HART

BEAT

Yield Prophet® simulations for 8 sites across the Mid-North of SA

Feature site:

HART

Additional site information for:

SPALDING | CONDOWIE

KYBUNGA | FARRELL FLAT | PINERY

EUDUNDA | TARLEE

HART
SA's premier cropping field site

ROCKY RIVER AG

CASE IH AGRICULTURE
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Incorporating
RiskWi$e Balancing risk and reward for on-farm N decision making
MINIMISE RISK & MAXIMISE REWARD
in 2024

ISSUE 66
July 30, 2024

DEFINITIONS

HART BEAT

HART BEAT definitions

The Hart field 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.

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.

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 drier, in a decile 3 year 30% of previous years were drier.

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, nitrogen processes and crop growth in the paddock. *Yield Prophet®* calculates the amount of water and nitrogen available to the crop as well as the water and nitrogen demand of the crop.

Important Notice: *Yield Prophet®* 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). Click on these links for more information about APSIM or *Yield Prophet®*.

HART BEAT 2024

HART BEAT

A look at HART BEAT in 2024

This season we're taking you through our RiskWi$e nitrogen decision making process, based on a risk-reward analysis. Similar to 2023, Yield Prophet® outputs for the Hart site this year are not just simulations – we're using actual data and important climate information (links included), then explained how we've pulled this together to make informed N decisions. **So, this document provides a real-life example of a nitrogen decision and that's the rate we'll apply to Hart's wheat variety trial, meaning we can also reflect on that decision at the end of the season.** We've also included some information on seven other sites across the Mid-North, so you can see predicted yield outcomes across a range of season deciles.

What is RiskWi$e?

RiskWi$e is a 5-year national investment from GRDC that will support the on-farm decision making strategies of Australian grain growers, by assisting them to better understand risk and provide risk management tools to maximise returns. Some key aspects include:

1. Understanding risk and reward
    a. Identifying the known and unknown components of risk.
    b. Tools to help assess and balance upside reward and downside risk.
2. Challenging grower decision-making to account for various probabilities or futures and seasonal outlooks when making decisions.

Through this project, growers and advisors will receive support to quantify the probability of various outcomes, then use that information to make risk vs reward assessments. This can be applied across a range of management decisions in the context of your own farming operations.

Background

Generally, our nitrogen decisions are based on one future, for example: a target yield in a particular environment of 3 t/ha. This target is helpful because we can use the 40 kg N per tonne of wheat rule, to calculate that we need 120kg N. If we know how much N is currently available to the crop, we know how much extra to add. But, we also know that if we are unlikely to hit this target, we are going to either under-fertilise and regret being too cautious or over-fertilise and regret being too optimistic. An alternative approach is to look at a range of possible outcomes so that we can better understand the downside risk and upside reward, using all the information available to us at that point in time. **By knowing the downside risk and upside reward of our decision, we can be more comfortable in weighing up the benefits of our decision and understand the risks.**

When it comes to harvest, we will know whether our decision was lucky or unlucky, but in July we can only know that we have made a wise or unwise decision.

Yield Prophet® uses the starting soil water and weather records for 2024 up to July 26 and shows the range of possible futures using all historic seasons. We also have a forecast from the Bureau of Meteorology.

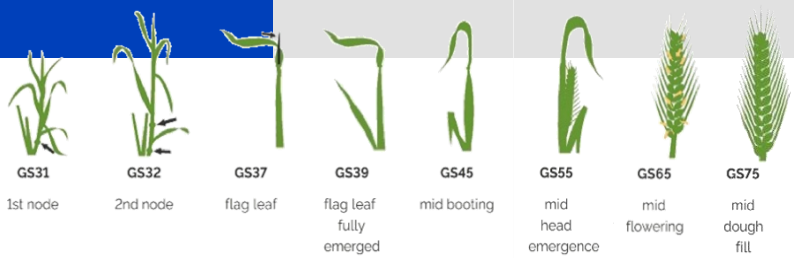
Compiled by Rebekah Allen; Hart Field-Site Group and supported by Peter Hayman; SARDI and Barry Mudge; Barry Mudge Consulting.

Location:

HART

HART BEAT

Date of report: July 30, 2024



Site information

Soil type: Sandy clay loam
Average annual rainfall: 400 mm

Crop growth

Variety:	Scepter wheat
Sowing date:	May 14, 2024
Emergence:	June 11, 2024
Soil sampling date:	April 9, 2024
Starting soil N:	65 kg N/ha
Seeding fertiliser:	14.4 kg N/ha

The season so far

Annual rainfall to date:	112 mm
GSR to date:	88 mm
Current GSR decile:	1
Initial PAW (April 9)	8.6 mm
Current predicted PAW:	32 mm (16% full)
PAWC:	206 mm

Yield Prophet® report: Hart field site

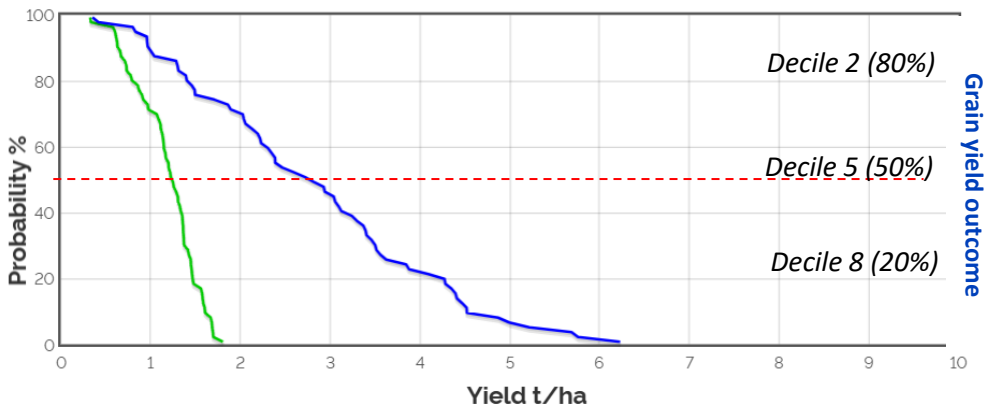
Output 1: What is our yield spread?

