

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

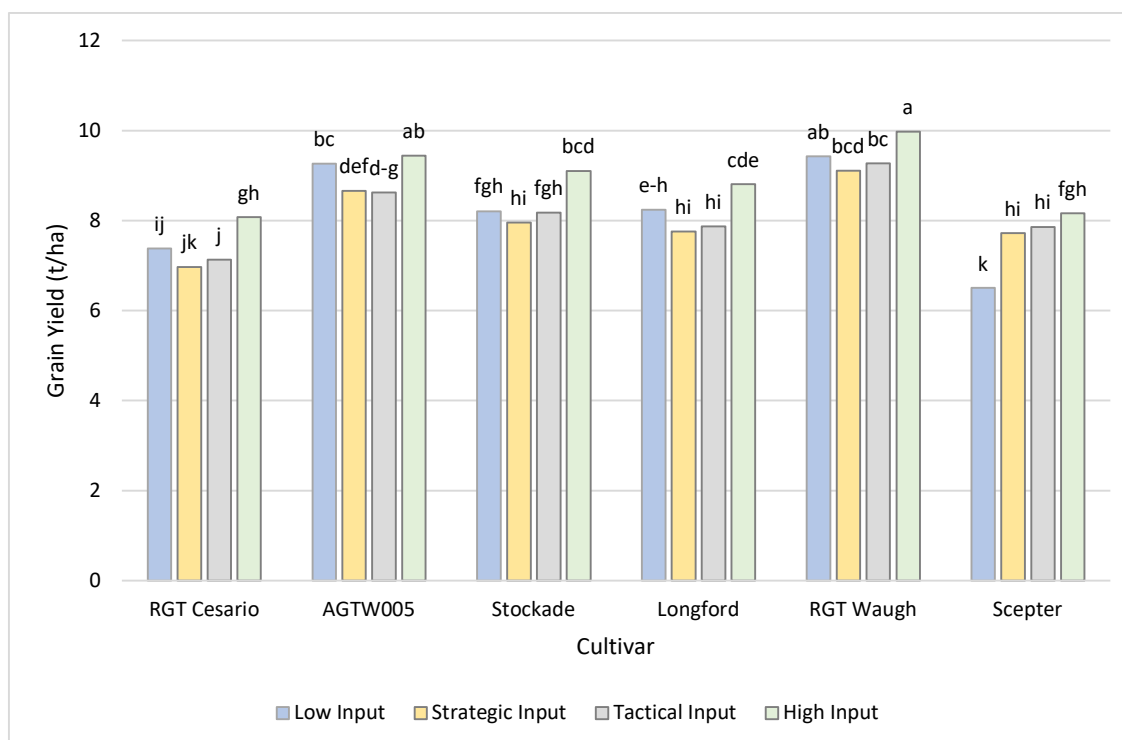


Figure 1. Influence of management strategy and cultivar on grain yield (t/ha). P value = 0.003, LSD (P=0.05)= 0.58.

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/m², 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).

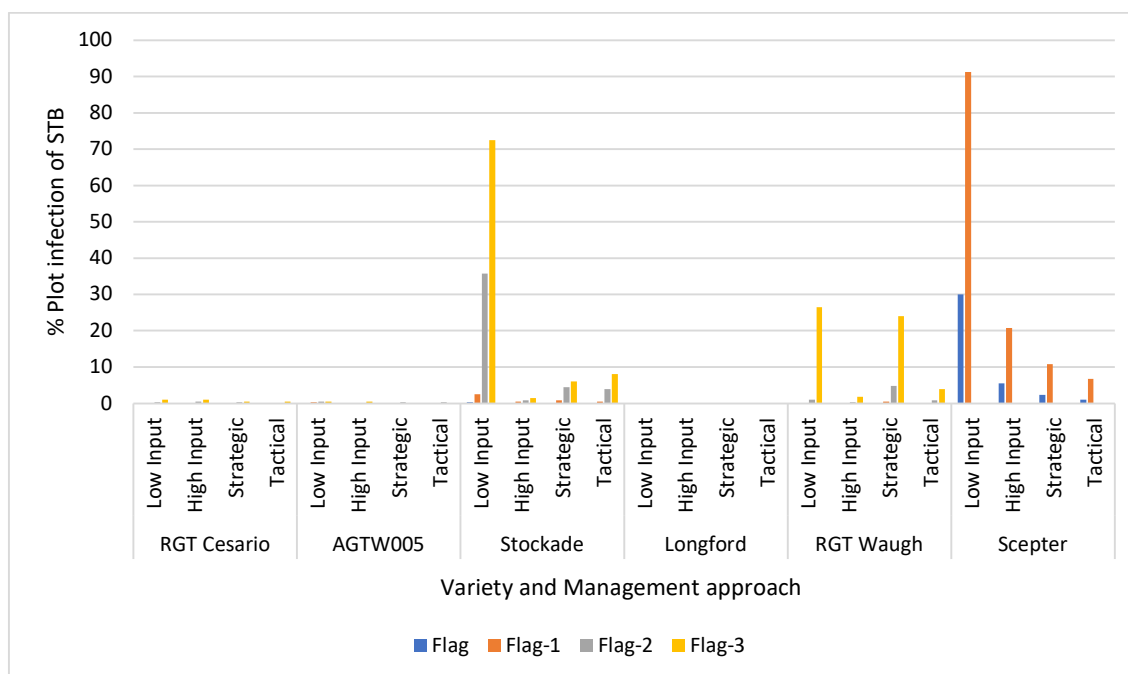


Figure 2. Influence of management strategy and cultivar on Septoria tritici blotch (STB) infection. Assessed 6 October.

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			Yield	Income		Income	Margin
	Fungicide	Nitrogen	PGR		Bin Grade	Price		
	\$/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