Using Yield Prophet® to manage in-crop nitrogen applications
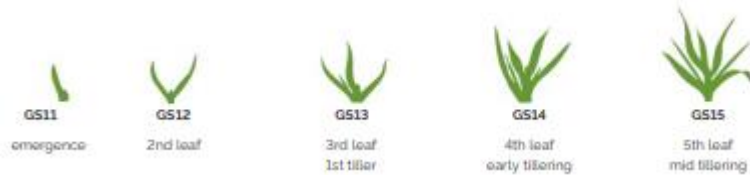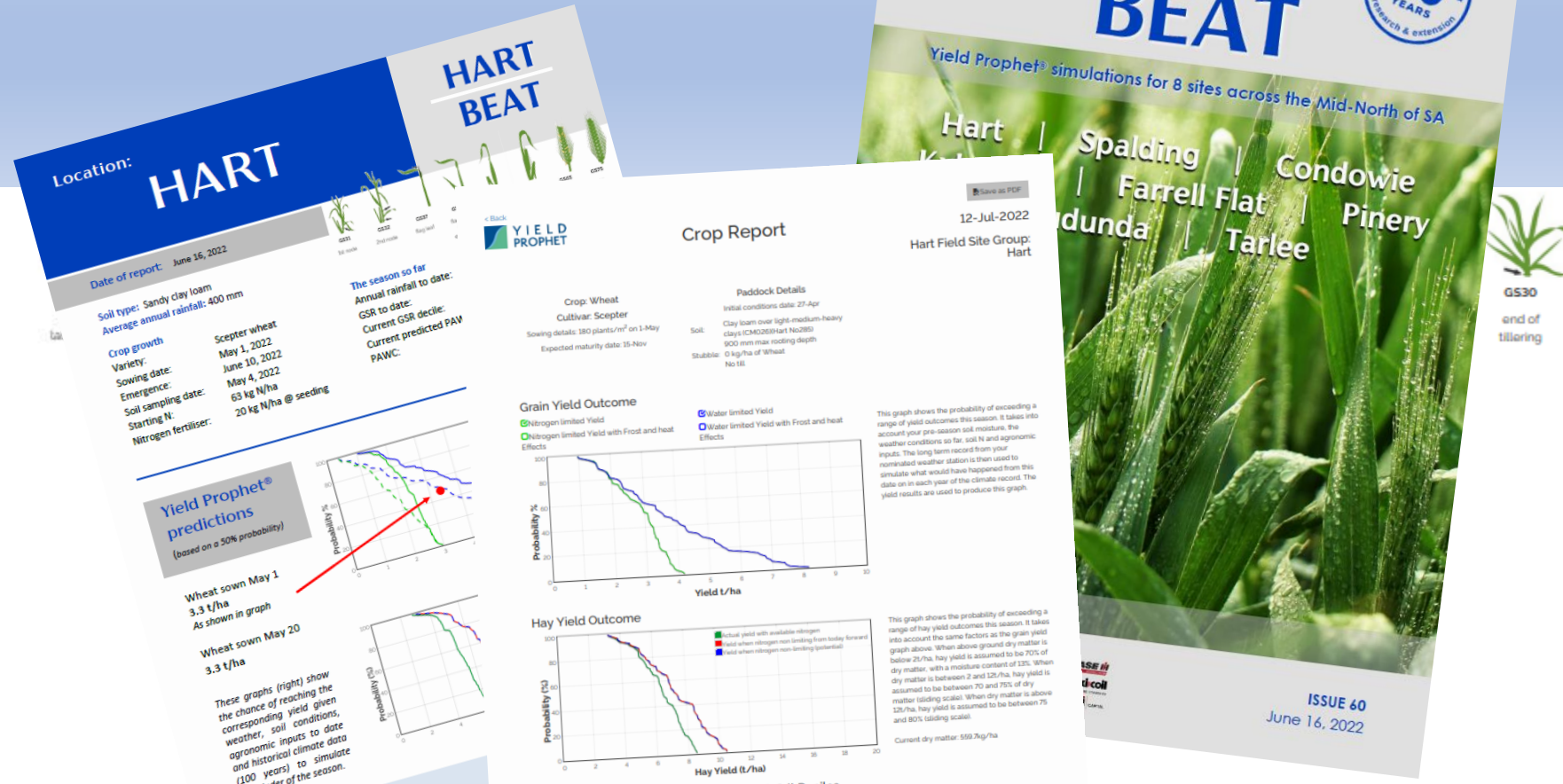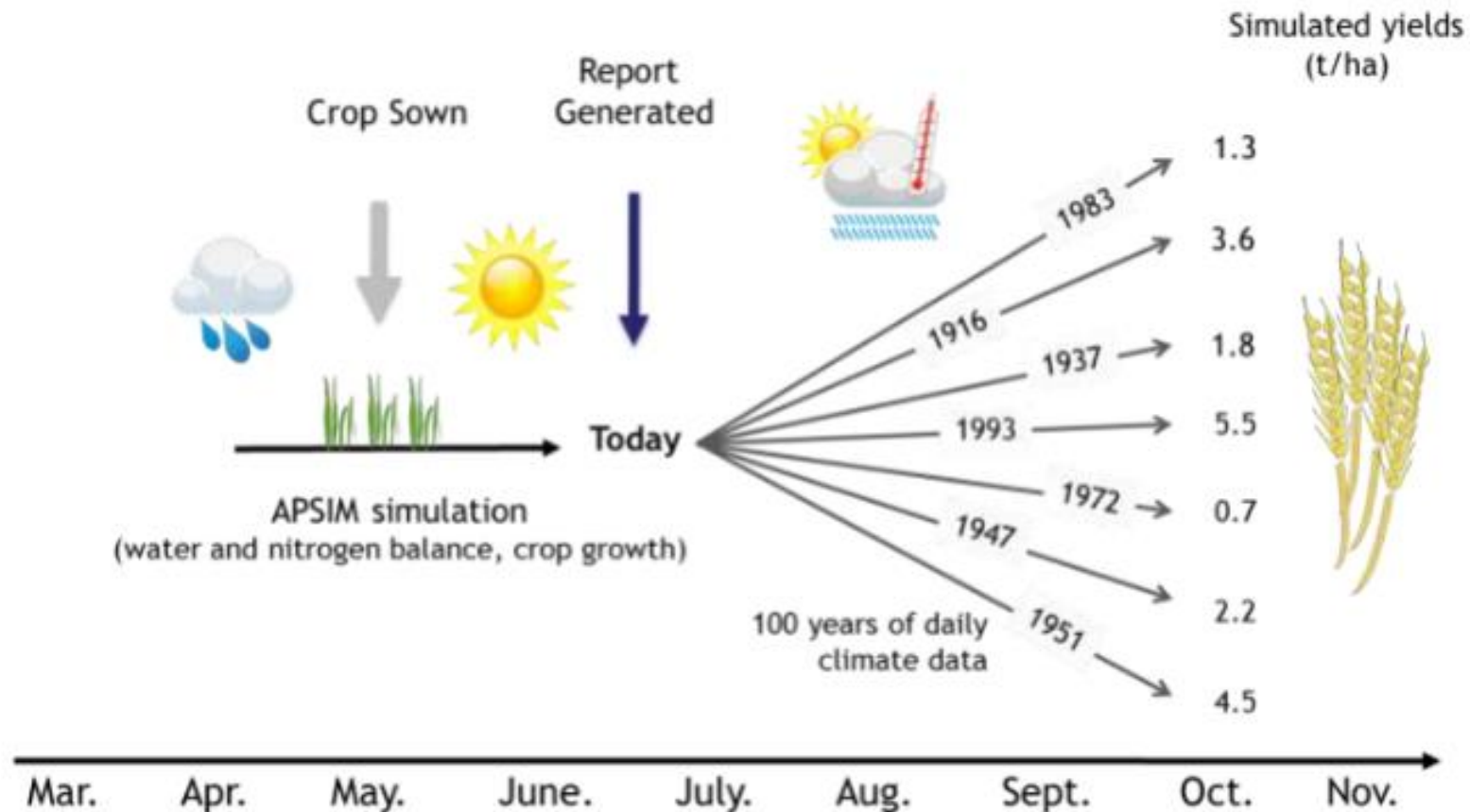