The first report (below) was run on July 10 with no additional nitrogen (N) added (starting soil and seeding N only). The yield probability curves display two different nitrogen scenarios. The **green** line displays grain yield at Hart with the current soil available nitrogen, or Nitrogen-limited yield (PY_N). The **blue** line represents the grain yield potential for water-limited yield potential (PY_w). A large difference between these two lines, as observed below, indicates additional N fertiliser is required for the crop to reach its yield potential and that the crop will respond to N even in a Decile 1 season. The red dotted line represents Decile 5 (or 50% probability of receiving 1.3 t/ha nitrogen-limited yield or 3 t/ha water-limited yield). We know that this site is highly responsive to N and it is clear that even a Decile 1 season from now on would require significant N input to realise PY_w.

You may notice a discrepancy between actual soil N measured of 65 kg N/ha (~1.6 t crop) and lowest recorded yield on graph (~0.7 t/ha). This is because soil N was measured at 0 – 105 cm and the Yield Prophet model assumes not all of this N is available to the crop at depth, particularly in a dry season. Top-up N would be required to ensure N is available in the root zone. Available N in top 60 cm was approximately 30 kg/ha, equivalent to 0.75 t/ha).

Total nitrogen:

Starting Soil N (0 – 105 cm):
65 kg N/ha
Fertiliser at seeding:
14.4 kg N/ha
(80 kg/ha DAP applied)



Output 2: The "no-brainer" application

As we know that significant N is required to improve our final yield, **we applied 30 kg N/ha (65 kg urea) as a top dress application on July 10 due to an opportunistic rain event**. Yield Prophet® was run again (below) on July 26 to track yield progress after initial our application and received rain events. In the graph below you can see that we have started to close the yield gap between nitrogen and water-limited yield.

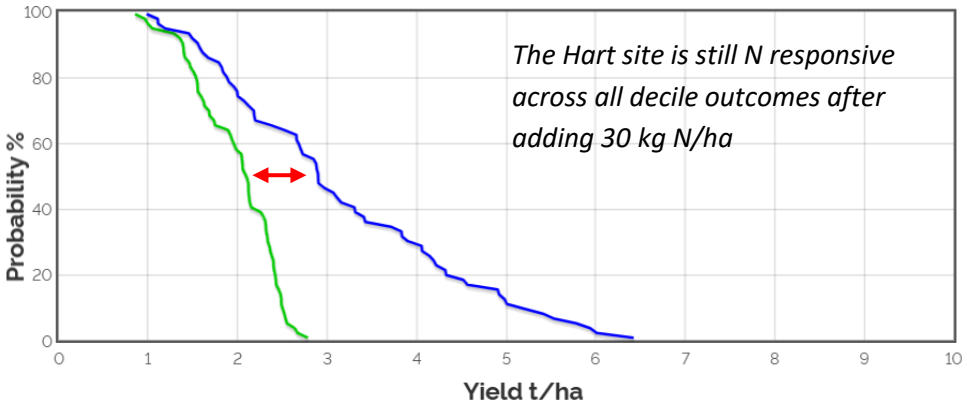
Total nitrogen:

Soil N = 65 kg N/ha

Seeding N = 14.4 kg N/ha

+ 30 kg N/ha applied on July 10 before rain event

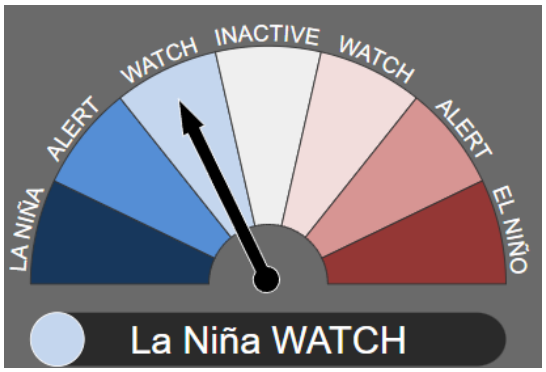
(18.8 mm within 5 days)



WHAT'S NEXT: Seek more information & consider climate outlook

ENSO Outlook – The alert system for El Niño–Southern Oscillation

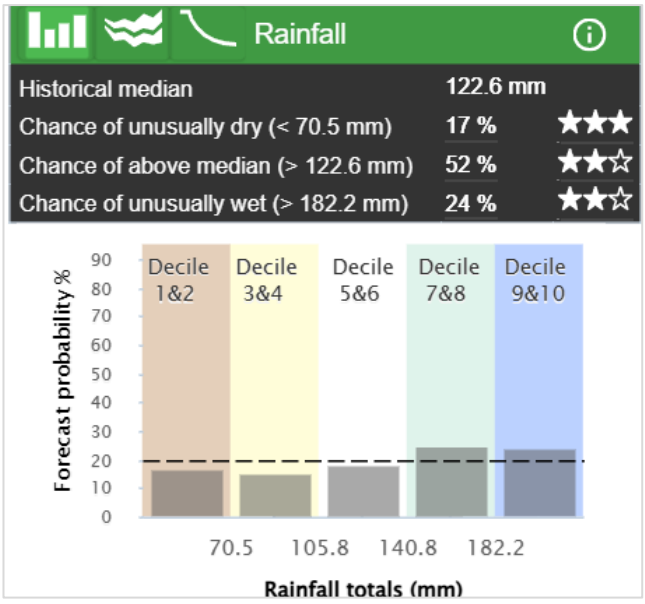
The Bureau have indicated La Niña Watch this season. **What does this mean?** There are signs that a La Niña may develop in the Pacific Ocean later in 2024, however this is not guaranteed. When these criteria have been met in the past, a La Niña event has developed approximately 50% of the time (BoM, 2024). There have been about 25 La Niña events in the last 100 years, so this is double the long term odds.



Sourced from Bureau of Meteorology

http://www.bom.gov.au/climate/enso/outlook/

August – October outlook



We can also find short and longer-term climate information indicating the likelihood of above average rainfall, in this case 3-month forecast (left). The shaded area in each bar indicates the likelihood of each of the five rainfall bands occurring. The forecast likelihood can be compared to the usual chance (20%) shown by the dashed line. In this case, we have a 32% chance that August – October rainfall will fall into a decile 1 – 4 category, and 49% chance of falling into decile 7 – 10. **Combined, this information tells us that the likelihood of recieving above median (average) rainfall from August - October is 52% which is simialr to the long-term odds.** This is in contrast to 2023, where we saw a strong swing in the odds to drier seasonal outcomes, with only a 22% chance of above average rainfall.

