

# HART BEAT

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CARING  
FOR  
OUR  
COUNTRY



## HART BEAT

### Yield Prophet<sup>®</sup> simulations for 8 sites across the mid-north of SA

The Yield Prophet<sup>®</sup> 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 – 21<sup>st</sup> July 2015

Hart Field Day - 15<sup>th</sup> September 2015

Spring Twilight Walk – 20<sup>th</sup> October 2015

Getting The Crop In – 16<sup>th</sup> March 2016 (tbc)

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[www.hartfieldsite.org.au](http://www.hartfieldsite.org.au)

# Effects of nitrogen on wheat varieties

Last year the Hart Field Site hosted a trial consisting of four wheat varieties (Mace, RAC1843 (Hatchet CL Plus), Scout and Trojan) under six nitrogen (N) rates (ranging from 0 to 240 kg N/ha). Variety and N rate affected grain yield but there was no significant interaction. Grain yield was reduced when rates greater than 120 kg N/ha were applied (Figure 1a). This can be attributed to the dry finish in 2014 which resulted in lower grain weights in the high N treatments. Grain protein increased with increase in N treatment (Figure 1b).

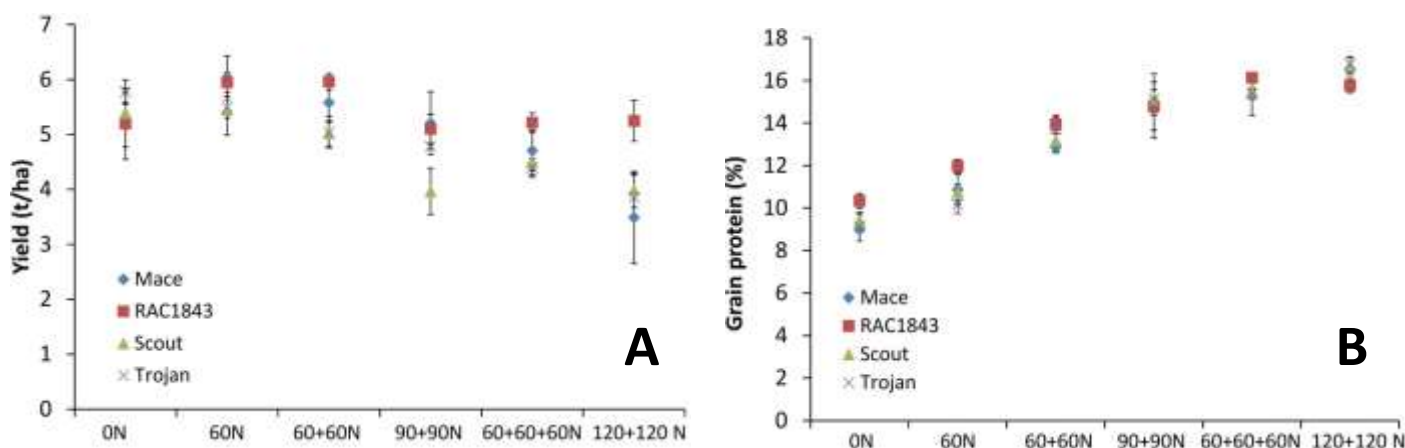


Figure 1. Grain (a) yield and (b) protein for each wheat variety and N rate. Error bars represent standard errors.

The total biomass of the wheat varieties did not differ significantly under the different N rates, however an increase in the leaf:stem ratio under higher N rates was observed (Figure. 2). This means under high N rates, there was relatively more leaf biomass compared with stem biomass, than under the low N rates. Greater leaf biomass can result in greater respiration and transpiration rates making these treatments more prone to water stress. Varieties Scout and Trojan showed a larger change in leaf:stem ratio under increasing N rate (Figure 2). However, there was no significant grain yield difference among all four varieties trialed. As the 2015 season is predicted to be drier, differences in yield due to water stress may become more pronounced.