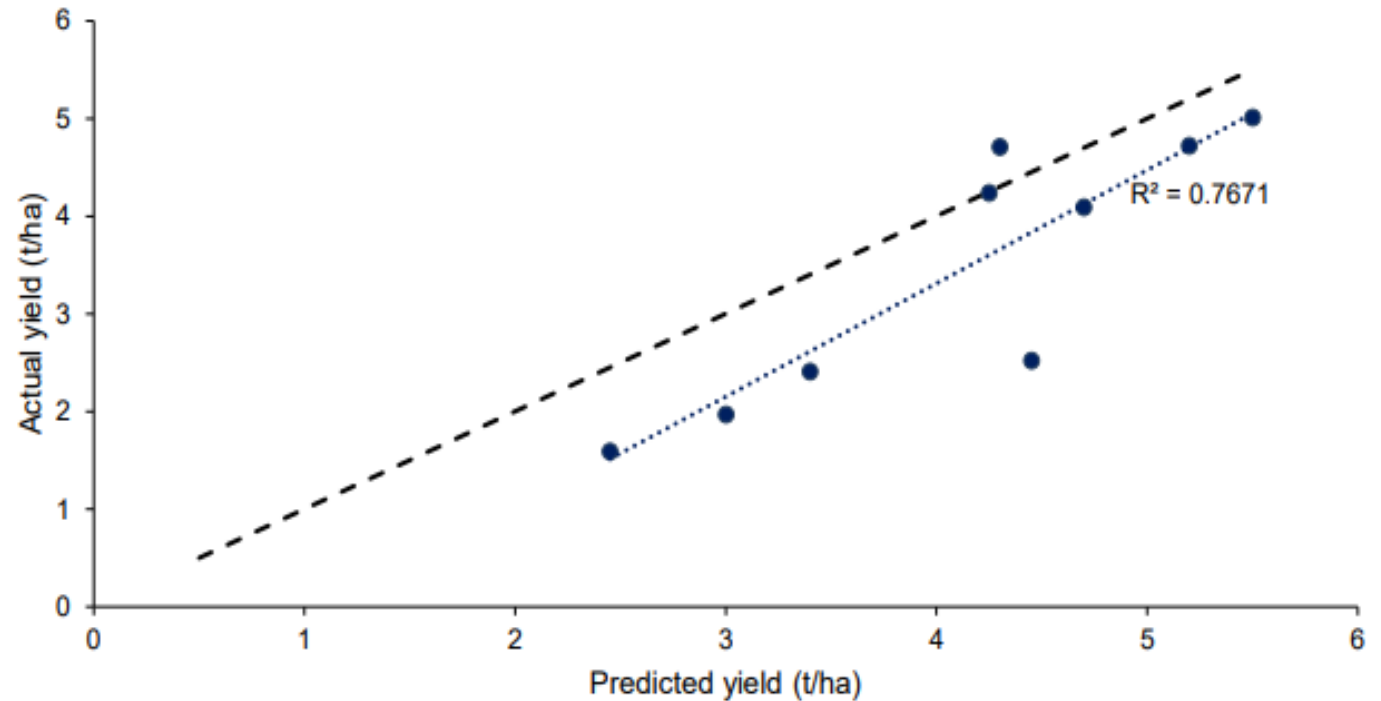
Rebekah Allen
Hart Field-Site Group