Sourced from Bureau of Meteorology

Rainfall - The chance of above median for August to October - Climate Outlooks (bom.gov.au)

NEXT UP: We combine Yield Prophet® output 2, the bureau forecast & economics

Yield Prophet® (based on output 2)

There is not a lot of upside benefit to applying N if Decile 1 occurs from now on. From Decile 3 and above, there is the potential still for significant yield to be left in the paddock due to insufficient N. In the absence of a forecast, there is seen to be considerable upside in applying N if a wetter than average spring eventuates. The difference between PY_W and PY_N at Decile 5 is around 0.8 t/ha. Based on the rule of thumb of 40 kg/Ha N required per tonne of wheat produced, this gap could be covered by adding 32 kg of N (Table 1). There is an upside to applying this amount of N while still remaining relatively conservative.

We are confident that if we get below average rainfall conditions, we'll see a portion of N carry over into 2024. The upside of adding an additional 30 kg N/ha is worthwhile, while remaining conservative due to a higher chance of above average rainfall across the next three months.

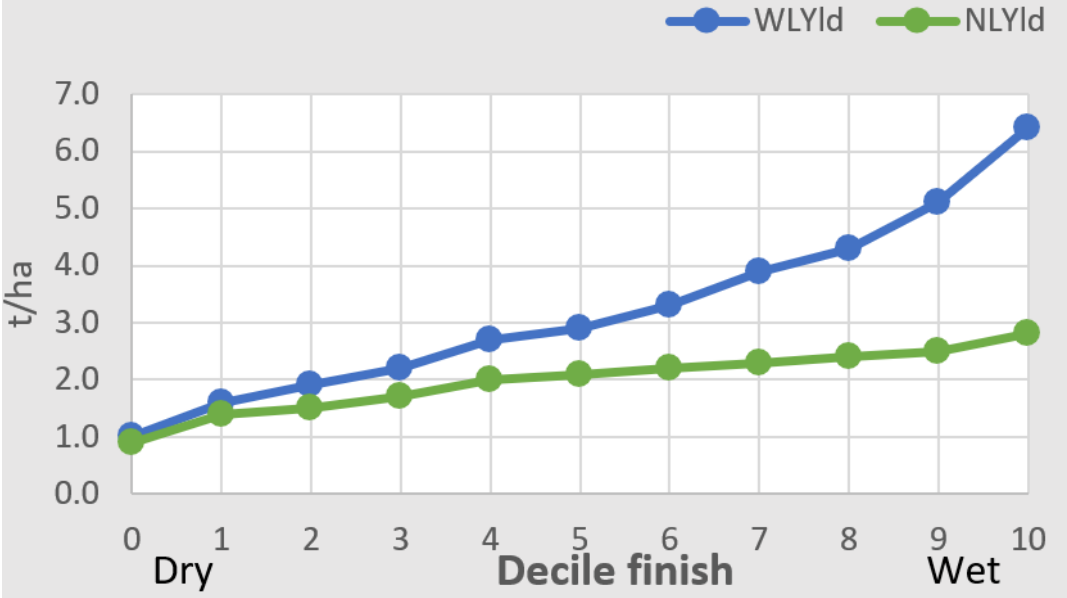


Figure 1. Yield x decile graph for adding an additional 30kg N/ha to Output 2. Graph source adapted from Peter Hayman's 'Fast Graphs For Slow Thinking' spreadsheet.

Table 1. N required across a range of decile seasons (derived from converted Yield Prophet graph above).

Equivalent decile finish	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PY_N (t/ha)	0.9	1.4	1.5	1.7	2	2.1	2.2	2.3	2.4	2.5	2.8
PY_w (t/ha)	1	1.6	1.9	2.2	2.7	2.9	3.3	3.9	4.3	5.1	6.4
Yield difference (t/ha)	0.1	0.2	0.4	0.5	0.7	0.8	1.1	1.6	1.9	2.6	3.6
N requirement (kg N/ha)	4	8	16	20	28	32	44	64	76	104	144

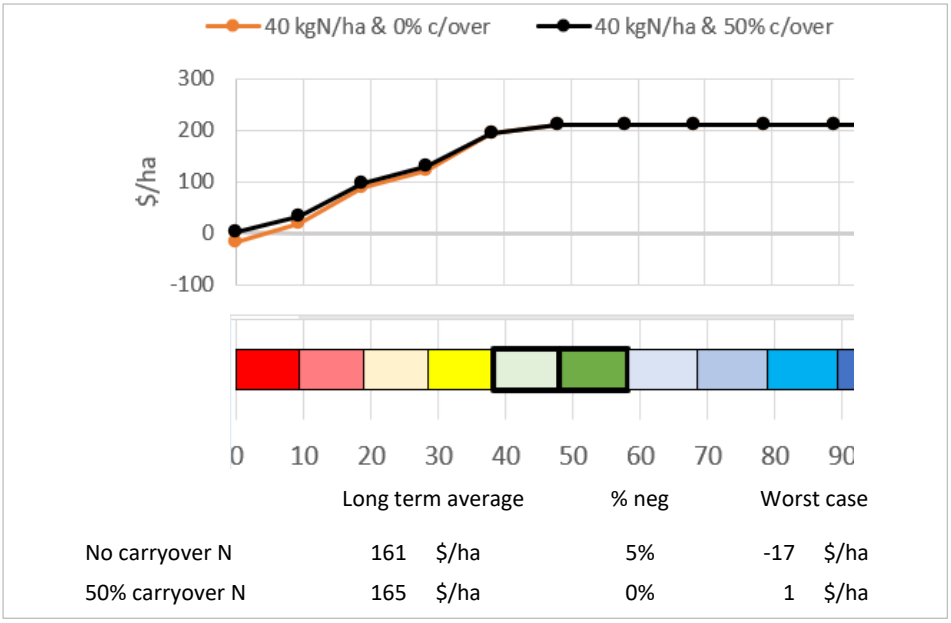


Figure 2. Example of economic appraisal of applying an additional 30 kg N (65 kg/ha of urea) with 52% chance of exceeding above rainfall. This is based on the yield information for each Decile provided in Output 2 (wheat price of $350/tonne, urea at $650/tonne and application cost of $10/ha). Any point above the "0" line is a profitable outcome. The orange line shows an additional 30kg N/ha with no value on carry over N and the black line an additional 30 kg N/ha accounting for 50% carry over on any un-used N.