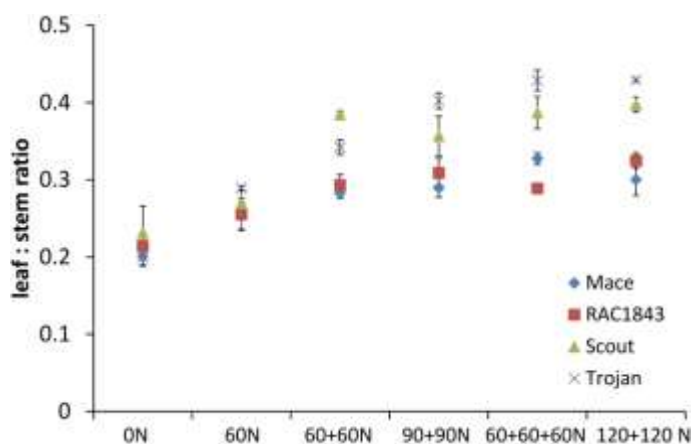


Figure 3. Leaf:stem ratio at flowering per variety under different N rates. Error bars represent standard errors (N=3).

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# 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<sup>®</sup>** has been very accurate throughout Australia, over the past 5 seasons. At the Hart field site the **Yield Prophet<sup>®</sup>** prediction on the 15<sup>th</sup> 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<sup>®</sup>** 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<sup>®</sup>** simulates the soil water and nitrogen processes in the paddock, and crop growth. **Yield Prophet<sup>®</sup>** calculates the amount of water and nitrogen available to the crop and the water and nitrogen demand of the crop.

**Disclaimer:** *Yield Prophet<sup>®</sup>* information is used entirely at your own risk. You will accept all risks and responsibility for losses, damages, costs and other consequences of using *Yield Prophet<sup>®</sup>* information and reports. To the maximum extent permitted by law, APSRU and BCG excludes all responsibility and liability to any person arising directly or indirectly from using the information generated by *Yield Prophet<sup>®</sup>*.

**Important Notice:** *Yield Prophet<sup>®</sup>* does not generate recommendations or advice, it is only a guide and must be combined with local paddock and district knowledge. APSIM does not take into account weed competition, pest/disease pressure, pesticide / herbicide damage, farmer error, or extreme events (such as extreme weather, flood and fire). For more information about APSIM or *Yield Prophet<sup>®</sup>* please visit or [www.yieldprophet.com.au](http://www.yieldprophet.com.au).

# Site information

## Rainfall and water soil characteristics for all sites

Site	Average annual rainfall (mm)	Soil type	Plant Available Water Capacity (mm)	Soil Profile Depth (cm)	Plant Available Water at 15 April (mm)	Pre-sowing soil nitrogen (0-90cm) (kg/ha)
Hart	400	Sandy clay loam	206	150	23	73
Spalding	430	Red brown earth	143	150	0	76
Condowie	350	Sandy loam	115	150	0	78
Kybunga	428	Clay loam	262	120	29	83
Farrell Flat	474	Light clay loam	172	120	34	89
Pinery	374	Silty clay loam	79	150	11	85
Eudunda	445	Gravelly loam	96	100	0	47
Tarlee	474	Sandy loam	113	150	18	69

## 2015 site locations





## SANDY CLAY LOAM

### The season so far

Annual rain to date: 172 mm  
 GSR to date: 99 mm (20 mm since last report)  
 GSR decile: 4  
 Current predicted PAW: 51 mm (25% full)  
 PAWC: 206 mm

### Crop growth

Variety: Mace wheat Sowing date: 1<sup>st</sup> May  
 Nitrogen fertiliser: 30 kg N/ha

### Grain & hay yield predictions

Yield prophet estimate: (Date of report 01/07/2015)

These estimates are based on a 50% probability

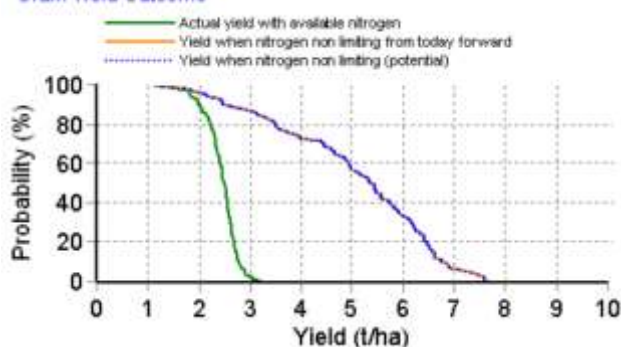
Yield t/ha	Sown 1 <sup>st</sup> May (see graph)	Change since last report	Sown 20 <sup>th</sup> May	Change since last report
Grain	3.9	-1.3	3.6	-1.7

French & Schultz grain yield estimate:

100% WUE: 3.7 t/ha, 80% WUE: 3.0 t/ha

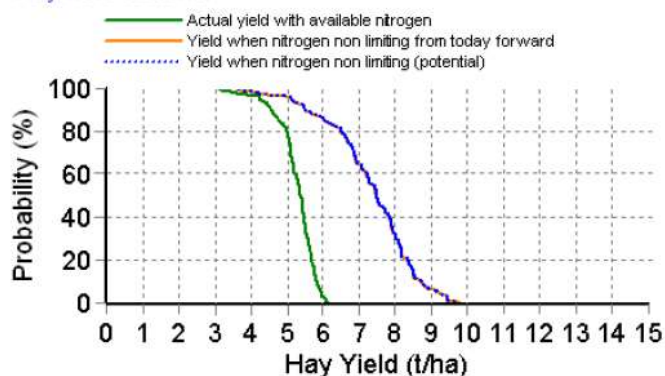
This model assumes that there is 22 mm stored moisture, 110 mm of evaporation and decile 5 (176 mm) rainfall for the rest of the season.

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.

Hay Yield Outcome



# SPALDING

## RED BROWN EARTH

### The season so far

Annual rain to date: 248 mm  
 GSR to date: 151 mm (33 mm since last report)  
 GSR decile: 7  
 Current predicted PAW: 53 mm (37% full)  
 PAWC: 143 mm

### Grain yield predictions

Yield prophet estimate: (Date of report 01/07/2015)  
 These estimates are based on a 50% probability

Yield t/ha	Sown 1 <sup>st</sup> May (see graph)	Change since last report	Sown 20 <sup>th</sup> May	Change since last report
Grain	4.1	+0.1	3.3	-0.1

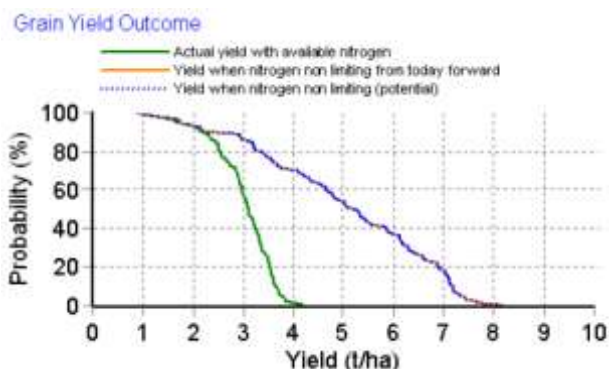
### French & Schultz grain yield estimate:

100% WUE: 5.2 t/ha, 80% WUE: 4.1 t/ha

This model assumes that there is 29 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: 1<sup>st</sup> May  
 Nitrogen fertiliser: 30 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 (100yrs) to simulate remainder of the season.

# CONDOWIE

## SANDY LOAM

### The season so far

Annual rain to date: 145 mm  
 GSR to date: 98 mm (18 mm since last report)  
 GSR decile: 6  
 Current predicted PAW: 30 mm (26% full)  
 PAWC: 115 mm

### Grain yield predictions

Yield prophet estimate: (Date of report 01/07/2015)  
 These estimates are based on a 50% probability

Yield t/ha	Sown 1 <sup>st</sup> May (see graph)	Change since last report	Sown 20 <sup>th</sup> May	Change since last report
Grain	2.2	0.0	1.9	-0.1

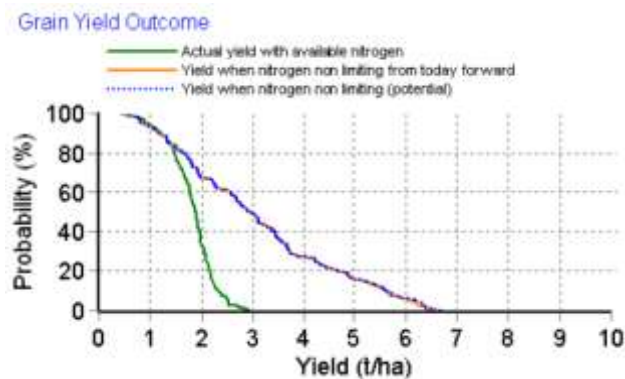
### French & Schultz grain yield estimate:

100% WUE: 2.8 t/ha, 80% WUE: 2.2 t/ha

This model assumes that there is 14 mm stored moisture, 110 mm of evaporation and decile 5 (136 mm) rainfall for the rest of the season.

### Crop growth

Variety: Mace wheat Sowing date: 1<sup>st</sup> May  
 Nitrogen fertiliser: 30 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.