What is Yield Prophet®?

Why use Yield Prophet®?

- Valuable in its ability to predict wheat yield potential

- Relies on accurate information to calculate crop yield
  - Soil characterisation
  - Plant available water
  - Soil nitrogen levels
  - Historical climate data
  - Local rainfall information

Hart Beat

- Simulating yields for 8 Mid-North sites

- Providing information on
  - Wheat crop yield (May 1 & May 20)
  - Wheat hay yield (May 1)
  - Starting soil nitrogen
  - Plant available water (PAW)
  - Annual rainfall
  - GSR decile
  - French & Schultz predictions at 80% and 100% WUE

Interpreting Hart Beat Newsletters – *Site information and rainfall*

Location/Weather Setup   Edit setup >

Location
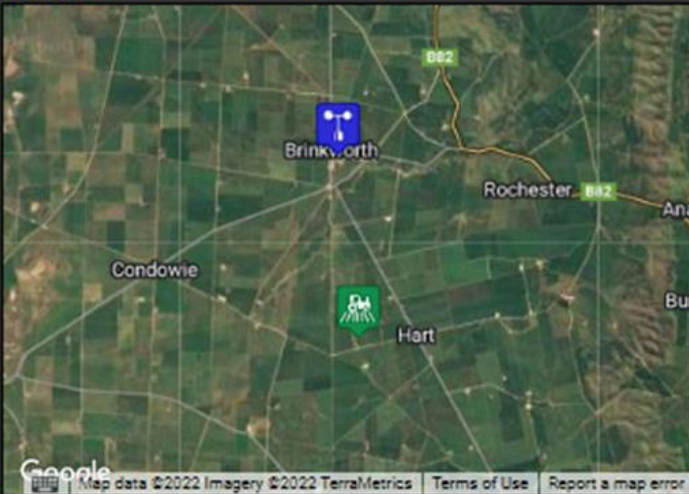
Closest weather station
Brinkworth, South Australia

Rainfall source
Manual entry

Paddock specifics
40 ha, 0m long, 0% slope

The season so far

Annual rainfall to date:	145 mm
GSR to date:	102 mm
Current GSR decile:	3
Current predicted PAW:	50 mm (24% full)
PAWC:	206 mm

Interpreting Hart Beat Newsletters –
What soil data do we collect?

Soil Setup   Edit soil details >

Selected soil characterisation
APSoil: Hart No285
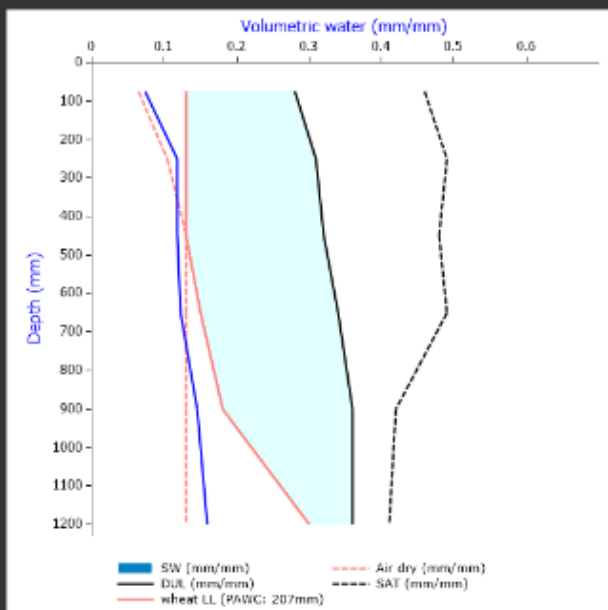
Soil sample date
27-Apr
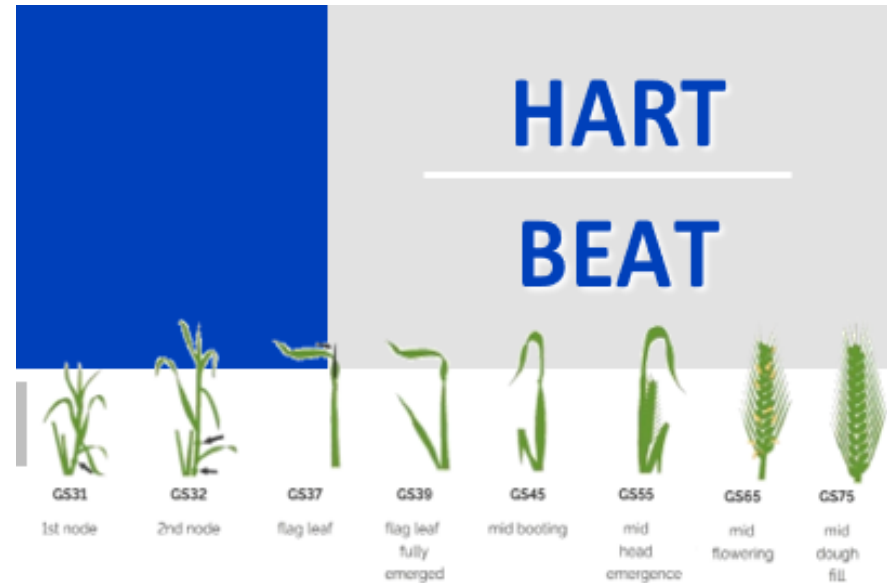
Starting soil water
0.0 mm