On the basis of the data shown above, applying additional N to this crop is profitable across virtually all seasons except the 5% or 1 in 20 worst seasons. Accepting of course that there may be other issues which could affect the crop yield (other than spring rainfall) such as frost or heat spikes. Also note that the above appraisal does not allow any value on un-used N which may be carried over in the event of a dry spring. A simple way to account for the carryover is to consider any N that is not used this year in the N budget. As an example, the yield gap in decile 1 is 0.2 t/ha which only needs 8 kgN/ha. Adding 30 kg N/ha means that 22 kg N/ha will not be used if we have a decile 1 finish and 11 kg N/ha will be carried forward to next year. Adding 30 kgN/ha (30*1.4+10 =$52) which is slightly profitable if it provides an extra 0.2t/ha of wheat @ $350/t = $70. The partial budget increases from $18/ha to $33/ha with the 11kg/N carried forward. Because the downside risk is small compared to the upside opportunity, a farmer would have to be very **risk averse** to not add N in this situation.

Output 3: Nitrogen application 2

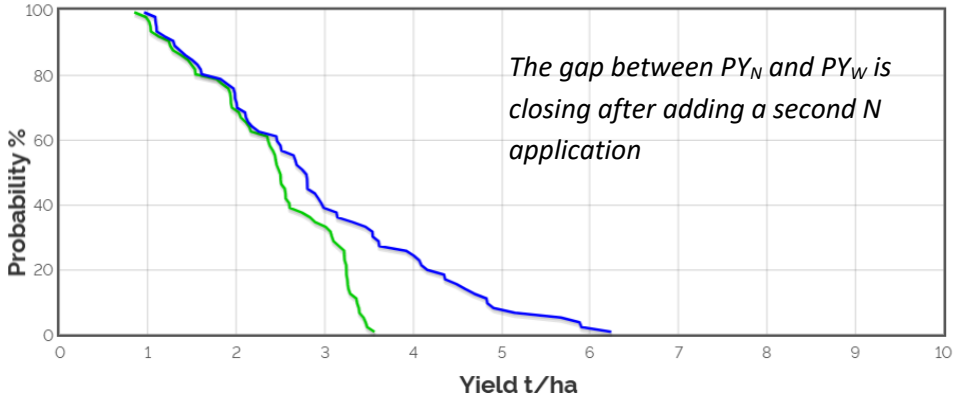
The below output was modelled on July 30 after initial nitrogen application and rain events. There is still a slight-moderate gap between nitrogen and water-limited yield from decile 5 onwards. Note that outputs 1, 2 and 3 have a similar blue line showing a wide yield range of 1 t/ha to 6.5 t/ha depending on how the season finishes. Adding extra nitrogen has moved the green line (YP_N) closer to the water-limited yield. You can see that by adding an additional 30 kg N/ha at Hart, we significantly close the yield gap between YP_W and YP_N compared to output 2.

Total nitrogen:

Soil N = 105 kg N/ha

Seeding = 14.4 kg N/ha

+ 60 kg N/ha has now been top-dressed in total



Summary of N application at Hart

By taking into account Yield Prophet® Output 2, an economic analysis and the Bureau forecast for Hart with a 52% chance of above average rainfall for August - October, we have applied two in-crop applications of Nitrogen, while remaining conservative with our N decision strategy this this season. Because we have a relatively even chance of falling either above or below average rainfall this season, we remain conservative with our approach in 2024.

Nitrogen application 1

'A no brainer', 30kg N/ha (65 kg urea) was applied to a very response site across all decile ranges.

Nitrogen application 2

A follow up application with an additional 30 kg N/ha (65 kg urea/ha) was applied. Taking into account the dry start we saw in 2024, with crops emerging mid-June, this decision to top-dress a second application of N was based on the substantial upside and small downside with close to even odds of any decile occurring. We are comfortable that we will meet our yield potential up until Decile 4 seasonal conditions.

In total, we applied 30 kg N/ha on June 10 with an additional top-dress of 30 kg N/ha planned prior to the next rainfall event to our wheat variety trial at Hart. Based on a price of $1.40/kg, our urea top dress inputs this season equal $84/ha.

We'll share our reflections on this decision and an update on how the season and yield potential across the 8 locations is tracking in our next edition of HART BEAT in August.

For more information on the 'Fast Graphs For Slow Thinking' spreadsheet, watch Peter Hayman and Barry Mudge here: *https://youtu.be/G8nUHXOLR90* or contact our R&E Manager, Bek.

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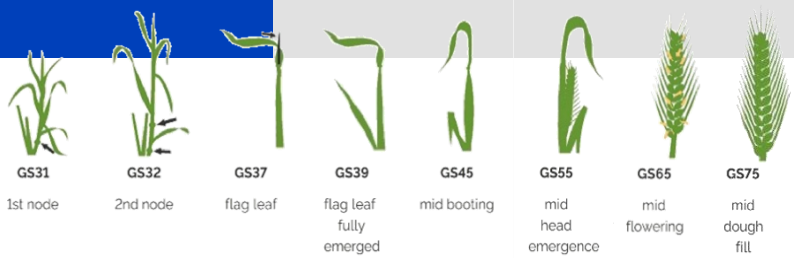
Location:

SPALDING

HART BEAT

Date of report: July 26, 2024



Soil type: Red brown earth
Average annual rainfall: 430 mm

Simulation assumptions

Crop growth

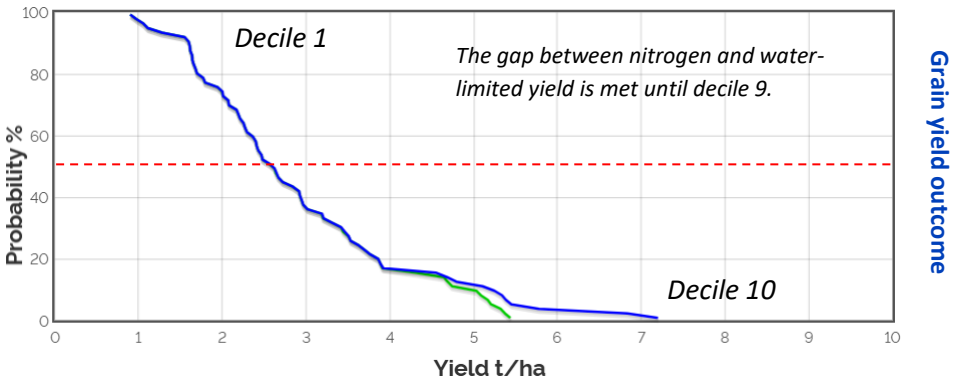
Variety:	Scepter wheat
Sowing date:	May 1, 2024
Measured starting N:	194 kg N/ha
Nitrogen fertiliser:	20 kg N @ seeding + 40 kg N/ha

