HART BEAT

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ISSUE 28

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THIS ISSUE

Article: Plant growth regulators in cereal crops

Definitions

Site information

Hart Beat site reports

- Hart
- Spalding
- Crystal Brook
- Jamestown
- Condowie
- Kybunga
- Farrell Flat
- Pinery
- Eudunda
- Tarlee

HART BEAT

Yield Prophet® simulations for 10 sites across the mid-north of SA

The Yield Prophet® simulations featured are not a crystal ball, but provide a realistic prediction of the available soil water and nitrogen status of your crop

HART EVENTS

Winter Walk - 22nd July 2014
Hart Field Day - 16th September 2014
Spring Twilight Walk - 21st October 2014

Plant growth regulators in cereal crops

The most common reason for using plant growth regulators (PGR's) when applied at early stem elongation in cereals is for the reduction of plant height. Shorter plant height increases crop resistance to lodging and can improve harvestability.

The effect of PGR's on grain yield and quality however, is inconsistent due to the complex interaction between crop variety, type, rate, timing of PGR application and environmental conditions. Over two seasons the Hart Field Site Group investigated the influence of nitrogen (N) timing and PGR applications on plant height, grain yield and quality of wheat.

Trials focused on the interaction between PGR and N. The PGR treatment used in all trials was 1 L/ha chlormequat (582 g/L) + 200 mL/ha Moddus Evo applied with either 46 kg N/ha or 0 kg N. The crop growth stage at the time of PGR application was early stem elongation, 1st node (GS31).

The application of a PGR to wheat significantly reduced the crop height by 10 – 15 cm. Compared to the treatments where no PGR was applied these plots were clearly identifiable. Also, there was no crop lodging evident at harvest.

Over two seasons of trials there was no significant impact of PGR application on grain yield (Table 1). For one site however, application of PGR significantly reduce grain yield by 0.20 t/ha. Generally the only grain quality parameter to be significantly effect by PGR application was protein and results were not consistent across sites or seasons (Table 1).

Photo: The effect of a PGR treatment on crop height at Hart, 2012.

These results show that where crops are susceptible to lodging a PGR application can reduce plant height and lodging. Although not directly measured in these trials a reduction in plant height will increase harvestability and decrease the amount of straw to be managed at seeding.

While PGR's may offer a number of management and logistical advantages, their effect on grain yield is variable and the cost of application is high. Furthermore it should be noted that applications of PGR's are not recommended when a crop is under stress (eg. nutrient deficiency, waterlogged soils or frost).

A combination of these factors should be considered when making decisions about PGR applications.

For full trial result article see the 2012 and 2013 Hart trial results books.

Site	Treatment		Grain yield (t/ha)	Protein (%)	Screenings (%)
	PGR	Nitrogen			
Hart	No	0	2.01	11.0	2.2
	No	46	1.73	11.5	2.5
	Yes	0	1.89	10.4	2.2
	Yes	46	1.70	10.8	2.1
LSD (0.05) Nitrogen, PGR, Nitrogen * PGR			ns, ns, ns	0.36, 0.36, ns	ns, ns, ns
Saddleworth	No	0	4.46	5.9	2.5
	No	46	4.89	6.4	2.5
	Yes	0	4.75	6.0	2.7
	Yes	46	4.88	7.1	2.5
LSD (0.05)			ns, ns, ns	0.73, ns, ns	ns, ns, ns
Condowie	No	0	2.50	10.1	2.7
	No	46	2.62	10.4	2.8
	Yes	0	2.47	10.2	2.3
	Yes	46	2.45	10.7	2.2
LSD (0.05)			ns, ns, ns	0.28, ns, ns	ns, ns, ns
Spalding	No	0	2.85	10.9	5.1
	No	46	3.16	12.0	4.8
	Yes	0	2.65	11.5	7.2
	Yes	46	2.83	13.1	7.1
LSD (0.05)			0.17, 0.17, ns	0.47, 0.47, ns	ns, 0.54, ns

Table 1. The interaction of a PGR and nitrogen on the grain yield and quality of wheat at Hart (400 mm annual rainfall), Saddleworth (500 mm), Condowie (350 mm) and Spalding (450 mm) in 2012.