Soil sample data

Depth (cm)	Water (%)	NO3 (ppm or mg/kg)	NH4 (ppm or mg/kg)	EC (dS/m)	pH (CaCl2)	Cl (ppm or mg/kg)	ESP (%)	B (ppm or mg/kg)	Al (ppm or mg/kg)
0-15	5.5			0.3	9	44	2.24719	3.8	
15-35	9.2	Input to Equal		0.2	8.5	39	2.41379	3.5	
35-55	9.2	~60kg N/ha		0.2	9.2	71	10.9170	6.6	
55-75	9.7	per paddock		0.4	9.8	39	21.9730	18.1	
75-105	10			0.5	9.8	33	32.4786	36.5	
105-135	10.7			0.8	10.3	359	36.6559	52.5	

Average water % = 8.7% to rooting depth (90cm)

Interpreting Hart Beat Newsletters – *Seeding date simulation*

Yield Prophet® predictions

(*based on a 50% probability*)

Wheat sown May 1
3.4 t/ha
(+0.1 t/ha since last report)
As shown in graph

Wheat sown May 20
3.4 t/ha
(+0.1 t/ha since last report)

Crop Setup

Setup the details of your current season's crop on this page.

☐ Tillage was applied to this paddock

Sowing date
01/May/2022

Emergence date
Automatic

Crop
Wheat

Cultivar
Scepter

Sowing density
180   plants/m²

Row spacing
250   mm

GS11
emergence

GS12
2nd leaf

GS13
3rd leaf
1st tiller

GS14
4th leaf
early tillering

Predicted
Earliest

10-Jun

20-Jun

28-Jun

9-Jul

Interpreting Hart Beat Newsletters –
Seeding date simulation

Yield Prophet®

predictions

(based on a 50% probability)

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Interpreting Hart Beat Newsletters – *Seeding date simulation*

Yield Prophet®

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As shown in graph

Wheat sown May 20
3.4 t/ha
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Crop Setup

Setup the details of your current season's crop on this page.

☐ Tillage was applied to this paddock

Sowing date	Emergence date
01/May/2022 📅	Automatic ⌄

Crop	Cultivar
Wheat ⌄	Scepter ⌄

Sowing density	Row spacing
180	plants/m²	250	mm

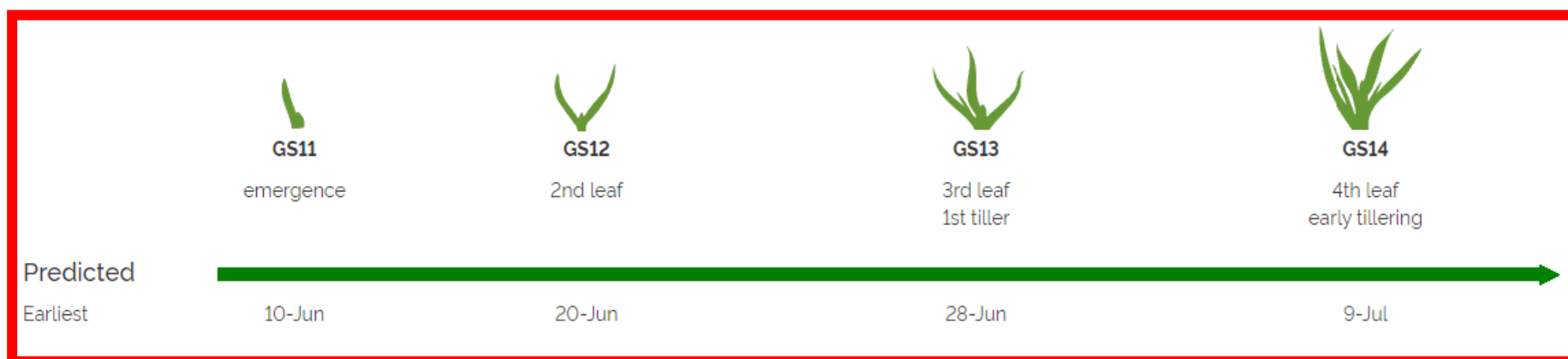|	GS11	GS12	GS13	GS14
	emergence	2nd leaf	3rd leaf 1st tiller	4th leaf early tillering
Predicted				
Earliest	10-Jun	20-Jun	28-Jun	9-Jul