The season so far

GSR to date:	116 mm
Estimated GSR decile to date:	2
Initial PAW (April 11):	3 mm
Current predicted PAW:	41 mm (29% full)
PAWC:	143 mm

Yield Prophet® prediction

Based on 214 kg N/ha starting soil & seeding N + 30 kg N/ha applied in crop



The **green** line in the graph above shows the predicted grain yield at Spalding for nitrogen-limited yield (PY_N). The **blue** line represents the grain yield potential for water-limited yield (PY_W). No difference between these two lines indicates the current soil N level is adequate for the crop to reach its yield potential. A large difference between these two lines, indicates additional N fertiliser is required for the crop to reach its yield potential. Site characterisation data from APSoil for Spalding has been used, and starting soil available nitrogen and water was measured. The red dotted line represents Decile 5 (or 50% probability of receiving 2.6 t/ha wheat grain yield – refer to below table).

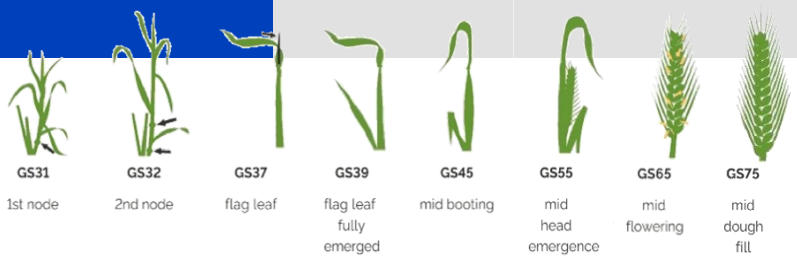
Based on the data from graph above, this table shows the amount of additional N required to meet the yield gap between the nitrogen and water-limited yield gap across a range of decile seasons.

Equivalent decile finish	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PY_N (t/ha)	0.9	1.6	1.7	2.1	2.3	2.6	2.9	3.4	3.9	4.9	5.4
PY_w (t/ha)	0.9	1.6	1.7	2.1	2.3	2.6	2.9	3.4	3.9	5.2	7.2
Yield difference (t/ha)	0	0	0	0	0	0	0	0	0	0.3	1.8
Additional N requirement (kg N/ha)	0	0	0	0	0	0	0	0	0	12	72

Location:

CONDOWIE

HART BEAT



Date of report: July 26, 2024

Soil type: Sandy loam
Average annual rainfall: 350 mm

Simulation assumptions

Crop growth

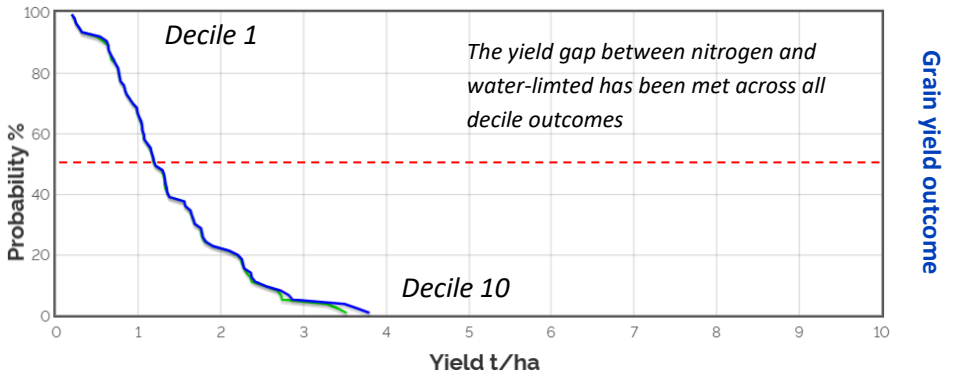
Variety:	Scepter wheat
Sowing date:	May 1, 2024
Measured starting N:	114 kg N/ha
Nitrogen fertiliser:	20 kg N/ha @ seeding + 30 kg N/ha

The season so far

GSR to date:	93 mm
Estimated GSR decile to date:	3
Initial PAW (April 11):	0 mm
Current predicted PAW:	19 mm (17% full)
PAWC:	115 mm

Yield Prophet® prediction

Based on 134 kg N/ha starting soil & seeding N + 30 kg N/ha applied in crop



The **green** line in the graph above shows the predicted grain yield at Spalding for nitrogen-limited yield (PY_N). The **blue** line represents the grain yield potential for water-limited yield (PY_W). No difference between these two lines indicates the current soil N level is adequate for the crop to reach its yield potential. A large difference between these two lines, indicates additional N fertiliser is required for the crop to reach its yield potential. Site characterisation data from APSoil for Condowie has been used, and starting soil available nitrogen and water was measured. The red dotted line represents Decile 5 (or 50% probability of receiving 1.2 t/ha wheat grain yield – refer to below table).

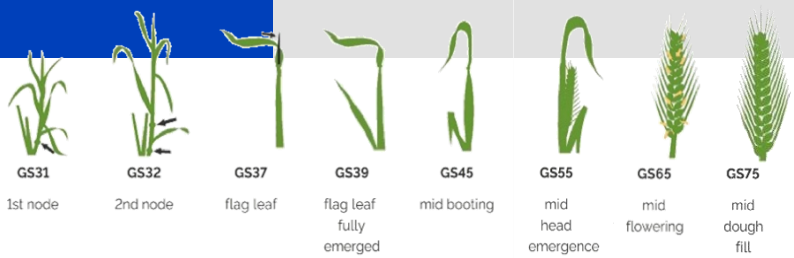
Based on the data from graph above, this table shows the amount of additional N required to meet the yield gap between the nitrogen and water-limited yield gap across a range of decile seasons.

