		**4 Fungicides**	**Mean**
Stockade	11.6	-	11.9	-	11.9 -	**11.8 a**
RGT Cesario	11.0	-	11.3	-	11.4 -	**11.2 b**
AGTW005	12.0	-	11.8	-	12.0 -	**11.9 a**
Longford	11.4	-	11.2	-	11.3 -	**11.3 b**
Mean	**11.5**	**-**	**11.5**	**-**	**11.6 -**	**11.5**
LSD Cultivar P=0.05			0.2		**P value**	<0.001
LSD Management P=0.05			ns		**P value**	0.084
LSD Cultivar x Man. P=0.05			ns		**P value**	0.386

Note: 150 N kg/ha of applied nitrogen fertiliser as solid prilled 46% N urea

Table 6. Influence of management strategy and cultivar on test weight (kg/hL).

	Test weight (kg/hL)					
	Management Strategy					
	Untreated		**1 Fungicide**		**4 Fungicides**	**Mean**
Stockade	75.3	-	76.8	-	77.1 -	**76.4 -**
RGT Cesario	75.0	-	76.7	-	77.1 -	**76.3 -**
AGTW005	77.0	-	76.2	-	77.4 -	**76.9 -**
Longford	77.4	-	77.0	-	77.5 -	**77.3 -**
Mean	**76.2**	**b**	**76.7**	**ab**	**77.3 a**	**76.7**
LSD Cultivar P=0.05			ns		**P value**	0.074
LSD Management P=0.05			0.7		**P value**	0.025
LSD Cultivar x Man. P=0.05			ns		**P value**	0.133

Table 7. Influence of management strategy and cultivar on screenings (%).

	Screenings (%)					
	Management Strategy					
	Untreated		**1 Fungicide**		**4 Fungicides**	**Mean**
Stockade	4.1	a	3.8	ab	3.5 bc	**3.8 a**
RGT Cesario	2.0	d	1.7	de	1.4 e	**1.7 c**
AGTW005	1.5	e	1.4	e	1.6 de	**1.5 c**
Longford	3.2	c	3.6	b	3.5 bc	**3.4 b**
Mean	**2.7**	**-**	**2.6**	**-**	**2.5 -**	**2.6**
LSD Cultivar P=0.05			0.3		**P value**	<0.001
LSD Management P=0.05			ns		**P value**	0.324
LSD Cultivar x Man. P=0.05			0.5		**P value**	0.034

Table 8. Trial input and management details.

Varieties:		**Longford, RGT Cesario, AGTW005 and Stockade**
Sowing date:		11 May 2023
Harvest date:		14 January 2024
Seed rate:		180 seeds/m^2
Basal fertiliser:	11 May	100 kg/ha MAP
Nitrogen:	26 Jul	50kg N/ha
	19 Sep	100kg N/ha
Fungicides:		As per treatment list

Table 9. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC

Trial 3. HYC Wheat Disease Management (FAR SAC W23-04)

Key Points:

- *Grain yield was significantly increased by fungicide application to BigRed at the Millicent research site with fungicide strategies of 1 – 4 units of fungicide giving yield responses of between 0.84t/ha – 1.24t/ha.*
- *Greater fungicide input in terms of more applications increased yield by 0.4t/ha over a single flag spray compared to 4 units of fungicide and this 4 spray approach was the most profitable.*
- *However, the advantage of 4 sprays over 2 sprays (standard approach) was less than $3/ha.*
- *Thus the additional flutriafol upfront on the fertiliser and third head wash fungicide generated less than $3/ha more.*
- *In contrast the inclusion of a GS31-32 fungicide of Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) was cost effective prior to the flag leaf spray lifting yield by 0.26t/ha and $46/ha.*
- *Delaying the first fungicide until later in stem elongation GS33 in the two-spray approach that straddles the flag leaf was not quite as effective as a more standard GS31-32 first application and flag leaf follow up, however the difference was not significant.*
- *Stripe rust differences were primarily related to differences in yield response, profitability, and green leaf retention in the lower canopy.*

Treatments:

Five levels of fungicide management were investigated with the popular red feed wheat BigRed. These were:

1. Nil – untreated control.
2. A single flag leaf fungicide applied at GS39 – Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha).
3. A two-spray (straddle) approach at GS33 (3rd node) SDHI/DMI Revystar applied at 750mL/ha & GS59 (head emergence) Opus 125 SC (epoxiconazole 125g/L) applied at 500mL/ha (62.5 g ai/ha).
4. A four-unit approach combining at sowing flutriafol on the MAP with three foliar sprays – GS31 Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai), GS39 and GS59 (as stated above).
5. A two-spray (standard) approach at GS31 Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) & GS39 SDHI/DMI mixture.

Results:

Fungicide management strategy had a significant impact on the grain yield but not grain quality (Table 1) of BigRed at the Millicent location, as result of low levels of stripe rust infection (Table 2). No improvements in protein, test weight or screenings were observed in the trial.

Table 1. Influence of fungicide strategy on grain yield (t/ha) and grain quality (protein (%), test weight (kg/hL) and screenings (%).

	Grain Yield and Quality			
Treatment	**Yield t/ha**	**Protein %**	**Test Weight kg/hL**	**Screenings %**
Untreated	8.56 c	11.2 -	78.7 -	2.3 -
1 F	9.40 b	11.1 -	79.4 -	2.2 -
2 F (Straddle)	9.47 b	11.3 -	79.2 -	2.4 -
4 F	9.80 a	11.2 -	79.7 -	2.4 -
2 F (Standard)	9.66 ab	11.2 -	79.6 -	2.5 -
Mean	9.38	11.2	79.3	2.3
P Value	<0.001	0.684	0.159	0.429
LSD P=0.05	0.32	ns	ns	ns

Fungicide application reduced observed stripe rust infection during grain fill with evidence that the single flag spray was less effective than those programmes applying more than one unit of fungicide. Trends for lower disease pressure under 4 units of fungicide were not statistically significant (Tables 2 & 3).

Table 2. Influence of fungicide management on the severity (% LAI) of Stripe Rust infection and % green leaf retention – assessed 17 November, GS71.

	Flag	**Flag-1**	**Flag-2**	**Flag-3**	**Flag-3**
Treatment	**SR %LAI**	**SR %LAI**	**SR %LAI**	**SR %LAI**	**% GLR**
Untreated	0.5 a	1.6 a	5.6 a	7.5 a	26.3 -
1 F	0.0 b	0.2 b	1.3 b	4.0 b	40.8 -
2 F (Straddle)	0.0 b	0.1 b	0.2 b	0.3 c	41.2 -
4 F	0.0 b	0.0 b	0.1 b	0.2 c	50.4 -
2 F (Standard)	0.0 b	0.0 b	0.1 b	0.1 c	45.6 -
Mean	0.1	0.4	1.4	2.4	40.8
P Value	0.003	<0.001	<0.001	<0.001	0.063
LSD P=0.05	0.2	0.4	1.6	2.2	ns

Table 3. Influence of fungicide management on the incidence (%) of Stripe Rust infection – assessed 17 November, GS71.

	Flag	**Flag-1**	**Flag-2**	**Flag-3**
Treatment	**SR %LAI**	**SR %LAI**	**SR %LAI**	**SR %LAI**
Untreated	40.0 a	80.0 a	92.5 a	100.0 a
1 F	2.5 b	7.5 b	50.0 b	75.0 b
2 F (Straddle)	0.0 b	2.5 b	7.5 c	12.5 c
4 F	0.0 b	0.0 b	7.5 c	10.0 c
2 F (Standard)	0.0 b	0.0 b	7.5 c	5.0 c
Mean	8.5	18.0	33.0	40.5
P Value	<0.001	<0.001	<0.001	<0.001
LSD P=0.05	15.0	8.3	19.7	20.6

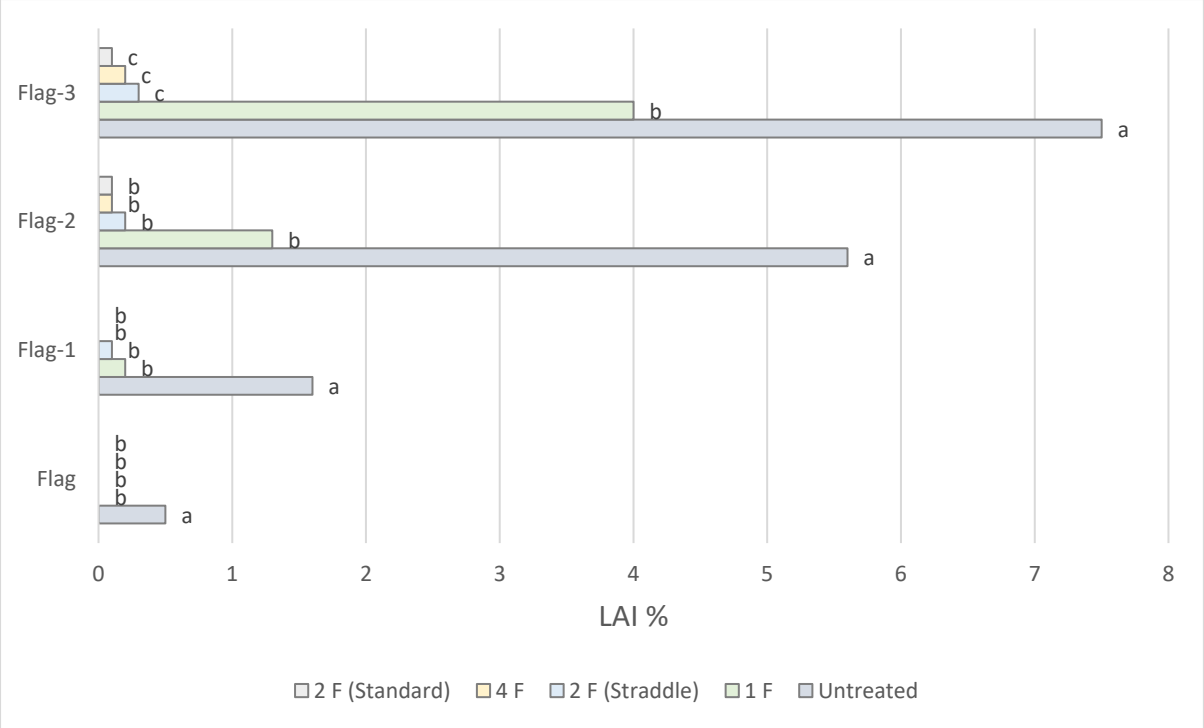

Figure 1. Influence of fungicide management on the severity (% LAI) of Stripe Rust infection – assessed 17 November, GS71.

Table 4. Influence of fungicide strategy on margin over input and application cost ($/ha) assuming untreated crop is zero.

Fungicide Management	Partial Gross Margin	Net Margin over Untreated
Untreated	$2,421.07	0.00
1F	$2,626.73	$205.66
2F (Straddle)	$2,624.19	$203.13
4F	$2,675.29	$254.23
2F (Standard)	$2,672.58	$251.52

i.e. Grain based on SFWR grade.

Table 5. Trial input and management details.

Sowing date:		**11 May 2023**
Harvest date:		14 January 2024
Seed rate:		180 seeds/m^2
Basal fertiliser:	11 May	100 kg/ha MAP
Nitrogen:	26 Jul	50kg N/ha
	19 Sep	100kg N/ha
Fungicides:		As per treatment list

Table 6. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC

Trial 4. Nutrition for Hyper Yielding Wheat (FAR SAC W23-05)

Key Points:

- *Following canola on an organosol soil type there was no yield response to increasing N application from 0 – 280kg N/ha, however all N applications above 80kg N/ha significantly increased protein.*
- *120kg N/ha plus 3t/ha of chicken manure incorporated at sowing was the only treatment to significantly increase yield over the nil N control (MAP only). The yield of the manure treatment was 0.93t/ha higher than 120N applied alone.*
- *This result would not appear to be related to the additional N content of the manure.*
- *Manure treatments significantly increased harvest dry matter and crop height. There was a significant reduction in harvest index relative to other treatments, however this was not sufficient to nullify the yield increase.*
- *Attempts to match the macro nutrient content of the manure with inorganic fertiliser were unsuccessful with significantly lower yields than manure treatments.*
- *With 253kg N/ha in the soil 0 – 30cm on 28 June, the zero N treatment (only 10kg N/ha MAP applied) yielded 8.88t/ha with a protein of 11.1%, indicating the presence of 173kg N/ha in the grain at harvest.*
- *If 75% of the N is assumed to be in the grain and 25% in the straw residue, then the total N uptake at harvest in zero N plots would be 230kg N/ha indicating that the available N in the soil profile could have provided sufficient N to satisfy this yield and protein content.*
- *200N applied as a 2 or 3 split urea application had no effect on either grain yield or quality in this trial. There was no lodging in this trial which in other trials has favoured the 3-split approach.*
- *Applying more macro nutrients to replicate manure on top of 120N gave no significant yield benefit over the 120N alone and were inferior to the manure treatment in terms of grain protein.*
- *Unlike the manure treatment the equivalent macro nutrients gave no significant boost to harvest dry matter content.*
- *The manure gave a yield increase of 0.93t/ha valued at $279/ha (assuming $300/t for grain) when applied with 120 kg N/ha applied alone which gave a 0.02t/ha yield compared to the control (100kg/ha MAP).*
- *The net margin of manure would be dependent on the cost of sourcing the manure and its application pre sowing.*
- *The trial does not take account of any potential legacy benefits of the manure in years following.*

Treatments:

Stockade white wheat was subjected to 10 nutrition treatments of varying nitrogen (timing and rate) and manure rates (Table 1). The 3t/ha manure (chicken manure pellets – dry weight) treatments were applied on top of 120kg N/ha applied as a two split 50% at GS30 (pseudo stem erect) and 50% at GS32 (2nd node). The chicken manure had an analysis of N 0.98%, P 1.0 %, K 2.4% and S 0.66% based on dry weight. The total value (NPKS) of the 3t/ha application is detailed in Table 3 of the 'Appendix. HYC Wheat SA Crop Technology Centre'. The available soil N was measured on 28 June with 0-10cm 137kg N/ha, and 10-30cm 116kg N/ha giving a total of 253kg N/ha in the 0 – 30cm horizon. Note this test was carried out after 100kg/ha MAP was applied. The trial site has an organic carbon content of 8.0% in the 0 – 10cm.

Table 1. Treatment list and timings.

Treatment Name		Sowing	GS30	GS32	GS39
		MAP kg/ha	N kg/ha	N kg/ha	N kg/ha
1	**Untreated**	100	0	0	
2	**80**	100	40	40	
3	**120**	100	60	60	
4	**160**	100	80	80	
5	**200**	100	100	100	
6	**240**	100	120	120	
7	**280**	100	140	140	
8	**200 3-split**	100	80	80	40
9	**120 + OM****	100 + 3 tonnes manure	60	60	
10	**120 + PKS***	100 + (PKS 2 June)	60	60	

**Urea 92.9 kg/ha, MOP 124.8 kg/ha, SOA 62.5 kg/ha, and MAP 83.2 kg/ha applied 2 June.*

***Organic manure. Refer to Table 4*

Table 2. Influence of fertiliser application on grain yield and grain quality (protein (%), test weight (kg/hL) and screenings (%)).

Treatment Name		Yield	Protein	Test weight	Screenings
		t/ha	%	kg/hL	%
1	**Untreated**	8.88 b	11.1 c	76.9 -	2.8 -
2	**80**	8.95 b	11.1 c	76.1 -	2.4 -
3	**120**	8.90 b	11.4 ab	76.8 -	2.7 -
4	**160**	9.00 b	11.4 ab	76.9 -	2.6 -
5	**200**	9.01 b	11.5 ab	76.9 -	2.5 -
6	**240**	8.97 b	11.6 a	76.9 -	2.4 -
7	**280**	9.07 b	11.6 a	76.9 -	2.3 -
8	**200 3 split**	9.04 b	11.5 a	77.1 -	2.3 -
9	**120 + OM**	9.83 a	11.6 a	76.3 -	2.3 -
10	**120 + PKS**	9.13 b	11.3 b	77.0 -	2.3 -
Mean		9.08	11.4	76.8	2.5
LSD P=0.05		0.26	0.2	ns	ns
P Value		<0.001	<0.001	0.642	0.129

Table 3. Influence of fertiliser application on crop dry matter (DM t/ha), harvest index (%), crop height (cm), and heads per square meter (heads/m^2).

Treatment Name		GS65 DM		GS99 DM		Harvest Index		Crop Height		Head Count	
		t/ha		t/ha		%		cm		heads/m^2	
1	**Untreated**	7.0	-	13.9	c	56.2	a	79.3	e	377	-
2	**80**	7.8	-	15.2	bc	51.8	ab	84.3	bcd	367	-
3	**120**	7.0	-	15.2	bc	51.5	ab	83.8	cd	334	-
4	**160**	8.8	-	15.8	bc	50.0	bc	83.6	cd	363	-
5	**200**	8.0	-	16.9	b	47.1	bc	85.9	a-d	411	-
6	**240**	8.4	-	15.8	bc	50.1	bc	83.3	d	375	-
7	**280**	8.2	-	15.9	b	50.1	bc	85.6	a-d	390	-
8	**200 split**	8.4	-	15.2	bc	52.6	ab	86.8	ab	388	-
9	**120 + OM**	8.9	-	19.3	a	45.1	c	88.3	a	440	-
10	**120 + PKS**	8.2	-	15.2	bc	53.0	ab	86.2	abc	366	-
Mean		8.1		15.8		50.7		84.7		381.0	
LSD P=0.05		ns		2.0		5.9		2.7		ns	
P Value		0.143		0.002		0.044		<0.001		0.134	

Table 4. Nutrient value of manure applied, and inorganic nutrients used in treatment 10.

Trt#	Product	Rate	Nutrient Value (kg/ha)			
		kg/ha	N	P	K	S
9	Manure (dry)	3000	**29.6**	**30**	**72**	**19.8**
10	Urea	92.9	42.8			
	MOP	124.8			74.9	
	SOA	62.5	13.1			15.0
	MAP	83.2	8.3	18.3		
	Total		**64.2**	**18.3**	**74.9**	**15.0**

Table 5. Trial input and management details.

Variety:		**Stockade**
Sowing date:		11 May 2023
Harvest date:		14 January 2024
Seed rate:		180 seeds/m^2
Basal fertiliser:	11 May	100 kg/ha MAP
Nitrogen:		As per treatment list
Fungicide:	GS31	Radial 0.84 L/ha
	GS39	Aviator Xpro 0.50 L/ha
	GS59-61	Opus 0.50 L/ha

Table 6. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC

Appendix. HYC Wheat SA Crop Technology Centre

The following details apply to all South Australian wheat trials unless specified differently.

Table 1. Overall Inputs

	Date applied	Product
Herbicide:	9 May	TriflurX 3 L/ha
	9 May	Spreadwet 0.2 L/ha
	15 Aug	Broadside 1.4 L/ha
Crop protection:	20 Jun	Metarex 3 kg/ha
	10 Nov	Alpha Scud 0.08 L/ha
	7 Jan	Metarex 3 kg/ha
Trace elements:	15 Aug	SprayGro Smartrace Triple 4 L/ha
	2 Sep	SprayGro Smartrace Triple 4 L/ha
	5 Sep	SprayGro Smartrace Triple 4 L/ha
	16 Sep	SprayGro Smartrace Triple 4 L/ha

**SprayGro Smartrace Triple*

Table 2. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Active 3	Type	
Herbicide							
TriflurX	Trifluralin	480 g/L	---	---	---	---	EC
Broadside	MCPA	280 g/L	Bromoxynil	140 g/L	Dicamba	40 g/L	EC
Adjuvant							
Spreadwet	Alkoxylated Alcohols	1000 g/L	---	---	---	---	
Crop Protection							
Metarex	Metaldehyde	50 g/kg	---	---	---	---	
Alpha Scud	Alpha-cypermethrin	300 g/L	---	---	---	---	SC

Table 3. Analysis of chicken manure used at Millicent 2023 (rates and nutrients reported on a dry basis except moisture).

Nutrient	Concentration in chicken manure
pH 1:5 water	5.7
Nitrate Nitrogen	960 mg/kg
Ammonium Nitrogen	8,900 mg/kg
Phosphorus	10,000 mg/kg
Potassium	24,000 mg/kg
Sulfur	6,600 mg/kg
Calcium	14,000 mg/kg
Magnesium	6,200 mg/kg
Carbon	39%
Iron	7,100 mg/kg
Manganese	530 mg/kg
Copper	74 mg/kg
Zinc	350 mg/kg
Boron	44 mg/kg
Moisture	30.8%

VIC Crop Technology Centre

Gnarwarre, VIC

Time of Sowing 1: 29-30 April 2023
Time of Sowing 2: 22 May 2023
Harvested: January 2024 *(no specific day with harvest interrupted by frequent rain)*
Rotation position: 2022 Faba beans
Soil type: Grey clay loam
Nitrogen 0-60 cm: 118kg N/ha
Colwell P (ppm) 0-10cm: 74 mg/kg
pH ($CaCl_2$) 0-10cm: 5.8
Organic Carbon (%) 0-10cm: 2.4%

Trial 1. HYC Wheat G.E.M Trial Series- Time of Sowing 1 (FAR VIC W23-03-01)

Key Points:

- *Grain yields of RGT Waugh were consistently higher yielding than other varieties, irrespective of management input, with no significant yield differences due to management input.*
- *Despite RGT Waugh having a slower development speed through stem elongation to booting, which might have been seen as a disadvantage, RGT Waugh produced better yields than Longford (AGF4818) a variety which is also later to develop.*
- *Regardless of the fungicide strategy, Longford (AGF4818) had the lowest disease severity (<1% plot disease infection), however the dry spring combined with its longer phenology resulted in it being the lowest yielding variety, despite good disease resistance.*
- *Lower input consistently resulted in the highest disease levels, particularly in varieties that were stripe rust susceptible such as RGT Accroc and RGT Cesario.*
- *Low input strategies used for BigRed, RGT Waugh and Stockade recorded the highest Septoria tritici blotch (STB) severity, however relative to 2020 – 2022 STB disease levels were low because of the dry spring reducing infection pressure.*
- *In terms of profitability there was a range in margin after of fungicide, PGR and nitrogen costs that ranged from $1468 to $1796/ha.*
- *Those varieties that were resistant to disease in the spring of 2023 such as Stockade, RGT Waugh and all gave their best margins with low input (no PGR, 2 fungicide units with no head wash spray and 150kg N/ha).*
- *With the stripe rust susceptible varieties such as RGT Accroc and RGT Cesario it was the HYC Strategic management approach that was the more profitable management approach, which set out a three-spray fungicide programme based on variety susceptibility to disease.*

Treatments:

Six cultivars (RGT Cesario, BigRed, RGT Accroc, Stockade, Longford (formerly AGF4818) and RGT Waugh) were tested under four different management programs;

1. High Input – 4 units of fungicides (Flutriafol plus foliar fungicides GS31, GS39, GS59), 225 N/ha and PGR.
2. Low Input – 2 units of fungicide based on Opus 125 SC (epoxiconazole 125g/L) applied at 500mL/ha (62.5 g ai/ha) and Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) & 150kg N/ha.
3. HYC Strategic Input – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

Treatments:

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 1.

Table 1. Trial input and management details**.**

Sowing date:		**29 April 2023**	
Harvest date:		**15 January 2024**	
Seed rate:		180 seeds/m2	
Basal fertiliser:	29 Apr	100 kg/ha MAP	
Nitrogen:		**Low Input**	**High Input**
	GS26-30	50kg N/ha	50kg N/ha
	GS31	100kg N/ha	125kg N/ha
	GS32-33		50kg N/ha
		Strategic	**Tactical**
	GS26-30	50kg N/ha	50kg N/ha
	GS31	100kg N/ha	100kg N/ha
PGR:		**High Input Only**	
	GS30	Moddus Evo 0.20 L/ha Errex 1.3 L/ha	
Fungicide:		**Low Input**	**High Input**
	GS00	**----**	Flutriafol 0.2 L/ha
	GS31/32	Opus 0.50 L/ha	Radial 0.84 L/ha
	GS39	Prosaro 0.3 L/ha	Aviator Xpro 0.416 L/ha
	GS59	----	Prosaro 0.15 L/ha
		Strategic	**Tactical**
	GS00	**----**	----
	GS31/32	See below	See below
	GS39	Radial 0.84 L/ha	Radial 0.84 L/ha
	GS59	Opus 0.5 L/ha	Prosaro 0.15 L/ha

Tactical and Strategic Fungicide GS31/32:					
RGT Cesario	**BigRed**	**RGT Accroc**	**Stockdale**	**Longford**	**RGT Waugh**
Prosaro 0.3 L/ha	Prosaro 0.3 L/ha	Aviator Xpro 0.416 L/ha	Prosaro 0.3 L/ha	Prosaro 0.3 L/ha	Prosaro 0.3 L/ha

Management treatments

The only grain yield differences in the trial were related to germplasm not management of crop inputs (Table 3). Whilst there was a yield trend to suggest higher yields from the high input approach (based on PGR application and additional N and flutriafol at sowing), it was not statistically significant. In contrast when averaged across the different management techniques, RGT Waugh was significantly higher yielding than all other varieties except Stockade. The drier shorter season did not favour Longford (AGF4818) which was significantly lower yielding than other varieties tested except RGT Cesario. RGT Waugh's slower development during booting (GS40-49) (Table 2) which one might have felt would reduce its yield potential in a dry spring did not penalise the variety and it was 0.78t/ha higher yielding than Longford (AGF4818) (averaged over the different management strategies).

Table 2. Zadoks development stage GS13 – 59 of different wheat varieties.

Cultivar	08-Jun	26-Jun	10-Jul	30-Jul	14-Aug	28-Aug	11-Sep	18-Sep	03-Oct	11-Oct
RGT Accroc	13	24	24	28	30	31	33	38	55	59
Longford	13	23	24	27	29	31	33	38	49	55
BigRed	13	25	25	27	29	31	32	38	55	57
RGT Waugh	13	23	26	28	30	32	33	37	49	59
Stockade	13	25	27	30	32	33	33	37	58	59
RGT Cesario	13	24	26	29	30	31	32	38	55	55

Table 3. Influence of management strategy and cultivar on grain yield (t/ha).

	Yield (t/ha)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
RGT Cesario	5.90 -	6.63 -	6.22 -	5.99 -	**6.18 bc**
BigRed	6.13 -	6.43 -	6.48 -	6.82 -	**6.46 ab**
RGT Accroc	6.49 -	6.78 -	6.68 -	6.06 -	**6.50 ab**
Stockade	6.30 -	6.09 -	6.12 -	6.20 -	**6.18 bc**
Longford	5.82 -	6.31 -	5.82 -	5.75 -	**5.92 c**
RGT Waugh	6.67 -	6.92 -	6.55 -	6.67 -	**6.70 a**
Mean	**6.22 -**	**6.52 -**	**6.31 -**	**6.25 -**	**6.33**
LSD Cultivar P=0.05	0.35		**P value**	<0.001	
LSD Management P=0.05	ns		**P value**	0.624	
LSD Cultivar x Man. P=0.05	ns		**P value**	0.570	

Table 4. Influence of management strategy and cultivar on protein (%)

	Protein (%)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
RGT Cesario	12.0 -	12.5 -	12.1 -	11.9 -	**12.1 b**
BigRed	11.6 -	12.4 -	11.8 -	11.6 -	**11.8 c**
RGT Accroc	12.3 -	12.7 -	12.1 -	12.4 -	**12.3 a**
Stockade	11.0 -	11.6 -	11.4 -	10.9 -	**11.2 d**
Longford	12.3 -	12.4 -	12.4 -	12.4 -	**12.3 a**
RGT Waugh	12.0 -	12.4 -	12.0 -	11.9 -	**12.1 b**
Mean	**11.9 -**	**12.3 -**	**11.9 -**	**11.8 -**	**12.0**
LSD Cultivar P=0.05	0.2		**P value**	<0.001	
LSD Management P=0.05	ns		**P value**	0.312	
LSD Cultivar x Man. P=0.05	ns		**P value**	0.135	

Grain proteins suggested that for the season sufficient nitrogen was applied irrespective of management approach. Variety produced the only significant differences with lower yielding Longford (AGF4818) giving rise to higher proteins and Stockade giving lower proteins, however all were over 11% (Table 4). Similar findings were apparent with test weight and screenings with small but significant differences due to variety (Tables 5 & 6).

Table 5. Influence of management strategy and cultivar on test weight (Kg/hL)

	Test Weight (Kg/hL)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
RGT Cesario	72.0 -	72.2 -	72.7 -	72.7 -	72.4 d
BigRed	74.8 -	75.6 -	75.1 -	75.1 -	75.1 a
RGT Accroc	74.1 -	74.3 -	74.0 -	74.0 -	74.1 bc
Stockade	71.5 -	71.3 -	71.6 -	71.9 -	71.6 e
Longford	74.0 -	74.9 -	74.4 -	74.4 -	74.4 b
RGT Waugh	74.0 -	73.8 -	74.1 -	74.1 -	74.0 c
Mean	**73.4 -**	**73.7 -**	**73.6 -**	**7.37 -**	**73.6**
LSD Cultivar P=0.05		0.4	**P value**		<0.001
LSD Management P=0.05		ns	**P value**		0.632
LSD Cultivar x Man. P=0.05		ns	**P value**		0.694

Table 6. Influence of management strategy and cultivar on screenings (%)

	Screenings (%)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
RGT Cesario	2.7 -	2.5 -	2.5 -	2.7 -	2.6 c
BigRed	5.2 -	4.5 -	4.7 -	4.1 -	4.6 a
RGT Accroc	3.3 -	3.4 -	3.3 -	3.6 -	3.4 b
Stockade	5.6 -	4.0 -	4.5 -	4.4 -	4.6 a
Longford	4.4 -	4.8 -	4.7 -	4.4 -	4.6 a
RGT Waugh	4.8 -	4.3 -	4.5 -	4.6 -	4.6 a
Mean	**4.3 -**	**3.9 -**	**4.0 -**	**4.0 -**	**4.1**
LSD Cultivar P=0.05		0.4	**P value**		<0.001
LSD Management P=0.05		ns	**P value**		0.559
LSD Cultivar x Man. P=0.05		ns	**P value**		0.311

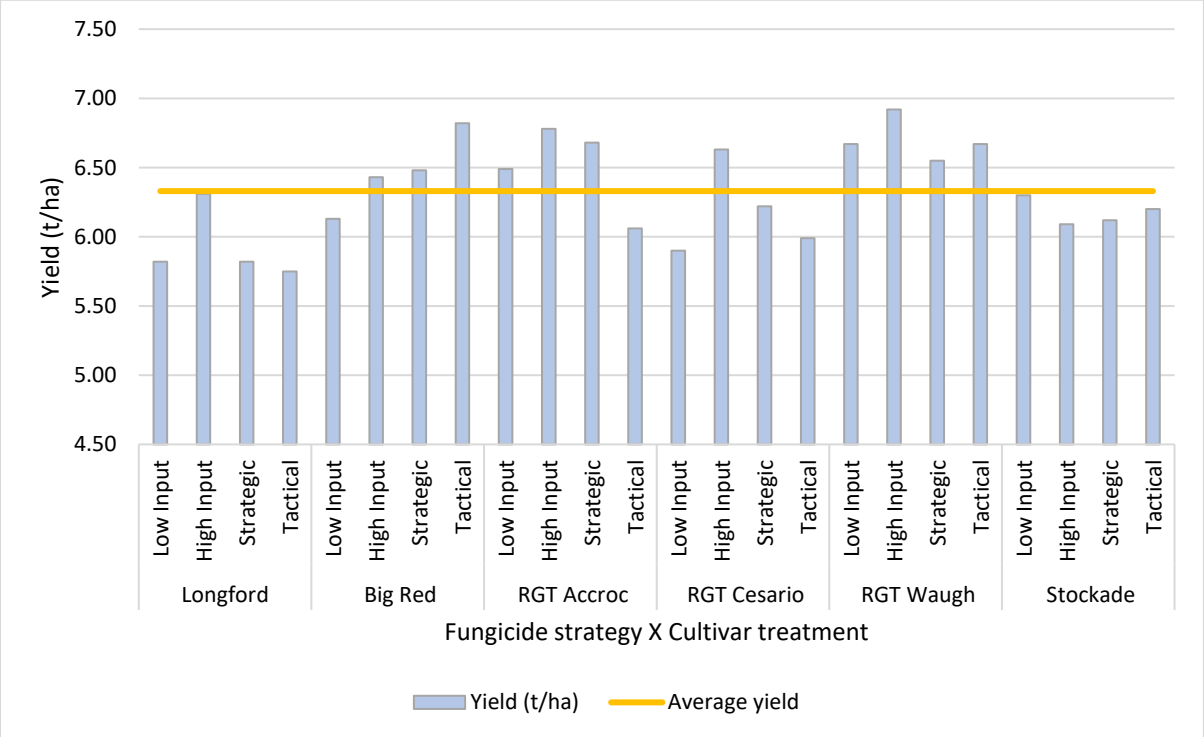

Figure 1. Influence of management strategy and cultivar on grain yield (t/ha).

Harvest dry matter was reduced by the dry spring and was on average approximately 14-16t/ha in most cases; in addition, the harvest index was particularly low averaging 37.7% (Table 7 & Figure 2) compared to Millicent that gave over 50% with corresponding higher grain yields and harvest dry matter at 18-20t/ha on average. There were no significant differences in the trial as a result of either harvest index or harvest dry matter.