Definitions

Hart Beat definitions

Each site has been characterised for plant available water capacity (PAWC) and bulk density to determine how much of the measured water and nitrogen is available to the crop during the season.

Drained upper limit (DUL) – is the amount of water that a saturated soil holds after it has drained.
Crop lower limit (CLL) – is the amount of water remaining in the soil after crop senescence.
Plant available water capacity (PAWC) – is the difference between the drained upper limit of the soil and the lower extraction limit of a crop over the depth of rooting. It is the maximum water available to a crop from a particular soil type.
Plant available water (PAW) – is the amount of water contained in the soil at a given time minus the crop lower limit.
Bulk density (BD) – is a measure of the weight of dry soil per unit volume of soil.
Growing season rainfall (GSR) – is rainfall for the period between and including April to October.
Decile – is a measure of seasonal rainfall on a scale of 1 to 9. In a decile 7 year, 70% of previous years were dryer, in a decile 3 year 30% of previous years were dryer.
Yield probability curves - display two different nitrogen scenarios for each site. The **green line** displays the actual grain yield with the current soil available nitrogen. The **blue line** represents the grain yield potential with unlimited nitrogen (yield potential). A small difference between these two lines indicates the current soil N level is adequate for the crop to reach its yield potential. Conversely, a large difference between these two lines indicates additional N fertiliser is required for the crop to reach its yield potential.

The **French & Schultz** formula estimates the rainfall limited grain yield based on the growing season rainfall (GSR). It assumes evaporation of 110mm, includes stored water at sowing (30% of Jan to Mar rainfall) and a maximum grain yield potential of 20 kg/mm/ha.
Yield Potential = GSR (Apr-Oct) – Evaporation (110mm) * 20 kg/mm/ha.

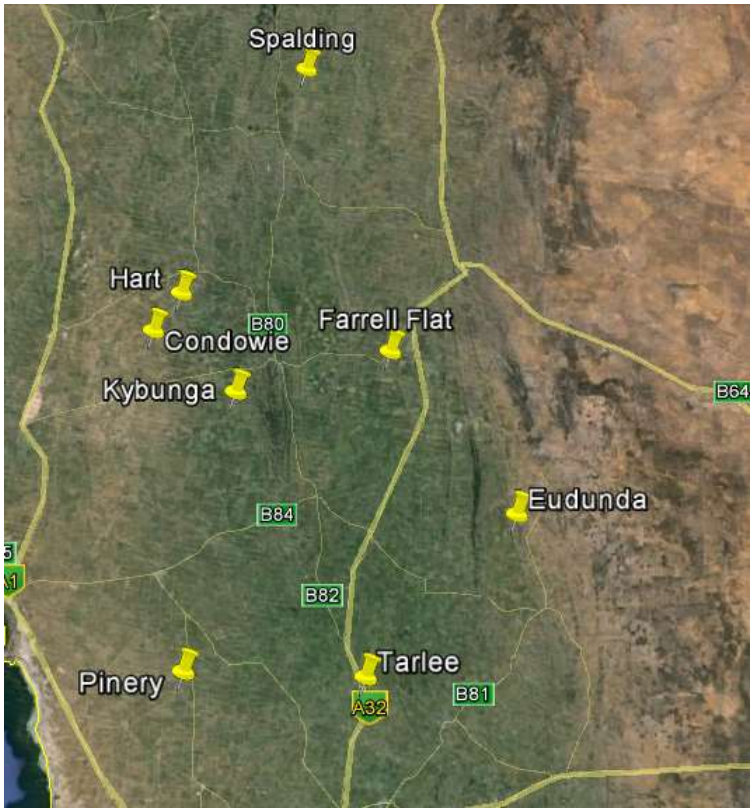
Yield Prophet® has been very accurate throughout Australia, over the past 5 seasons. At the Hart field site the *Yield Prophet*® prediction on the 15th September, using an average finish, has been only 16% above the final grain yield, averaged over the past 4 years, making wheat growth models such as APSIM highly valuable.
Yield Prophet® is an internet based service which uses the APSIM wheat prediction model.
The model relies on accurate soil, crop, historical climate data and up to date local weather information to predict plant growth rates and final hay or grain yields. These are critical measurements specific to the site being analysed and may not fit closely to individual situations. Instead the predictions will give a realistic guide to seasonal prospects based on a site with similar rainfall and / or soil type.
Using climate data for the current season, *Yield Prophet*® simulates the soil water and nitrogen processes in the paddock, and crop growth. *Yield Prophet*® calculates the amount of water and nitrogen available to the crop and the water and nitrogen demand of the crop.