Equivalent decile finish	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PY_N (t/ha)	0.2	0.6	0.8	0.9	1.1	1.2	1.4	1.7	2.2	2.5	3.5
PY_w (t/ha)	0.2	0.6	0.8	0.9	1.1	1.2	1.4	1.7	2.2	2.5	3.8
Yield difference (t/ha)	0	0	0	0	0	0	0	0	0	0	0.3
Additional N requirement (kg N/ha)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**

Location:

KYBUNGA

HART BEAT



Date of report: July 26, 2024

Soil type: Clay loam
Average annual rainfall: 428 mm

Simulation assumptions

Crop growth

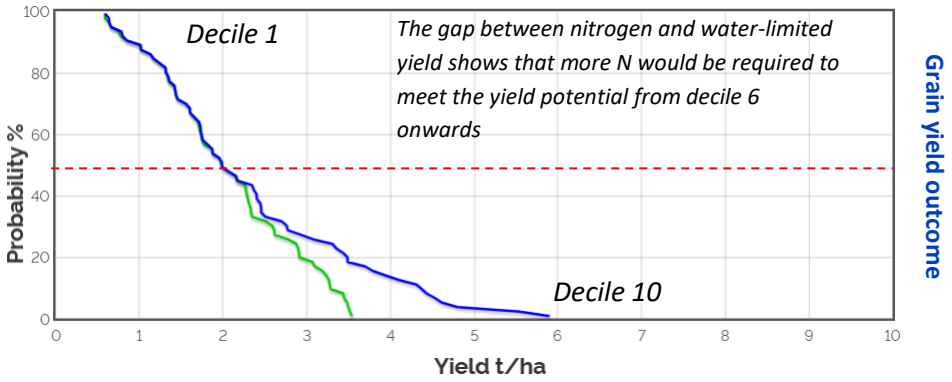
Variety:	Scepter wheat
Sowing date:	May 1, 2024
Estimated starting N:	87 kg N/ha
Nitrogen fertiliser:	20 kg N/ha @ seeding + 30 kg N/ha

The season so far

GSR to date:	106 mm
Estimated GSR decile to date:	1
Initial PAW (April 11):	0 mm
Current predicted PAW:	21 mm (8% full)
PAWC:	262 mm

Yield Prophet® prediction

Based on 107 kg N/ha starting soil & seeding N + 30 kg N/ha applied in crop



The **green** line in the graph above shows the predicted grain yield at Spalding for nitrogen-limited yield (PY_N). The **blue** line represents the grain yield potential for water-limited yield (PY_W). No difference between these two lines indicates the current soil N level is adequate for the crop to reach its yield potential. A large difference between these two lines, indicates additional N fertiliser is required for the crop to reach its yield potential. Site characterisation data from APSoil for Kybunga has been used, and starting soil available nitrogen and water was measured. The red dotted line represents Decile 5 (or 50% probability of receiving 2 t/ha wheat grain yield – refer to below table).

Based on the data from graph above, this table shows the amount of additional N required to meet the yield gap between the nitrogen and water-limited yield gap across a range of decile seasons.

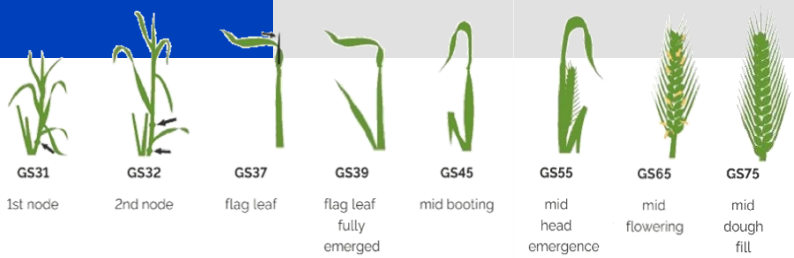
Equivalent decile finish	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PY_N (t/ha)	0.6	1.1	1.4	1.6	1.8	2	2.3	2.5	3	3.4	3.6
PY_w (t/ha)	0.6	1.1	1.4	1.6	1.9	2	2.5	2.9	3.5	4.4	5.8
Yield difference (t/ha)	0	0	0	0	0.1	0	0.2	0.4	0.5	1	2.2
Additional N requirement (kg N/ha)	0	0	0	0	4	0	8	16	20	40	88

Location:

FARRELL FLAT

HART BEAT

Date of report: July 26, 2024



Soil type: Light clay loam
Average annual rainfall: 474 mm

Simulation assumptions

Crop growth

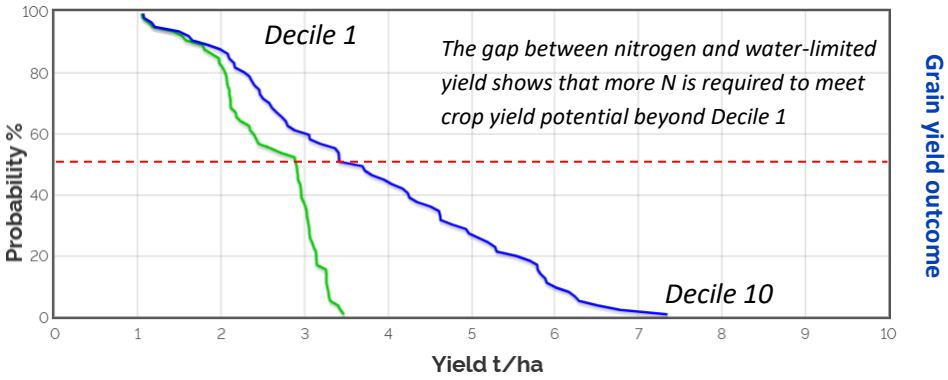
Variety:	Scepter wheat
Sowing date:	May 1, 2024
Estimated starting N:	66 kg N/ha
Nitrogen fertiliser:	20 kg N/ha @ seeding + 30 kg N/ha

The season so far

GSR to date:	128 mm
Estimated GSR decile to date:	2
Initial PAW (April 11):	0 mm
Current predicted PAW:	43 mm (25% full)
PAWC:	172 mm

Yield Prophet® prediction

Based on 86 kg N/ha starting soil & seeding N
+ 30 kg N/ha applied in crop



The **green** line in the graph above shows the predicted grain yield at Spalding for nitrogen-limited yield (PY_N). The **blue** line represents the grain yield potential for water-limited yield (PY_W). No difference between these two lines indicates the current soil N level is adequate for the crop to reach its yield potential. A large difference between these two lines, indicates additional N fertiliser is required for the crop to reach its yield potential. Site characterisation data from APSoil for Farrell Flat has been used, and starting soil available nitrogen and water was measured. The red dotted line represents Decile 5 (or 50% probability of receiving 2.9 t/ha nitrogen-limited yield or 3.6 t/ha water-limited yield– refer to below table).