Table 7. Influence of management strategy and cultivar on harvest index (%)

	Harvest Index (%)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
RGT Cesario	35.2 -	41.2 -	34.1 -	42.3 -	**37.4** -
BigRed	38.1 -	42.3 -	35.1 -	30.5 -	**40.1** -
RGT Accroc	40.4 -	39.3 -	34.4 -	40.3 -	**37.8** -
Stockade	35.9 -	36.8 -	35.0 -	42.9 -	**34.7** -
Longford	38.7 -	37.3 -	34.9 -	38.6 -	**37.3** -
RGT Waugh	38.2 -	38.0 -	41.3 -	35.1 -	**39.2** -
Mean	**37.1** -	**38.7** -	**39.0** -	**36.1** -	**37.7**
LSD Cultivar P=0.05		ns	**P value**		0.129
LSD Management P=0.05		ns	**P value**		0.175
LSD Cultivar x Man. P=0.05		ns	**P value**		0.428

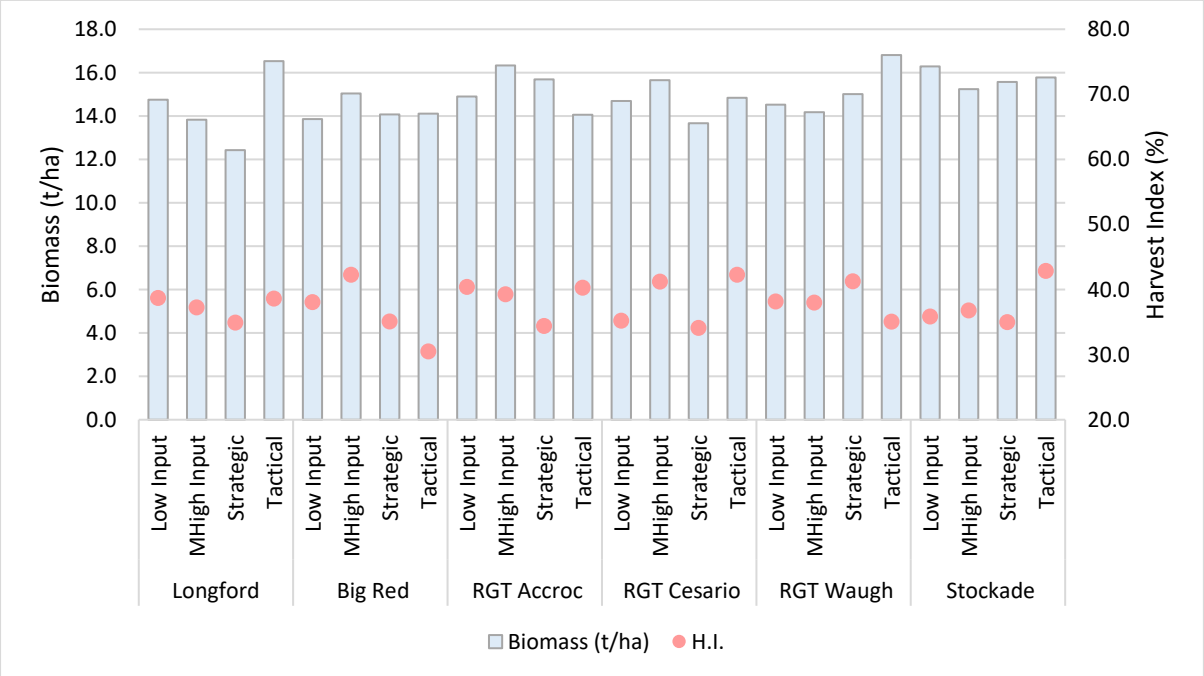

Figure 2. Influence of management strategy and cultivar on dry matter production (t/ha) at harvest and harvest index (%) (% of harvest dry matter that is grain).

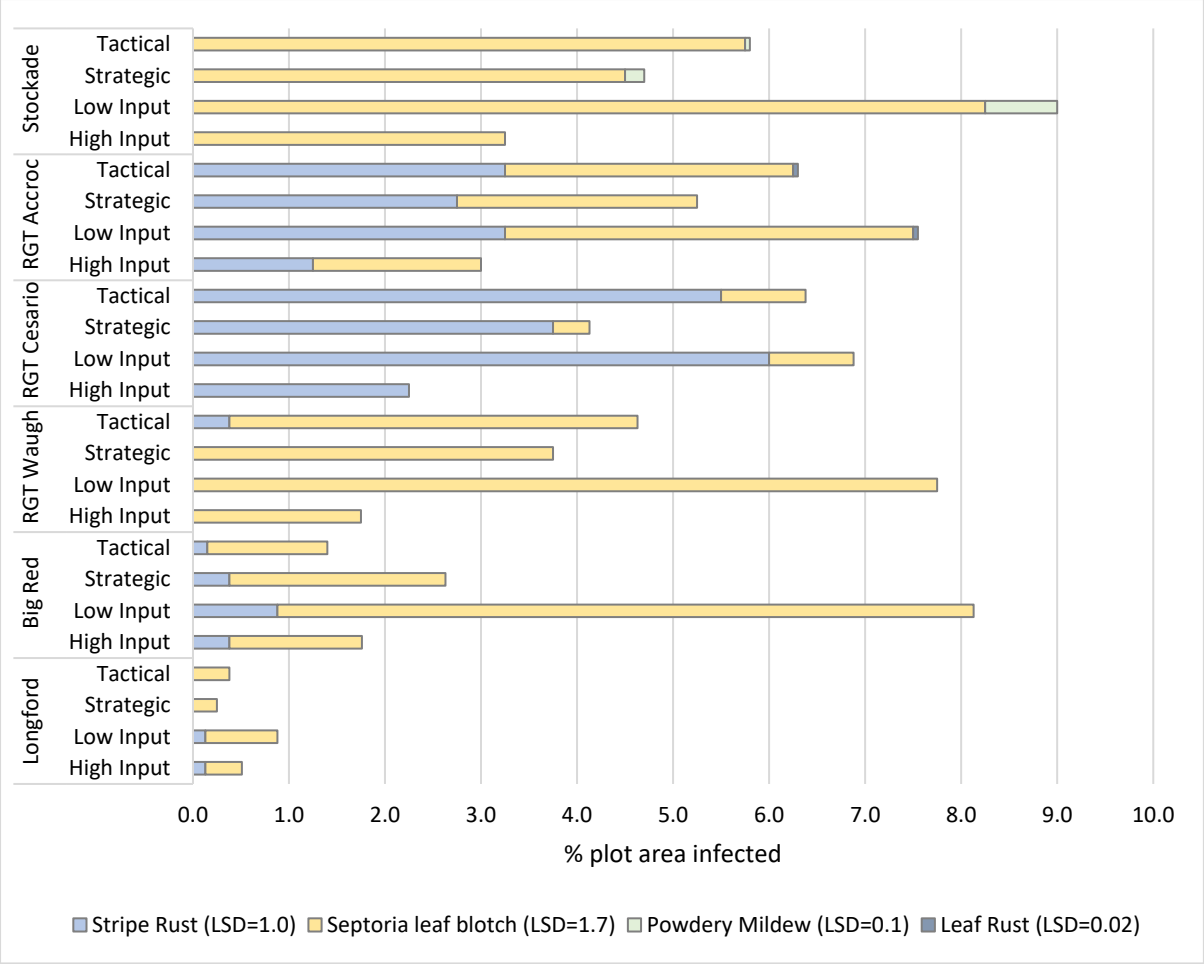

Figure 3. Influence of management strategy and cultivar on Stripe rust, Septoria leaf blotch, Powdery mildew and Leaf rust (% of plot area infected). Assessed 1 November 2023, GS69-75.

Statistically significant differences (P<0.001) were observed within the treatments for the observed diseases. Regardless of the fungicide strategy, Longford (AGF4818) had the lowest disease severity (<1% of cumulative disease), however the dry spring combined with its longer phenology resulted in it being the lowest yielding variety, despite its good disease resistance (Table 3 & Figure 3). Lower input consistently resulted in the highest disease levels, particularly in varieties that were stripe rust susceptible such as RGT Accroc and RGT Cesario. Low input strategies used for BigRed, RGT Waugh and Stockade recorded highest Septoria tritici blotch (STB) severity, however relative to 2020 – 2022 STB disease levels were low as a result of the dry spring reducing infection pressure. Note although wheat powdery mildew was recorded in Stockade it was not at a level significant enough to reduce yield.

Table 8. Influence of fungicide strategy and cultivar on Stripe rust, Septoria tritici blotch, Powdery mildew and Leaf rust severity. Assessed 1 November 2023, GS69-75.

	Stripe Rust	Septoria tritici blotch	Powdery Mildew	Leaf Rust
Fungicide Strategy				
Low Input	1.7 a	4.9 a	0.1 a	0.0 -
High Input	0.7 c	1.4 c	0.0 b	0.0 -
Strategic	1.2 b	2.3 b	0.0 b	0.0 -
Tactical	1.6 a	2.6 b	0.0 b	0.0 -
P Value	0.001	<0.001	0.001	0.185
LSD P=0.05	0.4	0.6	0.1	ns
	Stripe Rust	**Septoria tritici blotch**	**Powdery Mildew**	**Leaf Rust**
Cultivar				
RGT Cesario	4.4 a	0.5 d	0.0 b	0.0 b
BigRed	0.4 c	3.0 c	0.0 b	0.0 b
RGT Accroc	2.6 b	2.9 c	0.0 b	0.0 a
Stockade	0.0 c	5.4 a	0.3 a	0.0 b
Longford	0.1 c	0.4 d	0.0 b	0.0 b
RGT Waugh	0.1 c	4.4 b	0.0 b	0.0 b
Mean	**1.3**	**2.8**	**0.0**	**0.0**
P Value	<0.001	<0.001	<0.001	<0.001
LSD P=0.05	0.5	0.9	0.1	0.0
Fungicide X Cultivar				
Low Input, RGT Cesario	6.0 a	0.9 h-k	0.0 c	0.0 b
Low Input, BigRed	0.9 ef	7.3 ab	0.0 c	0.0 b
Low Input, RGT Accroc	3.3 bc	4.3 cd	0.0 c	0.1 a
Low Input, Stockade	0.0 f	8.3 a	0.8 a	0.0 b
Low Input, Longford	0.1 f	0.8 ijk	0.0 c	0.0 b
Low Input, RGT Waugh	0.0 f	7.8 a	0.0 c	0.0 b
High Input, RGT Cesario	2.3 cd	0.0 k	0.0 c	0.0 b
High Input, BigRed	0.4 ef	1.4 g-k	0.0 c	0.0 b
High Input, RGT Accroc	1.3 de	1.8 f-j	0.0 c	0.0 b
High Input, Stockade	0.0 f	3.3 def	0.0 c	0.0 b
High Input, Longford	0.1 f	0.4 jk	0.0 c	0.0 b
High Input, RGT Waugh	0.0 f	1.8 f-j	0.0 c	0.0 b
Strategic, RGT Cesario	3.8 b	0.4 jk	0.0 c	0.0 b
Strategic, BigRed	0.4 ef	2.3 e-i	0.0 c	0.0 b
Strategic, RGT Accroc	2.8 bc	2.5 e-h	0.0 c	0.0 b
Strategic, Stockade	0.0 f	4.5 cd	0.2 b	0.0 b
Strategic, Longford	0.0 f	0.3 jk	0.0 c	0.0 b
Strategic, RGT Waugh	0.0 f	3.8 de	0.0 c	0.0 b
Tactical, RGT Cesario	5.5 a	0.9 h-k	0.0 c	0.0 b
Tactical, BigRed	0.2 f	1.3 h-k	0.0 c	0.0 b
Tactical, RGT Accroc	3.3 bc	3.0 d-g	0.0 c	0.1 a
Tactical, Stockade	0.0 f	5.8 bc	0.1 c	0.0 b
Tactical, Longford	0.0 f	0.4 jk	0.0 c	0.0 b
Tactical, RGT Waugh	0.4 ef	4.3 cd	0.0 c	0.0 b
Mean	**1.3**	**2.8**	**0.0**	**0.0**
P Value	<0.001	<0.001	<0.001	0.030
LSD P=0.05	1.0	1.7	0.1	0.0

In terms of profitability there was a range in margin after of fungicide, PGR and nitrogen costs that ranged from $1468 to $1796/ha (Table 9). Those varieties that were resistant to disease in the spring of 2023 such as Stockade, RGT Waugh and Longford (AGF4818) all gave their best margins with low input (no PGR, 2 fungicide units with no head wash spray and 150kg N/ha). With the stripe rust susceptible varieties such as RGT Accroc and RGT Cesario it was the HYC Strategic management approach that was the more profitable management approach, this set out a three spray programme (GS31, GS39 & GS59) based on variety susceptibility to stripe rust and the need to provide season long protection including protection from head infection.

Table 9. Influence of management strategy and variety on system profitability.

Fungicide strategy	Fung & PGR costs + Application costs	Fertiliser costs + Application costs	Total (N, F, PGR) costs & application	Yield	Bin Grade	Grain Price	Gross Income	Margin
	$/ha	$/ha	$/ha	t/ha		$/t	$/ha	$/ha
Longford								
Low Input	$54.41	$215.65	$270.06	5.82	FEED	$307.00	$1,786.74	$1,516.68
High Input	$138.75	$323.48	$462.23	6.31	FEED	$307.00	$1,937.17	$1,474.94
Strategic	$91.04	$215.65	$306.69	5.82	FEED	$307.00	$1,786.74	$1,480.05
Tactical	$81.95	$215.65	$297.60	5.75	FEED	$307.00	$1,765.25	$1,467.65
BigRed								
Low Input	$54.41	$215.65	$270.06	6.13	FEED	$307.00	$1,881.91	$1,611.85
High Input	$138.75	$323.48	$462.23	6.43	FEED	$307.00	$1,974.01	$1,511.78
Strategic	$91.04	$215.65	$306.69	6.48	FEED	$307.00	$1,989.36	$1,682.67
Tactical	$81.95	$215.65	$297.60	6.82	FEED	$307.00	$2,093.74	$1,796.14
RGT Accroc								
Low Input	$54.41	$215.65	$270.06	6.49	FEED	$307.00	$1,992.43	$1,722.37
High Input	$138.75	$323.48	$462.23	6.78	FEED	$307.00	$2,081.46	$1,619.23
Strategic	$98.49	$215.65	$314.14	6.68	FEED	$307.00	$2,050.76	$1,736.62
Tactical	$89.39	$215.65	$305.05	6.06	FEED	$307.00	$1,860.42	$1,555.37
RGT Cesario								
Low Input	$54.41	$215.65	$270.06	5.90	FEED	$307.00	$1,811.30	$1,541.24
High Input	$138.75	$323.48	$462.23	6.63	FEED	$307.00	$2,035.41	$1,573.18
Strategic	$91.04	$215.65	$306.69	6.22	FEED	$307.00	$1,909.54	$1,602.85
Tactical	$81.95	$215.65	$297.60	5.99	FEED	$307.00	$1,838.93	$1,541.33
RGT Waugh								
Low Input	$54.41	$215.65	$270.06	6.67	FEED	$307.00	$2,047.69	$1,777.63
High Input	$138.75	$323.48	$462.23	6.92	FEED	$307.00	$2,124.44	$1,662.21
Strategic	$91.04	$215.65	$306.69	6.55	FEED	$307.00	$2,010.85	$1,704.16
Tactical	$81.95	$215.65	$297.60	6.67	FEED	$307.00	$2,047.69	$1,750.09
Stockade								
Low Input	$34.41	$215.65	$270.06	6.30	AGP1	$327.00	$2,060.10	$1,790.04
High Input	$108.75	$323.48	$462.23	6.09	AGP1	$327.00	$1,991.43	$1,529.20
Strategic	$61.04	$215.65	$306.69	6.12	AGP1	$327.00	$2,001.24	$1,694.55
Tactical	$51.95	$215.65	$297.60	6.20	AGP1	$327.00	$2,027.40	$1,729.80

Figure in green = most profitable, figures in red= least profitable

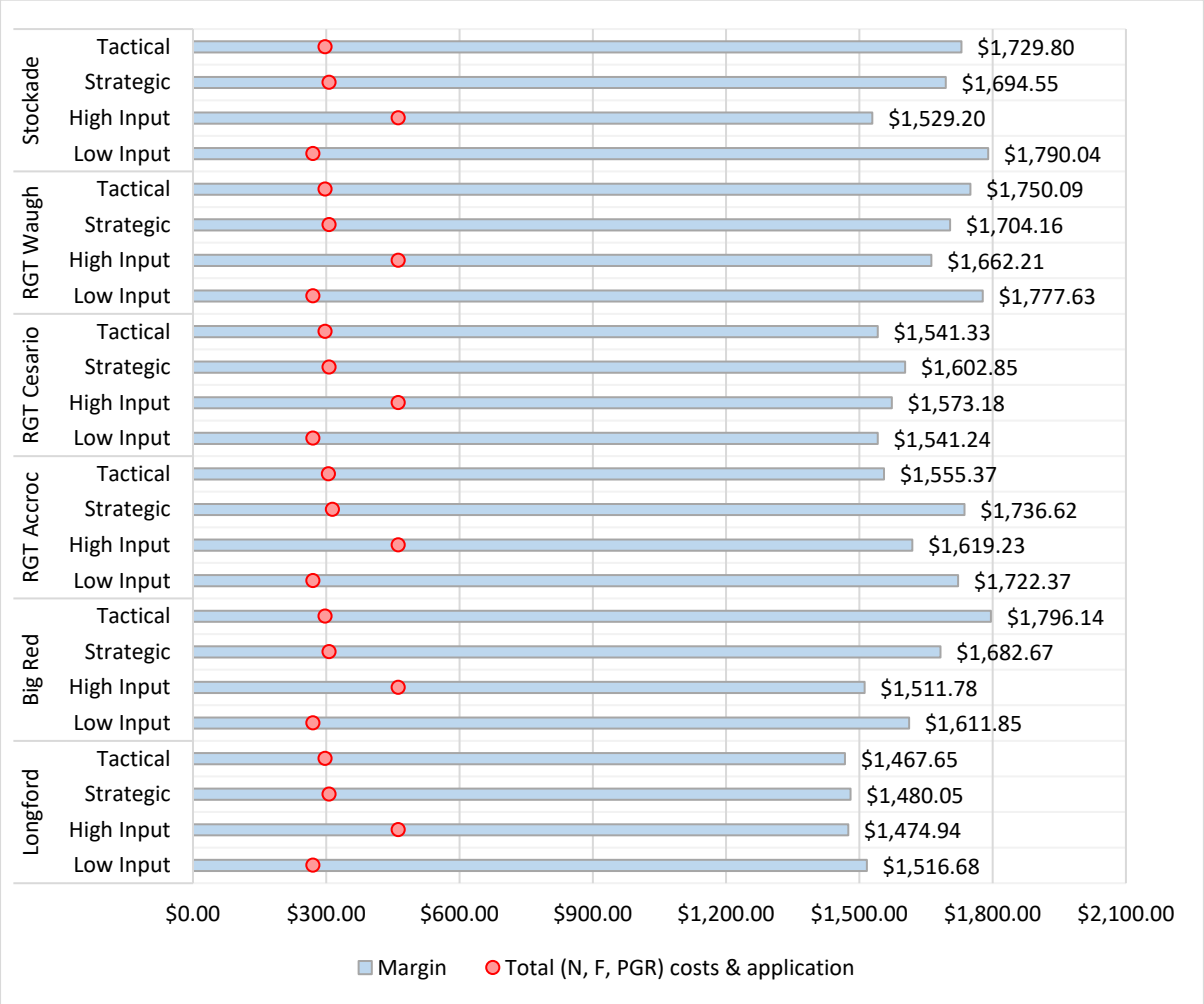

Figure 4. Influence of management strategy and cultivar on system profitability. Value outside the bar denotes margin after differential input costs (i.e. those costs varied N, Fungicides & PGRs), it does not take account of standard variable costs e.g. seed, herbicides, insecticides).

The following details are the costing assumptions for the economic analysis presented in Table 9 and Figure 4.

Table 10. Input costs in economic analysis.

Product	Product type	Price
Radial	Fungicide	$31.71/L
Opus	Fungicide	$35.06/L
Prosaro	Fungicide	$56.25/L
Aviator Xpro	Fungicide	$58.46/L
Flutriafol	Fungicide	$51.15/L
Moddus Evo	PGR	$84.95/L
Errex 750	PGR	$17.03/L
Urea	Fertiliser	$0.60/Kg ($1.30/kg)

Table 11. Foliar application costs in economic analysis.

Management strategy	Product type	Number of applications	Application cost ($/ha)
Low Input	Fungicide	2	20.00
High Input	Fungicide + PGR	3	30.00
Strategic	Fungicide	3	30.00
Tactical	Fungicide	3	30.00

Table 12. Nutrition application costs in economic analysis.

Management strategy	Product type	Number of applications	Application cost ($/ha)
Low Input	Urea	2	20.00
High Input	Urea	3	30.00
Strategic	Urea	2	20.00
Tactical	Urea	2	20.00

Grain price (AGP1: $327/t; FEED: $307/t) as of 1 February 2024 based off Geelong GrainCorp. Contractor rates factored in for analysis. Other costs such as seed sourcing and sowing, harvesting, insurance and MAP were not taken into consideration in this analysis as they were constant regardless of the management strategy used.

Table 13. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Errex 750	Chlormequat	582 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Trial 2. HYC Wheat G.E.M Trial Series - Time of Sowing 2 (FAR VIC W23-03-02)

Key Points:

- *Lower than average spring rainfall resulted in later sowings (22 May) averaging just less than 6t/ha irrespective of variety tested and management applied.*
- *There was a trend for lower input to yield less than other management approaches and the high input to yield more than other approaches, however none of the differences observed in yield response or grain quality were statistically significant.*
- *Statistically significant differences were observed in stripe rust severity (P value = 0.004; LSD(P=0.05)=2.9) with Willaura and Scepter having significantly more infection than Stockade.*
- *The dry conditions reduced harvest dry matter to between 12-14t/ha with harvest indices averaging approximately 40%.*
- *Stockade produced generally better grain quality with superior protein and test weights.*
- *Tactical and strategic management approaches gave superior profitability to the high and low input approaches with the standard 200kg N/ha and a three-spray foliar fungicide approach being more profitable than 2 foliar fungicides and a higher input approach based on 4 units of fungicide and 25kg N more nitrogen.*
- *Although there were no significant differences in grain yield, trends for higher yields if translated into margin resulted in differences of approximately $100 – 200/ha depending on variety.*

Treatments:

Three cultivars (Stockade, Scepter and Willaura) were tested under four different management programs:

1. High Input – 4 units of fungicides (Flutriafol plus foliar fungicides GS31, GS39, GS59), 225 N/ha and PGR.
2. Low Input – 2 units of fungicide based on Opus 125 SC (epoxiconazole 125g/L) applied at 500mL/ha (62.5 g ai/ha) and Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) & 150kg N/ha.
3. HYC Strategic Input – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 1.

Table 1. Trial input and management details.

Sowing date:		**22 May 2023**	
Harvest date:		**12 January 2024**	
Seed rate:		180 seeds/m2	
Basal fertiliser:	22 May	100 kg/ha MAP	
Nitrogen:		**Low Input**	**High Input**
	GS26-30	50kg N/ha	50kg N/ha
	GS31	100kg N/ha	125kg N/ha
	GS32-33		50kg N/ha
		Strategic	**Tactical**
	GS26-30	50kg N/ha	50kg N/ha
	GS31	100kg N/ha	100kg N/ha
PGR:		**High Input Only**	
	GS30	Moddus Evo 0.20 L/ha Errex 1.3 L/ha	
Fungicide:		**Low Input**	**High Input**
	GS00	**----**	Flutriafol 0.2 L/ha
	GS31/32	Opus 0.50 L/ha	Radial 0.84 L/ha
	GS39	0.3 L/ha	Aviator Xpro 0.416 L/ha
	GS59	----	Prosaro 0.15 L/ha
		Strategic	**Tactical**
	GS00	**----**	----
	GS31/32	See below	See below
	GS39	Radial 0.84 L/ha	Radial 0.84 L/ha
	GS59	Opus 0.5 L/ha	Prosaro 0.15 L/ha

Tactical and Strategic Fungicide GS31/32:		
Stockade	**Scepter**	**Willaura**
Prosaro 0.3 L/ha	Aviator Xpro 0.416 L/ha	Prosaro 0.3 L/ha

Lower than average spring rainfall (see metrological data at the end of the report p.260) resulted in later sowings (22 May) averaging just less than 6t/ha irrespective of variety tested and management applied. Although there was a trend for lower input to yield less than other management approaches and the high input to yield more than other approaches, none of the differences observed in yield response or grain quality were statistically significant (Tables 2, 3, 4 & 5), with the exception of the variety influence on protein, test weight and screenings. Stockade produced the best combination of all three grain characteristics.

Table 2. Influence of management strategy and cultivar on grain yield (t/ha).

	Yield (t/ha)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
Stockade	5.49 -	6.07 -	5.88 -	5.98 -	5.85 -
Scepter	5.42 -	5.80 -	5.91 -	5.83 -	5.74 -
Willaura	5.43 -	5.92 -	5.56 -	5.71 -	5.65 -
Mean	**5.45 -**	**5.93 -**	**5.78 -**	**5.84 -**	**5.75**
LSD Cultivar P=0.05	ns		**P value**		0.139
LSD Management P=0.05	ns		**P value**		0.218
LSD Cultivar x Man. P=0.05	ns		**P value**		0.719

Table 3. Influence of management strategy and cultivar on protein (%).

	Protein (%)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
Stockade	10.5 -	10.6 -	10.3 -	10.3 -	10.4 a
Scepter	10.2 -	10.3 -	9.8 -	9.9 -	10.0 b
Willaura	10.3 -	10.4 -	10.2 -	10.4 -	10.3 a
Mean	**10.3 -**	**10.4 -**	**10.1 -**	**10.2 -**	**10.2**
LSD Cultivar P=0.05	0.2		**P value**		0.002
LSD Management P=0.05	ns		**P value**		0.073
LSD Cultivar x Man. P=0.05	ns		**P value**		0.686

Table 4. Influence of management strategy and cultivar on test weight (Kg/hL).

	Test Weight (Kg/hL)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
Stockade	73.8 -	73.9 -	74.2 -	73.8 -	73.9 a
Scepter	70.3 -	71.2 -	71.3 -	71.6 -	71.1 c
Willaura	73.7 -	73.0 -	73.4 -	73.4 -	73.4 b
Mean	**72.6 -**	**72.7 -**	**72.9 -**	**72.9 -**	**72.8**
LSD Cultivar P=0.05	0.4		**P value**		<0.001
LSD Management P=0.05	ns		**P value**		0.399
LSD Cultivar x Man. P=0.05	ns		**P value**		0.092

Table 5. Influence of management strategy and cultivar on screenings (%).

	Screenings (%)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
Stockade	3.1 -	3.1 -	2.7 -	2.8 -	2.9 b
Scepter	3.7 -	4.1 -	3.4 -	3.5 -	3.7 a
Willaura	2.3 -	2.4 -	2.1 -	2.2 -	2.3 c
Mean	**3.0 ab**	**3.2 a**	**2.7 b**	**2.8 b**	**3.0**
LSD Cultivar P=0.05	0.3		**P value**		<0.001
LSD Management P=0.05	0.4		**P value**		0.043
LSD Cultivar x Man. P=0.05	ns		**P value**		0.894

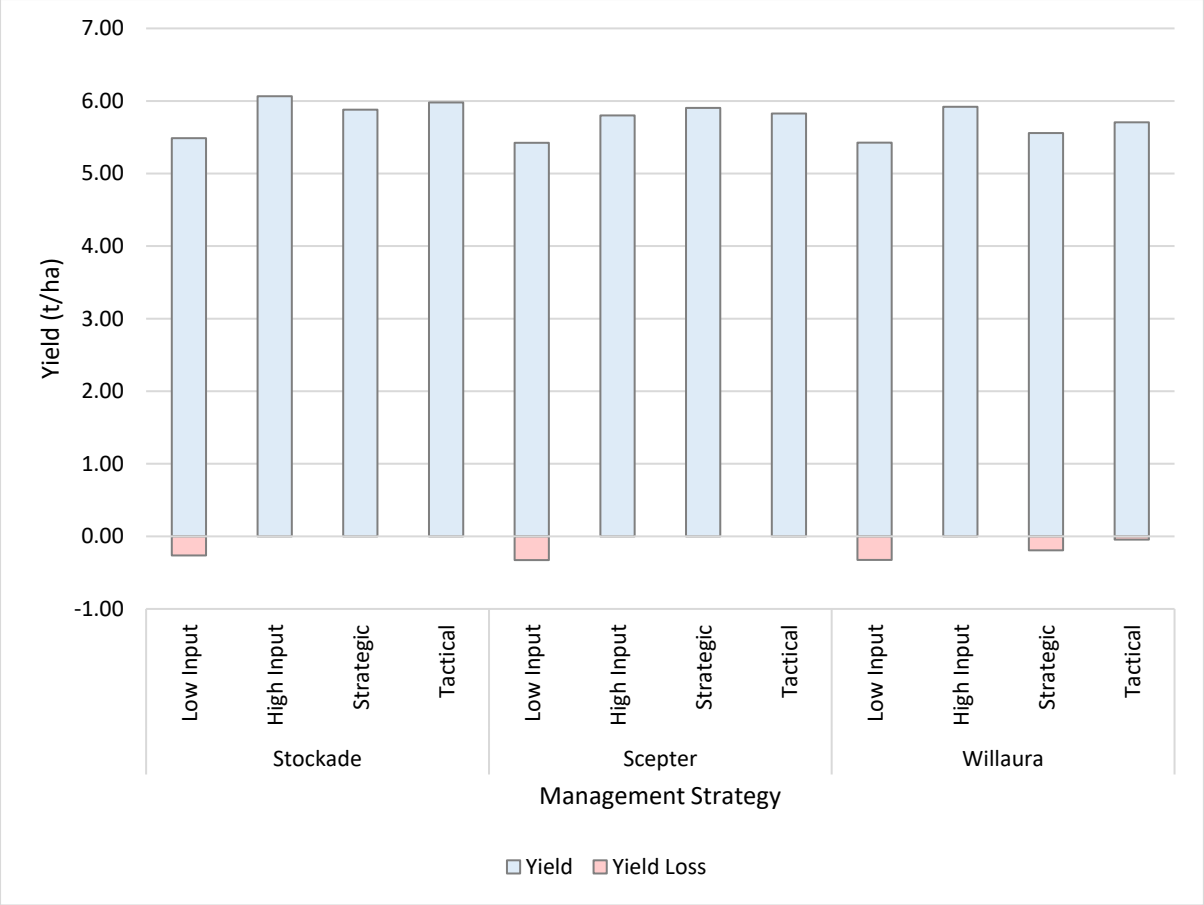

Figure 1. Influence of management strategy and cultivar on grain yield (t/ha) – relative to the mean yield of the trial (with red bars signifying yield loss relative to the variety mean).

Table 6. Influence of management strategy and cultivar on mean yield percentage.

	Stockade	Scepter	Willaura
Low Input	95.5	94.3	94.4
High Input	105.5	100.8	103.0
Strategic	102.3	102.7	96.7
Tactical	104.1	101.4	99.3

Low input strategy incurred a loss of 0.26-0.33t/ha across all the cultivars, while Willaura strategic and tactical approach incurred a loss of 0.19 and 0.04t/ha of yield respectively.

Table 7. Influence of management strategy and cultivar on harvest index (%).

	Harvest Index (%)				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
Stockade	41.3 -	38.7 -	37.6 -	44.3 -	40.5 -
Scepter	38.6 -	39.4 -	42.3 -	36.1 -	39.1 -
Willaura	40.9 -	46.3 -	38.6 -	38.9 -	41.2 -
Mean	**40.3 -**	**41.5 -**	**39.5 -**	**39.8 -**	**40.3**
LSD Cultivar P=0.05		ns	**P value**		0.520
LSD Management P=0.05		ns	**P value**		0.754
LSD Cultivar x Man. P=0.05		ns	**P value**		0.110

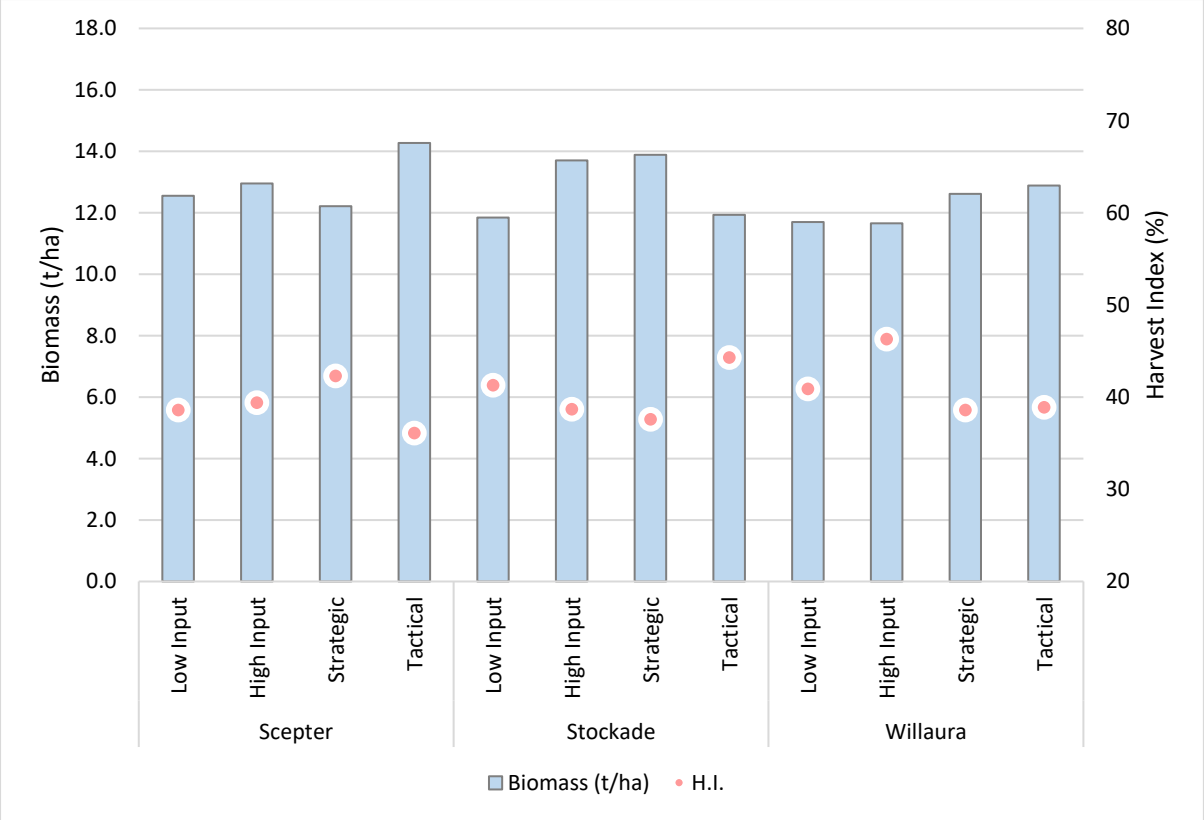

Figure 2. Influence of management strategy and cultivar on dry matter production (t/ha) and harvest index (%).