## CLAY LOAM

### The season so far

Annual rain to date: 267 mm  
 GSR to date: 168 mm (20 mm since last report)  
 GSR decile: 8  
 Current predicted PAW: 64 mm (24% full)  
 PAWC: 262 mm

### Grain yield predictions

Yield prophet estimate: (Date of report 01/07/2015)  
 These estimates are based on a 50% probability

Yield t/ha	Sown 1 <sup>st</sup> May (see graph)	Change since last report	Sown 20 <sup>th</sup> May	Change since last report
Grain	3.9	-0.5	3.4	-0.5

### French & Schultz grain yield estimate:

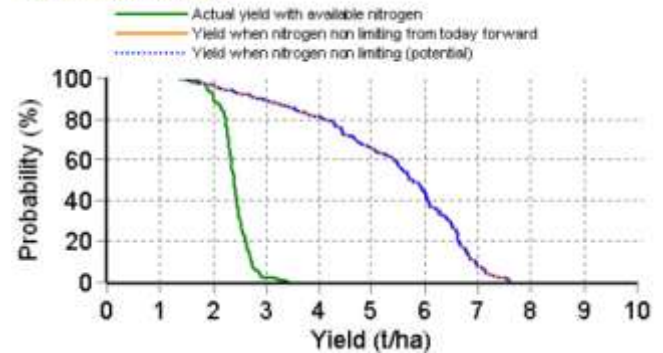
100% WUE: 6.1 t/ha, 80% WUE: 4.9 t/ha

This model assumes that there is 30 mm stored moisture, 110 mm of evaporation and decile 5 (218 mm) rainfall for the rest of the season.

### Crop growth

Variety: Mace wheat Sowing date: 1<sup>st</sup> May  
 Nitrogen fertiliser: 30 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.

# FARRELL FLAT

## LIGHT CLAY LOAM

### The season so far

Annual rain to date: 214 mm  
 GSR to date: 132 mm (29 mm since last report)  
 GSR decile: 6  
 Current predicted PAW: 76 mm (44% full)  
 PAWC: 172 mm

### Grain yield predictions

Yield prophet estimate: (Date of report 01/07/2015)  
 These estimates are based on a 50% probability

Yield t/ha	Sown 1 <sup>st</sup> May (see graph)	Change since last report	Sown 20 <sup>th</sup> May	Change since last report
Grain	5.3	-0.1	4.9	0.0

### French & Schultz grain yield estimate:

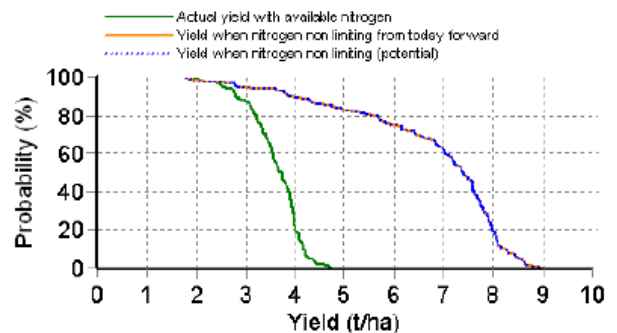
100% WUE: 5.2 t/ha, 80% WUE: 4.2 t/ha

This model assumes that there is 25 mm stored moisture, 110 mm of evaporation and decile 5 (216 mm) rainfall for the rest of the season.

### Crop growth

Variety: Mace wheat Sowing date: 1<sup>st</sup> May  
 Nitrogen fertiliser: 30 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.

## SILTY CLAY LOAM

### The season so far

Annual rain to date: 167 mm  
 GSR to date: 81 mm (7 mm since last report)  
 GSR decile: 6  
 Current predicted PAW: 40 mm (51% full)  
 PAWC: 79 mm

### Grain yield predictions

Yield prophet estimate: (Date of report 01/07/2015)  
 These estimates are based on a 50% probability

Yield t/ha	Sown 1 <sup>st</sup> May (see graph)	Change since last report	Sown 20 <sup>th</sup> May	Change since last report
Grain	3.2	-0.2	2.6	-0.2

### French & Schultz grain yield estimate:

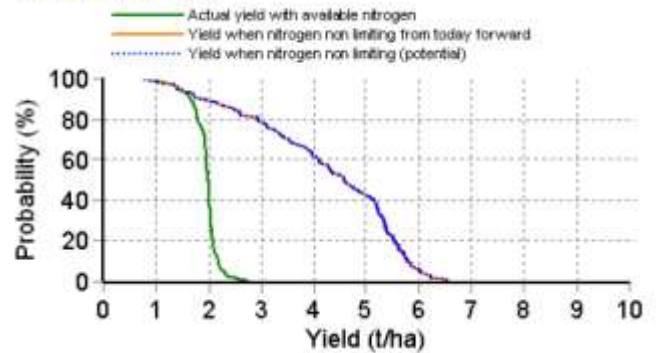
100% WUE: 3.3 t/ha, 80% WUE: 2.6 t/ha

This model assumes that there is 22 mm stored moisture, 110 mm of evaporation and decile 5 (176 mm) rainfall for the rest of the season.