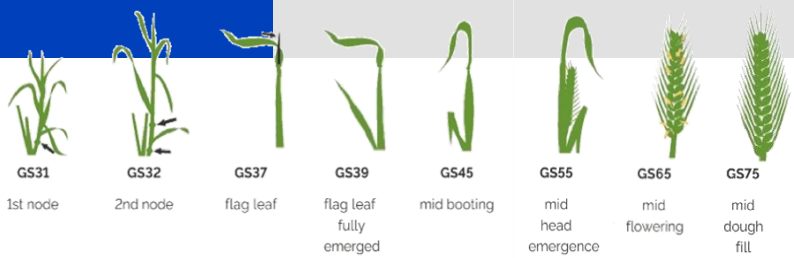
Based on the data from graph above, this table shows the amount of additional N required to meet the yield gap between the nitrogen and water-limited yield gap across a range of decile seasons.

Equivalent decile finish	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PY_N (t/ha)	1	1.6	2	2.1	2.4	2.9	3	3	3.1	3.3	3.5
PY_w (t/ha)	1.1	1.7	2.3	2.6	3	3.6	4.2	4.8	5.5	6	7.4
Yield difference (t/ha)	0.1	0.1	0.3	0.5	0.6	0.7	1.2	1.8	2.4	2.7	3.9
Additional N requirement (kg N/ha)	**4**	**4**	**12**	**20**	**24**	**28**	**48**	**72**	**96**	**108**	**156**

Location:

PINERY

HART BEAT



Date of report: July 26, 2024

Soil type: Silty clay loam
Average annual rainfall: 374 mm

Simulation assumptions

Crop growth

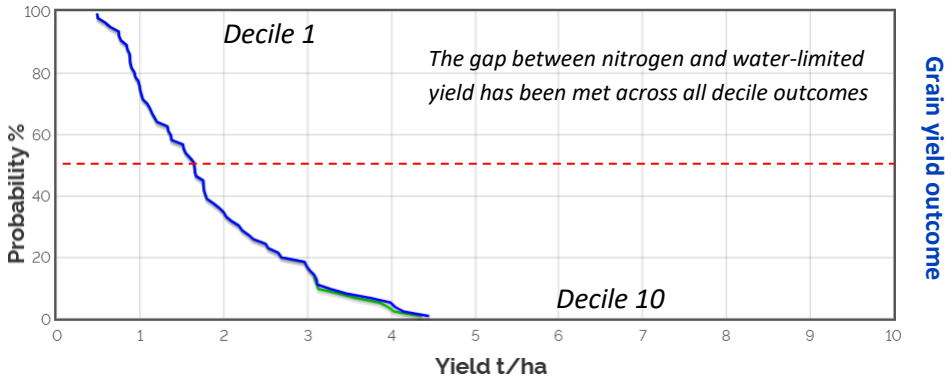
Variety:	Scepter wheat
Sowing date:	May 1, 2024
Estimated starting N:	182 kg N/ha
Nitrogen fertiliser:	20 kg N/ha @ seeding + 30 kg N/ha

The season so far

GSR to date:	94 mm
Estimated GSR decile to date:	1
Initial PAW (April 11):	0 mm
Current predicted PAW:	29 mm (37% full)
PAWC:	79 mm

Yield Prophet® prediction

Based on 202 kg N/ha starting soil & seeding N + 30 kg N/ha applied in crop



The **green** line in the graph above shows the predicted grain yield at Spalding for nitrogen-limited yield (PY_N). The **blue** line represents the grain yield potential for water-limited yield (PY_W). No difference between these two lines indicates the current soil N level is adequate for the crop to reach its yield potential. A large difference between these two lines, indicates additional N fertiliser is required for the crop to reach its yield potential. Site characterisation data from APSoil for Pinery has been used, and starting soil available nitrogen and water was measured. The red dotted line represents Decile 5 (or 50% probability of receiving 1.6 t/ha wheat grain yield – refer to below table).

Based on the data from graph above, this table shows the amount of additional N required to meet the yield gap between the nitrogen and water-limited yield gap across a range of decile seasons.

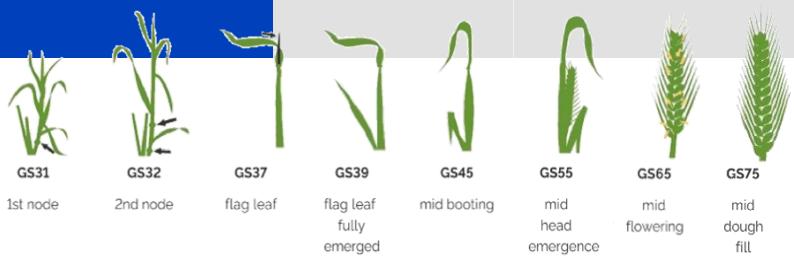
Equivalent decile finish	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PY_N (t/ha)	0.5	0.8	0.9	1.1	1.4	1.6	1.8	2.2	2.7	3.1	4.4
PY_w (t/ha)	0.5	0.8	0.9	1.1	1.4	1.6	1.8	2.2	2.7	3.2	4.5
Yield difference (t/ha)	0	0	0	0	0	0	0	0	0	0.1	0.1
Additional N requirement (kg N/ha)	0	0	0	0	0	0	0	0	0	4	4

Location:

EUDUNDA

HART BEAT

Date of report: July 26, 2024



Soil type: Gravelly loam
Average annual rainfall: 445 mm

Simulation assumptions

Crop growth

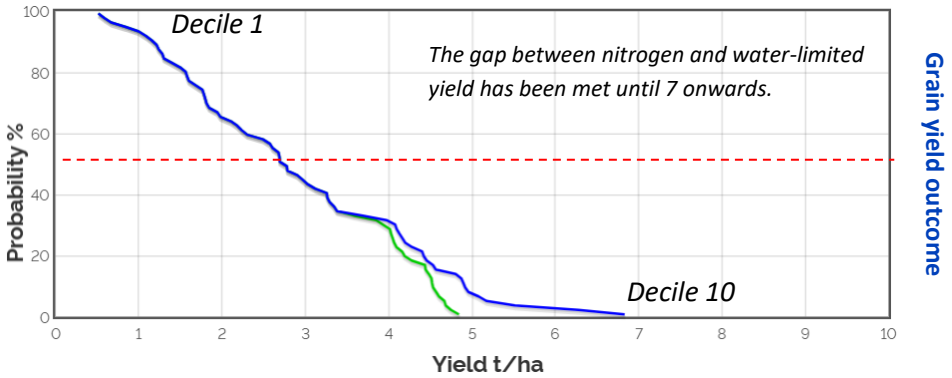
Variety:	Scepter wheat
Sowing date:	May 1, 2024
Estimated starting N:	115 kg N/ha
Nitrogen fertiliser:	20 kg N/ha @ seeding + 30 kg N/ha

The season so far

GSR to date:	101 mm
Estimated GSR decile to date:	1
Initial PAW (April 11):	48 mm
Current predicted PAW:	24 mm (25% full)
PAWC:	96 mm

Yield Prophet® prediction

Based on 135 kg N/ha starting soil & seeding N + 30 kg N/ha applied in crop



The **green** line in the graph above shows the predicted grain yield at Spalding for nitrogen-limited yield (PY_N). The **blue** line represents the grain yield potential for water-limited yield (PY_W). No difference between these two lines indicates the current soil N level is adequate for the crop to reach its yield potential. A large difference between these two lines, indicates additional N fertiliser is required for the crop to reach its yield potential. Site characterisation data from APSoil for Eudunda has been used, and starting soil available nitrogen and water was measured. The red dotted line represents Decile 5 (or 50% probability of receiving 2.7 t/ha wheat grain yield – refer to below table).

Based on the data from graph above, this table shows the amount of additional N required to meet the yield gap between the nitrogen and water-limited yield gap across a range of decile seasons.

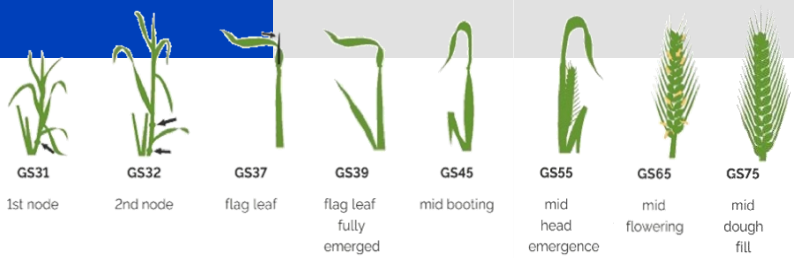
Equivalent decile finish	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PY_N (t/ha)	0.5	1.2	1.6	1.8	2.3	2.7	3.3	3.9	4.2	4.5	4.8
PY_w (t/ha)	0.5	1.2	1.6	1.8	2.3	2.7	3.3	4.1	4.4	4.9	6.8
Yield difference (t/ha)	0	0	0	0	0	0	0	0.2	0.2	0.4	2
Additional N requirement (kg N/ha)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**8**	**16**	**80**

Location:

TARLEE

HART BEAT

Date of report: July 26, 2024



Soil type: Sandy loam
Average annual rainfall: 428 mm

Simulation assumptions

Crop growth

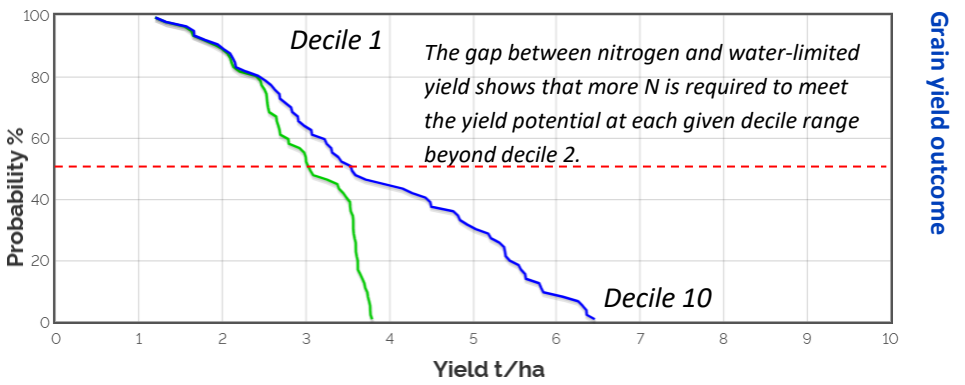
Variety:	Scepter wheat
Sowing date:	May 1, 2024
Estimated starting N:	67 kg N/ha
Nitrogen fertiliser:	20 kg N/ha @ seeding + 40 kg N/ha

The season so far

GSR to date:	100 mm
Estimated GSR decile to date:	1
Initial PAW (April 11):	43.7 mm
Current predicted PAW:	44 mm (39% full)
PAWC:	113 mm

Yield Prophet® prediction

Based on 87 kg N/ha starting soil & seeding N
+ 40 kg N/ha applied in crop



The **green** line in the graph above shows the predicted grain yield at Spalding for nitrogen-limited yield (PY_N). The **blue** line represents the grain yield potential for water-limited yield (PY_W). No difference between these two lines indicates the current soil N level is adequate for the crop to reach its yield potential. A large difference between these two lines, indicates additional N fertiliser is required for the crop to reach its yield potential. Site characterisation data from APSoil for Tarlee has been used, and starting soil available nitrogen and water was measured. The red dotted line represents Decile 5 (or 50% probability of receiving 3 t/ha nitrogen-limited yield or 3.5 t/ha water-limited yield).

Based on the data from graph above, this table shows the amount of additional N required to meet the yield gap between the nitrogen and water-limited yield gap across a range of decile seasons.

Equivalent decile finish	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PY_N (t/ha)	1.3	1.9	2.4	2.5	2.8	3	3.5	3.6	3.6	3.7	3.8
PY_w (t/ha)	1.3	2	2.4	2.8	3.2	3.5	4.4	5	5.4	5.8	6.5
Yield difference (t/ha)	0	0.1	0	0.3	0.4	0.5	0.9	1.4	1.8	2.1	2.7
Additional N requirement (kg N/ha)	0	4	0	12	16	20	36	56	72	84	108