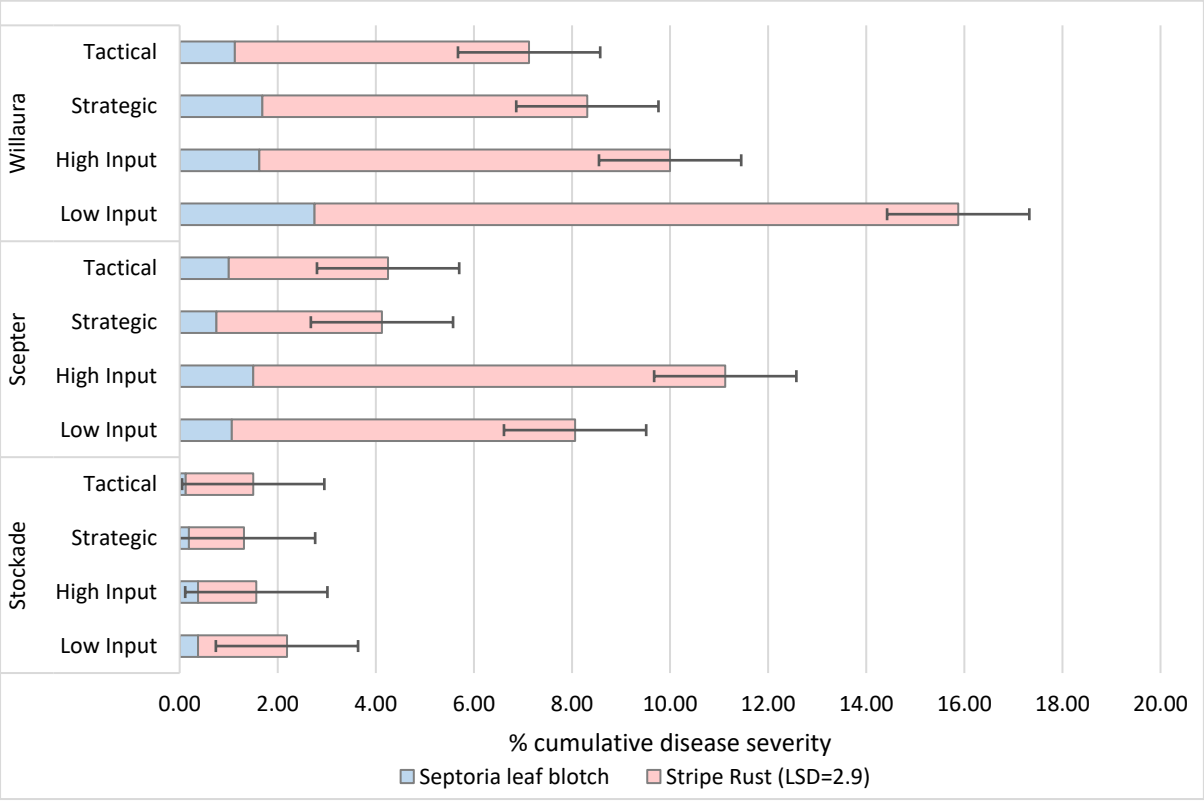

Figure 3. Influence of management strategy and cultivar on Septoria leaf blotch and Stripe rust. Assessed 12 November 2023, GS75-80.

Table 8. Disease rating for Stockade, Scepter and Willaura for Septoria Leaf Blotch and Stripe Rust.

	Septoria tritici Blotch	Stripe Rust
Stockade	MS	MR
Scepter	S	MSS
Willaura	S	S

Source: GRDC 2024, National Variety Trials. NVT Disease Ratings | NVT (grdc.com.au)

Statistically significant differences were observed in stripe rust severity (P Value=0.004; LSD (P=0.05) = 2.9). No differences were observed in septoria tritici blotch infection levels, although early in spring Stockade had high infection levels. STB infection dissipated with the dry spring during stem elongation. Willaura with disease rating of S to Stripe Rust had the highest levels of stripe rust infection, while it was statically lower when managed with high input, strategic or tactical management strategies. Stockade being rated as MR to Stripe Rust had the lowest stripe rust infection (<2% LAI) and the fungicide strategy didn't have any effect.

Table 9. Influence of fungicide strategy and cultivar on Stripe rust and Septoria tritici blotch. Assessed 12 November 2023, GS75-80.

	Stripe Rust	Septoria tritici blotch
Fungicide Strategy		
Low Input	7.3 a	1.4 -
High Input	6.4 ab	1.2 -
Strategic	3.7 b	0.9 -
Tactical	3.5 b	0.8 -
P Value	0.034	0.132
LSD P=0.05	2.9	ns
Cultivar		
Stockade	1.4 c	0.3 c
Scepter	5.8 b	1.1 b
Willaura	8.5 a	1.8 a
Mean	**5.2**	**1.0**
P Value	<0.001	<0.001
LSD P=0.05	1.5	0.5
Fungicide X Cultivar		
Low Input; Stockade	1.8 e	0.4 -
Low Input; Scepter	7.0 bc	1.1 -
Low Input; Willaura	13.1 a	2.8 -
High Input; Stockade	1.2 e	0.4 -
High Input; Scepter	9.6 b	1.5 -
High Input; Willaura	8.4 bc	1.6 -
Strategic; Stockade	1.1 e	0.2 -
Strategic; Scepter	3.4 de	0.8 -
Strategic; Willaura	6.6 c	1.7 -
Tactical; Stockade	1.4 e	0.1 -
Tactical; Scepter	3.3 de	1.0 -
Tactical; Willaura	6.0 cd	1.1 -
Mean	**5.2**	**1.0**
P Value	0.004	0.165
LSD P=0.05	2.9	ns

Table 10. Influence of management strategy and cultivar on system profitability.

Fungicide strategy	Fung & PGR costs + Application costs	Fertiliser costs + Application costs	Total (N, F, PGR) costs & application	Yield	Bin Grade	Grain Price	Gross Income	Margin after N,F & PGR costs
	$/ha	$/ha	$/ha	t/ha		$/t	$/ha	$/ha
Scepter								
Low Input	$54.41	$215.66	$270.07	5.42	AGP	$327.00	$1,773.32	$1,503.25
High Input	$138.75	$323.48	$462.23	5.80	AGP1	$327.00	$1,896.60	$1,434.37
Strategic	$98.49	$215.66	$314.15	5.91	AGP1	$327.00	$1,930.94	$1,616.79
Tactical	$89.39	$215.66	$305.05	5.83	AGP1	$327.00	$1,905.76	$1,600.70
Stockade								
Low Input	$54.41	$215.66	$270.07	5.49	AGP1	$327.00	$1,794.58	$1,524.51
High Input	$138.75	$323.48	$462.23	6.07	AGP1	$327.00	$1,983.26	$1,521.02
Strategic	$91.04	$215.66	$306.70	5.88	AGP1	$327.00	$1,922.76	$1,616.06
Tactical	$81.95	$215.66	$297.61	5.98	AGP1	$327.00	$1,955.46	$1,657.85
Willaura								
Low Input	$54.41	$215.66	$270.07	5.43	AGP1	$327.00	$1,773.98	$1,503.91
High Input	$138.75	$323.48	$462.23	5.92	AGP1	$327.00	$1,935.84	$1,473.61
Strategic	$91.04	$215.66	$306.70	5.56	AGP1	$327.00	$1,817.47	$1,510.76
Tactical	$81.95	$215.66	$297.61	5.71	AGP1	$327.00	$1,865.54	$1,567.93

See table 11-13 for complete pricing information.

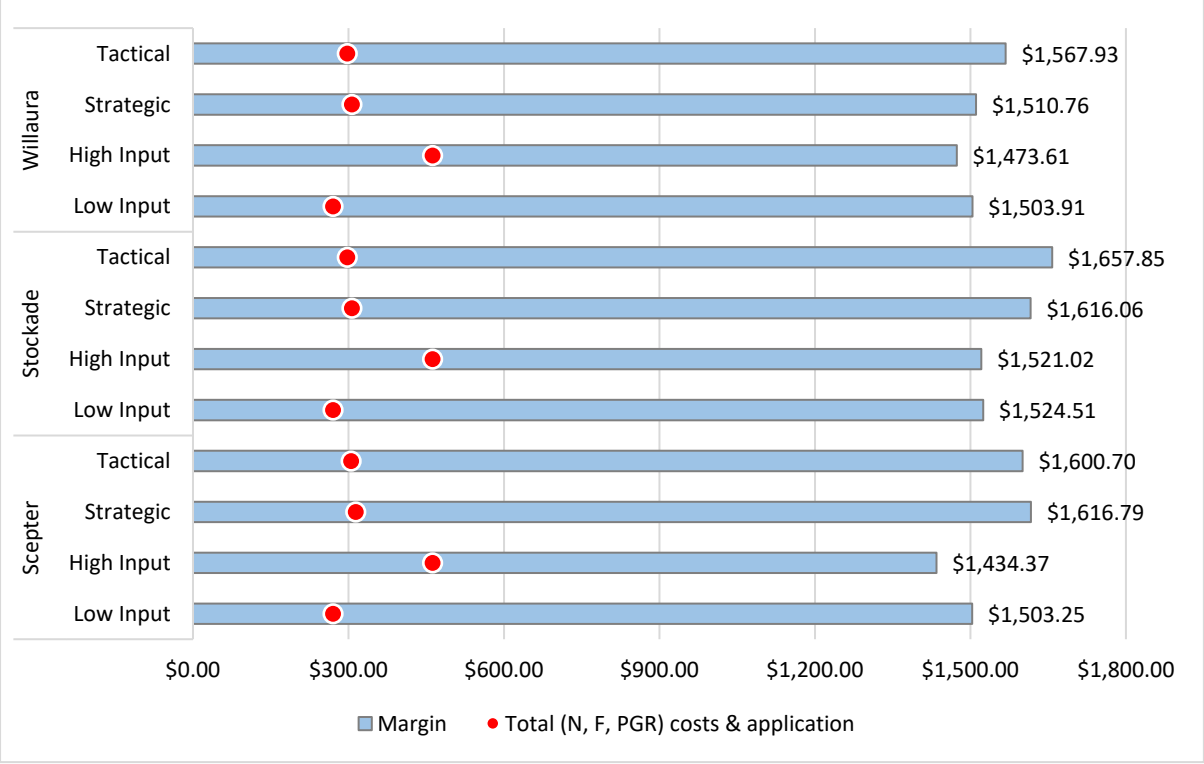

Figure 4. Influence of management strategy and cultivar on system profitability. Value outside the bar denotes margin after cost of N, fungicides and PGRs removed. Operational costs are based on the cost of N, fungicides & PGRs and their application.

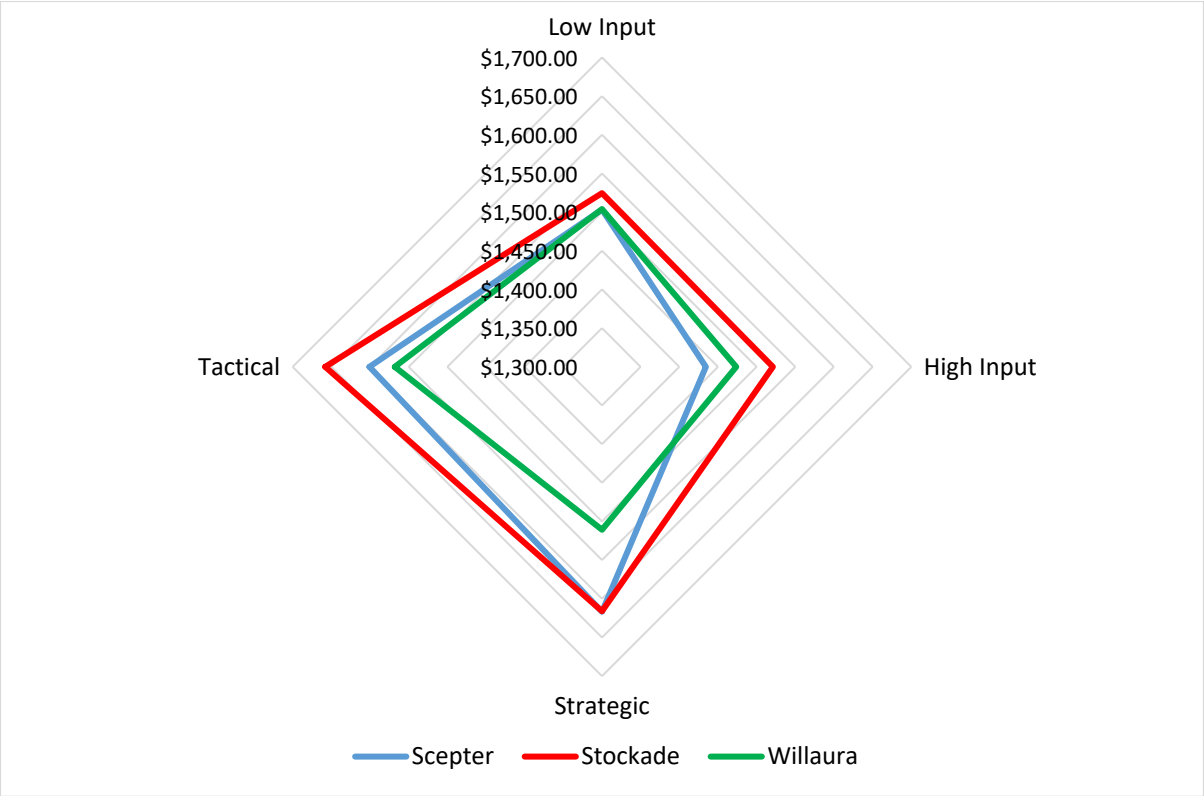

Figure 5. Partial gross margin analysis across 4 fungicide strategies and 3 cultivars (values averaged for fungicide strategies from table 10).

On average, Stockade had the highest margin when all the four fungicide strategies were averaged. HYC Tactical strategies had margins equal or greater than HYC strategic and were generally superior to both high and low input with these three varieties (Table 10, Figure 4 & 5).

The following details are the costing assumptions for the economic analysis presented in Table 10 and Figure 4.

Table 11. Input costs in economic analysis.

Product	Product type	Price
Radial	Fungicide	$31.71/L
Opus	Fungicide	$35.06/L
Prosaro	Fungicide	$56.25/L
Aviator Xpro	Fungicide	$58.46/L
Flutriafol	Fungicide	$51.15/L
Moddus Evo	PGR	$84.95/L
Errex 750	PGR	$17.03/L
Urea	Fertiliser	$0.60/Kg

Table 12. Foliar application costs in economic analysis.

Management strategy	Product type	Number of applications	Application cost ($/ha)
Low Input	Fungicide	2	20.00
High Input	Fungicide + PGR	3	30.00
Strategic	Fungicide	3	30.00
Tactical	Fungicide	3	30.00

Table 13. Nutrition application costs in economic analysis.

Management strategy	Product type	Dosage (units of N/ha)	Number of applications	Application cost ($/ha)
Low Input	Urea	150	2	20.00
High Input	Urea	225	3	30.00
Strategic	Urea	150	2	20.00
Tactical	Urea	150	2	20.00

Grain price (AGP1: $327/t) as of 1 February 2024 based off Geelong GrainCorp. Contractor rates factored in for analysis. Other costs such as seed sourcing and sowing, harvesting, insurance and MAP were not taken into consideration in this analysis as they were constant regardless of the management strategy used.

Table 14. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Errex 750	Chlormequat	582 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Trial 3. HYC Wheat Disease Management x Variety (FAR VIC W23-04a-01)

Key Points:

- *Fungicide input was not cost effective when applied to Longford (AGF4818) and AGTW005 at the Victoria research site.*
- *As a result of stripe rust infection RGT Cesario gave significant yield and margin improvements when full fungicide protection (4 units of fungicide) was applied.*
- *Although yield increases were much smaller and not significant Stockade gave its highest yield and margin under a single flag leaf spray, however the dry spring protected this variety from severe Septoria tritici blotch (STB) infection which was present in the base at early stem elongation.*
- *Fungicide management and cultivar affected grain protein in this trial, but the only effects on test weight and screenings were due to variety.*
- *AGTW005 had the highest yields and grain protein overall but unfortunately after four years in HYC trials it is not being commercialised.*

Treatments:

Three red feed winter wheats Longford (AGF4818), RGT Cesario, AGTW005 and the white wheat Stockade (APW) were managed with three levels of fungicide, untreated, a single flag leaf spray and full protection.

- **Untreated.**
- **A single flag leaf spray (GS39) – 1 unit of fungicide** Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha).
- **Full protection - 4 units of fungicide** – flutriafol-coated MAP in furrow at sowing (500 g ai/L at 200 mL/ha), Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) at GS31, Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha) at GS39 and Opus 125 SC (epoxiconazole 125g/L) applied at 500mL/ha (62.5 g ai/ha) at GS59 – 4 units of fungicide.

Table 1: List of varieties and treatments applied.

Trt	Description	Variety	GS00	GS31	GS39	GS59-61
1	Untreated	Stockade	----	----	----	----
2	Untreated	RGT Cesario	----	----	----	----
3	Untreated	AGTW005	----	----	----	----
4	Untreated	Longford	----	----	----	----
5	1 Fungicide Flag Leaf Approach	Stockade	----	----	Revystar 0.75 L/ha	----
6	1 Fungicide Flag Leaf Approach	RGT Cesario	----	----	Revystar 0.75 L/ha	----
7	1 Fungicide Flag Leaf Approach	AGTW005	----	----	Revystar 0.75 L/ha	----
8	1 Fungicide Flag Leaf Approach	Longford	----	----	Revystar 0.75 L/ha	----
9	4 Fungicides Full Protection	Stockade	Flutriafol 0.2 L/ha	Prosaro 0.3 L/ha	Revystar 0.75 L/ha	Opus 0.5 L/ha
10	4 Fungicides Full Protection	RGT Cesario	Flutriafol 0.2 L/ha	Prosaro 0.3 L/ha	Revystar 0.75 L/ha	Opus 0.5 L/ha
11	4 Fungicides Full Protection	AGTW005	Flutriafol 0.2 L/ha	Prosaro 0.3 L/ha	Revystar 0.75 L/ha	Opus 0.5 L/ha
12	4 Fungicides Full Protection	Longford	Flutriafol 0.2 L/ha	Prosaro 0.3 L/ha	Revystar 0.75 L/ha	Opus 0.5 L/ha

Table 2: Influence of management strategy and cultivar on grain yield (t/ha).

	Yield (t/ha)							
	Management Strategy							
	Untreated		**1 Fungicide**		**4 Fungicides**		**Mean**	
Stockade	6.14	abc	6.48	abc	5.71	c	6.11	b
RGT Cesario	4.36	d	4.77	d	5.89	bc	5.00	c
AGTW005	6.82	a	6.40	abc	6.91	a	6.71	a
Longford	6.65	ab	6.19	abc	6.39	abc	6.41	ab
Mean	**5.99**	**-**	**5.96**	**-**	**6.22**	**-**	**6.06**	
LSD Cultivar P=0.05			0.53		**P value**		<0.001	
LSD Management P=0.05			ns		**P value**		0.060	
LSD Cultivar x Man. P=0.05			0.93		**P value**		0.035	

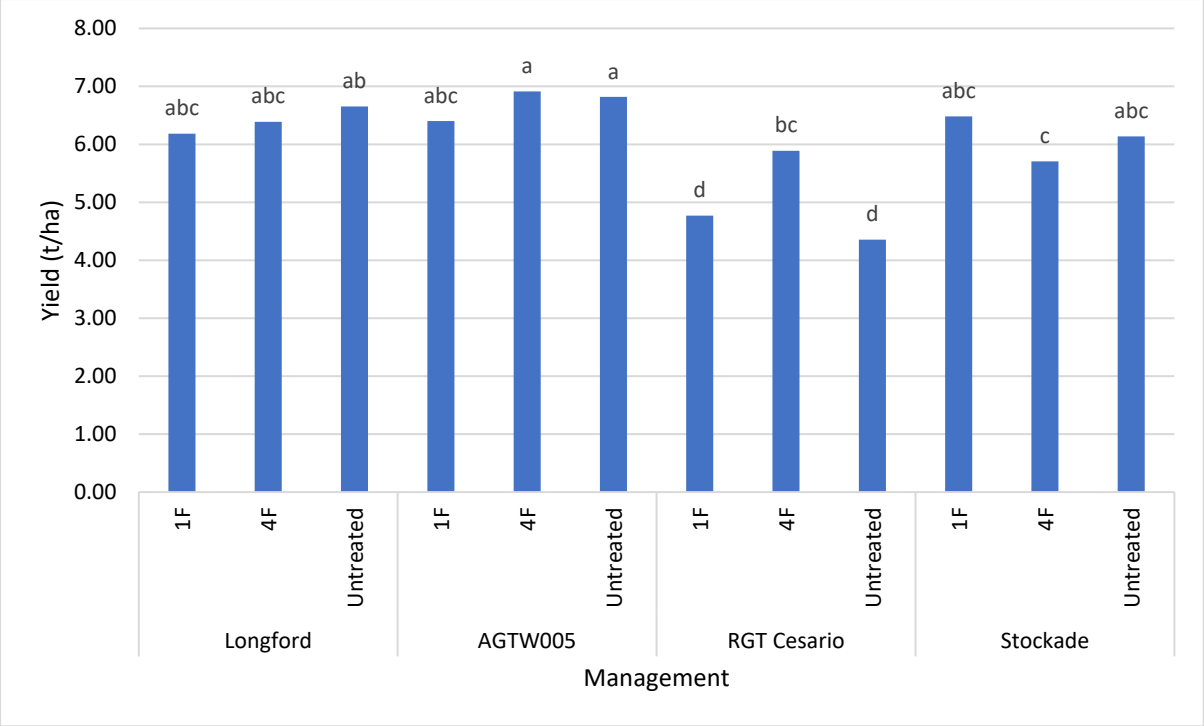

Figure 1. Interaction of cultivar and level of fungicide input on grain yield (t/ha) (P Value=0.035, LSD (P=0.05)= 0.93).

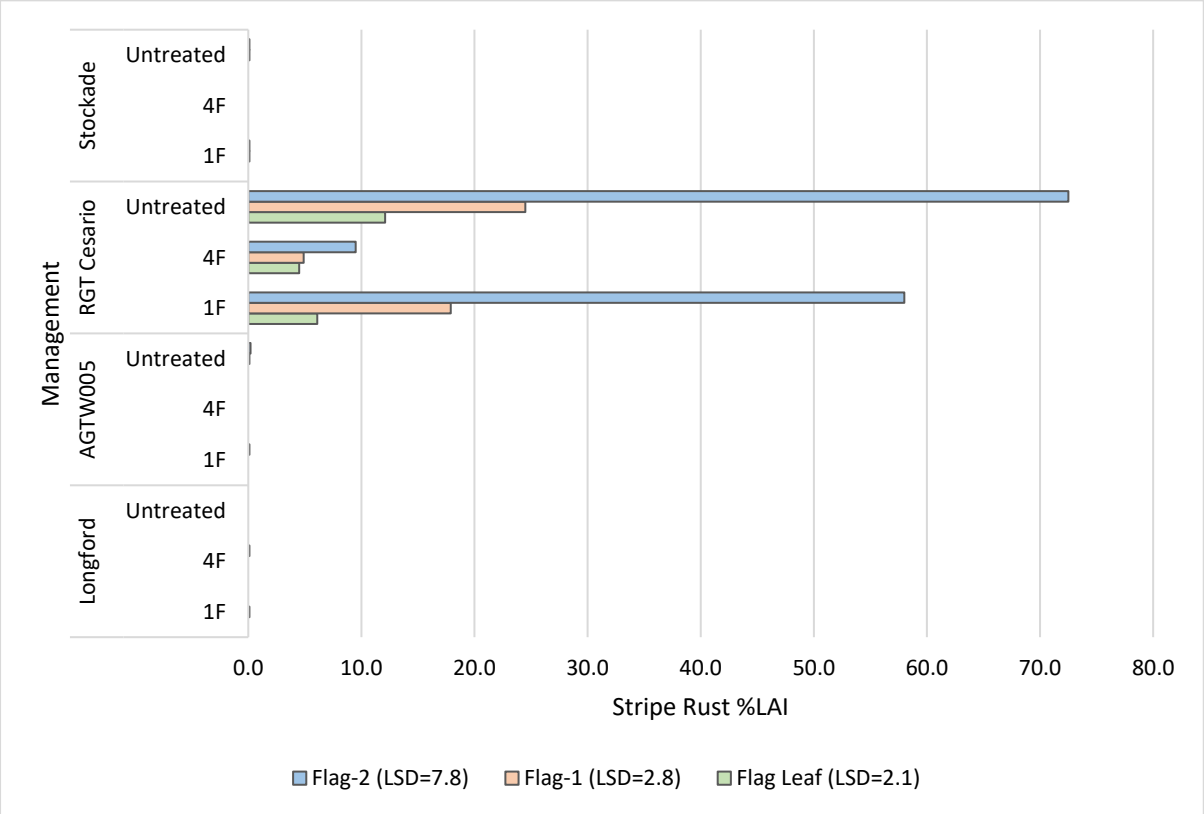

Figure 2. Influence of fungicide management strategy and cultivar on (%) Stripe Rust leaf area infection (LAI) on Flag, Flag-1 and Flag-2 assessed 3 November (GS71). Refer to Table 3 for significance.

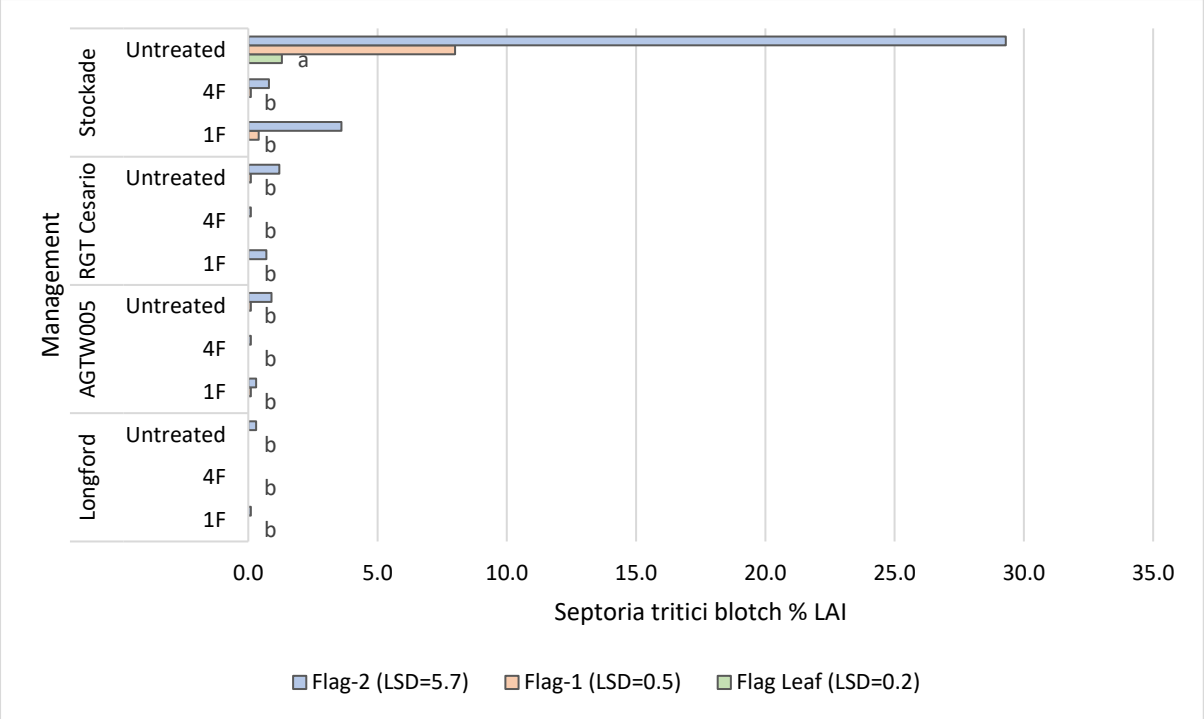

Figure 3. Influence of fungicide management strategy and cultivar on % STB leaf area infection (LAI) on Flag, Flag-1 and Flag-2 assessed 3 November (GS71). Refer to Table 2 for significance.

Table 3: Significance analysis of the influence of management strategy and cultivar on leaf area infection (%) of septoria tritici blotch (STB), stripe rust and, green leaf retention (See Figure 2 and 3).

			P Value	LSD P=0.05
Septoria tritici blotch	**Flag**	**Cultivar**	<0.001	0.1
		Management	0.001	0.1
		Cultivar x Man.	<0.001	0.2
	Fl-1	**Cultivar**	<0.001	0.3
		Management	<0.001	0.3
		Cultivar x Man.	<0.001	0.5
	FL-2	**Cultivar**	<0.001	3.3
		Management	0.002	3.2
		Cultivar x Man.	<0.001	5.7
Stripe rust	**Flag**	**Cultivar**	<0.001	1.2
		Management	0.025	1.3
		Cultivar x Man.	<0.001	2.1
	FL-1	**Cultivar**	<0.001	1.6
		Management	<0.001	1.6
		Cultivar x Man.	<0.001	2.8
	FL-2	**Cultivar**	<0.001	4.5
		Management	<0.001	4.8
		Cultivar x Man.	<0.001	7.8
Green Leaf Retention	**FL-3**	**Cultivar**	<0.001	12.6
		Management	0.045	12.8
		Cultivar x Man	0.050	21.9

Grain protein was significantly influenced by both management and variety with fungicide application increasing grain protein compared to the untreated crop. The white wheat Stockade produced significantly lower protein than the three red wheats tested (Table 4). The variety also produced significantly lower test weights than two of the other varieties (Table 5).

Table 4: Influence of management strategy and cultivar on protein (%).

	Protein (%)			
	Management Strategy			
	Untreated	**1 Fungicide**	**4 Fungicides**	**Mean**
Stockade	11.0 -	11.0 -	11.2 -	**11.1 b**
RGT Cesario	11.3 -	11.7 -	12.1 -	**11.7 a**
AGTW005	12.0 -	12.0 -	12.0 -	**12.0 a**
Longford	11.8 -	12.2 -	11.9 -	**12.0 a**
Mean	**11.5 b**	**11.7 a**	**11.8 a**	**11.7**
LSD Cultivar P=0.05	0.4	**P value**	<0.001	
LSD Management P=0.05	0.1	**P value**	<0.001	
LSD Cultivar x Man. P=0.05	ns	**P value**	0.449	

Note: 150 N kg/ha of applied nitrogen fertiliser as solid prilled 46% N urea

Table 5: Influence of management strategy and cultivar on test weight (kg/hL).

	Test weight (kg/hL)			
	Management Strategy			
	Untreated	**1 Fungicide**	**4 Fungicides**	**Mean**
Stockade	72.7 -	73.0 -	72.6 -	**72.7 b**
RGT Cesario	72.6 -	73.0 -	73.6 -	**73.1 b**
AGTW005	75.2 -	75.2 -	75.1 -	**75.2 a**
Longford	74.8 -	74.3 -	75.2 -	**74.8 a**
Mean	**73.8 -**	**73.9 -**	**74.1 -**	**73.9**
LSD Cultivar p = 0.05	0.7	**P val**	<0.001	
LSD Management p = 0.05	ns	**P val**	0.695	
LSD Cultivar x Man. P = 0.05	ns	**P val**	0.675	

Table 6: Influence of management strategy and cultivar on screenings (%).

	Screenings (%)			
	Management Strategy			
	Untreated	**1 Fungicide**	**4 Fungicides**	**Mean**
Stockade	3.6 -	3.8 -	3.6 -	3.7 a
RGT Cesario	2.1 -	1.9 -	2.4 -	2.1 c
AGTW005	2.6 -	2.6 -	2.7 -	2.6 b
Longford	3.4 -	3.9 -	3.8 -	3.7 a
Mean	**2.9 -**	**3.0 -**	**3.1 -**	3.0
LSD Cultivar p = 0.05	0.5	**P val**	<0.001	
LSD Management p = 0.05	ns	**P val**	0.434	
LSD Cultivar x Man. P = 0.05	ns	**P val**	0.737	

Table 7: Trial input and management details.