Site information

Rainfall and water soil characteristics for all sites

Site	Average annual rainfall (mm)	Soil type	Pre-sowing soil nitrogen (0-90cm) (kg/ha)	Plant Available Water Capacity (mm)
Hart	400	Sandy clay loam	94	206
Spalding	430	Red brown earth	108	143
Crystal Brook	398	***	**	**
Jamestown	453	***	**	**
Condowie	350	Sandy loam	64	115
Kybunga	428	Friable clay loam	89	262
Farrell Flat	474	Red clay loam over clay	97	172
Pinery	374	Silty clay loam over clay	98	79
Eudunda	445	Loam over clay loam	86	96
Tarlee	474	Sandy loam over clay on rock	174	113

2014 site locations



HART

SANDY CLAY LOAM

The season so far

Annual rain to date: 351 mm *(81 mm since last report)*
GSR to date: 239 mm
GSR decile: 9
Current predicted PAW: 170 mm (83% full)
PAWC: 206 mm

Crop growth

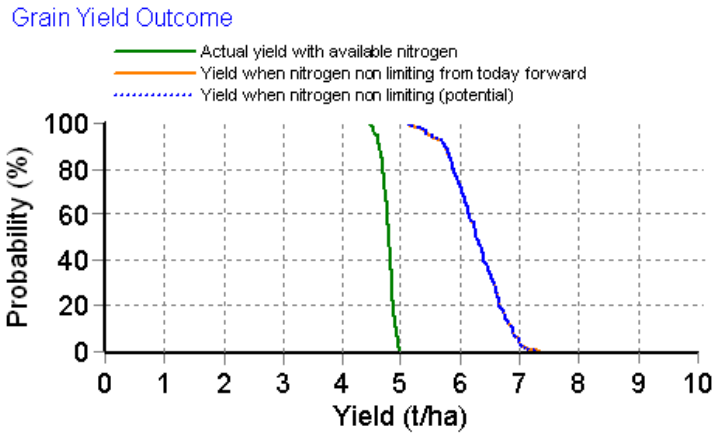
Variety: Mace wheat **Sowing date:** 1st May
Nitrogen fertiliser: 30 kg N/ha + 46 kg N/ha

Grain & hay yield predictions

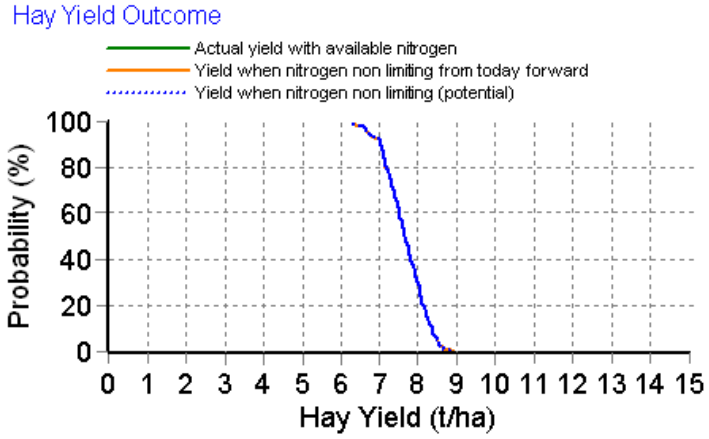
Yield prophet estimate: (Date of report 16/07/2014)
These estimates are based on a 50% probability