Interpreting Hart Beat Newsletters – *Nitrogen application*

Yield Prophet Simulation for Nitrogen at Hart:

Starting N: 63 kg N/ha

Nitrogen fertiliser: 20 kg N/ha @ seeding

+ 40 kg N/ha on July 10

= 123 kg N/ha

National average for in-crop nitrogen application each season

= 45 kg N / ha

Interpreting Hart Beat Newsletters – *Wheat crop yield*

Total N = 123 kg /ha

Yield Prophet® predictions

(*based* on a 50% probability)

Wheat sown May 1
3.4 t/ha
(+0.1 t/ha since last report)
As shown in graph

Nitrogen limited yield 3.1 t/ha

Yield potential (unlimited nitrogen) 3.6 t/ha

Grain yield outcome

Probability %

Yield t/ha

Decile 1	Decile 2-3	Decile 4-7	Decile 8-9	Decile 10
VERY LOW RAINFALL	LOW RAINFALL	AVERAGE RAINFALL	HIGH RAINFALL	VERY HIGH RAINFALL

Legend:
- Potential yield with unlimited N (dark green)
- Potential yield with current N (light green)

Yield potential (t/ha)

1.5t/ha	2.2t/ha	3.5t/ha	5.4t/ha	7t/ha
	* IF 7KG/HA N ADDED	* IF 18KG/HA N ADDED	* IF 78KG/HA N ADDED	* IF 126KG/HA N ADDED

YIELD PROPHET

YIELD PROPHET *Lite*

Yield Prophet Lite is a free tool that lets you estimate potential yield values for your crop given different rainfall amounts and fertiliser application rates. It also gives the rainfall likelihood for the remainder of the growing season. Start by choosing your crop. ❷

WHEAT

BARLEY

CANOLA

OATS

Download on the App Store

GET IT ON Google Play

CSIRO

BCG *shared solutions*

Choose your nearest weather station

STATE

South Australia ▾

STATION NAME

Brinkworth ▾

OR Select by clicking the map

💧 Water

A good rule of thumb for approximating stored soil water is one quarter of your summer rainfall.

If you don't know your GSR to-date, leave it blank and we'll get the data from your selected weather station.