Varieties:		**Longford, RGT Cesario, AGTW005 and Stockade**
Sowing date:		29 April 2023
Harvest date:		16 January 2024
Seed rate:		180 seeds/m^2
Basal fertiliser:	29 Apr	100 kg/ha MAP
Nitrogen:	06 Jul	108.7 Kg/ha Urea (50 N/ha)
	28 Aug	217.4 Kg/ha Urea (100 N/ha)
Fungicides:		As per treatment list (refer to table 1)

Table 8. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC

Trial 4. HYC Wheat Disease Management (FAR VIC W23-04-01) cv BigRed

Key Points:

- *Fungicide input was not cost effective in the variety BigRed at the Victoria CTC in 2023, although low levels of stripe rust were noted in the untreated crop.*
- *All fungicide strategies (based on 1,2 and 4 units of fungicide) had significantly less stripe rust infection than the untreated, but the level of infection on the top three leaves were low no greater than 2% on the flag leaf, 5% on F-1 and 7% on F-2.*
- *Fungicides were observed to control disease with four units of fungicide being better than one and two units of fungicide for stripe rust control, however there were no significant differences in either grain yield or quality as a result with an average yield of almost 6t/ha and protein of 11.7%.*

The red wheat BigRed was subjected to four levels of fungicide put compared to the untreated. The popular variety was subject to a range of fungicide inputs varying from a single fungicide to an input based on four units – flutriafol in furrow followed by three foliar products. The IDM approach based on two units of fungicide has an earlier timing emphasis (GS31 and GS39) than the two unit "straddle" where fungicide timings are applied either side of the flag leaf (GS33 – third node) targeting F-1 and early head emergence GS55.

Treatments:

Table 1. Fungicide treatments applied – products rates and timings.

Trt	Description	GS00	GS31	GS33	GS39	GS55	GS59-61
		29 Apr	**1 Sep**	**14 Sep**	**26 Sep**	**6 Oct**	**18 Oct**
1	**Untreated**	----	----	----	----	----	----
2	1 Fungicide **1F Flag Leaf Approach**	----	----	----	Revystar 0.75 L/ha	----	----
3	2 Fungicides – **2F Straddle approach**	----	----	Revystar 0.75 L/ha	----	Opus 500 mL/ha	----
4	4 Fungicides **4F Full Protection**	Flutriafol 200mL/ha	Prosaro 300 mL/ha	----	Revystar 0.75 L/ha	----	Opus 500 mL/ha
5	2 Fungicides **2F Standard approach (IDM)**	----	Prosaro 300 mL/ha	----	Revystar 0.75 L/ha	----	----

Table 2. Influence of fungicide strategy on grain yield (t/ha) and grain quality (protein (%), test weight (kg/hL) and screenings (%).

		Grain Yield and Quality			
Treatment		**Yield t/ha**	**Protein %**	**Test Weight kg/hL**	**Screenings %**
1	**Untreated**	7.18 -	11.4 -	75.6 -	4.1 -
2	**1F Flag leaf approach**	6.74 -	11.7 -	75.8 -	4.5 -
3	**2F Straddle approach**	6.78 -	11.7 -	75.8 -	4.8 -
4	**4F Full Protection**	6.92 -	11.8 -	75.6 -	4.5 -
5	**2F Standard approach (IDM)**	7.07 -	11.6 -	75.9 -	4.3 -
Mean		6.94	11.7	75.7	4.4
P Value		0.919	0.187	0.860	0.765
LSD P=0.05		ns	ns	ns	ns

Table 3. Influence of fungicide management on the severity (% LAI) of Stripe Rust (SR) infection – assessed 3 November, GS71.

		Flag	**Flag-1**	**Flag-2**	**Flag-3**
Treatment		**SR %LAI**	**SR %LAI**	**SR %LAI**	**GLR %LAI**
1	**Untreated**	2.1 a	4.9 a	6.7 a	25.8 -
2	**1F Flag leaf approach**	0.5 b	1.8 b	4.2 b	25.8 -
3	**2F Straddle approach**	0.4 b	1.4 bc	3.2 bc	19.5 -
4	**4F Full Protection**	0.2 b	0.5 c	1.1 c	28.6 -
5	**2F Standard approach (IDM)**	0.3 b	0.5 c	2.6 bc	39.0 -
Mean		0.7	1.8	3.5	27.7
P Value		<0.001	<0.001	0.002	0.056
LSD P=0.05		0.5	1.2	2.2	ns

Table 4. Influence of fungicide management on the incidence (%) of Stripe Rust (SR) infection – assessed 3 November, GS71.

		Flag	**Flag-1**	**Flag-2**
Treatment		**SR %LAI**	**SR %LAI**	**SR %LAI**
1	**Untreated**	72.5 a	95.0 a	95.0 ab
2	**1F Flag leaf approach**	30.0 b	65.0 b	97.5 a
3	**2F Straddle approach**	17.5 b	47.5 bc	77.5 bc
4	**4F Full Protection**	15.6 b	20.6 d	41.4 d
5	**2F Standard approach (IDM)**	17.5 b	27.5 cd	75.0 c
Mean		30.6	51.1	77.3
P Value		0.002	<0.001	<0.001
LSD P=0.05		25	20.8	18.5

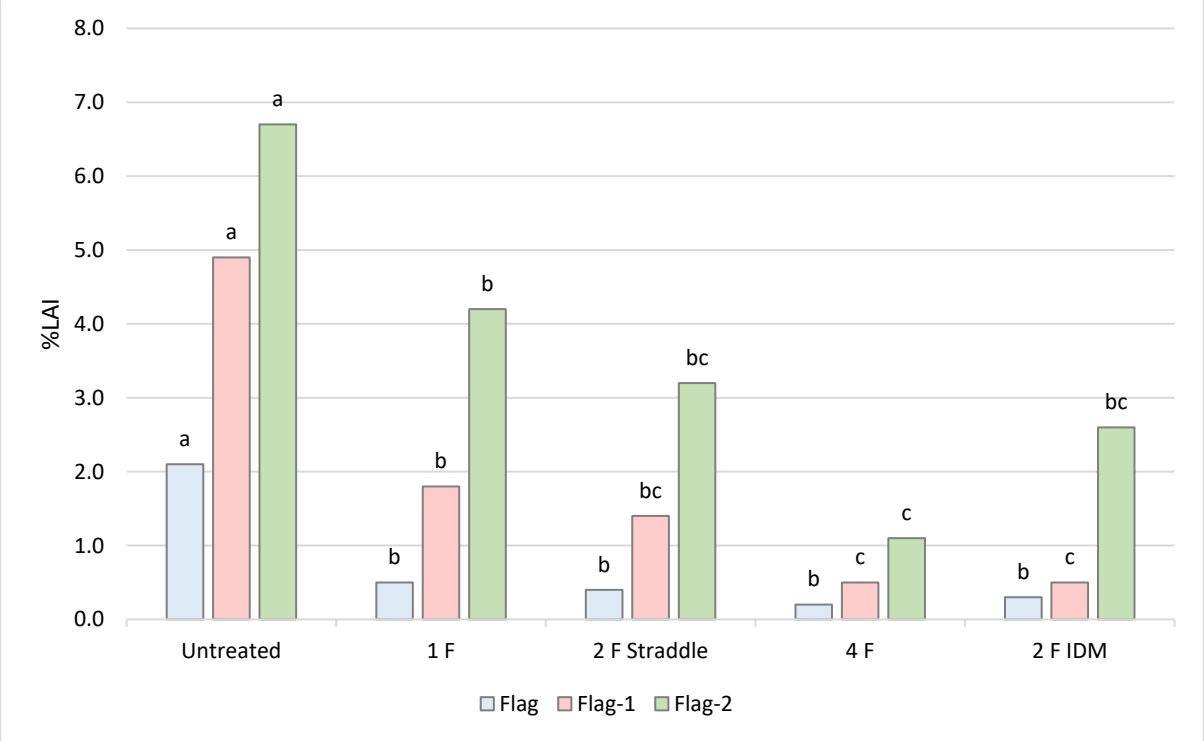

Figure 1. Influence of fungicide management on the severity (% LAI) of Stripe Rust infection – assessed 3 November, GS71.

Table 5. Influence of fungicide management on the severity (% LAI) of Septoria tritici blotch (STB) infection – assessed 3 November, GS71.

		Flag	Flag-1	Flag-2
Treatment		**STB %LAI**	**STB %LAI**	**STB %LAI**
1	**Untreated**	0.2 -	1.8 a	10.1 a
2	**1F Flag leaf approach**	0.0 -	0.2 b	4.3 b
3	**2F Straddle approach**	0.0 -	0.2 b	2.2 bc
4	**4F Full Protection**	0.0 -	0.0 b	0.7 c
5	**2F Standard approach (IDM)**	0.0 -	0.3 b	1.1 c
Mean		0.0	0.5	3.7
P Value		0.133	0.003	<0.001
LSD P=0.05		ns	0.8	2.3

Table 6. Influence of fungicide management on the incidence (% leaves showing infection) of Septoria tritici blotch (STB) infection – assessed 3 November, GS71.

Treatment		Flag STB %		Flag-1 STB %		Flag-2 STB %	
1	Untreated	7.5	a	55.0	a	95.0	a
2	1F Flag leaf approach	0.0	b	12.5	b	90.0	a
3	2F Straddle approach	0.0	b	12.5	b	67.5	b
4	4F Full Protection	0.0	b	0.0	b	28.3	c
5	2F Standard approach (IDM)	0.0	b	17.5	b	60.0	b
Mean		1.5		19.5		68.2	
P value		0.001		<0.001		<0.001	
LSD P=0.05		ns		20.2		19.4	

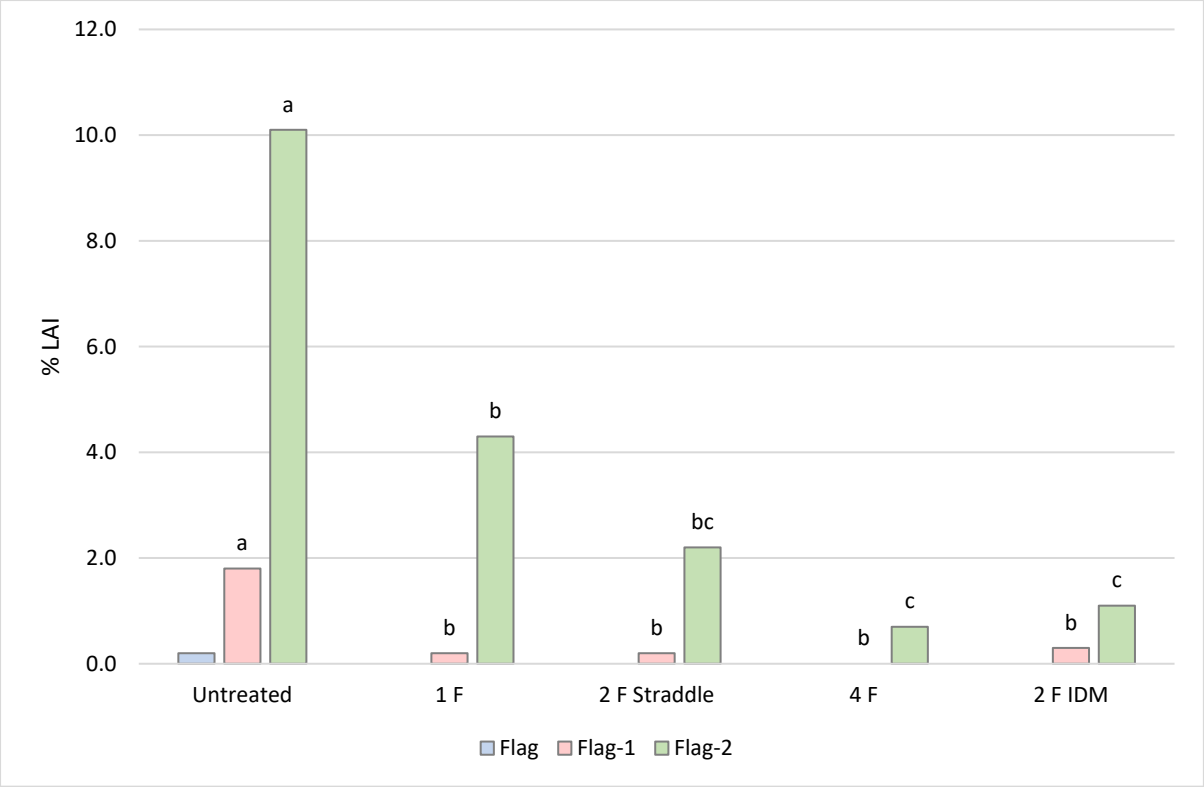

Figure 2. Influence of fungicide management on the severity (% Leaf area infected - LAI) of Septoria tritici blotch (SLB) infection– assessed 3 November, GS71.

Table 7. Trial input and management details**.**

Variety:		**BigRed**
Sowing date:		29 April 2023
Harvest date:		15 January 2024
Seed rate:		180 seeds/m^2
Basal fertiliser:	29 Apr	100 kg/ha MAP
Nitrogen:	06 Jul	108.7 Kg/ha Urea (50 N/ha)
	28 Aug	217.4 Kg/ha Urea (100 N/ha)
Fungicides:		As per treatment list

Table 8. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC

Trial 5. Nutrition for Hyper Yielding Wheat (FAR VIC W23-05-01)

Key Points:

- *Following faba beans in 2022 there was no significant yield response to applied nitrogen (0-280kg N/ha), although there was a significant increase in grain protein from 0-160kg N/ha (9.6% - 12.2%).*
- *With 133.5kg N/ha in the soil 0 – 100cm on 26 April, the zero N treatment (only 10kg N/ha MAP applied) yielded 5.93t/ha with a protein of 9.6% indicating the presence of approximately 100kg N/ha in grain at harvest.*
- *If 75% of the N is assumed to be in the grain and 25% in the straw residue then the total N uptake at harvest in zero N plots was approximately 133kg N/ha, indicating that the soil could have provided sufficient N to satisfy this yield.*
- *There were no significant differences in harvest dry matter as a result of N application, although there was a trend suggesting higher N rate applications increased harvest dry matter up to 120kg N/ha.*
- *This trend in increased dry matter at harvest was linked to significantly higher head numbers up to 120kg N/ha.*
- *Although lodging levels at harvest were low there was a gradual increase in lodging as N input increased from 0 -160kg N/ha.*
- *No differences were observed in NDVI during early season, but during late season, treatments with 160kg N/ha and 120kg N/ha + PKS had statistically better NDVI scores (0.21 and 0.23 respectively) than other treatments. Treatment with 0kg N/ha had the lowest NDVI rating (0.11) recorded at GS89 on 24 November.*

Treatments:

RGT Cesario wheat was subjected to 10 nutrition treatments of varying nitrogen (timing and rate) and manure rates (Table 1). The 3t/ha (dry weight) manure (chicken manure) treatments were applied on top of 120kg N/ha applied as a two split 50% at GS30 (pseudo stem erect) and 50% at GS32 (2nd node). The chicken manure had an analysis of N 0.98%, P 1.0 %, K 2.4% and S 0.66% based on dry weight. The available soil N was measured on 26 April with 0-30cm 96.9kg N/ha, 30-60cm 21.1kg N/ha and 60-100cm 15.6kg N/ha giving a total of 133.5kg N/ha in the 0 – 100cm horizon. The trial site had an organic carbon content of 2.4% in the 0 – 10cm.

Table 1. Treatment details and application timings.

		Sowing	GS30	GS32	GS39
		29 April	6 Jul	~6 Sep	~26 Sep
Treatment		**kg/ha (MAP at sowing)**	**kg N/ha**	**kg N/ha**	**kg N/ha**
1	0N	100	-	-	-
2	80kg N/ha	100	40	40	-
3	120kg N/ha	100	60	60	-
4	160kg N/ha	100	80	80	-
5	200kg N/ha	100	100	100	-
6	240kg N/ha	100	120	120	-
7	280kg N/ha	100	140	140	-
8	200kg N/ha (3 split)	100	80	80	40
9	120kg N/ha + Manure*	100+3t/ha Manure	60	60	-
10	120kg N/ha + add NPKS **	100+ NPKS	60	60	-

**Manure nutrient analysis and equivalent nutrient rates detailed in table 4*

***130kg N/ha, 65 Kg P/ha, 120 Kg K/ha and 48 Kg S/ha applied 2 June.*

Table 2. Influence of nutrition strategy on wheat grain yield (t/ha), protein (%), test weight (kg/hL), and screenings (%).

		Grain Yield and Quality									
Treatment		**Yield t/ha**		**Protein %**		**Test Weight kg/hL**		**Screenings %**		**Lodging Index %**	
1	0N	5.93	-	9.6	e	72.8	-	1.8	-	5.0	d
2	80kg N/ha	5.97	-	11.3	d	72.9	-	1.6	-	15.0	cd
3	120kg N/ha	6.16	-	11.8	cd	72.8	-	1.7	-	72.5	abc
4	160kg N/ha	6.36	-	12.2	abc	73.1	-	1.7	-	96.3	ab
5	200kg N/ha	5.75	-	12.6	ab	72.6	-	1.7	-	92.5	ab
6	240kg N/ha	5.95	-	12.6	ab	73.2	-	1.7	-	85.0	ab
7	280kg N/ha	6.31	-	12.7	a	73.5	-	1.7	-	127.5	a
8	200kg N/ha (3 split)	6.23	-	12.2	abc	72.7	-	1.8	-	43.8	bcd
9	120kg N/ha + Manure	5.99	-	12.2	abc	72.9	-	1.8	-	123.8	a
10	120kg N/ha + additional NPKS	6.63	-	12.0	bc	73.6	-	1.8	-	85.0	ab
Mean		6.13		11.9		73.0		1.7		74.6	
P Value		0.152		<0.001		0.114		0.982		0.007	
LSD P=0.05		ns		0.6		ns		ns		66	

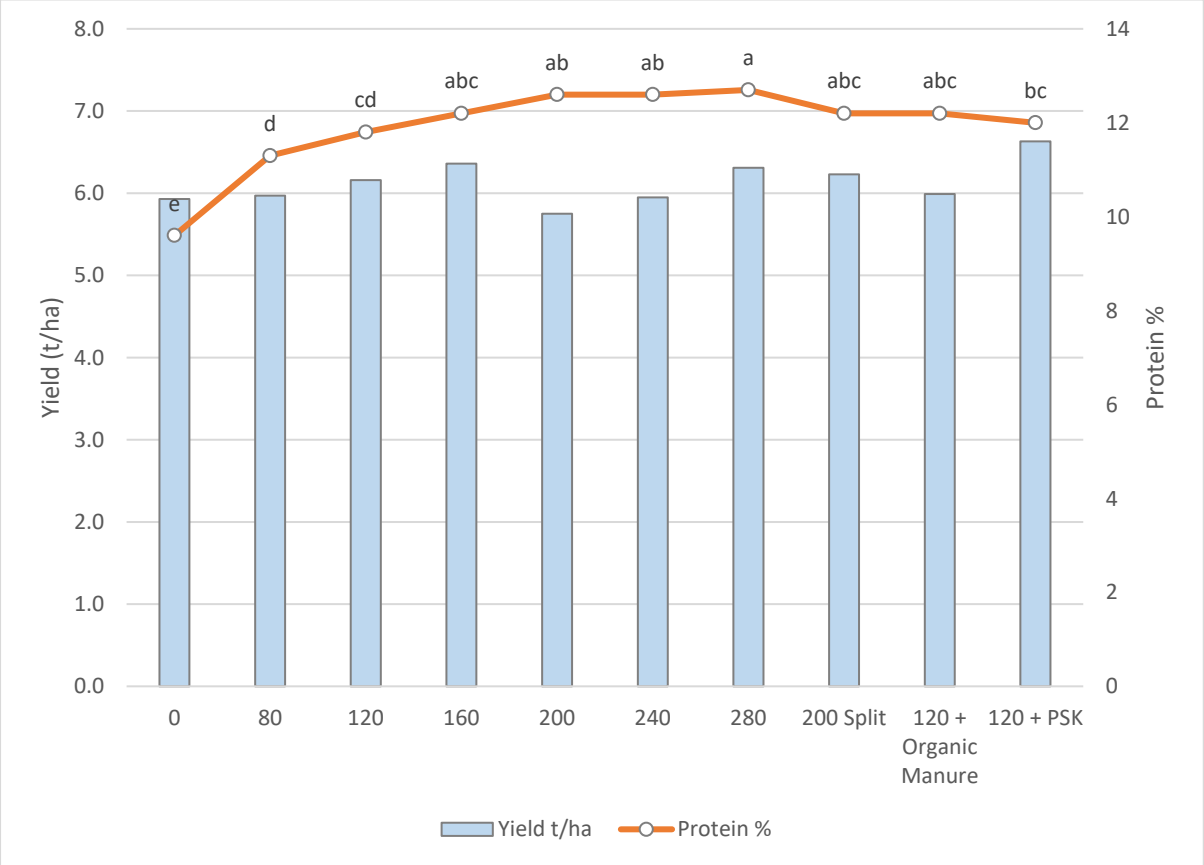

Figure 1: Influence of nutrition strategy on grain yield (t/ha) and protein content (%)

Table 3: Influence of nutrition strategy on plant dry matter (DM) yield (t/ha) and head counts(m^2)

		GS65		GS99		GS99	
Treatment		**DM t/ha**		**DM t/ha**		**Head Counts (m^2)**	
1	0N	12.36	-	14.99	-	393.6	c
2	80kg N/ha	13.91	-	15.36	-	458.0	bc
3	120kg N/ha	13.17	-	16.59	-	508.6	ab
4	160kg N/ha	12.60	-	14.78	-	443.9	bc
5	200kg N/ha	14.48	-	16.69	-	492.4	ab
6	240kg N/ha	12.26	-	16.36	-	498.3	ab
7	280kg N/ha	15.11	-	17.41	-	497.7	ab
8	200kg N/ha (3 split)	12.66	-	18.42	-	552.7	a
9	120kg N/ha + Manure	13.62	-	16.28	-	511.7	ab
10	120kg N/ha + Additional NPKS	15.03	-	17.56	-	511.9	ab
Mean		13.52		16.44		486.9	
P Value		0.375		0.119		0.015	
LSD P=0.05		ns		ns		75	

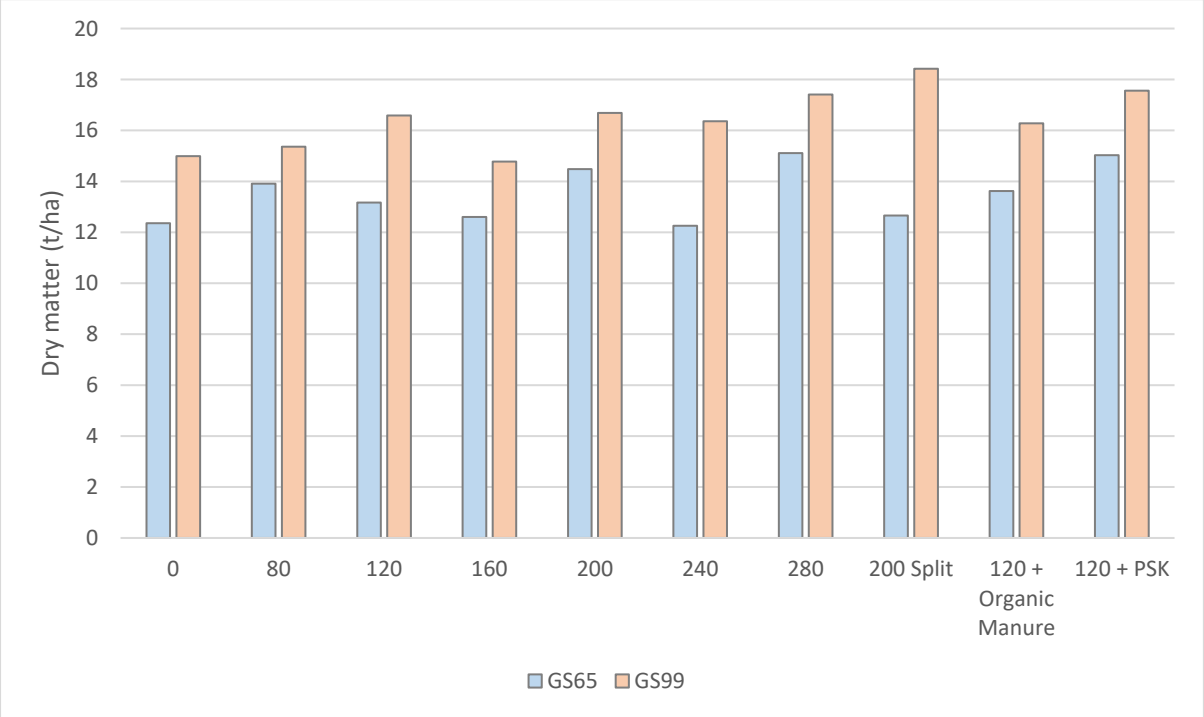

Figure 2: Influence of nutrition strategy on dry matter yield (t/ha) - GS65 (mid flower) and GS99 (harvest)

Table 4. Nutrient value of manure applied, and nutrients & products used in treatment 10.

Trt#	**Product**	**Rate**	**Nutrient Value (kg/ha)**			
		kg/ha	N	P	K	S
9	Manure (dry)	3000	**29.6**	**30**	**72**	**19.8**
10	Urea	92.9	42.8			
	MOP	124.8			74.9	
	SOA	62.5	13.1			15.0
	MAP	83.2	8.3	18.3		
	Total		**64.2**	**18.3**	**74.9**	**15.0**

Table 5. Analysis of chicken manure used at Gnarwarre 2023 (rates and nutrients reported on a dry basis except moisture).

Nutrient	Concentration in chicken manure
pH 1:5 water	5.7
Nitrate Nitrogen	960 mg/kg
Ammonium Nitrogen	8,900 mg/kg
Phosphorus	10,000 mg/kg
Potassium	24,000 mg/kg
Sulfur	6,600 mg/kg
Calcium	14,000 mg/kg
Magnesium	6,200 mg/kg
Carbon	39%
Iron	7,100 mg/kg
Manganese	530 mg/kg
Copper	74 mg/kg
Zinc	350 mg/kg
Boron	44 mg/kg
Moisture	30.8%

Table 6. Trial Input and management details

Sowing date:		**29 April 2023**
Harvest date:		16 January 2024
Seed rate:		180 seeds/m^2
Basal fertiliser:	29 Apr	100 kg/ha MAP
Nitrogen:		As per treatment list
PGR:	GS31	Moddus Evo 0.20 L/ha
		Errex 1.3 L/ha
Fungicides:	GS31	Radial 0.84 L/ha
	GS39	Aviator Xpro 0.50 L/ha
	GS59-61	Opus 0.50 L/ha

Table 7. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Opus	Epoxiconazole	125 g/L	---	---	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Errex 750	Chlormequat	582 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Appendix. HYC Wheat VIC Crop Technology Centre

The following details apply to all Victorian wheat trials unless specified differently.

Table 1. Overall inputs

	Date applied	Product
Herbicide:	21 May	Treflan 2 L/ha
		Overwatch 1.25 L/ha
		Paraquat 2.4
	29 Jun	Mateno complete
		LVE MCPA 570
		Lontrel advanced

Table 2. Active ingredients and chemical loading (g/L) for products used.

Herbicide	Active 1		Active 2		Active 3		Type
Treflan	Trifluralin	480 g/L					EC
Overwatch	Bixlozone	400 g/L					SC
Paraquat	Paraquat	250 g/L					SL
Mateno complete	Aclonifen	400 g/L	Diflufenican	66 g/L	Pyroxasulfone	100 g/L	SC
LVE MCPA 570	MCPA	570 g/L					EC
Lontrel advanced	Clopyralid	600 g/L					SC

WA Crop Technology Centre

Frankland River, Western Australia

Sown: 29 April (FAR WAA W23-03) & 30 April (FAR WAA W23-05) 2023
Harvested: 13 December (FAR WAA W23-03) & 21 November (FAR WAA W23-05) 2023
R**otation position:** 2022 Canola
Soil type: Forest gravel loam
Nitrogen 0-60 cm: 83kg N/ha
Colwell P (ppm) 0-10cm: 43 mg/kg
pH ($CaCl_2$) 0-10cm: 5.9
Organic Carbon (%) 0-10cm: 2.7 %

Trial 1. HYC Wheat G.E.M Trial Series (FAR WAA W23-03)

Key Points:

- *With a dry spring period management input had no significant impact on grain yield, although in absolute terms high input gave rise to the highest yields and protein levels.*
- *In contrast variety performance had a significant impact on grain yield with the longer season spring wheats RockStar and Denison being significantly higher yielding (5.95 & 5.85t/ha) than all other varieties averaged across the four management approaches when sown 30 April.*
- *There was no interaction between variety and management approach indicating that variety ranking was similar irrespective of whether crops were farmed with high input or low input.*
- *The shorter season spring wheat Scepter and the two winter wheats Mowhawk and Illabo all yielded similarly (5.24 – 5.36t/ha).*
- *The longer season winter wheat RGT Accroc that has performed similarly to RockStar over the last two years was not suited to the drier conditions in 2023 and was significantly lower yielding than all other cultivars.*
- *Scepter produced significantly higher protein than all other varieties except the red grained feed wheat RGT Accroc (4.76t/ha).*
- *With grain protein the low input approach based on 125kg N/ha resulted in significantly lower protein with an average of 11.5% compared to over 12% with other management approaches where 150 -175kg N/ha was applied.*

Treatments:

Six cultivars (three spring wheats RockStar, Denison, Scepter and three winter wheats RGT Accroc, Illabo and Mowhawk) were tested under four different management programs;

1. High Input – 4 units of fungicides (Systiva seed treatment, 3 foliar fungicides GS31, GS39, GS59), 175kg N/ha, PGR.
2. Low Input – One unit of fungicide based on Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) & 125kg N/ha.
3. HYC Strategic Input – This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 1.

Table 1. Trial input and management details.

Sowing date:		**29 April 2023**	
Harvest date:		**13 December 2023**	
Seed rate:		180 seeds/m^2	
Basal fertiliser:	29 Apr	169kg MAP/MOP (66/33 divide)	
Nitrogen:		**Low Input**	**High Input**
		125kg N/ha	175kg N/ha
		Strategic	**Tactical**
		150kg N/ha	175kg N/ha
PGR:		**Low Input**	**High Input**
	GS31	----	Moddus Evo 0.10 L/ha Errex 1.3 L/ha
		Strategic	**Tactical**
	GS31	----	Mowhawk and Denison (same as High Input)
Fungicide:		**Low Input**	**High Input**
	GS00	----	Systiva
	GS31	Tilt 0.50 L/ha	Prosaro 0.30 L/ha
	GS39	Opus 0.50 L/ha	Radial 0.84 L/ha
	GS61-71	----	Opus 0.50 L/ha
		Strategic	**Tactical**
	GS00	----	----
	GS31	Prosaro 0.15 L/ha	See below
	GS39	Radial 0.84 L/ha	Opus 0.50 L/ha
	GS61-71	Opus 0.50 L/ha	----

Tactical Fungicide GS31:					
Scepter	**RGT Accroc**	**Mowhawk**	**Illabo**	**RockStar**	**Denison**
Prosaro 0.30 L/ha	Prosaro 0.30 L/ha	Prosaro 0.15 L/ha	Prosaro 0.15 L/ha	Prosaro 0.15 L/ha	Prosaro 0.30 L/ha

Table 2. Influence of management strategy and cultivar on grain yield (t/ha).

	Yield (t/ha)									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
Scepter	5.29	-	5.47	-	5.28	-	5.02	-	**5.26**	**b**
RGT Accroc	4.61	-	4.94	-	4.76	-	4.74	-	**4.76**	**c**
Mowhawk	5.40	-	5.36	-	5.24	-	4.97	-	**5.24**	**b**
Illabo	5.49	-	5.47	-	5.21	-	5.28	-	**5.36**	**b**
RockStar	5.70	-	6.19	-	6.03	-	5.88	-	**5.95**	**a**
Denison	5.87	-	6.01	-	5.72	-	5.82	-	**5.86**	**a**
Mean	**5.39**	**-**	**5.57**	**-**	**5.37**	**-**	**5.29**	**-**	**5.41**	
LSD Cultivar P=0.05			0.184		**P value**				<0.001	
LSD Management P=0.05			ns		**P value**				0.227	
LSD Cultivar x Man. P=0.05			ns		**P value**				0.526	

Table 3. Influence of management strategy and cultivar on protein (%).

	Protein (%)									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
Scepter	12.6	-	13.2	-	12.4	-	12.8	-	**12.8**	**a**
RGT Accroc	11.9	-	12.7	-	12.4	-	12.4	-	**12.3**	**ab**
Mowhawk	11.3	-	11.5	-	11.4	-	12.2	-	**11.6**	**c**
Illabo	10.9	-	12.3	-	11.7	-	12.4	-	**11.8**	**bc**
RockStar	11.1	-	12.9	-	12.3	-	12.2	-	**12.1**	**bc**
Denison	11.2	-	12.0	-	11.8	-	11.8	-	**11.7**	**c**
Mean	**11.5**	**b**	**12.4**	**a**	**12.0**	**a**	**12.3**	**a**	**12.0**	
LSD Cultivar P=0.05			0.5		**P value**				0.001	
LSD Management P=0.05			0.5		**P value**				0.005	
LSD Cultivar x Man. P=0.05			ns		**P value**				0.720	

Table 4. Influence of management strategy and cultivar on test weight (kg/hl).

	Test Weight (kg/hl)									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
Scepter	73.3	-	73.0	-	73.9	-	74.1	-	**73.6**	**c**
RGT Accroc	72.5	-	73.5	-	73.1	-	73.0	-	**73.0**	**c**
Mowhawk	75.5	-	75.4	-	74.6	-	73.5	-	**74.7**	**b**
Illabo	72.0	-	73.1	-	71.7	-	71.9	-	**72.2**	**d**
RockStar	74.9	-	75.2	-	75.1	-	74.8	-	**75.0**	**b**
Denison	76.3	-	74.9	-	76.5	-	75.9	-	**75.9**	**a**
Mean	**74.1**	**-**	**74.2**	**-**	**74.2**	**-**	**73.9**	**-**	**74.1**	
LSD Cultivar P=0.05			0.9		**P value**				<0.001	
LSD Management P=0.05			ns		**P value**				0.951	
LSD Cultivar x Man. P=0.05			ns		**P value**				0.356	

Table 5. Influence of management strategy and cultivar on screenings (%).