Yield t/ha	Sown 1st May (see graph)	Change since last report	Sown 20th May	Change since last report
Grain	5.5	+0.6	5.9	+0.9

French & Schultz grain yield estimate:
100% WUE: 6.2 t/ha, 80% WUE: 5.0 t/ha
This model assumes that there is 33 mm stored moisture, 110 mm of evaporation and decile 5 (148 mm) rainfall for the rest of the season.



This graph shows the chance of reaching the corresponding yield given weather, soil conditions and agronomic inputs to date, and historical climate data (100 yrs) to simulate remainder of the season.



SPALDING

RED BROWN EARTH

The season so far

Annual rain to date:318 mm *(76 mm since last report)*
GSR to date: 236 mm
GSR decile: 9
Current predicted PAW: 126 mm (88% full)
PAWC: 143 mm

Grain & hay yield predictions

Yield prophet estimate: (Date of report 16/07/2014)
These estimates are based on a 50% probability

Yield t/ha	Sown 1st May (see graph)	Change since last report	Sown 20th May	Change since last report
Grain	6.1	+0.8	5.7	+1.1

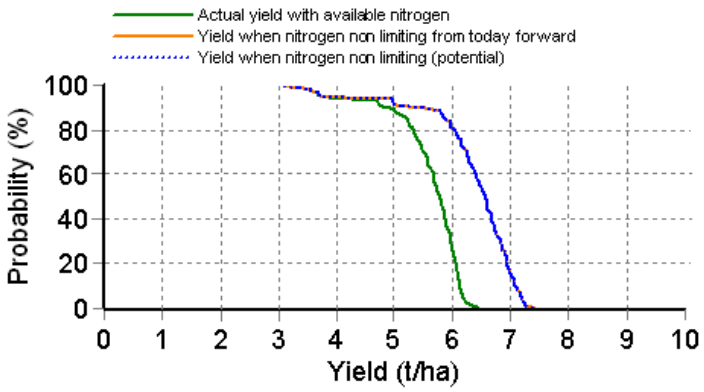
French & Schultz grain yield estimate:
100% WUE: 6.4 t/ha, 80% WUE: 5.1 t/ha

This model assumes that there is 25 mm stored moisture, 110 mm of evaporation and decile 5 (171 mm) rainfall for the rest of the season.

Crop growth

Variety: Mace wheat **Sowing date:** 1st May
Nitrogen fertiliser: 30 kg N/ha + 46 kg N/ha

Grain Yield Outcome



This graph shows the chance of reaching the corresponding yield given weather, soil conditions and agronomic inputs to date, and historical climate data (100yrs) to simulate remainder of the season.

CRYSTAL BROOK

COMING SOON!

Site confirmed,
pending final soil analysis results

CONDOWIE

SANDY LOAM

The season so far

Annual rain to date: 333mm *(101 mm since last report)*
GSR to date: 229 mm
GSR decile: 9
Current predicted PAW: 115 mm (100% full)
PAWC: 115 mm

Grain & hay yield predictions

Yield prophet estimate: (Date of report 16/07/2014)
These estimates are based on a 50% probability