STORED SOIL WATER
ON APR 1

14.4 mm

GROWING SEASON
RAINFALL TO-DATE

102 mm

N Nitrogen
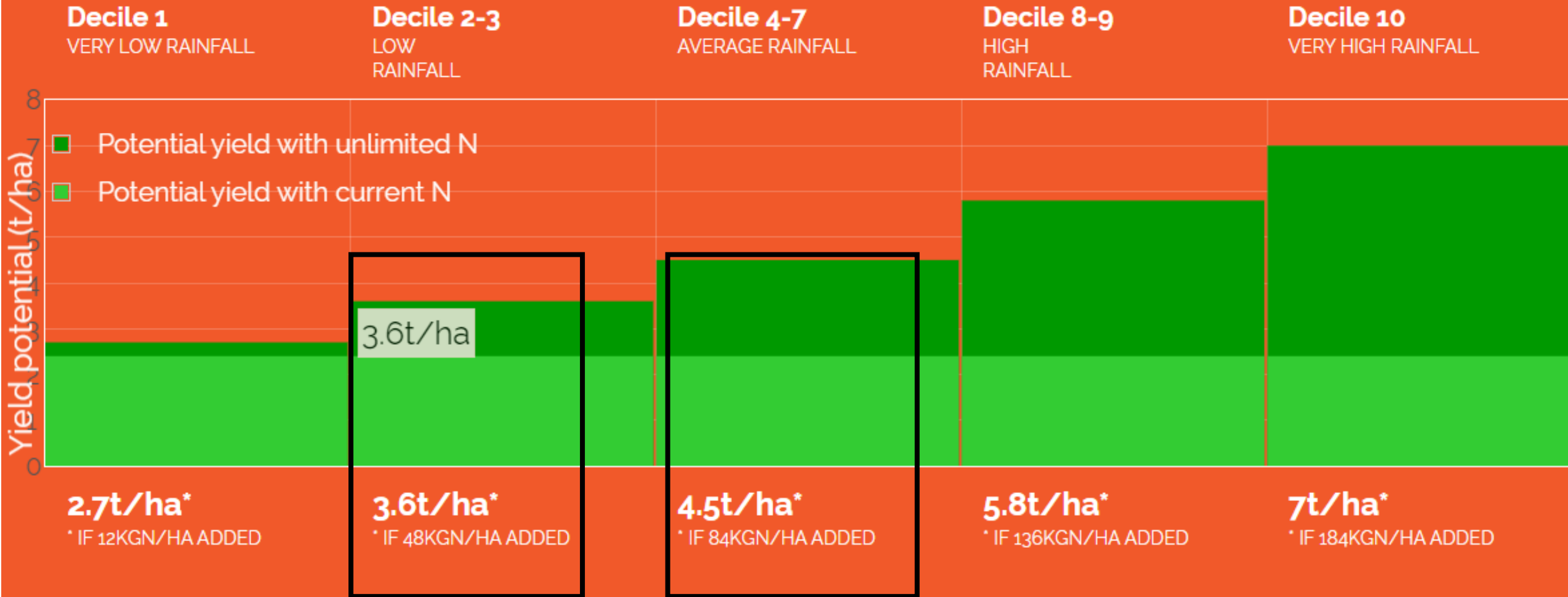
Your estimated soil N should be in your soil test results.

Remember to list any N applications in kg of N and **not kg of fertiliser!**

ESTIMATED SOIL N
ON **APR 1**

77 kgN/ha

N APPLIED
AT SOWING

20 kgN/ha

N APPLIED
AFTER SOWING

0 kgN/ha

Calculate

Yield Prophet® lite

Decile 1 VERY LOW RAINFALL	Decile 2-3 LOW RAINFALL	Decile 4-7 AVERAGE RAINFALL	Decile 8-9 HIGH RAINFALL	Decile 10 VERY HIGH RAINFALL

Potential yield with unlimited N
Potential yield with current N

3.6t/ha

Yield potential (t/ha)

| 2.7t/ha* | 3.6t/ha* | 4.5t/ha* | 5.8t/ha* | 7t/ha* |
| * IF 12KGN/HA ADDED | * IF 48KGN/HA ADDED | * IF 84KGN/HA ADDED | * IF 136KGN/HA ADDED | * IF 184KGN/HA ADDED |

Decile 1 10%	Decile 2-3 20%	Decile 4-7 40%	Decile 8-9 20%	Decile 10 10%

French & Schultz calculations

- French & Schultz Model (1984)

Yield potential (t/ha) = ((Stored Soil Water + Growing Season Rainfall) – Evaporation Coefficient (110)) * WUE (20 kg mm/ha)

- Sadras & Angus (2006) - Yield Prophet Lite

Yield potential (t/ha) = ((Stored Soil Water + Growing Season Rainfall) - Evaporation Coefficient (60)) * WUE (22 kg mm/ha). **= 4.5 t/ha**