	Screenings (%)									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
Scepter	3.2	-	2.9	-	3.0	-	3.1	-	**3.0**	**bcd**
RGT Accroc	2.8	-	2.7	-	3.1	-	3.0	-	**2.9**	**cd**
Mowhawk	4.6	-	4.6	-	4.5	-	5.1	-	**4.7**	**a**
Illabo	3.2	-	3.0	-	3.4	-	3.5	-	**3.3**	**bc**
RockStar	2.7	-	3.2	-	2.5	-	2.7	-	**2.8**	**d**
Denison	3.4	-	3.7	-	3.0	-	3.6	-	**3.4**	**b**
Mean	**3.3**	**-**	**3.4**	**-**	**3.2**	**-**	**3.5**	**-**	**3.3**	
LSD Cultivar P=0.05			0.5		**P value**				<0.001	
LSD Management P=0.05			ns		**P value**				0.663	
LSD Cultivar x Man. P=0.05			ns		**P value**				0.883	

Table 6. Influence of management strategy and cultivar on harvest index %.

	Harvest Index									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
Scepter	42.1	-	42.2	-	43.2	-	39.3	-	**41.7**	**bc**
RGT Accroc	38.4	-	40.2	-	37.1	-	42.6	-	**39.6**	**c**
Mowhawk	49.3	-	45.8	-	40.9	-	47.5	-	**45.9**	**a**
Illabo	44.2	-	46.3	-	39.7	-	43.9	-	**43.5**	**ab**
RockStar	40.9	-	45.7	-	45.4	-	43.7	-	**43.9**	**ab**
Denison	43.9	-	43.1	-	41.1	-	42.3	-	**42.6**	**abc**
Mean	**43.1**	**-**	**43.9**	**-**	**41.2**	**-**	**43.2**	**-**	**42.9**	
LSD Cultivar P=0.05			3.8		**P value**				0.042	
LSD Management P=0.05			ns		**P value**				0.170	
LSD Cultivar x Man. P=0.05			ns		**P value**				0.710	

There was a low level of lodging recorded in the trial (Figure 1) which illustrated better standing power where PGR was applied, however it should be stressed that the lodging was minimal on the lodging index and is unlikely to have affected grain yield. Low levels of disease (Figure 2) were recorded in the trial (less than 5%) and are unlikely to have had a significant effect on grain yield (Figure 3).

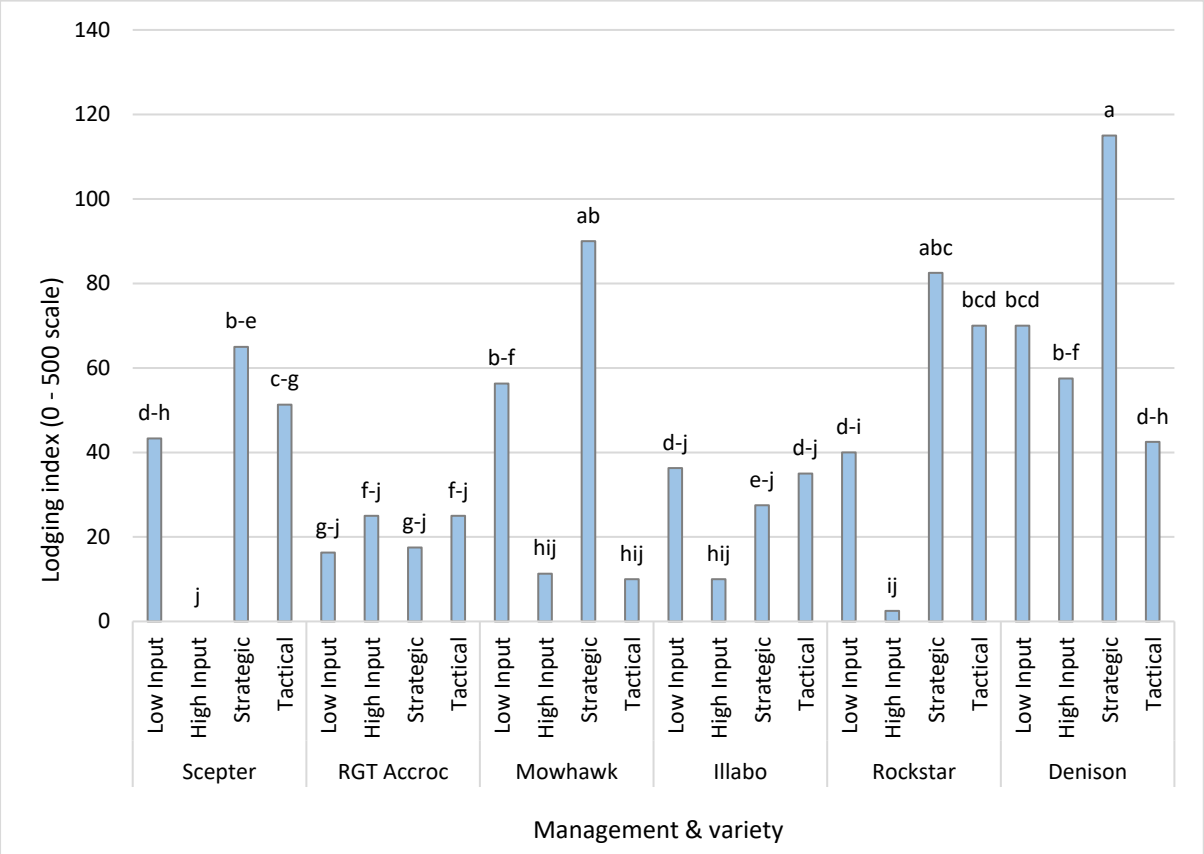

Figure 1. Influence of management strategy and cultivar on lodging index (0-500). P Value=0.005, LSD (P=0.05) = 38.

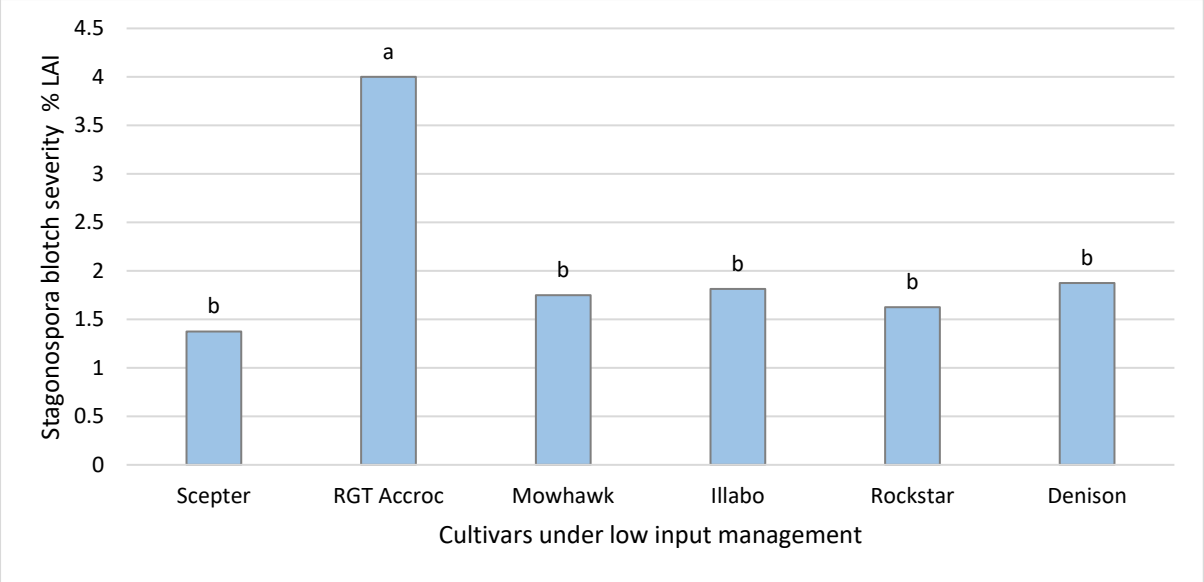

Figure 2. Influence of cultivar on Stagonospora blotch severity under Low Input management (%LAI) P Value=0.042, LSD (P=0.05) = 1.65.

Economic analysis

Despite yields in wheat staying consistent across management strategies, the same cannot be said for grain classification (results not shown). While costing less on average, the low and tactical inputs showed lower partial net margins (taking into account the variable costs in each strategy) when compared to high and strategic inputs in the wheat GEM trial (Figure 3). The upside potential of achieving higher grain classifications offset the additional costs involved. For example, under low input Mowhawk, Illabo and RockStar only achieved feed standard to receive a price of $350/t (averaging a partial net margin of $1,737/ha) compared to high input where the same three varieties achieved AUH2/H3 classification at $402/t (and an average partial net margin of $1,950/ha).

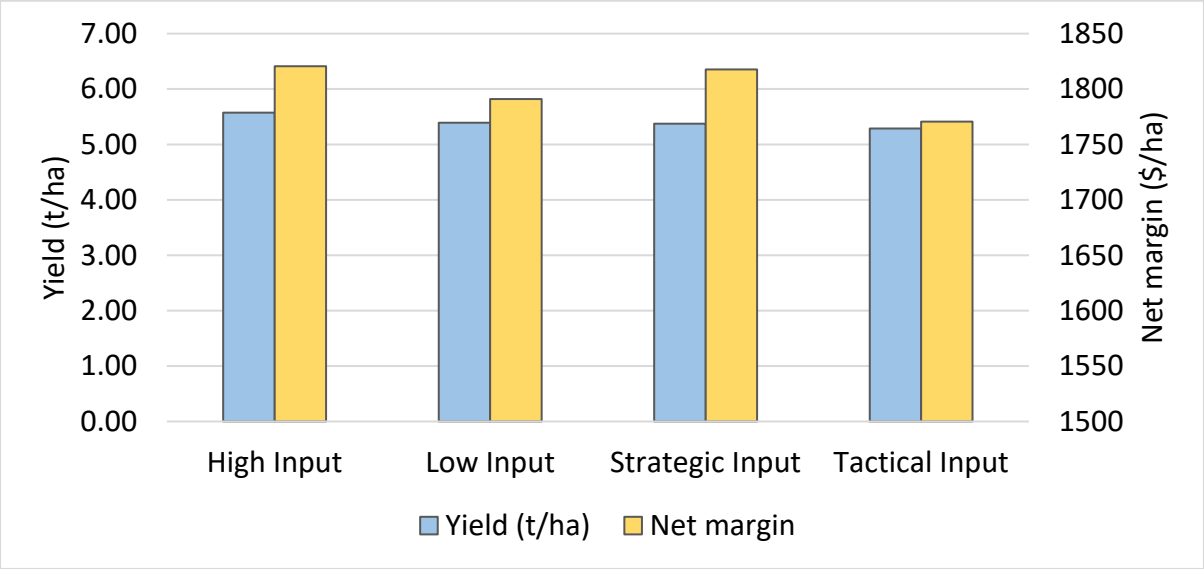

Figure 3. Influence of management strategy on wheat yield (t/ha) and net margin (margin after the application of N, PGR & F was taken into account ($/ha).

Prices based on AUH2/H3 $402/t, APW1 $407/t, SFW1 $350/t, CT spraying $16.2/ha, CT spreading $9.2/ha, high input cost average - $473.2/ha, low input cost - $338.7/ha, strategic input average - $402.3/ha and tactical input average - $404.2/ha. Includes cost of seed treatment, foliar fungicides, PGR, nutrition and grain.

Table 7. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Active 2		Type
Fungicide					
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
Systiva	Fluxapyroxad	333 g/L	---	---	FS
Tilt	Propiconazole	500 g/L	---	---	EC
PGR					
Errex 750	Chlormequat	582 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Trial 2. Nutrition for Hyper Yielding Wheat (FAR WAA W23-05)

Key points:

- *Additional N over the 120kg N/ha farm standard (10N basal MAP + 110N in crop) applied at GS32 was associated with higher grain protein and higher screenings, however yield differences were not statistically significant.*
- *The only visual differences were observed in response to the horticulture mix (NPKS (13-2-8-14) which delivered only 2kg P/ha.*
- *Lower rates of phosphate (2kg P/ha) were inferior giving significantly lower dry matters when assessed at 50% head emergence, with lower yields compared to higher rates of phosphate.*
- *There were no benefits demonstrated to applying higher rates of P than 5 kg/ha P, but variable yields in the trial resulted in no significant differences in yield.*
- *The lower phosphate rate resulted in lower crop canopy reflectance (crop canopy greenness measured as NDVI) and lower head numbers.*
- *Manure did not have any significant effect on crop dry matter, head number or yields in 2023 with no significant NDVI effects, unlike results generated in 2022.*

Treatments:

Mowhawk winter wheat sown 30 April after canola was managed with five different levels of basal nutrition and manure application at sowing. These treatments were followed by the farm standard post emergence application of N 110kg N/ha applied in three applications at tillering GS22 (55N applied as Urea:MOP 75/25% mixture), and the start of stem elongation GS30 and GS31 when urea was used to apply 32 kg N/ha and 23 kg N/ha. The influence of additional N input was assessed with 4 treatments that applied between 11 – 46 kg N at second node stage to crops that had all received the same input of basal fertiliser (139kg/ha - MAP: MOP: MnSO4 mix (66.8/28.6/4.6)).

The pig manure applied at 5t/ha had the following % composition:

P	**K**	**N**
0.573	0.904	1.28

This delivered the following levels of macro nutrients 28.7 kg P/ha, 45.2 kg K/ha and 64.0kg N/ha.

Table 1. Treatment list and timings – Rates of macro nutrients N, P, K & S applied as kg/ha.

	Treatment Name	Sowing Fertiliser	Basal nutrients applied at sowing			
Trt.			**kg N/ha**	**kg P/ha**	**kg K/ha**	**kg S/ha**
1	Standard MAP	MAP 100kg/ha	10	22	0	2
2	50% increase of Farm Standard	208.5kg/ha Farm Std Mix*	14	30.5	36	2
3	Horticulture Mixture	Hort Mix** 100kg/ha	13	2	8	14
4	50% Standard MAP	MAP 50kg	5.5	11	0	1
5	Farm Standard + Manure	139kg/ha Farm Std Mix* + 5t/ha Manure	9.3 64	20.3 28.7	24 45.2	1.3 na
			GS22 Urea:MOP***	GS30 Urea	GS31 Urea	GS32 Urea
			kg N/ha/kg K/ha	**kg N/ha**	**kg N/ha**	**kg N/ha**
6	Farm Standard MAP	139kg/ha Farm Std Mix*	55/18	32	23	0
7	Farm Standard + 25kg Urea	139kg/ha Farm Std Mix*	55/18	32	23	11.5
8	Farm Standard + 50kg Urea	139kg/ha Farm Std Mix*	55/18	32	23	23.0
9	Farm Standard + 75kg Urea	139kg/ha Farm Std Mix*	55/18	32	23	34.5
10	Farm Standard + 100kg Urea	139kg/ha Farm Std Mix*	55/18	32	23	46.0

Trt 1 – 5 received the standard N top dressing applications outlined in treatment 6.
*MAP: MOP: MnSO4 mix (66.8/28.6/4.6)
Horticulture mixture **NPKS (13-2-8-14) 13N, 2P, 8K and 14 S kg/ha
***Urea:MOP (75/25)

Table 2. Influence of nitrogen rate on grain yield and grain quality, protein (%), test weight (kg/hL) and screenings (%).

	Treatment Name	Yield		Protein		Test weight		Screenings	
Trt.		**t/ha**		**(%)**		**(kg/hL)**		**(%)**	
1	Standard MAP	4.57	-	11.6	bc	71.6	abc	6.0	ab
2	50% increase of Farm Standard	4.98	-	10.8	d	74.4	ab	4.2	c
3	Hort Mix	3.99	-	10.5	d	75.6	a	3.9	c
4	50% Standard MAP	4.46	-	10.7	d	75.1	ab	3.5	c
5	Farm Standard + Manure	4.73	-	11.2	cd	71.1	bc	5.1	bc
6	Farm Standard	3.68	-	10.7	d	75.2	ab	3.7	c
7	Farm Standard + 25kg Urea	4.71	-	11.8	bc	71.5	abc	5.0	bc
8	Farm Standard + 50kg Urea	4.73	-	12.2	b	73.1	ab	5.0	bc
9	Farm Standard + 75kg Urea	4.48	-	13.5	a	68.5	c	7.0	a
10	Farm Standard + 100kg Urea	3.51	-	13.4	a	68.4	c	6.5	ab
Mean		4.38		11.6		72.4		5.0	
LSD P=0.05		ns		0.8		4.4		1.7	
P Value		0.683		<0.001		0.012		0.002	

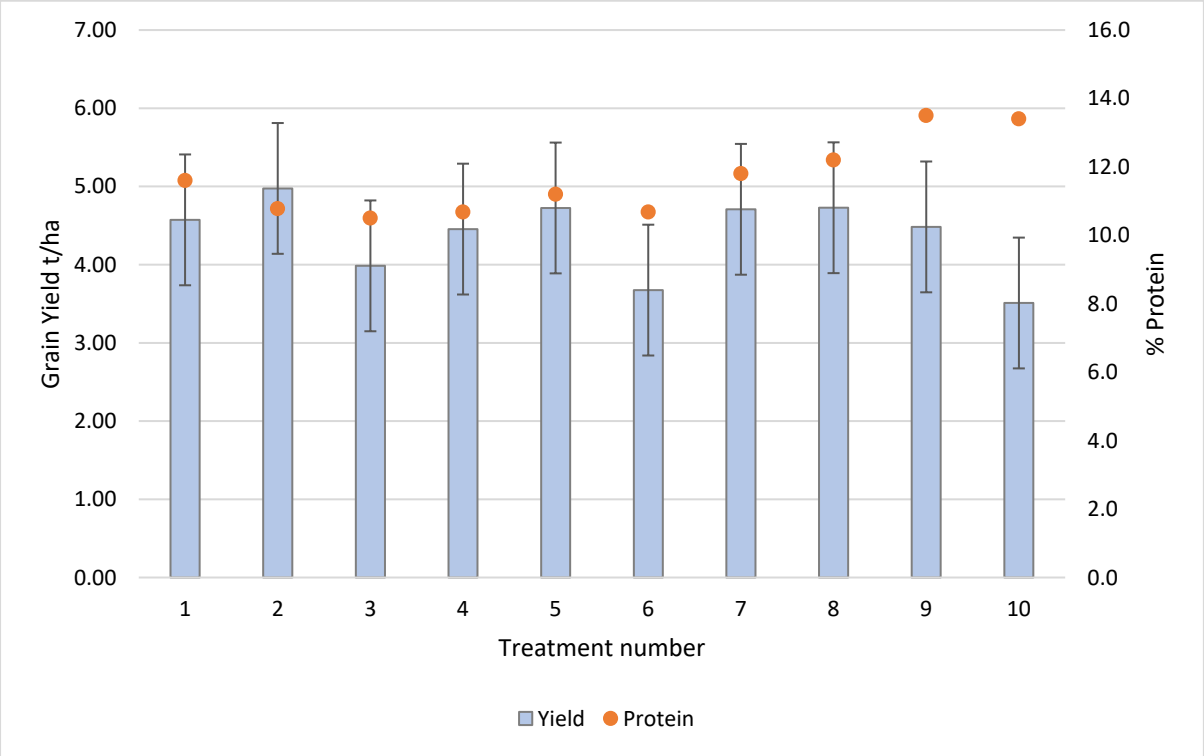

Figure 1. Relationship between yield and protein (refer to table 2 for P values).

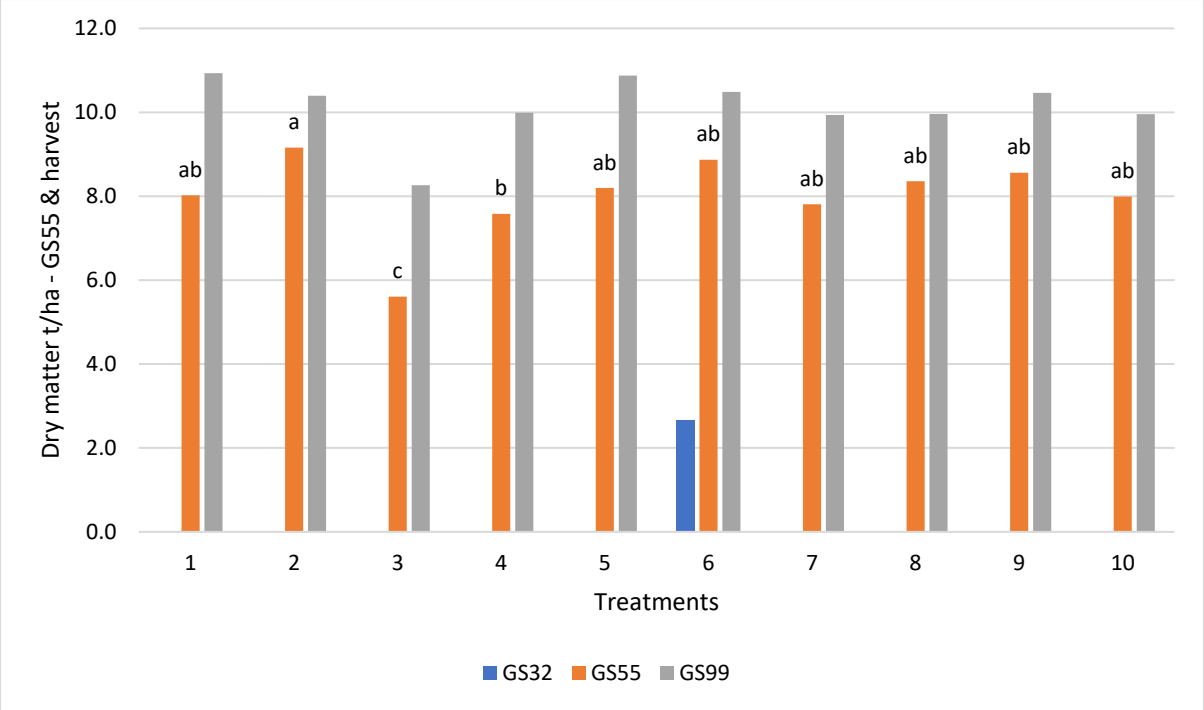

Figure 2. Treatment Dry Matter (t/ha) by growth stage. GS99 series is non-significantly different. GS55 series: P value=0.003, LSD (P=0.05)= 1.4).

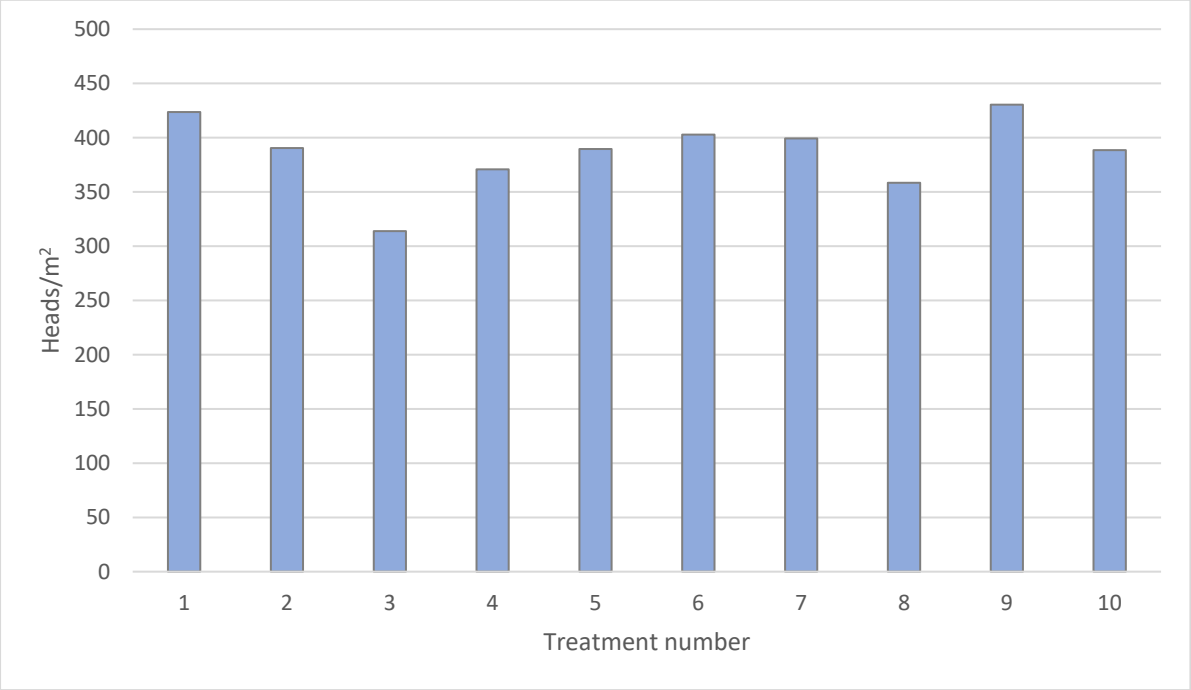

Figure 3. Influence of treatment on head number (Heads/m^2). Differences are not significant.

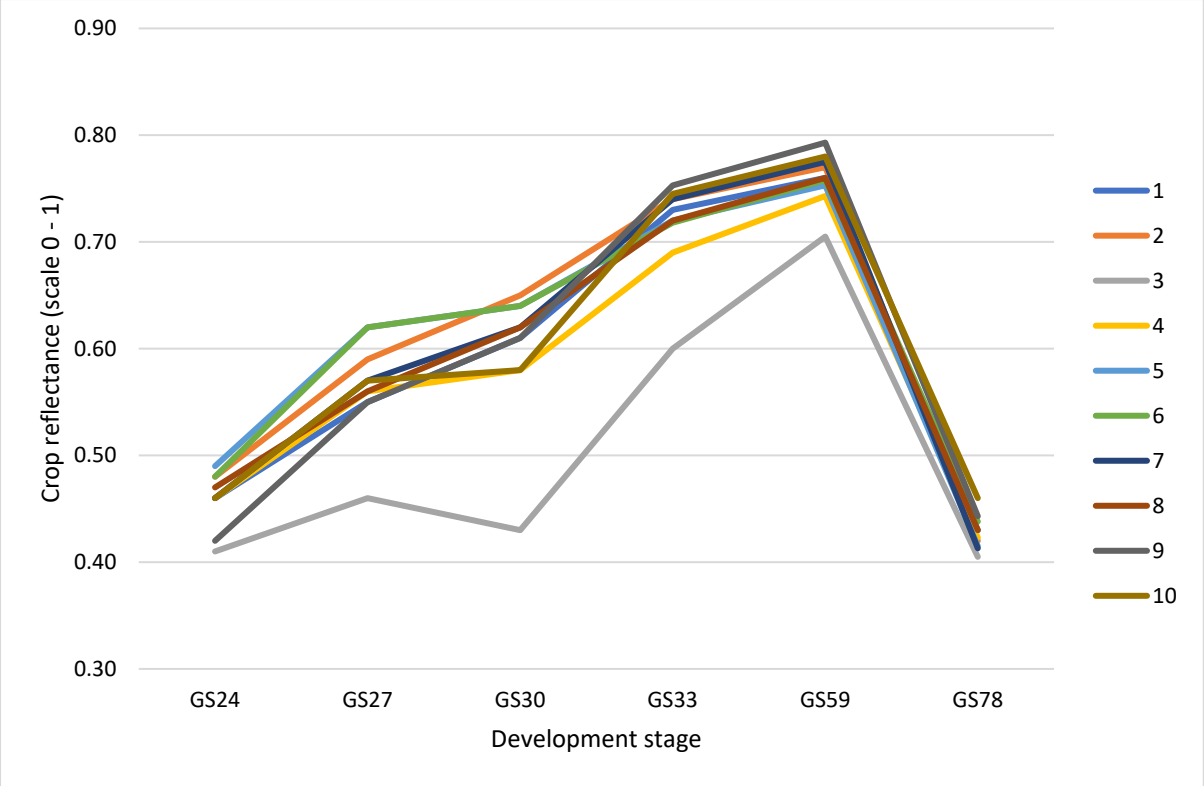

Figure 4. Influence of treatment (treatment number) on crop canopy reflectance measured as NDVI – (GS24 tillering – GS78 grain fill).

Table 3. Trial input and management details.

Variety:		**Mowhawk**
Sowing date:		**30 April 2023**
Harvest date:		**13 December 2023**
Seed rate:		180 seeds/m^2
Basal fertiliser:	29 Apr	169kg MAP/MOP/MnSO4 (66%/29%/5% blend)
Nitrogen:	12 Jun	55 kg N/ha
	13 Jul	32kg N/ha
	2 Aug	23kg N/ha
Fungicide:	GS31	Prosaro 0.30 L/ha
	GS39	Radial 0.84 L/ha
	GS61-71	Opus 0.50 L/ha

Table 4. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC

Appendix. HYC Wheat WA Crop Technology Centre

The following details apply to all Western Australian wheat trials unless specified differently.

Table 1. Overall inputs

	Date applied	Product
Herbicide:	29 Apr	Triflurex 2L/ha
		Overwatch 1.25L/ha
Nitrogen:	12 Jun	55kg N/ha (20K)
	13 Jul	32kg N/ha
	2 Aug	23kg N/ha

Table 2. Active ingredients and chemical loading (g/L) for products used.

Name	Active 1		Type
Herbicide			
TriflurX	Trifluralin	480 g/L	EC
Overwatch	Bixlozone	400 g/L	SC

Tasmania Crop Technology Centre

Hagley, TAS

Sown: 26 April 2023
Harvested: 25-27 January 2024
Rotation position: 2022 poppies
Soil type: Chromosol
Nitrogen 0 – 60cm: 110.4kg N/ha
Colwell P (ppm) 0-10cm: 225.9
pH ($CaCl^2$) 0-10cm: 6.31
Organic Carbon (%) 0-10cm: 1.87
Irrigation: 94mm

Trial 1. HYC Wheat G.E.M Trial Series (FAR TAS W23-03)

Key Points:

- *Grain yields of Anapurna were consistently higher yielding than other varieties, irrespective of management input, with no significant interaction between management input and variety, all varieties giving their highest yields under the highest input.*
- *Severe stripe rust infection was the primary driver of yield differences in variety and management performance.*
- *Additional N (75N), fungicide input (flutriafol and better foliar fungicides for stripe rust control) and a PGR application associated with the high input approach generated a yield advantage over low input of 0.9t/ha.*
- *With stiffer strawed or more disease resistant varieties such as Anapurna, RGT Waugh and Longford (AGF4818) there was little or no yield advantage to the high input approach over the HYC strategic management approach which omitted PGR and upfront flutriafol on the basal fertiliser.*
- *For those cultivars that were stripe rust susceptible the choice of the head spray made a significant difference in yield outcome, with the HYC tactical approach using Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) (tebuconazole/prothioconazole) for head wash giving poorer results than where Opus 125 SC (epoxiconazole 125g/L) applied at 500mL/ha (62.5 g ai/ha) was employed with HYC strategic approach.*

Treatments:

Six cultivars (RGT Cesario, BigRed, RGT Accroc, Stockade, Longford (formerly AGF4818) and RGT Waugh) were tested under four different management programs;

1. High Input – 223kg N/ha, 5 units of fungicides (Flutriafol plus foliar fungicides GS25, GS31/32, GS39, GS59) and PGR.
2. Low Input – 148kg N/ha, 3 units of fungicide based on 500 mL/ha and Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) & 150kg N/ha.
3. HYC Strategic Input – 148kg N/ha, 4 units of fungicide. This management strategy was set out at the start of the season based on crop inputs that had been associated with higher yields in previous HYC research for that variety.
4. HYC Tactical Input – 148kg N/ha, 4 units of fungicide. This was in essence the HYC strategic approach but modified to take account of particular variety agronomic traits such as disease resistance, grain quality or straw strength (Standing power).

The exact crop inputs applied to the different varieties and crop management regimes can be found in table 1.

Table 1. Trial input and management details.

Sowing date:		**26 April 2023**	
Harvest date:		**27 January 2024**	
Seed date:		180 seeds/m^2	
Basal fertiliser:	26 Apr	100 kg/ha MAP	
Nitrogen:		**Low Input**	**High Input**
	28 Jul	46kg N/ha	71kg N/ha
	29 Aug	92kg N/ha	142kg N/ha
		Strategic	**Tactical**
	28 Jul	46kg N/ha	46kg N/ha
	29 Aug	92kg N/ha	92kg N/ha
PGR:		**High Input Only**	
	GS30	Moddus Evo 0.20 L/ha Errex 1.3 L/ha	
Fungicide:		**Low Input**	**High Input**
	GS00	**----**	Flutriafol
	GS25	Opus 0.5 L/ha	Opus 0.5 L/ha
	GS31/32	Opus 0.50 L/ha	Radial 0.84 L/ha
	GS39	Prosaro 0.3 L/ha	Aviator Xpro 0.42 L/ha
	GS59	----	Prosaro 0.3 L/ha
		Strategic	**Tactical**
	GS00	**----**	----
	GS25	Opus 0.5 L/ha	Opus 0.5 L/ha
	GS31/32	See below	See below
	GS39	Radial 0.84 L/ha	Radial 0.84 L/ha
	GS59	Opus 0.5 L/ha	Prosaro 0.15 L/ha

Tactical and Strategic Fungicide GS31/32:

RGT Cesario	**BigRed**	**Anapurna**	**Stockdale**	**Longford**	**RGT Waugh**
Prosaro 0.3 L/ha	Prosaro 0.3 L/ha	Aviator Xpro 0.42 L/ha	Prosaro 0.3 L/ha	Prosaro 0.3 L/ha	Prosaro 0.3 L/ha

There was no significant interaction between variety and management approach on yield indicating that all varieties reacted similarly to the management strategies applied (Table 2). Stripe rust was severe in the trial and five units of fungicide were unable to arrest the development of the disease. As a consequence, in this trial RGT Cesario was significantly lower yielding than the other varieties tested. Anapurna was significantly higher yielding than all other varieties, although there was almost 1t/ha difference in yield between low and high input. When averaged over all varieties, a high input approach was significantly higher yielding than all other management approaches by an average of between 0.45 - 0.9t/ha. RGT Waugh and BigRed gave identical average yields in the trial with both varieties responding with similar yields to the extremes of management applied.