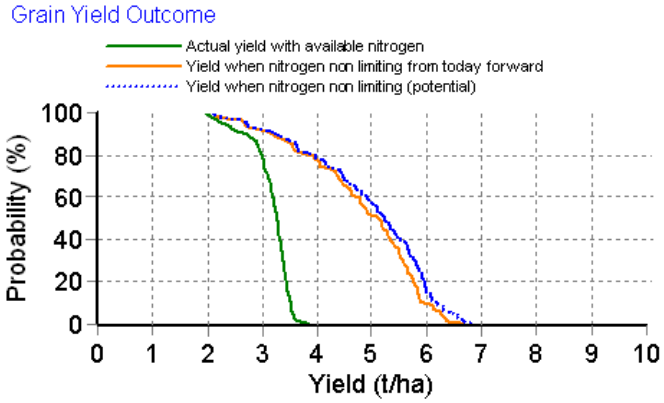
Yield t/ha	Sown 1st May (see graph)	Change since last report	Sown 20th May	Change since last report
Grain	4.1	+0.7	3.4	+0.5

French & Schultz grain yield estimate:
100% WUE: 5.4 t/ha, 80% WUE: 4.4 t/ha

This model assumes that there is 31 mm stored moisture, 110 mm of evaporation and decile 5 (122 mm) rainfall for the rest of the season.

Crop growth

Variety: Mace wheat **Sowing date:** 1st May
Nitrogen fertiliser: 30 kg N/ha + 46 kg N/ha



This graph shows the chance of reaching the corresponding yield given weather, soil conditions and agronomic inputs to date, and historical climate data (100 yrs) to simulate remainder of the season.

JAMESTOWN

COMING SOON!

Site confirmed,

pending final soil analysis results

KYBUNGA

CLAY LOAM

The season so far

Annual rain to date: 346 mm *(92 mm since last report)*
GSR to date: 252 mm
GSR decile: 9
Current predicted PAW: 165 mm (63% full)
PAWC: 262 mm

Grain & hay yield predictions

Yield prophet estimate: (Date of report 16/07/2014)
These estimates are based on a 50% probability

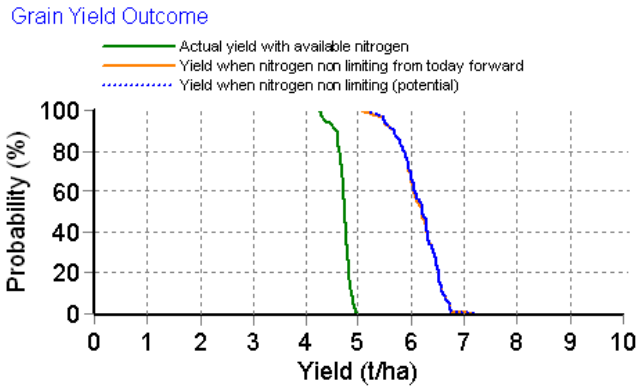
Yield t/ha	Sown 1st May (see graph)	Change since last report	Sown 20th May	Change since last report
Grain	5.4	+0.5	6.0	+1.2

French & Schultz grain yield estimate:
100% WUE: 7.4 t/ha, 80% WUE: 5.9 t/ha

This model assumes that there is 28 mm stored moisture, 110 mm of evaporation and decile 5 (200 mm) rainfall for the rest of the season.

Crop growth

Variety: Mace wheat **Sowing date:** 1st May
Nitrogen fertiliser: 30 kg N/ha + 46 kg N/ha



This graph shows the chance of reaching the corresponding yield given weather, soil conditions and agronomic inputs to date, and historical climate data (100 yrs) to simulate remainder of the season.

FARRELL FLAT

LIGHT CLAY LOAM

The season so far

Annual rain to date: 422mm *(105mm since last report)*
GSR to date: 327 mm
GSR decile: 9
Current predicted PAW: 144 mm (84% full)
PAWC: 172 mm

Grain & hay yield predictions

Yield prophet estimate: (Date of report 16/07/2014)
These estimates are based on a 50% probability