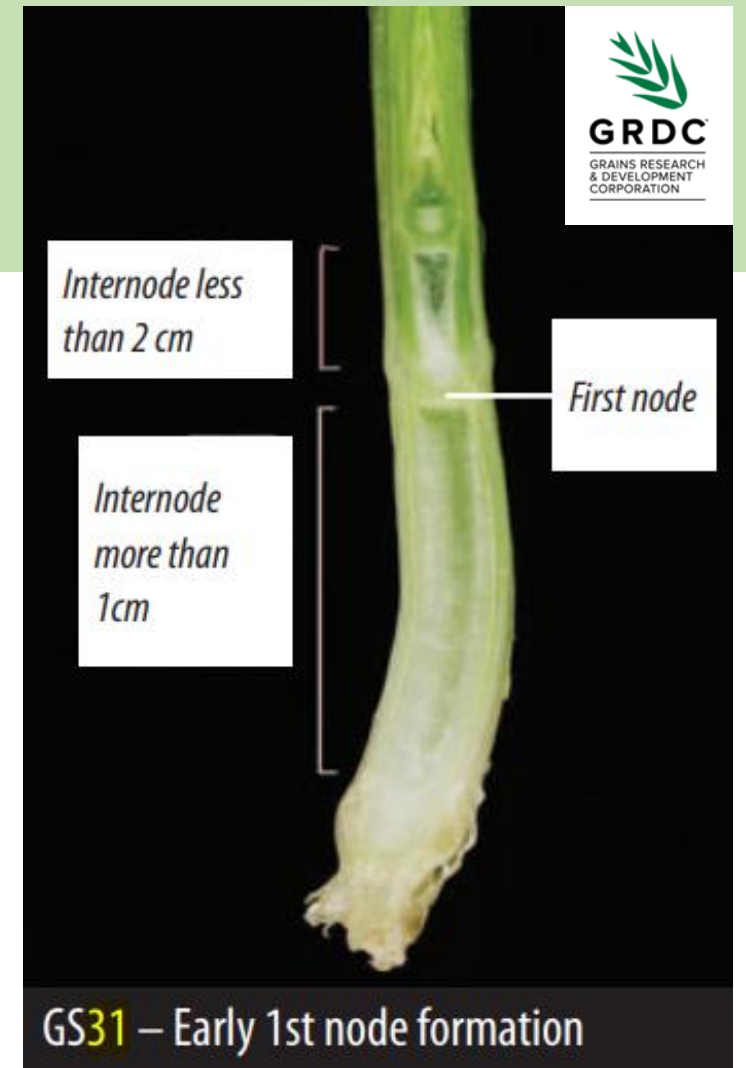**French & Schultz predictions**

This model assumes that there is 15.3 mm stored moisture, 110 mm of evaporation and Decile 5 rainfall (151 mm) for the remainder of the growing season.

100% WUE	**3.4 t/ha**
80% WUE	**2.7 t/ha**

Nitrogen Rule of Thumb

When should you apply Nitrogen?

- There are two 'stages' –
    1. Uptake of N driving growth and yield potential
    2. Remobilisation of N to grain (influencing grain protein)

- **Apply <u>before</u> stem elongation (GS 30 – 31)**
    - 20 -30% of total N is taken up by stem elongation
    - Responses in some cases have led to higher yields when all N is applied at seeding.
    - Most reliable and effective strategy

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

Internode less than 2 cm

First node

Internode more than 1cm

GS31 – Early 1st node formation

THE UNIVERSITY of ADELAIDE

Key messages

- Yield prophet® or yield prophet® lite are valuable tools to determine crop yield potential and assist in nitrogen management decisions

- Using accurate soil and water data to make informed nitrogen management decisions is key

- Considering seasonal forecasts is important and are generally most accurate in July / August

- It is best to apply atleast 80% of all in-crop nitrogen prior to stem elongation (GS 31).

Useful Resources

Hart Website

- Hart Beat Newsletters

- 2021 Yield Prophet® performance review

- Article: Managing your fertiliser dollar in wheat and barley – a study across three seasons

Other

- Yield Prophet® Lite

  https://www.yieldprophet.com.au/yplite/

- GRDC Updates 2022 (James Murray; BCG & James Hunt; UofMelb)

  Managing N fertiliser to profitably close yield gaps – GRDC

- Nitrogen decisions (McDonald & Hooper, 2013)

- Nitrogen decision - Guidelines and rules of thumb - GRDC

Harts Next event in 2022

Improving climate risky decision making

August 2, 2022 | 9am - 12pm

Blyth Town Hall, Blyth, SA

Explore NEW climate forecast products and more importantly, how we can use them to make better on-farm decisions

More info & to register
www.hartfieldsite.org.au

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