Table 2. Influence of management strategy and cultivar on grain yield (t/ha).

	Yield (t/ha)									
	Management Strategy									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT Cesario	8.81	-	9.65	-	9.03	-	8.77	-	**9.06**	**d**
BigRed	12.09	-	12.96	-	12.55	-	11.65	-	**12.31**	**b**
Anapurna	12.01	-	12.97	-	13.38	-	12.43	-	**12.70**	**a**
Stockade	11.45	-	12.55	-	11.89	-	11.85	-	**11.93**	**c**
Longford	11.83	-	12.45	-	12.07	-	11.90	-	**12.06**	**bc**
RGT Waugh	12.03	-	13.07	-	12.02	-	12.13	-	**12.31**	**b**
Mean	**11.37**	**c**	**12.27**	**a**	**11.82**	**b**	**11.45**	**bc**	**11.73**	
LSD Cultivar P=0.05			0.33		**P value**				<0.001	
LSD Management P=0.05			0.45		**P value**				0.005	
LSD Cultivar x Man. P=0.05			ns		**P value**				0.192	

Longford (AGF4818) was the most resistant variety to stripe rust infection but still showed inferior stripe rust control with tactical management based on the lower label rate of Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 150mL/ha (31.5 g ai/ha of each ai) at the head spray timing giving inferior control of disease (Figure 1). This trend for poorer disease control and yield with tactical management was also noted with Stockade and BigRed.

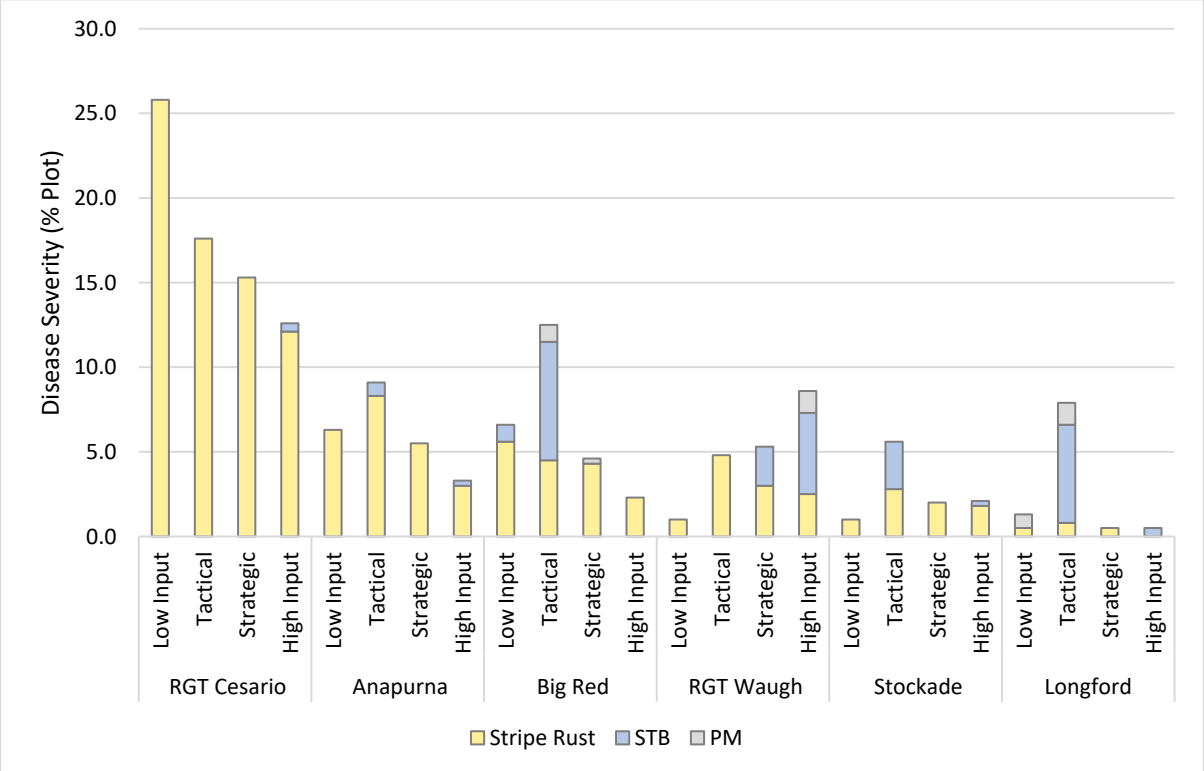

Figure 1. Influence of management strategy and cultivar on plot infection (%) of stripe rust, Septoria Tritici Blotch and Powdery Mildew, 11 October.

Higher fungicide input and variety were noted to produce small but significant differences in test weight which generally related higher test weights to higher yields (Table 3).

Table 3. Influence of management strategy and cultivar on harvest test weights (kg/hL).

	Test Weights (kg/hL)									
	Management Strategy									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT Cesario	71.8	-	72.8	-	73.6	-	73.1	-	**72.8**	**d**
BigRed	74.6	-	76.4	-	75.8	-	75.3	-	**75.6**	**c**
Anapurna	77.3	-	77.9	-	77.2	-	77.5	-	**77.5**	**a**
Stockade	75.8	-	76.9	-	77.1	-	76.2	-	**76.5**	**b**
Longford	75.3	-	76.2	-	75.5	-	75.4	-	**75.6**	**c**
RGT Waugh	75.3	-	76.5	-	75.4	-	75.4	-	**75.6**	**c**
Mean	**75.0**	**c**	**76.1**	**a**	**75.8**	**ab**	**75.5**	**bc**	**75.6**	
LSD Cultivar p = 0.05			0.5			**P value**			<0.001	
LSD Management p = 0.05			0.5			**P value**			0.006	
LSD Cultivar x Man. P = 0.05			ns			**P value**			0.407	

Although not as predisposed to lodging as RGT Accroc, BigRed had slightly higher levels of lodging than other varieties, although it should be emphasised that there were only low levels of lodging in this trial with scores below 20 on a 0 – 500 index (Figure 2) for all varieties except BigRed.

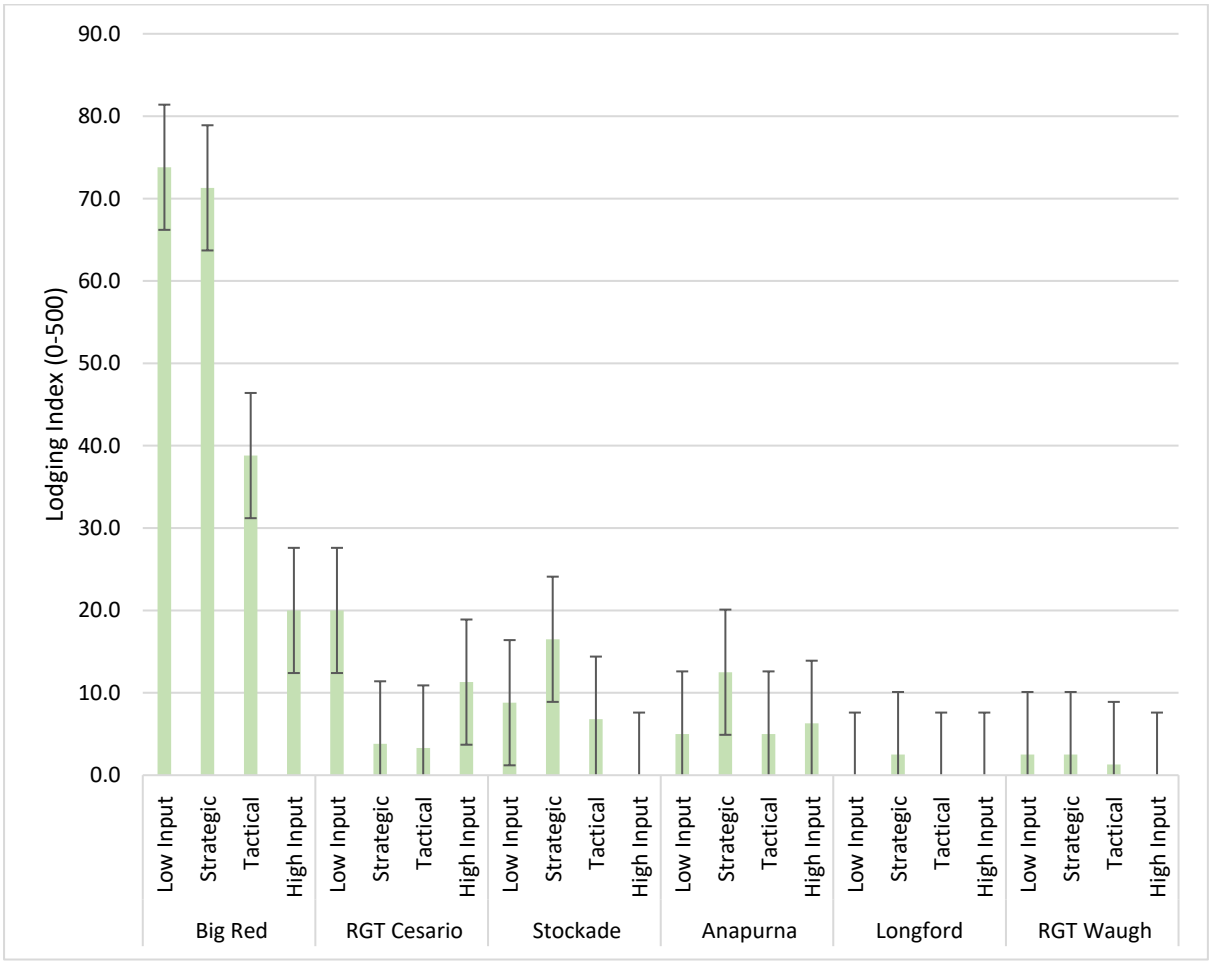

Figure 2. Influence of management strategy and cultivar on lodging index (0-500), 26 January.

The highest protein levels (over 12.5%) were produced by RGT Waugh and Anapurna with the highest levels of input producing the highest protein, however the differences in fungicide and PGR input produced only small differences (0.3%) in protein content when management approaches were compared (Table 3). In comparison variety differences produced differences that averaged 1.4% with Longford (AGF4818) producing the lowest protein levels at 11.5%. Screenings were very low in the trial with the only significant differences being due to variety (Table 4).

Table 4. Influence of management strategy and cultivar on harvest protein (%).

	Protein (%)									
	Management Strategy									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT Cesario	11.5	i	11.7	ghi	12.1	f	12.0	fg	**11.8**	**c**
BigRed	11.8	fgh	12.0	f	12.0	fg	11.6	hi	**11.9**	**c**
Anapurna	12.4	e	12.8	bc	12.7	cd	12.5	de	**12.6**	**b**
Stockade	11.7	hi	12.1	f	11.8	fgh	11.6	hi	**11.8**	**c**
Longford	11.5	i	11.5	i	11.7	ghi	11.5	i	**11.5**	**d**
RGT Waugh	12.7	cde	13.1	ab	13.1	a	12.8	cd	**12.9**	**a**
Mean	**11.9**	**b**	**12.2**	**a**	**12.2**	**a**	**12.0**	**b**	12.1	
LSD Cultivar P=0.05			0.1			**P value**			<0.001	
LSD Management P=0.05			0.2			**P value**			0.005	
LSD Cultivar x Man. P=0.05			0.3			**P value**			0.039	

Table 5. Influence of management strategy and cultivar on harvest screenings (%).

	Screenings (%)									
	Management Strategy									
	Low Input		**High Input**		**Strategic**		**Tactical**		**Mean**	
RGT Cesario	1.6	-	1.4	-	1.3	-	1.4	-	**1.5**	**c**
BigRed	2.0	-	1.6	-	1.8	-	1.7	-	**1.7**	**b**
Anapurna	1.7	-	2.0	-	2.1	-	1.7	-	**1.9**	**b**
Stockade	2.1	-	2.3	-	2.0	-	2.8	-	**2.3**	**a**
Longford	2.3	-	2.2	-	2.2	-	2.2	-	**2.2**	**a**
RGT Waugh	1.5	-	1.7	-	1.7	-	1.2	-	**1.5**	**c**
Mean	**1.9**	**-**	**1.9**	**-**	**1.8**	**-**	**1.8**	**-**	**1.8**	
LSD Cultivar P=0.05			0.2			**P value**			<0.001	
LSD Management P=0.05			ns			**P value**			0.966	
LSD Cultivar x Man. P=0.05			ns			**P value**			0.065	

Table 6. Influence of management strategy and cultivar on crop dry matter (t/ha) at maturity (GS99).

	GS99 Dry matter (t/ha)				
	Management Strategy				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
RGT Cesario	17.0 -	17.8 -	17.5 -	15.9 -	**17.1 c**
BigRed	20.4 -	21.0 -	18.8 -	19.1 -	**19.8 b**
Anapurna	23.7 -	19.1 -	19.8 -	18.8 -	**20.3 ab**
Stockade	20.5 -	22.1 -	21.1 -	20.0 -	**21.0 ab**
Longford	20.4 -	22.1 -	19.1 -	21.9 -	**20.9 ab**
RGT Waugh	21.7 -	24.4 -	20.6 -	20.9 -	**21.9 a**
Mean	**20.6 -**	**21.1 -**	**19.5 -**	**19.4 -**	
LSD Cultivar P=0.05	1.7		**P value**	<0.001	
LSD Management P=0.05	ns		**P value**	0.158	
LSD Cultivar x Man. P=0.05	ns		**P value**	0.339	

Table 7. Influence of management strategy and cultivar on harvest index (%).

	Harvest Index (%)				
	Management Strategy				
	Low Input	**High Input**	**Strategic**	**Tactical**	**Mean**
RGT Cesario	45.4 -	47.6 -	45.6 -	49.3 -	**47.0 c**
BigRed	52.1 -	54.0 -	58.5 -	49.3 -	**53.5 ab**
Anapurna	46.4 -	60.4 -	60.5 -	58.3 -	**56.4 a**
Stockade	48.8 -	50.2 -	49.6 -	52.2 -	**50.2 bc**
Longford	50.7 -	49.6 -	55.3 -	47.8 -	**50.9 b**
RGT Waugh	48.8 -	47.6 -	51.7 -	50.9 -	**49.7 bc**
Mean	**48.7 -**	**51.6 -**	**53.5 -**	**51.3 -**	
LSD Cultivar P=0.05	3.9		**P value**	<0.001	
LSD Management P=0.05	ns		**P value**	0.263	
LSD Cultivar x Man. P=0.05	ns		**P value**	0.149	

Table 8. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Aviator Xpro	Prothioconazole	150 g/L	Bixafen	75 g/L	EC
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Errex 750	Chlormequat	582 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Trial 2. HYC Wheat Disease Management (FAR TAS W23-04) cv BigRed

Key Points:

- *Grain yields of irrigated BigRed were significantly improved by fungicide input by between 0.58 – 1.59t/ha.*
- *Stripe rust was the primary driver of the productivity and financial differences amongst the five different fungicide management approaches tested.*
- *Four units of fungicide gave a yield advantage of 0.39t/ha (gross value $128/ha) over two spray approaches with the additional input of flutriafol at sowing and a third foliar spray on the head giving better stripe rust control.*
- *Two fungicides applied at GS31 and GS39 gave better stripe rust control in the lower canopy, whilst the two fungicides applied at GS33 & GS59 gave better stripe rust control in the upper canopy. There was no significant difference in grain yield between the two approaches.*

Treatments:

Five levels of fungicide management were investigated using the popular red wheat BigRed. The five levels of fungicide compared increasing the fungicide input from untreated, one unit, two units and four units of fungicide input. The five treatment levels were as follows.

1. Nil – untreated control.
2. A single flag leaf fungicide applied at GS39 – SDHI/DMI mixture Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha).
3. A two-spray (straddle) approach at GS33 (3rd node) Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha) & GS59 (head emergence) Opus 125 SC (epoxiconazole 125g/L) applied at 500mL/ha (62.5 g ai/ha).
4. A four-unit approach combining at sowing flutriafol on the MAP with three foliar sprays – GS31, GS39 and GS59 (as stated above).
5. A two-spray (standard) approach at GS31 Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) & GS39 SDHI/DMI mixture.

The five levels of fungicide produced significant differences in grain yield but had no significant effect on grain quality (Table 1). All fungicide management approaches except the one-unit approach significantly out yielded the untreated by between 0.51 and 1.4t/ha. There was no statistically significant difference between two and four units of fungicide although the higher input (4F full protection) was the higher yielding, and unlike the two spray approaches was significantly better than one unit of fungicide. The 0.34t/ha advantage of four units over two sprays at GS31 & GS39 valued at $300/t would be $102/ha giving an economic advantage to the higher input approach once the extra foliar fungicide and flutriafol on the MAP was accounted for.

Table 1. Influence of fungicide strategy on grain yield (t/ha) and grain quality (protein (%), test weight (kg/hL) and screenings (%) cv BigRed.

	Grain Yield and Quality			
Treatment	**Yield t/ha**	**Protein %**	**Test Weight kg/hL**	**Screenings %**
Untreated	10.42 c	11.2 -	73.1 -	2.0 -
1F	11.00 bc	11.3 -	73.3 -	1.9 -
2F Straddle	11.46 ab	11.8 -	72.9 -	1.9 -
4F Full Protection	12.01 a	11.4 -	74.1 -	1.9 -
2F Standard	11.62 ab	11.2 -	73.2 -	1.6 -
Mean	11.30	11.4	73.3	1.9
P Value	0.002	0.168	0.841	0.374
LSD P=0.05	0.65	ns	ns	ns

Stripe rust was the primary disease driving the productivity and financial differences (Table 2 & Figure 1) with greater fungicide input associated with better stripe rust control and green leaf retention at mid grain fill. Comparison of disease infection levels show that the two-spray standard gave better control of early stripe rust infection than the two-spray straddle which started at GS33. In contrast, the 2-spray straddle approach combining a flag and head target for the fungicide was more effective later in the season.

Table 2. Influence of fungicide strategy on disease infection severity (Stripe rust (YR) leaf area infected (LAI) at GS39 and GS80 and green leaf retention (GLR) at GS80).

	Flag	**Flag-1**	**Flag-2**	**Flag-3**	**Flag**	**Flag-1**	**Flag-2**
Treatment	**YR %LAI GS39**	**YR %LAI GS39**	**YR %LAI GS39**	**YR %LAI GS39**	**YR %LAI GS80**	**YR %LAI GS80**	**GLR %LA GS80**
Untreated	0.4 a	4.7 a	4.9 -	8.2 a	41.4 a	69.8 a	4.0 b
1F	---	---	---	---	3.2 bc	43.3 b	9.1 b
2F Straddle	0.0 b	0.9 b	2.6 -	4.9 ab	8.5 b	9.2 c	15.4 ab
4F Full Protection	0.0 b	2.1 b	2.1 -	1.1 b	1.0 c	9.9 c	28.6 a
2F Standard	0.0 b	1.2 b	1.8 -	1.4 b	3.3 bc	18.8 c	17.1 ab
Mean	0.1	2.2	2.9	3.9	11.5	30.2	14.9
P Value	0.015	0.001	0.065	0.007	<0.001	<0.001	0.006
LSD P=0.05	0.2	1.5	ns	3.8	4.4	10.1	11.5

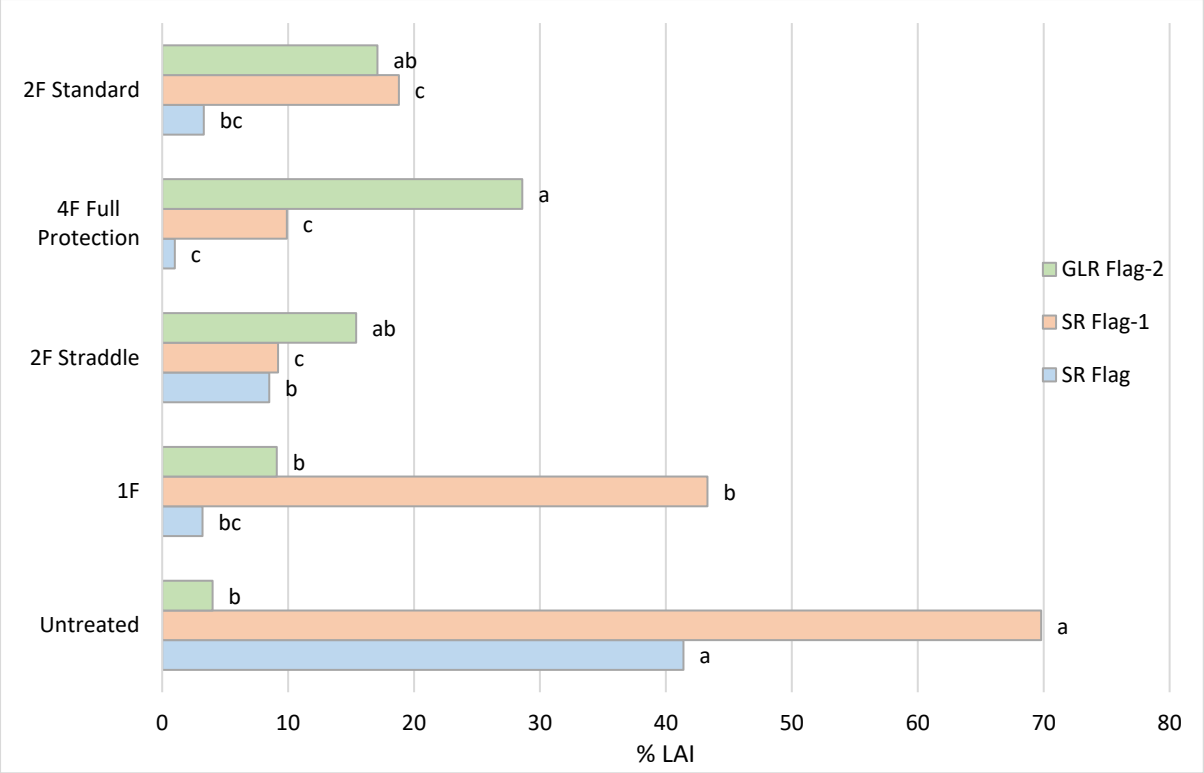

Figure 1: Influence of fungicide strategy on disease infection severity (%LAI) and Green leaf index (Stripe rust (SR) and Green leaf retention (GLR) at GS80)

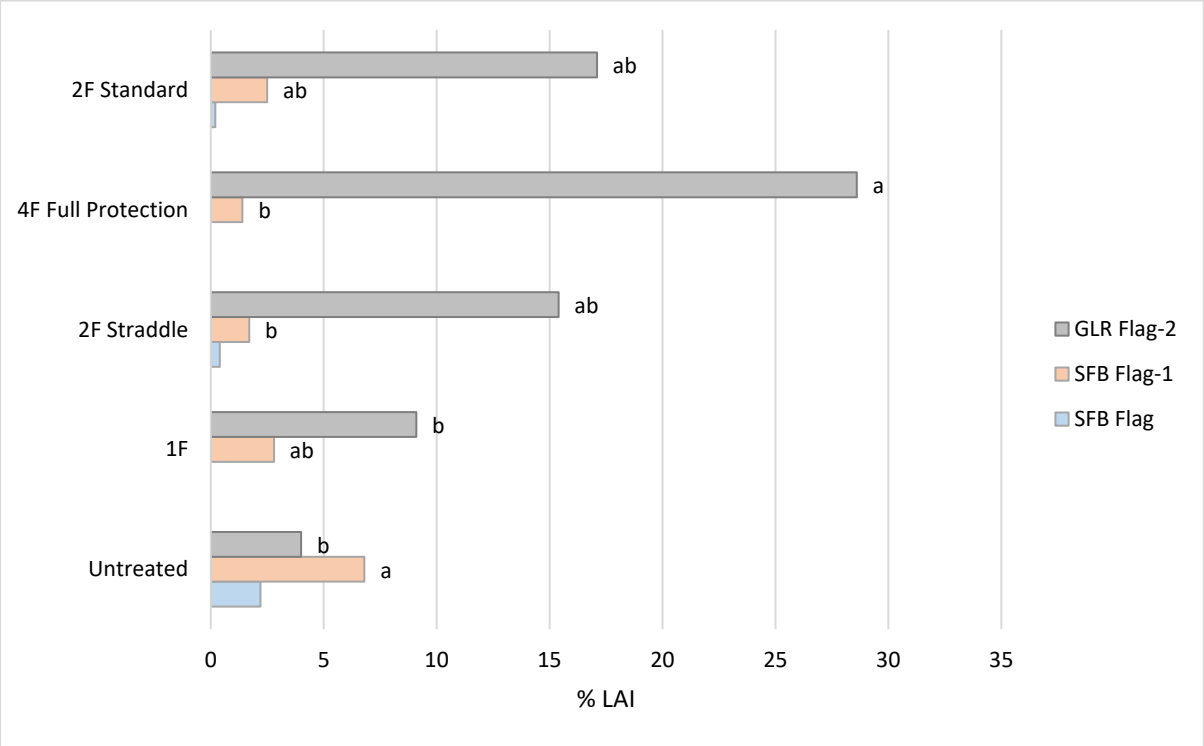

Figure 2. Influence of fungicide strategy on disease infection severity and Green leaf index (Septoria tritici blotch (STB) and Green leaf retention (GLR) at GS80)

Table 3. Trial input and management details.

Sowing date:		**26 April 2023**
Harvest date:		**25 January 2024**
Variety:		BigRed
Seed rate:		180 seeds/m^2
Basal fertiliser:	26 Apr	100 kg/ha MAP
Nitrogen:	28 Jul	46kg N/ha
	29 Aug	92kg N/ha
Fungicides:		As per treatment list

Table 4. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC

Trial 3. HYC Wheat Disease Management x Variety (FAR TAS W23-04a)

Key points:

- *There was a significant interaction between cultivar and fungicide management for grain yield with no significant yield differences between untreated, one and four units of fungicide with Longford (AGF4818) (0.30t/ha difference) and a 2.22t/ha yield advantage to four units over untreated with RGT Cesario.*
- *Both Stockade and AGTW005 gave a significant and cost-effective return from increasing fungicide input from one to four units of fungicide, but the differences were not as great as those observed with RGT Cesario.*
- *The primary driver of the yield differences where they occurred was due to stripe rust infection.*

Treatments:

A similar experiment was run to FAR TAS W23-04 looking at the grain yield response of three red feed winter wheats Longford (AGF4818), RGT Cesario, AGTW005 and the white wheat Stockade (APW). There were managed with three levels of fungicide, untreated, a single flag leaf spray and full protection based on four units of fungicide. The aim being to understand whether looking purely at fungicide any current variety could be farmed with no fungicide or only one unit of fungicide in an irrigated long season high rainfall zone region.

- **Untreated**.
- **1 Fungicide** single flag leaf spray (GS39) – 1 unit of fungicide.
- **4 fungicides** Full protection – flutriafol-coated MAP in furrow at sowing (500 g ai/L at 200 mL/ha), Prosaro 420 SC (prothioconazole 210g/L, tebuconazole 210g/L) applied at 300mL/ha (63g ai/ha of each ai) at GS31, Revystar 150EC (mefentrifluconazole 100g/L, fluxapyroxad 50g/L) applied at 750mL/ha (75g ai/ha & 37.5g ai/ha) at GS39 and Opus 125SC applied at 500 mL/ha (62.5g ai/ha) at GS59 – 4 units of fungicide.

Differential stripe rust infection resulted in a significant interaction between variety and fungicide input with the more stripe rust resistant variety giving no significant difference in yield between untreated and four units of fungicide (Table 1 & Figure 1).

Table 1. Influence of management strategy and cultivar on grain yield (t/ha).

	Yield (t/ha)			
	Management Strategy			
	Untreated	**1 Fungicide**	**4 Fungicides**	**Mean**
Stockade	11.20 cd	11.74 bc	12.39 a	**11.78 a**
RGT Cesario	5.12 h	6.74 g	8.34 f	**6.73 c**
AGTW005	10.42 e	11.02 d	11.67 bc	**11.04 b**
Longford	11.84 ab	11.72 bc	12.14 ab	**11.90 a**
Mean	**9.64 c**	**10.30 b**	**11.13 a**	**10.36**
LSD Cultivar P=0.05		0.34	**P value**	<0.001
LSD Management P=0.05		0.59	**P value**	0.003
LSD Cultivar x Man. P=0.05		0.59	**P value**	<0.001

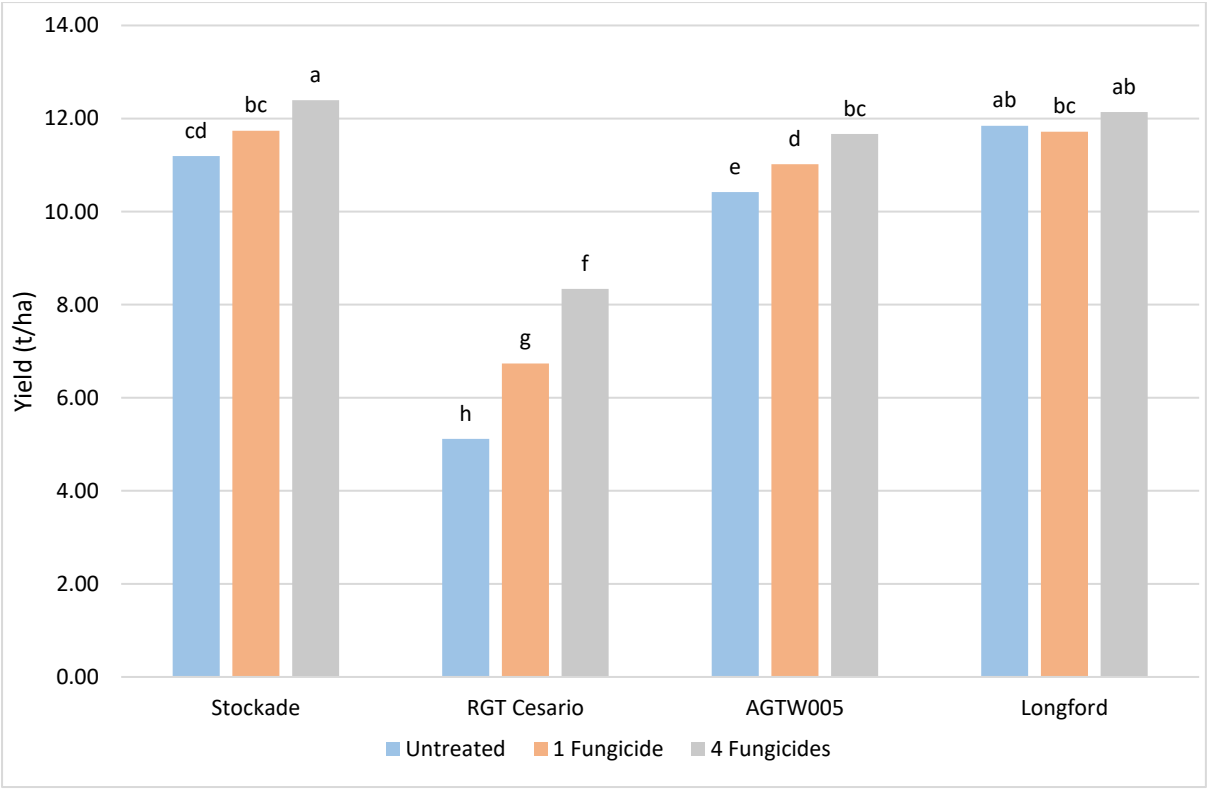

Figure 1. Interaction of cultivar and fungicide on grain yield (t/ha) ($p < 0.001$, LSD = 0.59t/ha).