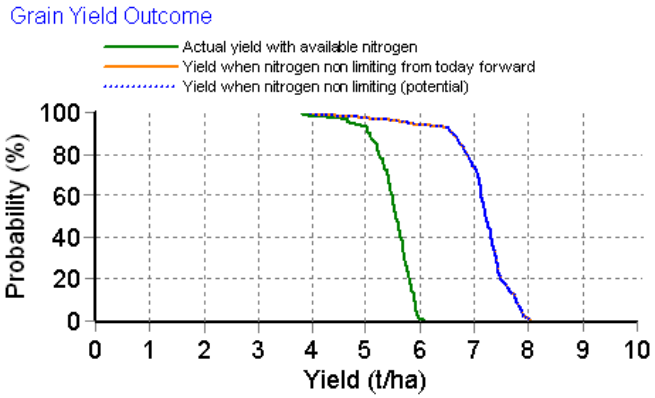
Yield t/ha	Sown 1st May (see graph)	Change since last report	Sown 20th May	Change since last report
Grain	6.4	+0.6	6.5	+0.9

French & Schultz grain yield estimate:
100% WUE: 8.7 t/ha, 80% WUE: 7.1 t/ha

This model assumes that there is 29 mm stored moisture, 110 mm of evaporation and decile 5 (188 mm) rainfall for the rest of the season.

Crop growth

Variety: Mace wheat **Sowing date:** 1st May
Nitrogen fertiliser: 30 kg N/ha + 46 kg N/ha



This graph shows the chance of reaching the corresponding yield given weather, soil conditions and agronomic inputs to date, and historical climate data (100 yrs) to simulate remainder of the season.

PINERY

SILTY CLAY LOAM

The season so far

Annual rain to date: 263 mm *(34 mm since last report)*
GSR to date: 172 mm
GSR decile: 9
Current predicted PAW: 74 mm (94% full)
PAWC: 79 mm

Grain & hay yield predictions

Yield prophet estimate: (Date of report 16/07/2014)
These estimates are based on a 50% probability

Yield t/ha	Sown 1st May (see graph)	Change since last report	Sown 20th May	Change since last report
Grain	4.5	+1.0	3.9	+0.9

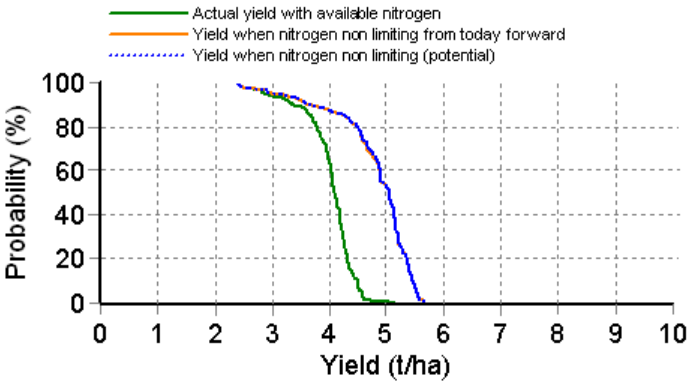
French & Schultz grain yield estimate:
100% WUE: 4.5 t/ha, 80% WUE: 3.6 t/ha

This model assumes that there is 27 mm stored moisture, 110 mm of evaporation and decile 5 (137 mm) rainfall for the rest of the season.

Crop growth

Variety: Mace wheat **Sowing date:** 1st May
Nitrogen fertiliser: 30 kg N/ha + 46 kg N/ha

Grain Yield Outcome



This graph shows the chance of reaching the corresponding yield given weather, soil conditions and agronomic inputs to date, and historical climate data (100 yrs) to simulate remainder of the season.