### Crop growth

Variety: Mace wheat Sowing date: 1<sup>st</sup> May  
 Nitrogen fertiliser: 30 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.

## GRAVELLY LOAM

### The season so far

Annual rain to date: 231 mm  
 GSR to date: 147 mm (25 mm since last report)  
 GSR decile: 7  
 Current predicted PAW: 33 mm (34% full)  
 PAWC: 96 mm

### Grain yield predictions

Yield prophet estimate: (Date of report 01/07/2015)  
 These estimates are based on a 50% probability

Yield t/ha	Sown 1 <sup>st</sup> May (see graph)	Change since last report	Sown 20 <sup>th</sup> May	Change since last report
Grain	4.0	-0.4	3.4	-0.2

### French & Schultz grain yield estimate:

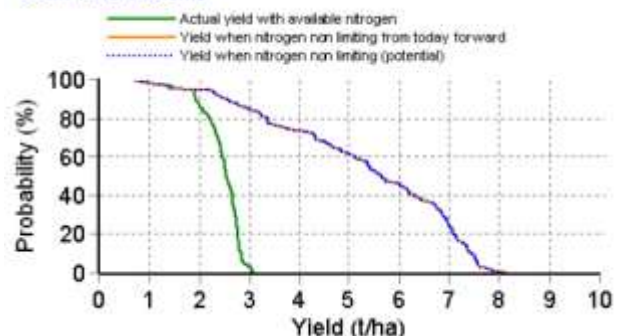
100% WUE: 5.3 t/ha, 80% WUE: 4.3 t/ha

This model assumes that there is 25 mm stored moisture, 110 mm of evaporation and decile 5 (205 mm) rainfall for the rest of the season.

### Crop growth

Variety: Mace wheat Sowing date: 1<sup>st</sup> May  
 Nitrogen fertiliser: 30 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.



## SANDY LOAM



### The season so far

Annual rain to date: 214 mm\*  
 GSR to date: 139 mm\* (22 mm since last report)  
 GSR decile: 5  
 Current predicted PAW: 44 mm (39% full)  
 PAWC: 113 mm  
 \*Error in data entry in edition 32.

### Grain yield predictions

Yield prophet estimate: (Date of report 01/07/2015)  
 These estimates are based on a 50% probability

Yield t/ha	Sown 1 <sup>st</sup> May (see graph)	Change since last report	Sown 20 <sup>th</sup> May	Change since last report
Grain	4.5	0.0	4.3	-0.1

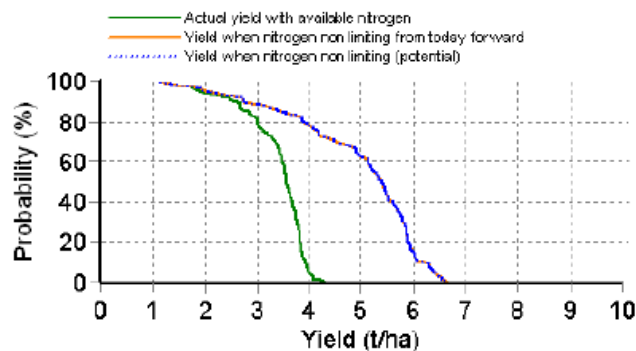
**French & Schultz grain yield estimate:**  
 100% WUE: 5.3 t/ha, 80% WUE: 4.2 t/ha

This model assumes that there is 23 mm stored moisture, 110 mm of evaporation and decile 5 (211 mm) rainfall for the rest of the season.

### Crop growth

Variety: Mace wheat Sowing date: 1<sup>st</sup> May  
 Nitrogen fertiliser: 30 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.

## Around the site...

BELOW: SANTFA precision planter demo at Hart. The aim is to try to reduce canola seeding rate by focussing on seed placement.



ABOVE: WA Grower Group Alliance, Hart and Ag Ex reps catch up to discuss various models of farming systems groups.