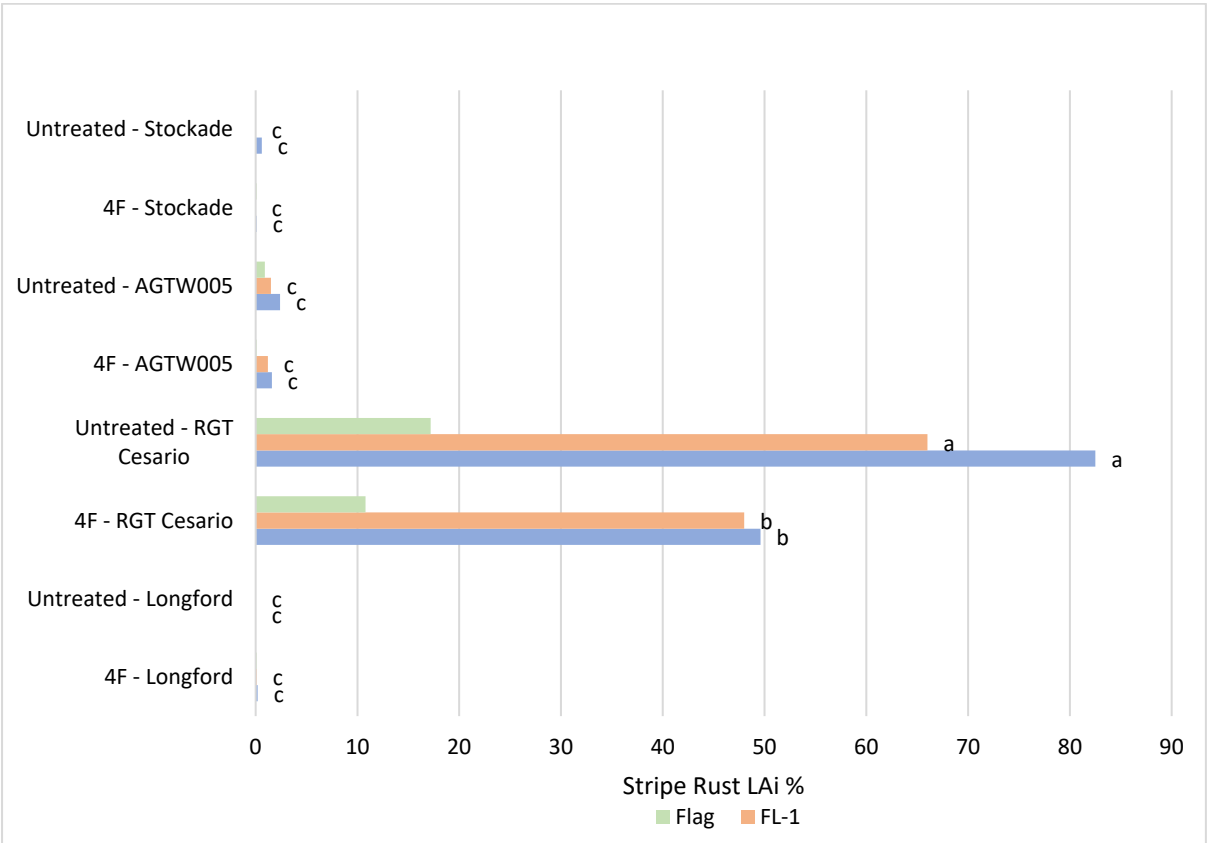

Figure 2. Influence of fungicide management strategy and cultivar on Flag, F-1 and F-2 leaf area infection (%) Stripe Rust assessed 14 November (GS39). Refer to Table 2 for significance.

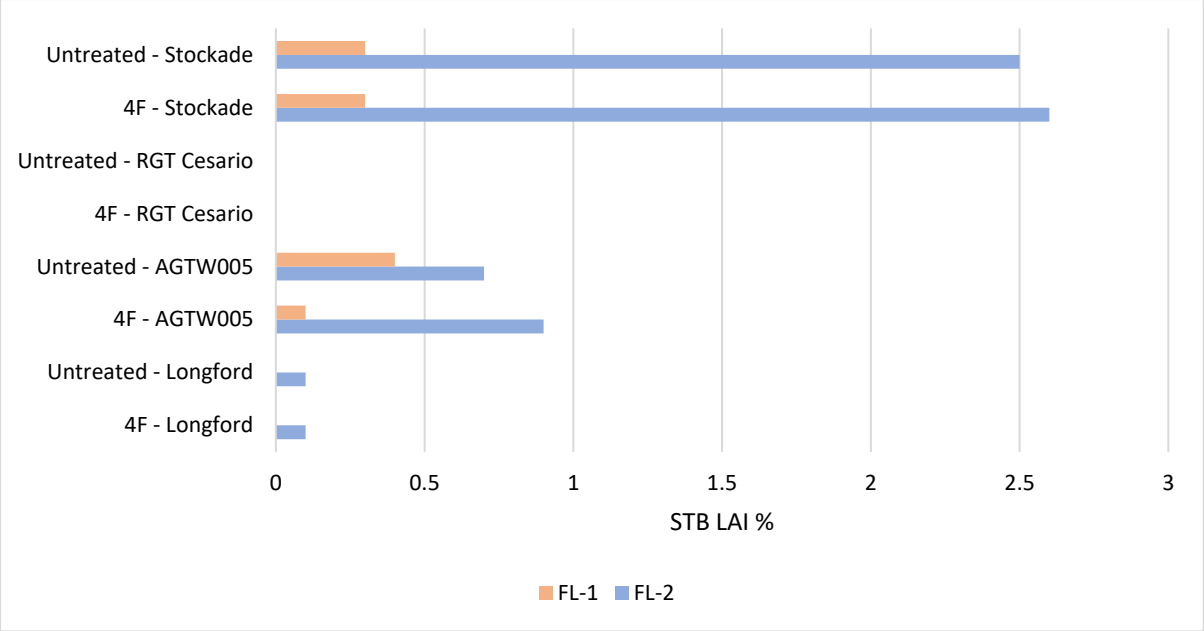

Figure 3. Influence of fungicide management strategy and cultivar on Flag, F-1 and F-2 leaf area infection (%) Septoria tritici blotch (STB) assessed 14 November (GS39). Refer to Table 2 for significance.

Table 2. Significance analysis of the influence of management strategy and cultivar on leaf area infection (%) of septoria tritici blotch (STB), stripe rust and, green leaf retention (See Figure 2 and 3).

			P Value	LSD P=0.05
Septoria tritici blotch	**Flag**	**Cultivar**	1.000	ns
		Management	1.000	ns
		Cultivar x Man.	1.000	ns
	Fl-1	**Cultivar**	0.134	ns
		Management	0.385	ns
		Cultivar x Man.	0.657	ns
	FL-2	**Cultivar**	0.001	1.0
		Management	0.881	ns
		Cultivar x Man.	0.998	ns
Stripe rust	**Flag**	**Cultivar**	<0.001	2.3
		Management	0.081	ns
		Cultivar x Man.	0.082	ns
	FL-1	**Cultivar**	<0.001	3.8
		Management	0.009	3.3
		Cultivar x Man.	<0.001	6.6
	FL-2	**Cultivar**	<0.001	6.9
		Management	0.009	6.0
		Cultivar x Man.	0.001	12
Green Leaf Retention	**FL-3**	**Cultivar**	<0.001	8.2
		Management	0.071	ns
		Cultivar x Man	0.701	ns

Table 3. Influence of management strategy and cultivar on protein (%).

	Protein (%)			
	Management Strategy			
	Untreated	**1 Fungicide**	**4 Fungicides**	**Mean**
Stockade	11.6 -	11.5 -	11.7 -	11.6 -
RGT Cesario	11.6 -	12.2 -	11.4 -	11.7 -
AGTW005	11.5 -	12.2 -	11.2 -	11.6 -
Longford	11.8 -	12.0 -	11.7 -	11.8 -
Mean	**11.6 -**	**12.0 -**	**11.6 -**	11.7
LSD Cultivar P=0.05		ns	**P value**	0.505
LSD Management P=0.05		ns	**P value**	0.188
LSD Cultivar x Man. P=0.05		ns	**P value**	0.225

Note: 150 N kg/ha of applied nitrogen fertiliser as solid prilled 46% N urea

There was a significant interaction between variety and fungicide input on test weight (Table 4). Where fungicide input had little effect on grain yield it had little effect on test weight

Table 4. Influence of management strategy and cultivar on test weight (kg/hL).

	Test weight (kg/hL)			
	Management Strategy			
	Untreated	**1 Fungicide**	**4 Fungicides**	**Mean**
Stockade	74.6 bc	75.4 ab	76.5 a	75.5 a
RGT Cesario	62.5 f	66.9 e	71.6 d	67.0 c
AGTW005	73.3 cd	73.1 cd	74.4 bc	73.6 b
Longford	73.9 bc	73.3 cd	74.1 bc	73.8 b
Mean	**71.1 b**	**72.2 b**	**74.1 a**	72.5
LSD Cultivar P=0.05		1.089	**P value**	<0.001
LSD Management P=0.05		1.137	**P value**	0.002
LSD Cultivar x Man. P=0.05		1.887	**P value**	<0.001

Table 5. Influence of management strategy and cultivar on screenings (%).

	Screenings (%)			
	Management Strategy			
	Untreated	**1 Fungicide**	**4 Fungicides**	**Mean**
Stockade	2.3 -	2.1 -	2.0 -	2.1 ab
RGT Cesario	2.9 -	2.3 -	1.6 -	2.3 a
AGTW005	1.5 -	1.6 -	1.2 -	1.4 c
Longford	1.9 -	1.8 -	2.0 -	1.9 b
Mean	2.2 -	1.9 -	1.7 -	1.9
LSD Cultivar P=0.05		0.39	**P value**	0.001
LSD Management P=0.05		ns	**P value**	0.066
LSD Cultivar x Man. P=0.05		ns	**P value**	0.142

Table 6. Trial input and management details.

Sowing date:		**26 April 2023**
Harvest date:		**26 January 2024**
Varieties:		Stockade, RGT Cesario, AGTW005 & Longford
Seed rate:		180 seeds/m^2
Basal fertiliser:	26 Apr	100 kg/ha MAP
Nitrogen:	28 Jul	46kg N/ha
	29 Aug	92kg N/ha
Fungicides:		As per treatment list

Table 7. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Flutriafol	Flutriafol	500 g/L	---	---	SC
Opus	Epoxiconazole	125 g/L	---	---	SC
Prosaro	Prothioconazole	210 g/L	Tebuconazole	210 g/L	SC
Revystar	Mefentrifluconazole	100 g/L	Fluxapyroxad	50 g/L	EC

Trial 4. Nutrition for Hyper Yielding Wheat (FAR TAS W23-05) cv Stockade

Key points:

- *There was no significant positive response to applied nitrogen fertiliser.*
- *Applied nitrogen input higher than 120kg N/ha only served to reduce yield, although the reduction in yield was not statistically significant until the N applied exceeded 200kg N/ha (240 & 280 N applied).*
- *With 110kg N/ha in the soil 0 – 60cm on 11 July the zero N treatment (only 10kg N/ha MAP applied) yielded 11.55t/ha with a protein of 10.9% indicating the presence of 221kg N/ha in grain.*
- *If 75% of the N is assumed to be in the grain and 25% in the straw residue then the total N uptake at harvest in zero N plots would be approximately 294kg N/ha.*
- *With 10kg N/ha from the MAP and approximately 100kg N/ha in the soil in July it would indicate that 184kg N/ha came from deeper in the soil profile and or mineralization through the course of the season.*
- *There were no differences in grain protein, test weight and screenings, although there was a trend for increased N applied to increase grain protein up to a level of 160 N.*

Table 1. Treatment list and timings.

	Treatment Name	Sowing	GS30	GS32	GS39
		MAP kg/ha	N kg/ha	N kg/ha	N kg/ha
1	**Untreated**	100	0	0	
2	**80**	100	40	40	
3	**120**	100	60	60	
4	**160**	100	80	80	
5	**200**	100	100	100	
6	**240**	100	120	120	
7	**280**	100	140	140	
8	**200 3-split**	100	80	80	40
9	**120 + OM****	100 + 3 tonnes chicken manure	60	60	
10	**120 + PKS***	100 + PKS content to match OM	60	60	

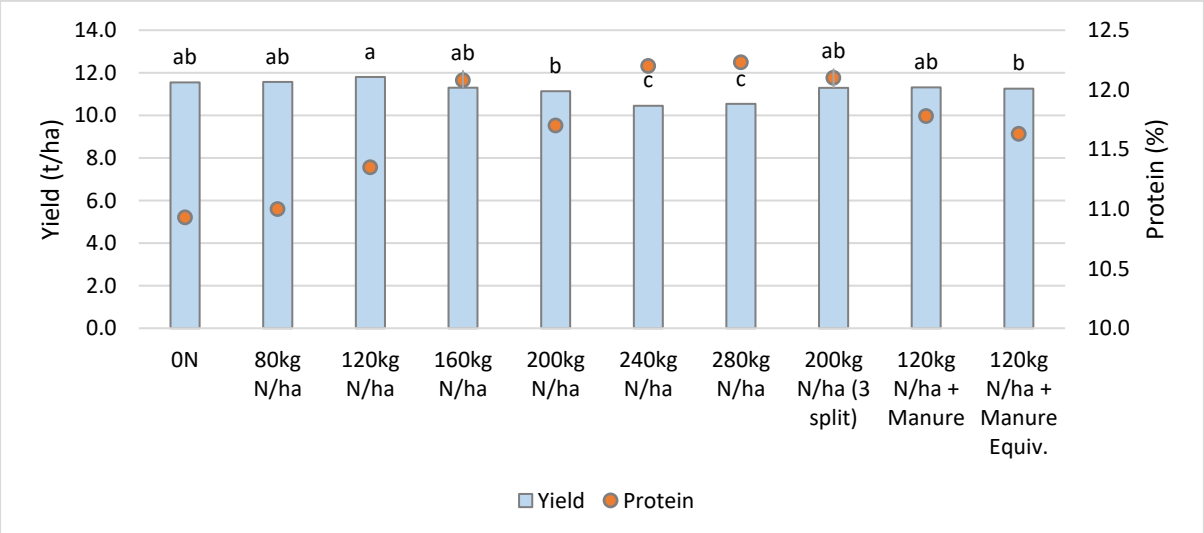

Figure 1. Influence of nutrition strategy on grain yield (t/ha) and protein content (%), harvested 26 January 2023.

Table 2. Influence of nutrition strategy on wheat grain yield (t/ha) and grain quality (Protein (%), test weight (kg/hL), and screenings (%)).

	Grain Yield and Quality			
Treatment	**Yield t/ha**	**Protein %**	**Test Weight kg/hL**	**Screenings %**
0N	11.55 ab	10.9 d	75.9 a	2.6 -
80kg N/ha	11.57 ab	11.0 cd	76.5 a	2.7 -
120kg N/ha	11.81 a	11.4 bcd	75.6 ab	3.1 -
160kg N/ha	11.30 ab	12.1 ab	75.3 abc	2.5 -
200kg N/ha	11.13 b	11.7 a-d	75.2 abc	2.7 -
240kg N/ha	10.45 c	12.2 a	74.5 bc	2.8 -
280kg N/ha	10.54 c	12.2 a	74.1 c	3.1 -
200kg N/ha (3 split)	11.29 ab	12.1 ab	75.3 abc	2.6 -
120kg N/ha + Manure	11.32 ab	11.8 abc	76.3 a	2.6 -
120kg N/ha + Manure Equiv.	11.25 b	11.6 a-d	76.2 a	2.9 -
Mean	11.22	11.7	75.5	2.8
LSD (P=0.05)	0.55	0.8	1.5	ns
P Value	<0.001	0.024	0.040	0.376

Table 3. Influence of nutrition strategy on crop height (cm), head count (m^2), crop dry matter at maturity (t/ha) and harvest index (%).

Treatment	**Height cm**	**Heads m^2**	**GS99 Dry matter t/ha**	**Harvest Index %**
0N	98.3 -	627.3 -	27.3 -	37.9 -
80kg N/ha	98.3 -	515.9 -	22.8 -	44.3 -
120kg N/ha	98.3 -	593.9 -	26.2 -	37.8 -
160kg N/ha	99.6 -	557.8 -	23.0 -	43.7 -
200kg N/ha	99.2 -	536.4 -	21.5 -	51.5 -
240kg N/ha	97.9 -	548.0 -	22.3 -	43.4 -
280kg N/ha	99.2 -	544.4 -	23.5 -	40.6 -
200kg N/ha (3 split)	96.7 -	495.5 -	21.6 -	45.2 -
120kg N/ha + Manure	100.0 -	615.9 -	25.9 -	38.0 -
120kg N/ha + Manure Equiv.	99.2 -	605.4 -	25.1 -	40.8 -
Mean	98.7	23.9	564.0	42.3
LSD (P=0.05)	ns	ns	ns	ns
P Value	0.120	0.279	0.597	0.533

Table 4. Analysis of chicken manure composition (Applied at 3t/ha, treatment 9).

Analyte	Unit	Result
Sodium (total)	mg/kg	5,400
Total Nitrogen (Combustion)	%	2.80
Total Carbon (combustion)	%	36.00
C:N Ratio		13.00
Nitrate Nitrogen	mg/kg	<50
Chloride	%	0.51
Moisture	%	40.4
Ammonium Nitrogen	mg/kg	1,100.0
pH (1:5 Water)		7.3
pH (1:5 CaCl2)		7.1
Electrical Conductivity (1:5 water)	dS/m	6.98
Dry Matter	%	59.6
Manganese (total)	mg/kg	680.0
Iron (total)	mg/kg	5,700
Copper (total)	mg/kg	150.0
Zinc (total)	mg/kg	430.0
Boron (total)	mg/kg	25.0
Phosphorus (water soluble)	mg/kg	2,800
Potassium (water soluble)	mg/kg	13,000
Calcium (water soluble)	mg/kg	530
Magnesium (water soluble)	mg/kg	570
Sulphur (water soluble)	mg/kg	2,100
Boron (water soluble)	mg/kg	16.00
Zinc (water soluble)	mg/kg	45.00
Manganese (water soluble)	mg/kg	32.00
Copper (water soluble)	mg/kg	19.00
Iron (water soluble)	mg/kg	130.00
Sodium (water soluble)	mg/kg	3,900
Phosphorus (total)	mg/kg	10,000
Potassium (total)	mg/kg	18,000
Calcium (total)	mg/kg	21,000
Magnesium (total)	mg/kg	6,300
Sulphur (Total)	mg/kg	5,200
Molybdenum (water soluble)	mg/kg	5.00

Table 5. Trial input and management details.

Sowing date:		**26 April 2023**
Harvest date:		**26 January 2024**
Variety:		Stockade
Seed rate:		180 seeds/m^2
Basal fertiliser:	26 Apr	100 kg/ha MAP
Nitrogen:		As per treatment list
PGR:	GS31	Moddus Evo 0.20 L/ha & Errex 1.3 L/ha
Fungicides:	GS31	Opus 0.50 L/ha
	GS39	Radial 0.84 L/ha
	GS59-61	Opus 0.50 L/ha

Table 6. Active ingredients and chemical loading (g/L) for products used.

Name	**Active 1**		**Active 2**		**Type**
Fungicide					
Opus	Epoxiconazole	125 g/L	---	---	SC
Radial	Azoxystrobin	75 g/L	Epoxiconazole	75 g/L	EC
PGR					
Errex 750	Chlormequat	582 g/L	---	---	SL
Moddus Evo	Trinexapac-ethyl	250 g/L	---	---	DC

Appendix. HYC Wheat TAS Crop Technology Centre

The following details apply to all Tasmanian wheat trials unless specified differently.

Table 1. Overall inputs

	Date applied	Product
Herbicide:	07 Jun	Mateno complete
	20 Jun	Paradigm 37.5 g
		LVE Polo 0.9L
		Clop 750 90g
		Hasten 2.25L
Irrigation:	27-Oct	15mm
	9-Nov	27mm
	25-Nov	25mm
	9-Dec	25mm

Table 2. Active ingredients and chemical loading (g/L) for products used.

	Active 1		Active 2		Active 3		Type
Herbicide							
Paradigm	Arylex active	200 g/kg	florasulam	200 g/kg	---	---	GC
LVE Polo	MCPA	570 g/L	---	---	---	---	EC
Clop 750	Clopyralid	750 g/L	---	---	---	---	SG
Mateno complete	Aclonifen	400 g/L	Diflufenican	66 g/L	Pyroxasul-fone	100 g/L	SC
Adjuvant							
Hasten	Ethyl and Methyl Esters of Canola Oil Fatty Acids	704 g/L	Non-ionic Surfactants	196 g/L	---	---	

Meteorological Data

NSW Crop Technology Centre- Wallendbeen, New South Wales

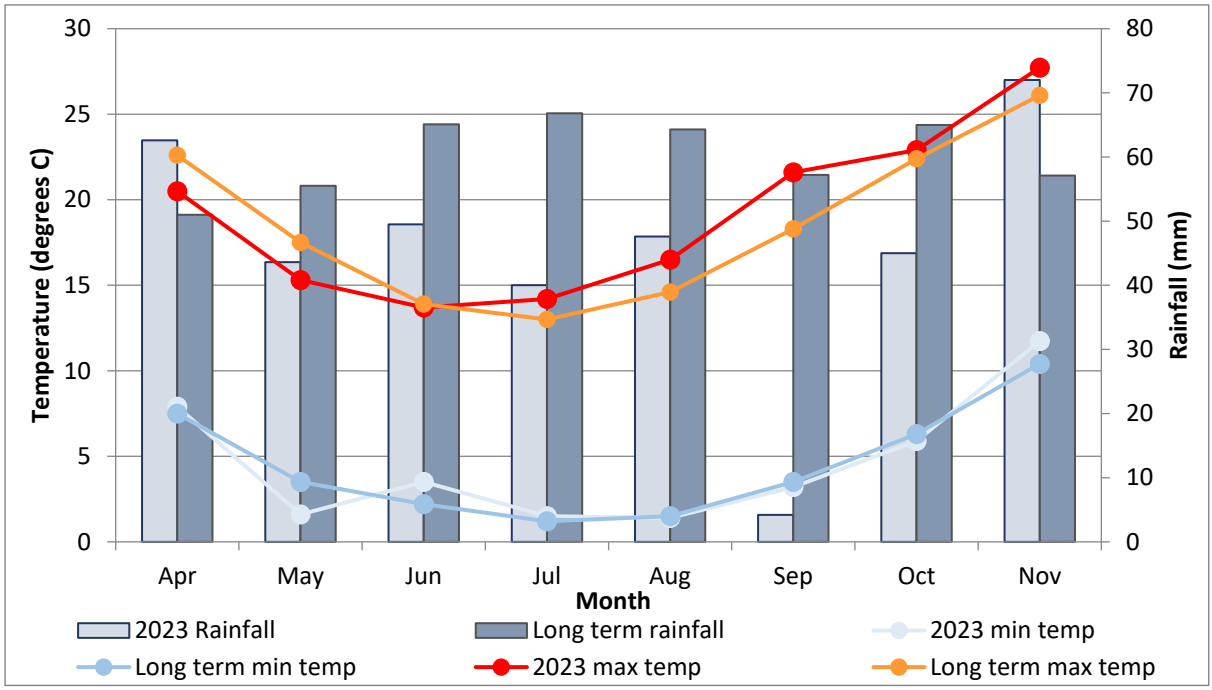

Figure 1. 2023 growing season rainfall and long-term rainfall recorded at Wallendbeen (Corang) (1914 -2023) and long-term min and max temperatures recorded at Cootamundra Airport (1995 to 2023) for the growing season (April to November). *Rainfall April to November = 364.5mm.*

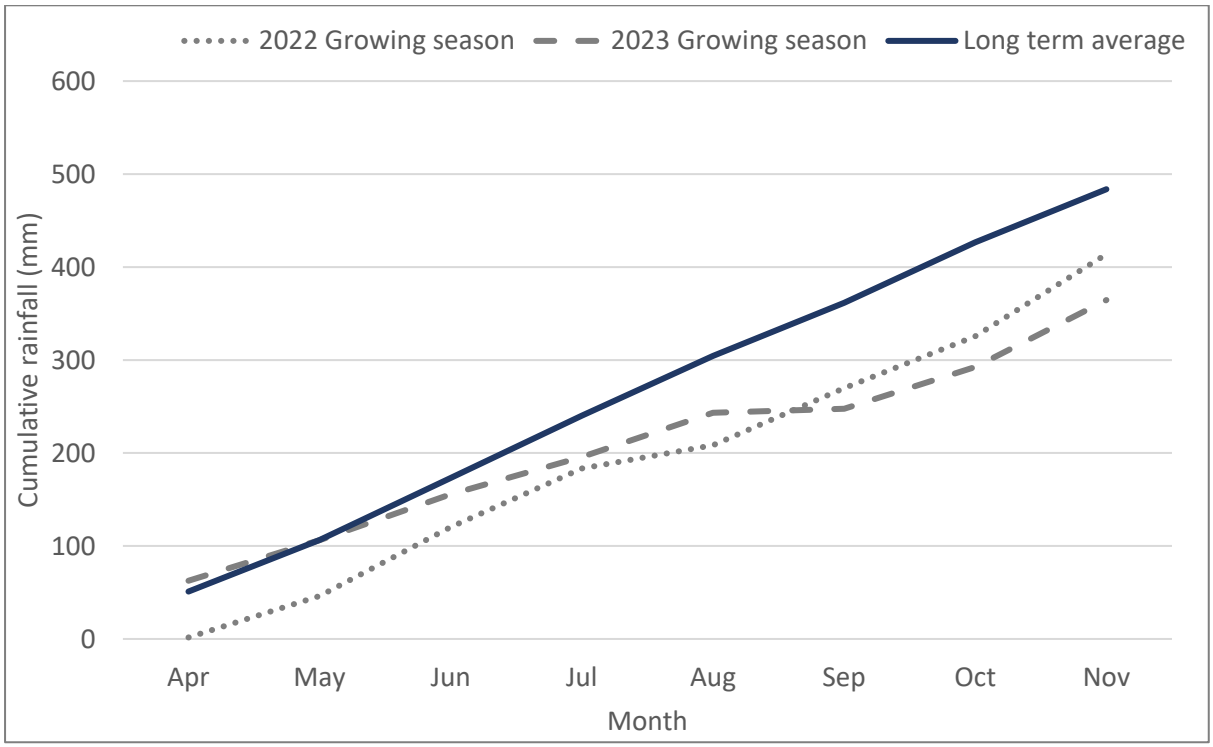

Figure 2. Cumulative growing season rainfall for 2022, 2023 and the long-term average for the growing season (April-November).

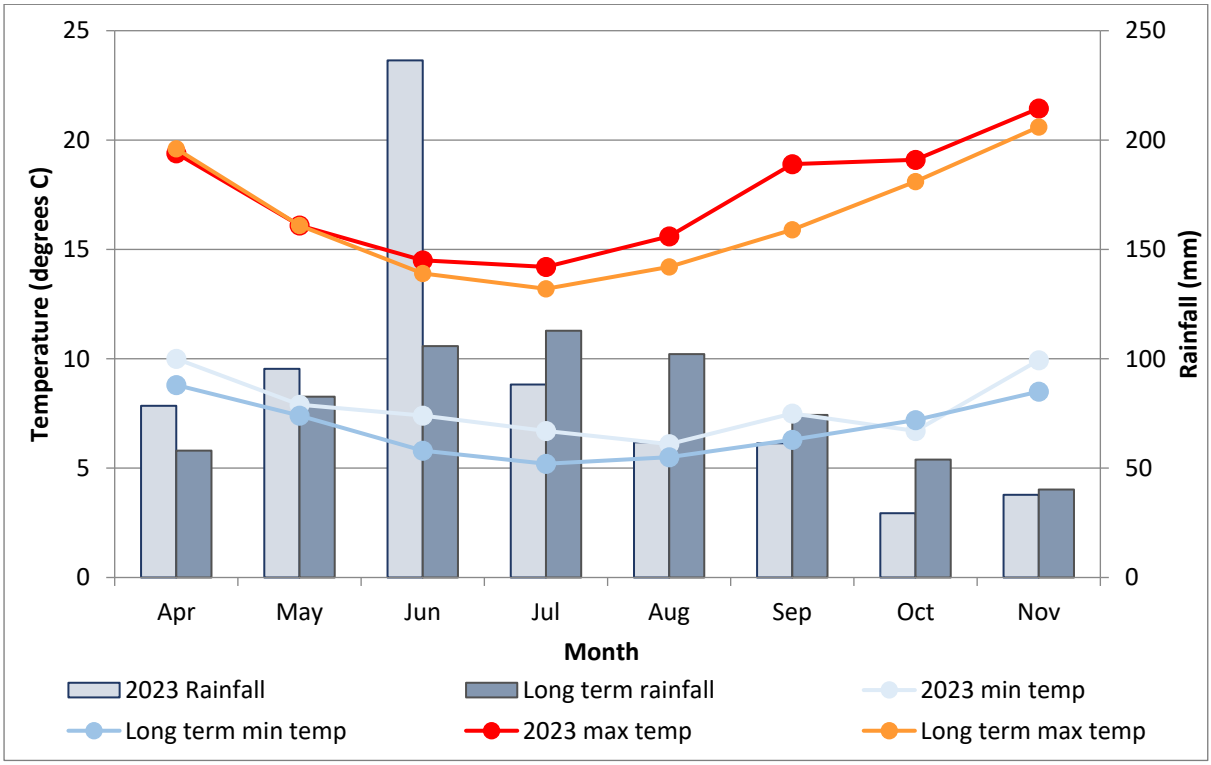

Figure 1. 2023 growing season rainfall and long-term rainfall recorded at Millicent (1878-2023). 2023 min and max temperatures, and long-term temperatures recorded at Mount Gambier (1942-2023). *Growing season rainfall April to October= 689 mm.*

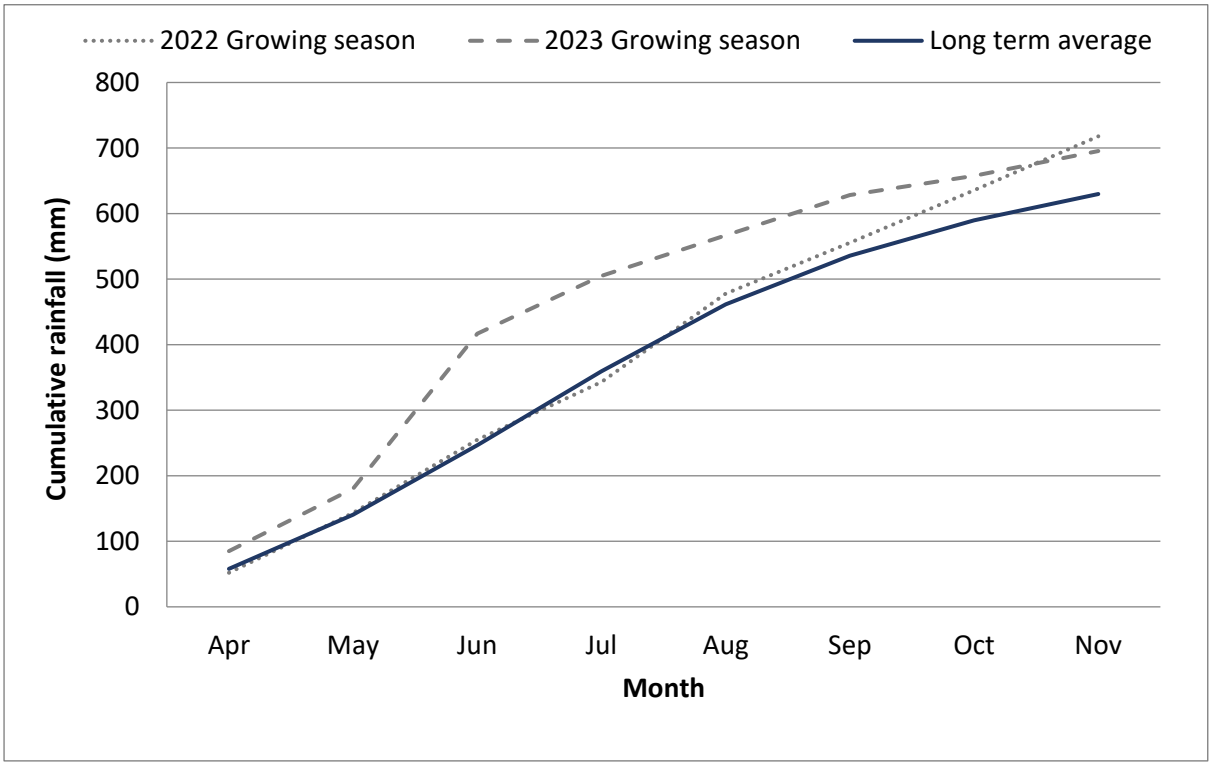

Figure 2. Cumulative growing season rainfall for 2022, 2023 and the long-term average for the growing season (April- November).