EUDUNDA

GRAVELLY LOAM

The season so far

Annual rain to date: 397mm *(71 mm since last report)*
GSR to date: 284 mm
GSR decile: 9
Current predicted PAW: 96 mm (100% full)
PAWC: 96 mm

Grain & hay yield predictions

Yield prophet estimate: (Date of report 16/07/2014)
These estimates are based on a 50% probability

Yield t/ha	Sown 1st May (see graph)	Change since last report	Sown 20th May	Change since last report
Grain	5.3	+0.4	4.9	+0.5

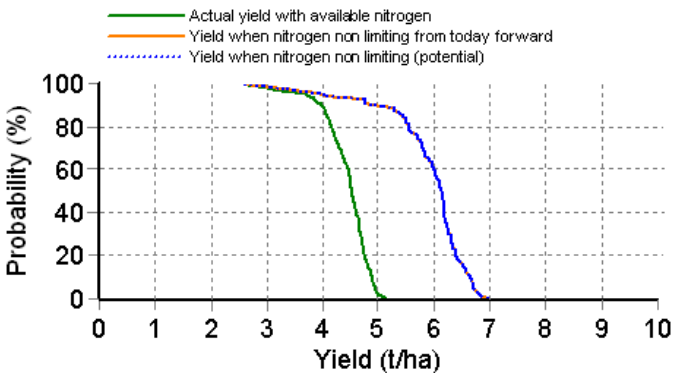
French & Schultz grain yield estimate:
100% WUE: 7.2 t/ha, 80% WUE: 6.2 t/ha

This model assumes that there is 34 mm stored moisture, 110 mm of evaporation and decile 5 (189 mm) rainfall for the rest of the season.

Crop growth

Variety: Mace wheat **Sowing date:** 1st May
Nitrogen fertiliser: 30 kg N/ha + 46 kg N/ha

Grain Yield Outcome



This graph shows the chance of reaching the corresponding yield given weather, soil conditions and agronomic inputs to date, and historical climate data (100 yrs) to simulate remainder of the season.

TARLEE

SANDY LOAM

The season so far

Annual rain to date: 347 mm *(87 mm since last report)*
GSR to date: 257 mm
GSR decile: 9
Current predicted PAW: 113 mm (100% full)
PAWC: 113 mm

Grain & hay yield predictions

Yield prophet estimate: (Date of report 16/07/2014)
These estimates are based on a 50% probability

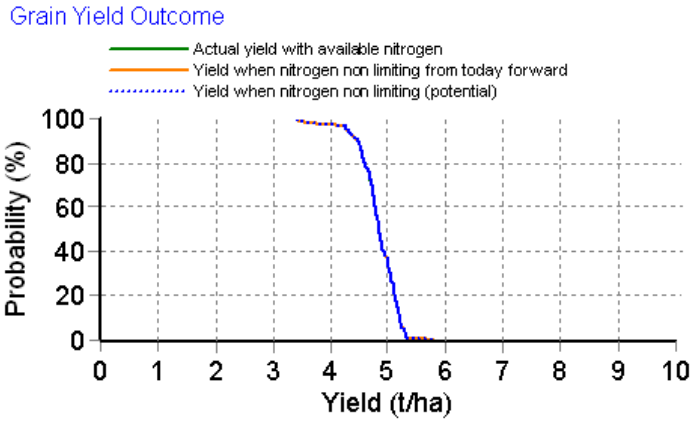
Yield t/ha	Sown 1st May (see graph)	Change since last report	Sown 20th May	Change since last report
Grain	4.9	-0.1	5.7	+0.1

French & Schultz grain yield estimate:
100% WUE: 7.2 t/ha, 80% WUE: 5.8 t/ha

This model assumes that there is 27 mm stored moisture, 110 mm of evaporation and decile 5 (187 mm) rainfall for the rest of the season.

Crop growth

Variety: Mace wheat **Sowing date:** 1st May
Nitrogen fertiliser: 30 kg N/ha + 46 kg N/ha



This graph shows the chance of reaching the corresponding yield given weather, soil conditions and agronomic inputs to date, and historical climate data (100 yrs) to simulate remainder of the season.

2014 trial photos from Hart

Time of sowing trial Compass barley (left) and RAC1843 (right) taken 14th July, sown 14th April.

Long term cropping systems trial Commander barley sown into stripper front straw using a disc seeder. (photo taken 18/6/14)

Canola time of sowing trial plots sown on 14th April (photo taken 14th July).