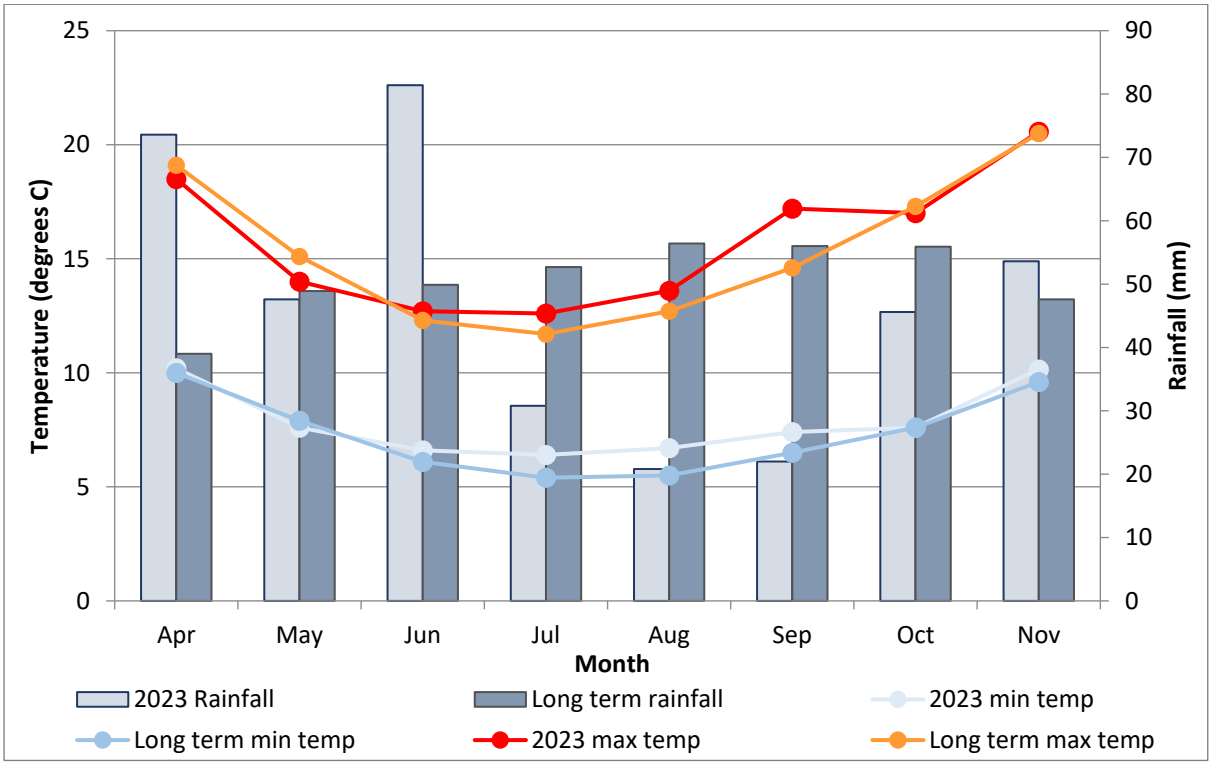

Figure 1. 2023 growing season rainfall and long-term rainfall recorded at Winchelsea Post Office (1898 -2023) and long-term min and max temperatures recorded at Mount Gellibrand (2000 to 2023) for the growing season (April to November). *Rainfall April to November = 375.4mm.*

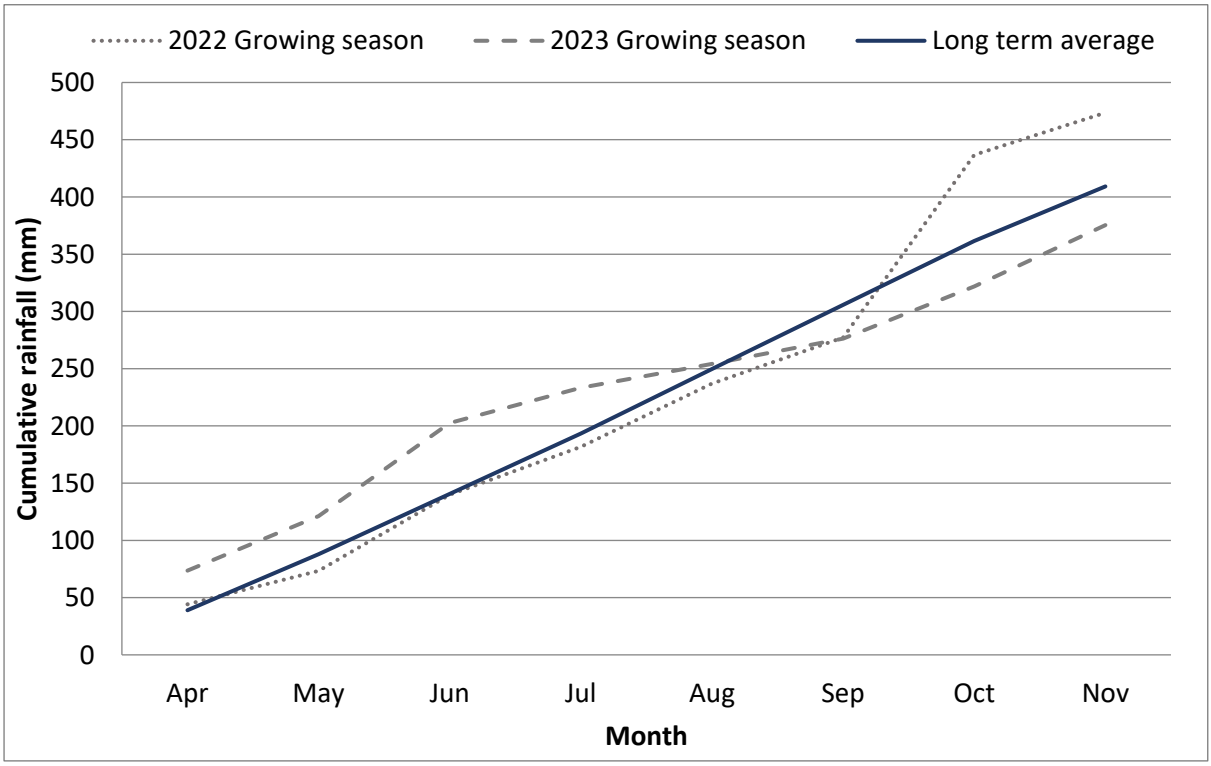

Figure 2. Cumulative growing season rainfall for 2022, 2023 and the long-term average for the growing season (April-November).

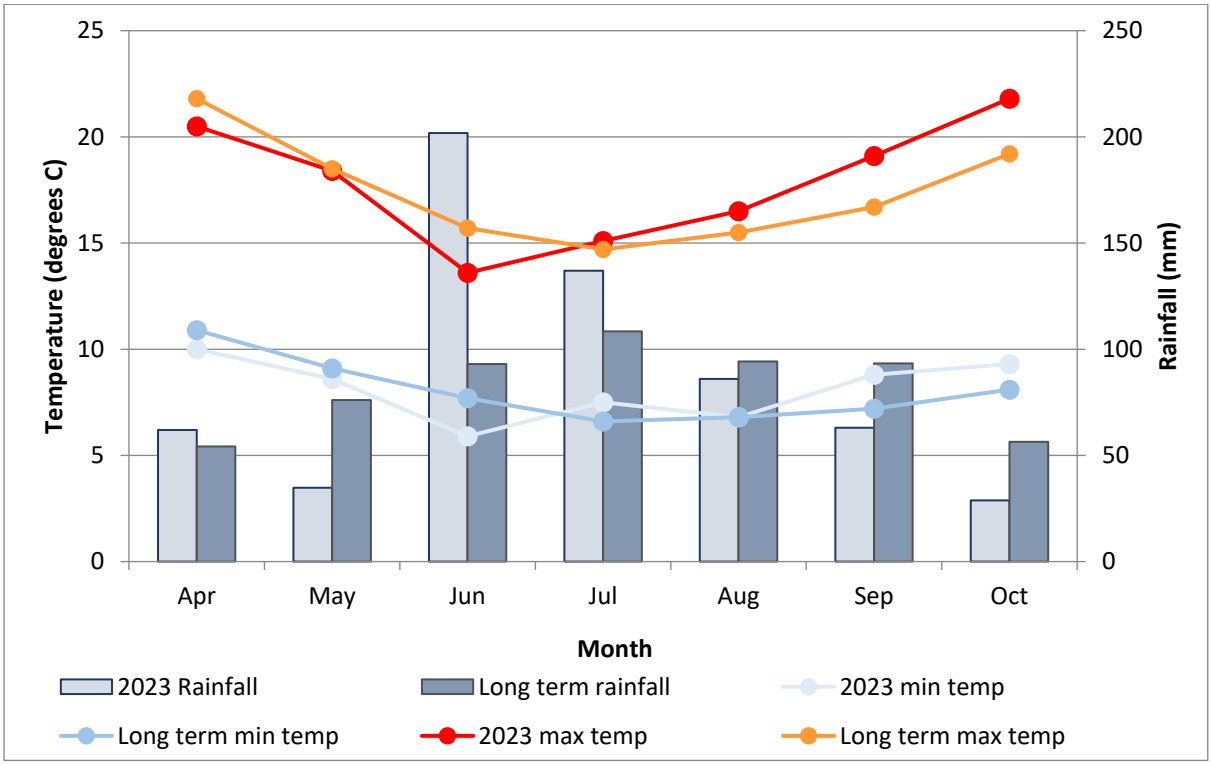

Figure 1. 2023 growing season rainfall, long-term rainfall, 2023 min and max temperatures, and long-term temperatures recorded at Rocky Gully (1996-2023). *Growing season rainfall April to October= 613 mm.*

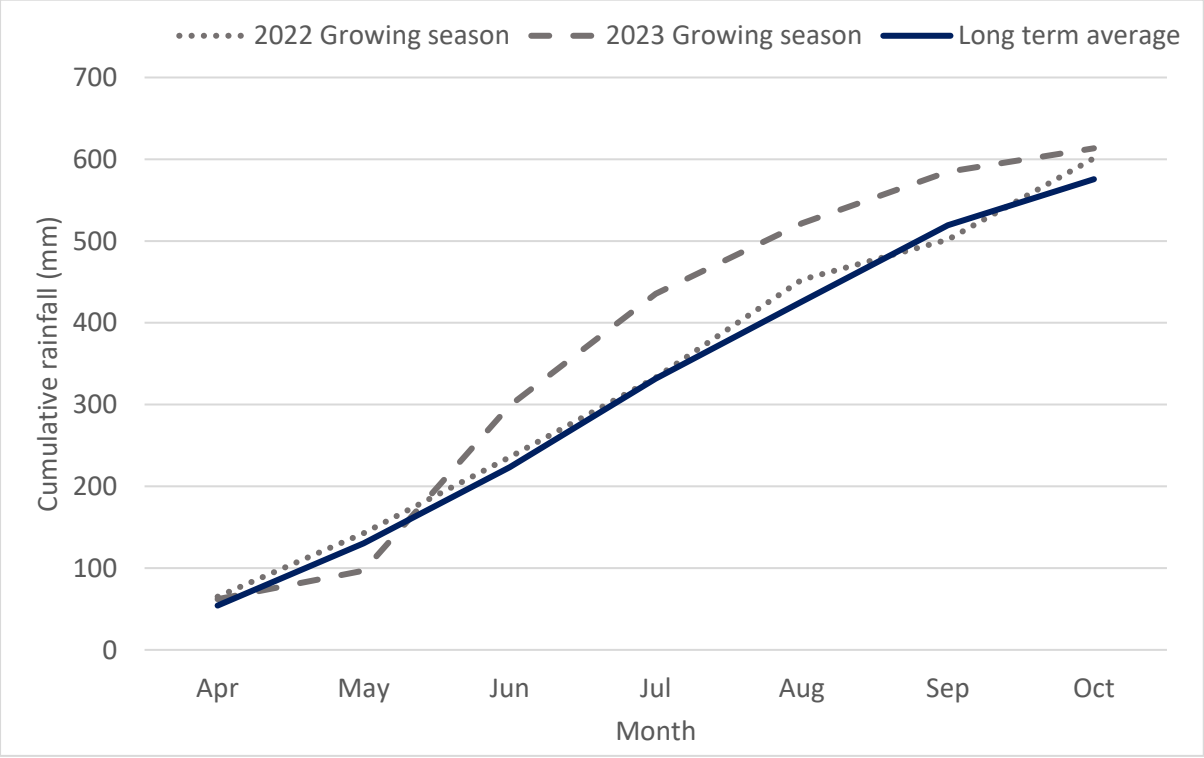

Figure 2. Cumulative growing season rainfall for 2022, 2023 and the long-term average for the growing season (April-October).

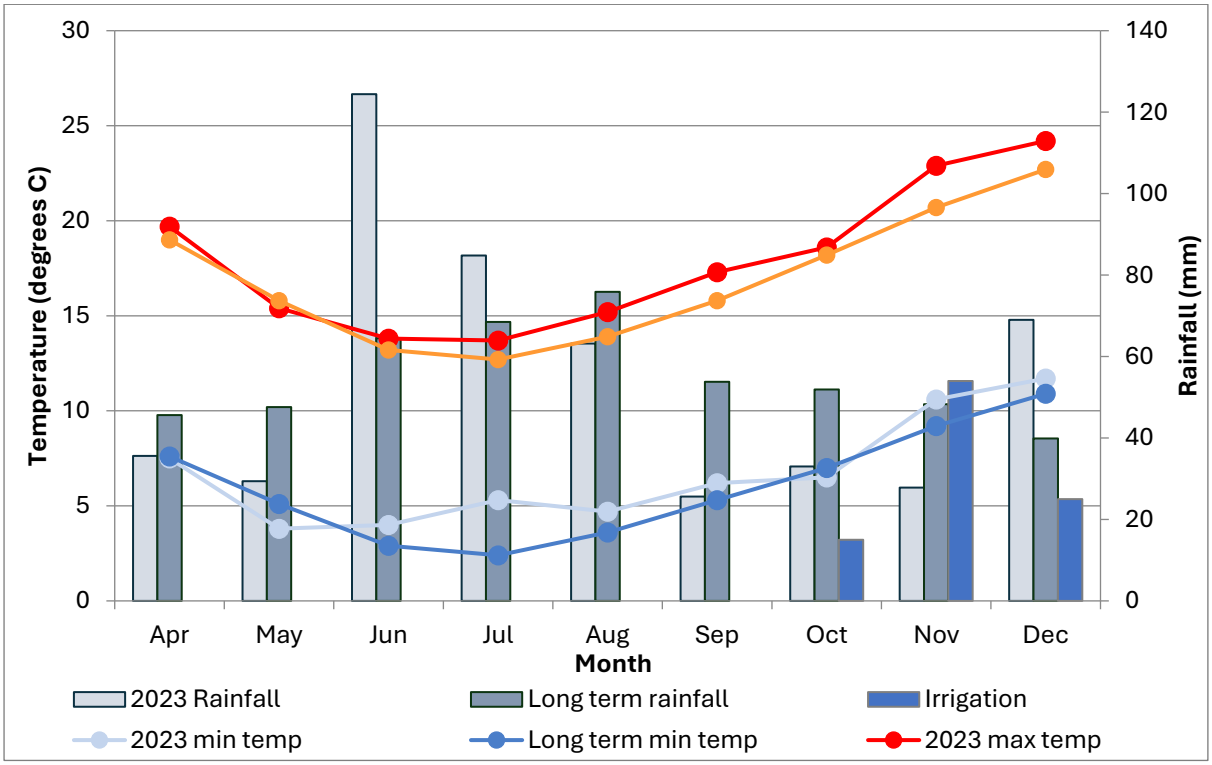

Figure 1. 2023 growing season rainfall and long-term rainfall recorded at Strathbridge (Meander River) (1985 -2023) and long-term min and max temperatures recorded at Cressy (1999 to 2023) for the growing season (April to December). *Rainfall and irrigation April to December= 586.8mm.*

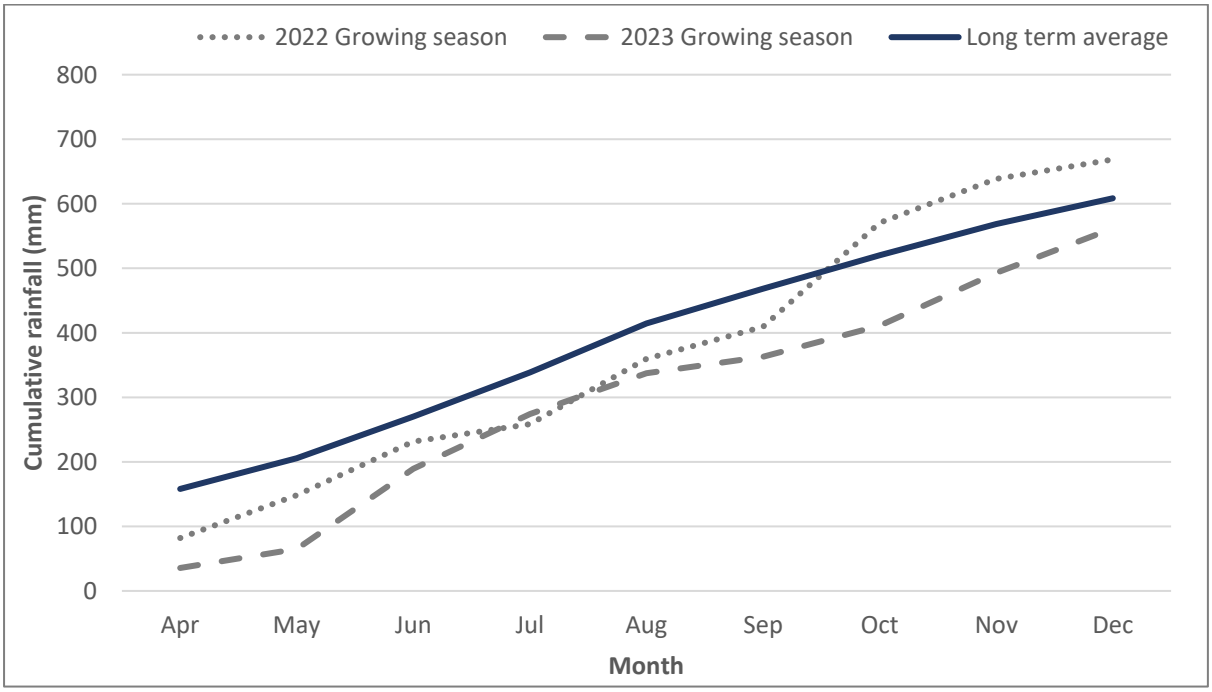

Figure 2. Cumulative growing season rainfall for 2022, 2023 and the long-term average for the growing season (April-December).

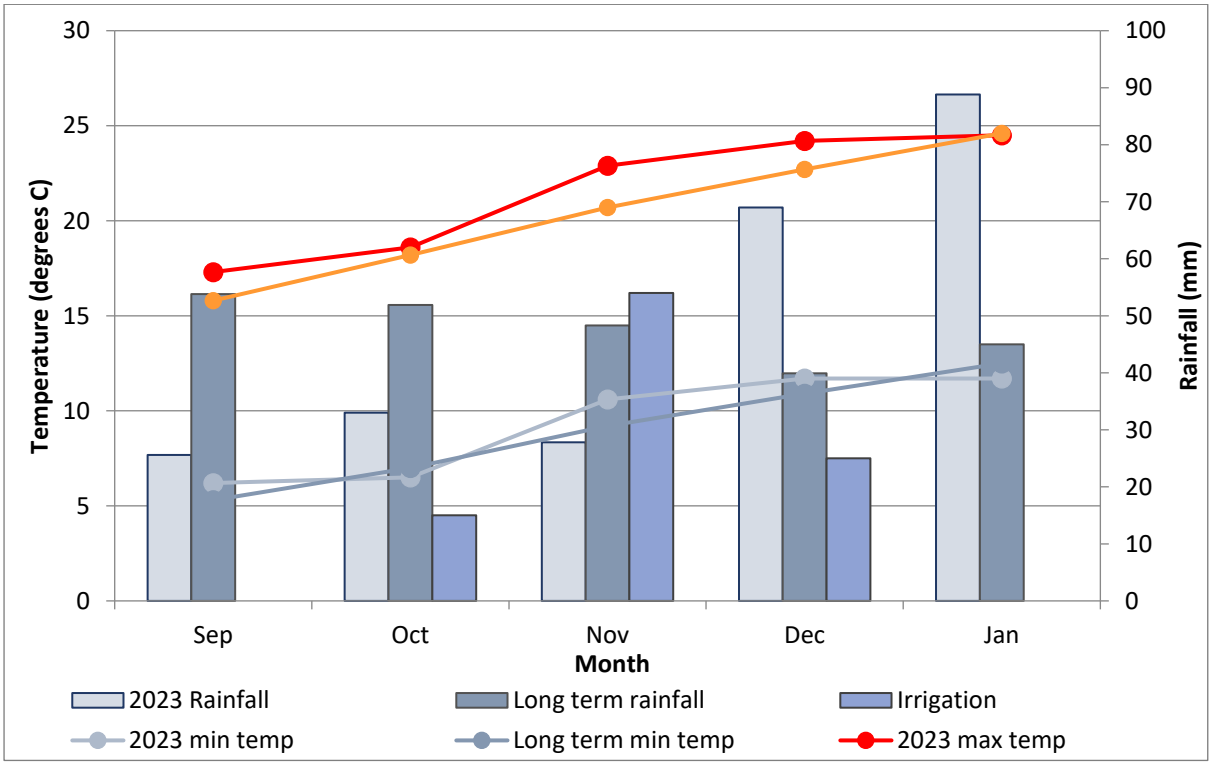

Figure 1. 2023/24 growing season rainfall and long-term rainfall recorded at Strathbridge (Meander River) (1985 -2024) and long-term min and max temperatures recorded at Cressy (1999 to 2024) for the growing season (Sep to Jan). *Rainfall and irrigation September to January= 338.2mm.*

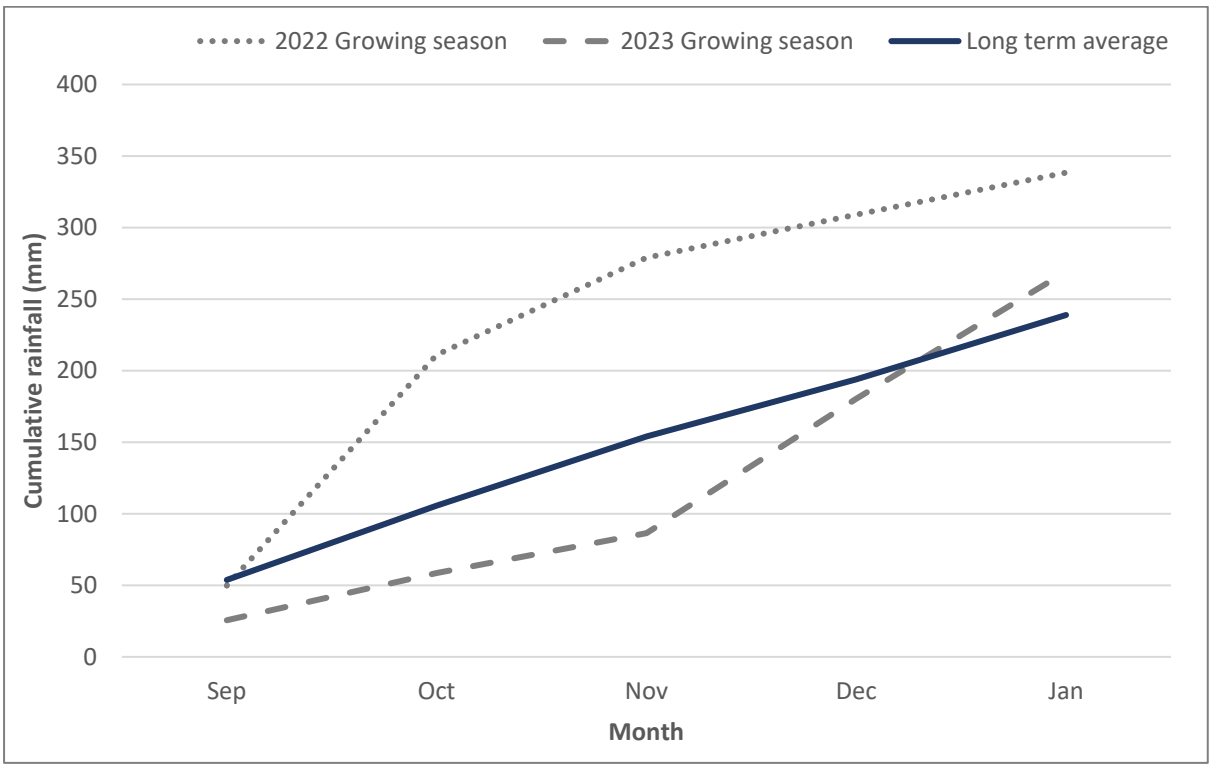

Figure 2. Cumulative growing season rainfall for 2022, 2023 and the long-term average for the growing season (April-October).

Soil Test Results

NSW Crop Technology Centre- Wallendbeen, New South Wales

Table 1: Soil test results for Wallendbeen (New South Wales) for 0-10cm- sampled 10 July 2023.

Analyte	Result
pH (1:5 $CaCl_2$)	5.0
Organic Carbon (W&B)	2.6 %
Electrical Conductivity (1:5 water)	0.13 dS/m
Nitrate Nitrogen	27.0 mg/Kg
Ammonium Nitrogen	6.1 mg/Kg
Total Nitrogen	43 Kg N/ha
Phosphorus (Colwell)	32 mg/Kg
Phosphorus Buffer Index (PBI-Col)	120
Chloride	<10 mg/Kg
Sulphur (KCl40)	16 mg/Kg
Cation Exchange Capacity	14.6 cmol(+)/Kg
Sodium % of Cations (ESP)	0.23 %
Aluminium Saturation	<1.0 %
Calcium (Amm-acet.)	74.0 %
Magnesium (Amm-acet.)	13.0 %
Potassium (Amm-acet.)	12.00 %

SA Crop Technology Centre - Millicent, South Australia

Cereals

Table 1: Soil test results for cereals paddock at SA Crop Technology Centre- sampled 27 June 2023.

Analyte	0-10 cm	10-30 cm
pH (1:5 Water)	8.1	8.3
pH (1:5 $CaCl_2$)	7.5	7.6
Electrical Conductivity (1:5 water)	0.35 dS/m	0.24 dS/m
Electrical Conductivity (Sat. Ext.)	2.2 dS/m	1.5 dS/m
Chloride	13 mg/kg	25 mg/kg
Organic Carbon (W&B)	8 %	6.3 %
Nitrate Nitrogen	110 mg/kg	47 mg/kg
Ammonium Nitrogen	4.4 mg/kg	1.4 mg/kg
Total Mineral Nitrogen	137 kg N/ha	116 kg N/ha
Phosphorus (Colwell)	59 mg/kg	25 mg/kg
Phosphorus Buffer Index (PBI-Col)	130	130
Cation Exchange Capacity	41.2 cmol(+)/kg	36.6 cmol(+)/kg
Calcium (Amm-acet.)	39 cmol(+)/kg	35 cmol(+)/kg
Potassium (Amm-acet.)	0.33 cmol(+)/kg	0.2 cmol(+)/kg
Magnesium (Amm-acet.)	2 cmol(+)/kg	1.6 cmol(+)/kg
Sodium (Amm-acet.)	0.15 cmol(+)/kg	0.17 cmol(+)/kg
Available Potassium	130 mg/kg	78 mg/kg
Aluminium (KCl)	<0.1 cmol(+)/kg	<0.1 cmol(+)/kg
Sodium % of Cations (ESP)	0.36 %	0.46 %
Calcium (Amm-acet.)	94 %	95 %
Magnesium (Amm-acet.)	4.7 %	4.3 %
Potassium (Amm-acet.)	0.81 %	0.55 %
Aluminium Saturation	<1.0 %	<1.0 %
Copper (DTPA)	1.3 mg/kg	0.33 mg/kg
Iron (DTPA)	27 mg/kg	31 mg/kg
Manganese (DTPA)	3.4 mg/kg	0.7 mg/kg
Zinc (DTPA)	5.4 mg/kg	1.1 mg/kg
Boron (Hot $CaCl_2$)	1.4 mg/kg	1.3 mg/kg
Sulphur (KCl40)	18 mg/kg	30 mg/kg

Canola

Table 2. Soil test results for canola paddock at SA Crop Technology Centre- sampled 28 June 2023.

Analyte	0-10 cm	10-30 cm
pH (1:5 Water)	8.3	8.5
pH (1:5 $CaCl_2$)	7.6	7.8
Electrical Conductivity (1:5 water)	0.22 dS/m	0.26 dS/m
Electrical Conductivity (Sat. Ext.)	1.4 dS/m	1.6 dS/m
Chloride	27 mg/kg	92 mg/kg
Organic Carbon (W&B)	7.7 %	4.1 %
Nitrate Nitrogen	26 mg/kg	38 mg/kg
Ammonium Nitrogen	3.3 mg/kg	1.3 mg/kg
Total Mineral Nitrogen	44 kg N/ha	118 kg N/ha
Phosphorus (Colwell)	39 mg/kg	18 mg/kg
Phosphorus Buffer Index (PBI-Col)	100	110
Cation Exchange Capacity	40.7 cmol(+)/kg	32.9 cmol(+)/kg
Calcium (Amm-acet.)	38 cmol(+)/kg	31 cmol(+)/kg
Potassium (Amm-acet.)	0.71 cmol(+)/kg	0.41 cmol(+)/kg
Magnesium (Amm-acet.)	2 cmol(+)/kg	1.6 cmol(+)/kg
Sodium (Amm-acet.)	0.33 cmol(+)/kg	0.3 cmol(+)/kg
Available Potassium	280 mg/kg	160 mg/kg
Aluminium (KCl)	<0.1 cmol(+)/kg	<0.1 cmol(+)/kg
Sodium % of Cations (ESP)	0.81 %	0.9 %
Calcium (Amm-acet.)	93 %	93 %
Magnesium (Amm-acet.)	4.8 %	4.9 %
Potassium (Amm-acet.)	1.7 %	1.2 %
Aluminium Saturation	<1.0 %	<1.0 %
Copper (DTPA)	2.5 mg/kg	0.77 mg/kg
Iron (DTPA)	15 mg/kg	8.2 mg/kg
Manganese (DTPA)	3.6 mg/kg	0.8 mg/kg
Zinc (DTPA)	5.2 mg/kg	1.7 mg/kg
Boron (Hot $CaCl_2$)	2.2 mg/kg	1.4 mg/kg
Sulphur (KCl40)	13 mg/kg	14 mg/kg

VIC Crop Technology Centre - Gnarwarre, Victoria

Cereals

Table 1: Soil test results for cereals paddock at Victoria Crop Technology Centre for 0-10 cm- sampled 26 April 2023.

Analyte	Result
pH (1:5 Water)	6.5
pH (1:5 $CaCl_2$)	5.8
Electrical Conductivity (1:5 water)	0.19 dS/m
Electrical Conductivity (Sat. Ext.)	1.2 dS/m
Chloride	62 mg/kg
Organic Carbon (W&B)	2.4 %
Nitrate Nitrogen	47.0 mg/kg
Ammonium Nitrogen	9.8 mg/kg
Phosphorus (Colwell)	74 mg/kg
Phosphorus Buffer Index	98
Sulphur (KCl40)	11 mg/kg
Cation Exchange Capacity (CEC)	14.7 cmol(+)/kg
Calcium (Amm-acet.)	10.0 cmol(+)/kg
Magnesium (Amm-acet.)	3.3 cmol(+)/kg
Sodium (Amm-acet.)	0.63 cmol(+)/kg
Potassium (Amm-acet.)	0.77 cmol(+)/kg
Available Potassium	300 mg/kg
Aluminium (KCl)	<0.1 cmol(+)/kg
Aluminium % of Cations	<1.0 %
Calcium % of Cations	68.0 %
Magnesium % of Cations	23.0 %
Sodium % of Cations (ESP)	4.30 %
Potassium % of Cations	5.20 %
Calcium/Magnesium Ratio	3.0

Canola

Table 2. Soil test results for canola paddock at Victoria Crop Technology Centre– sampled 26 April 2023.

Analyte	0-10 cm	10-20 cm	20-30 cm	30-60 cm	60-100 cm
Total Mineral N	45 kg/ha	21 kg/ha	13 kg/ha	8 kg/ha	4 kg/ha
ECEC	0.9 dS/m	0.8 dS/m	0.9 dS/m	1.1 dS/m	2.5 dS/m
Organic Carbon W&B	2.5 %	N/A	N/A	N/A	N/A
pH 1:5 water	5.9 pH	7.0 pH	7.9 pH	8.7 pH	9.2 pH
pH $CaCl_2$	5.0 pH	5.9 pH	6.5 pH	7.1 pH	7.8 pH
Colwell Phosphorus	62 ppm	N/A	N/A	N/A	N/A
Available Potassium	410 ppm	N/A	N/A	N/A	N/A
KCl Sulfur	7 ppm	5 ppm	6 ppm	15 ppm	53 ppm

Table 1: Soil test results for Frankland River (Western Australia) for 0-15cm.

Analyte	Result
pH (1:5 Water)	6.3
pH (1:5 $CaCl_2$)	5.9
Texture	1.5
Gravel	45-50
Colour	Dark Grey
Electrical Conductivity	0.08 dS/m
Organic Carbon	2.70 %
Nitrate Nitrogen	30 mg/Kg
Ammonium Nitrogen	< 1 mg/kg
Phosphorus (Colwell)	43 mg/kg
Potassium (Colwell)	25 mg/kg
Phosphorus Buffer Index	84.8
Sulphur (KCl40)	7.1 mg/kg
Boron ($CaCl_2$)	0.51 mg/kg
Copper (DTPA)	0.58 mg/kg
Zinc (DTPA)	0.63 mg/kg
Manganese (DTPA)	1.53 mg/kg
Iron (DTPA)	64.50 mg/kg
Calcium (Exchangeable)	7.94 cmol(+)/kg
Magnesium (Exchangeable)	0.56 cmol(+)/kg
Sodium (Exchangeable)	0.03 cmol(+)/kg
Potassium (Exchangeable)	0.04 cmol(+)/kg
Aluminium (Exchangeable)	0.032 cmol(+)/kg

Table 1. Soil test results for Hagley Crop Technology Centre for 0-10cm- sampled 11 July 2023.

Analyte	Result
pH (1:5 Water)	6.99
pH (1:5 $CaCl_2$)	6.31
Electrical Conductivity	0.13 dS/m
Organic Carbon	1.87 %
Potassium (NH_4Cl)	1.21 cmol(+)/kg
Calcium (NH_4Cl)	8.32 cmol(+)/kg
Magnesium (NH_4Cl)	1.21 cmol(+)/kg
Sodium (NH_4Cl)	0.04 cmol(+)/kg
Aluminium (KCl)	0.00 cmol(+)/kg
Chloride	15.8 ppm
Nitrate Nitrogen (H_2O)	3.6 ppm
Phosphorus (Colwell)	225.9 ppm
Potassium (Colwell)	519.2 ppm
Phosphorus Buffer Index	123.1 units
Sulphur (KCl)	4.7 ppm
Copper (DTPA)	2.60 ppm
Iron (DTPA)	37.40 ppm
Zinc (DTPA)	2.20 ppm
Manganese (DTPA)	115.71 ppm
Cation Exchange Capacity (CEC)	10.78 cmol(+)/kg
Calcium % of Cations	0.772 %
Magnesium % of Cations	0.1122 %
Potassium % of Cations	0.1123 %
Sodium % of Cations	0.0037 %
Calcium/Nitrate Ratio	11.59
Calcium/Magnesium Ratio	6.88

Table 2. Available nitrogen for Hagley Crop Technology Centre for 0-60cm- sampled 11 July 2023.

Sampling Depth	Total Available N
0-30cm	36.2 kg N/ha
30-60cm	74.2 kg N/ha
Total	110.4 kg N/ha