Yield Prophet® performance in 2021

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Key findings

- Yield Prophet® simulation of wheat grain yields sown on May 1 at Hart in 2021 predicted 2.61 t/ha above actual harvested yield.

- Differences observed between predicted and actual wheat grain yields were attributed to crops receiving above average rainfall in July and August, followed by dry seasonal conditions influencing actual nitrogen, moisture uptake and yield potential.

- Differences between the 20%, 50% and 80% yield probabilities in the final simulation (October) were small, however, damaging weather conditions pre-harvest at Hart contributed to significant grain loss.

Why do the trial?

Wheat growth models such as APSIM are highly valuable in their ability to predict wheat yield.

Yield Prophet® is an internet-based service using the APSIM wheat prediction model. The model relies on accurate soil information such as plant available water (PAW) and soil nitrogen (N) levels, as well as historical climate data and current local weather information to predict plant growth rates and final hay or grain yields.

This early prediction of grain yield potential means it can be used to directly influence crop input decisions. No other tool to provide information of this accuracy at such a useful time of the season is currently available to growers.

How was it done?

Location	Hart, SA	**Fertiliser**	May 1: 30 kg N/ha
Seeding date	May 1, 2021		July 21: 40 kg N/ha
Variety	Scepter wheat @ 180 plants/m^2		

Yield Prophet® simulations were issued monthly during the growing season (June – October) to track the progress of wheat growth stages and changes in predicted grain yield. This data was published for 8 Mid-North sites and can be viewed online through Hart's Hart Beat Newsletter.

Soil at the Hart field site ranges from a loam to clay-loam texture (0 – 30 cm) and provides moderate infiltration and PAW. The estimated starting available soil N entered in Yield Prophet® at Hart in 2021 was 61 kg/ha.

Results

The first yield prediction was simulated on June 28 for wheat sown on May 1 and was estimated to yield 3.6 t/ha in 50% of years. In 20% of years, the same crop would achieve a grain yield of 3.9 t/ha and in 80% of years, 3.1 t/ha (Figure 1). The 20%, 50% and 80% level of probability refers to the percentage of years where the predicted yield estimate would have been met, according to the previous 100 years of rainfall data at Hart.

By the end of July, Hart had received 46 mm rainfall since the first simulation in June, bringing growing season rainfall (GSR) to 147 mm. At this time, wheat grain yield predictions increased to 4.5 t/ha due to above average rainfall (Figure 2). The soil moisture profile was 26% full (Figure 3), increasing plant available water (PAW) to 54 mm.

The August Yield Prophet® prediction estimated similar yields of 4.9 t/ha with a prediction of 78 mm rainfall left for the growing season, based on historic rainfall data. September and October both received well below average rainfall with the simulation on October 8 predicting a lower yield of 3.65 t/ha, similar to that estimated in June, reflecting a dryer finish to the season.

In 2021 at Hart, Scepter wheat yielded 47% below the predicted yield (at 50% probability) for August, yielding 2.29 t/ha.

The differences observed between the predicted and actual harvested yield can be attributed to Hart receiving above average rainfall for July and August, leading to an increase in soil moisture, yield potential and the application of N at this time. Actual rainfall events following this prediction were below average, with September and October months receiving only 36 mm rainfall. Damaging weather conditions pre-harvest also contributed to grain loss.
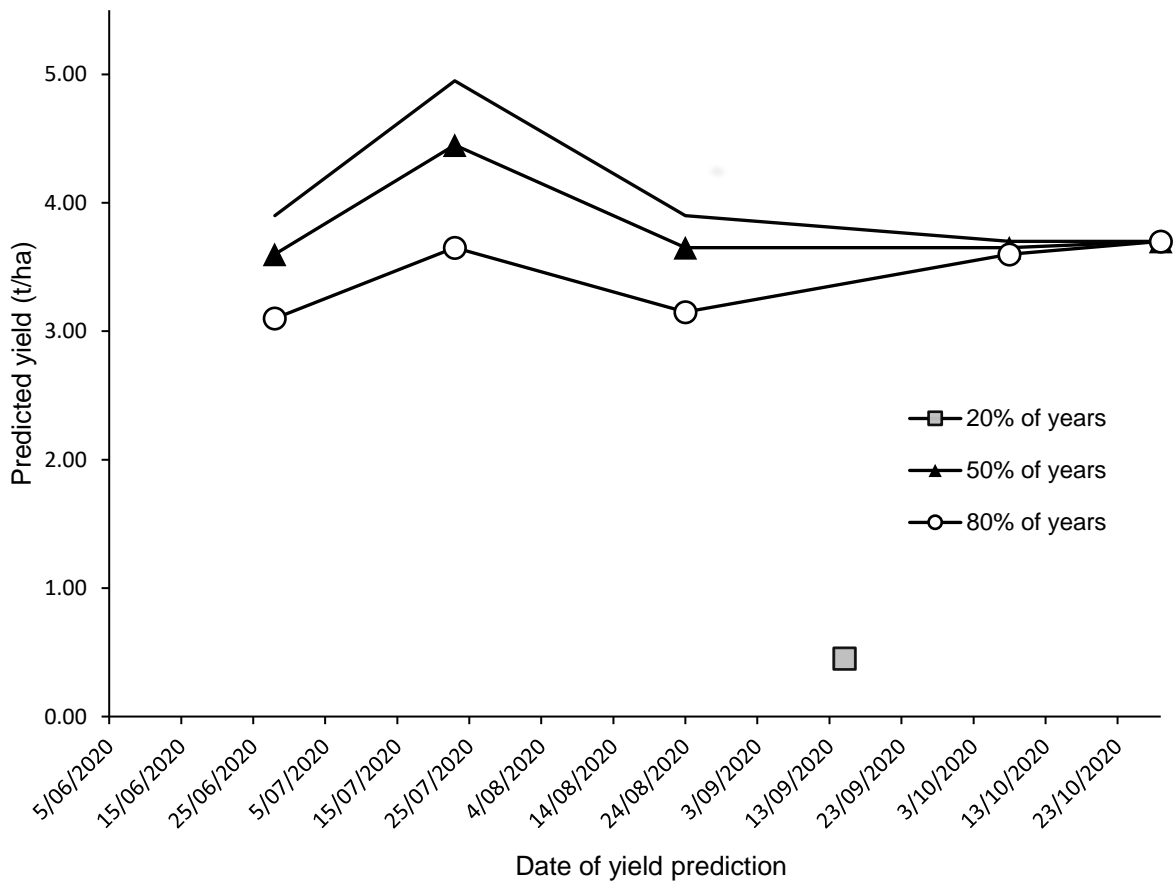

Figure 1. Yield Prophet® predicted yields at 20%, 50% and 80% probabilities at Hart, 2021.

Table 1. Long-term average (100 years) and 2021 rainfall at Hart. Shaded values show months with above average rainfall (mm).

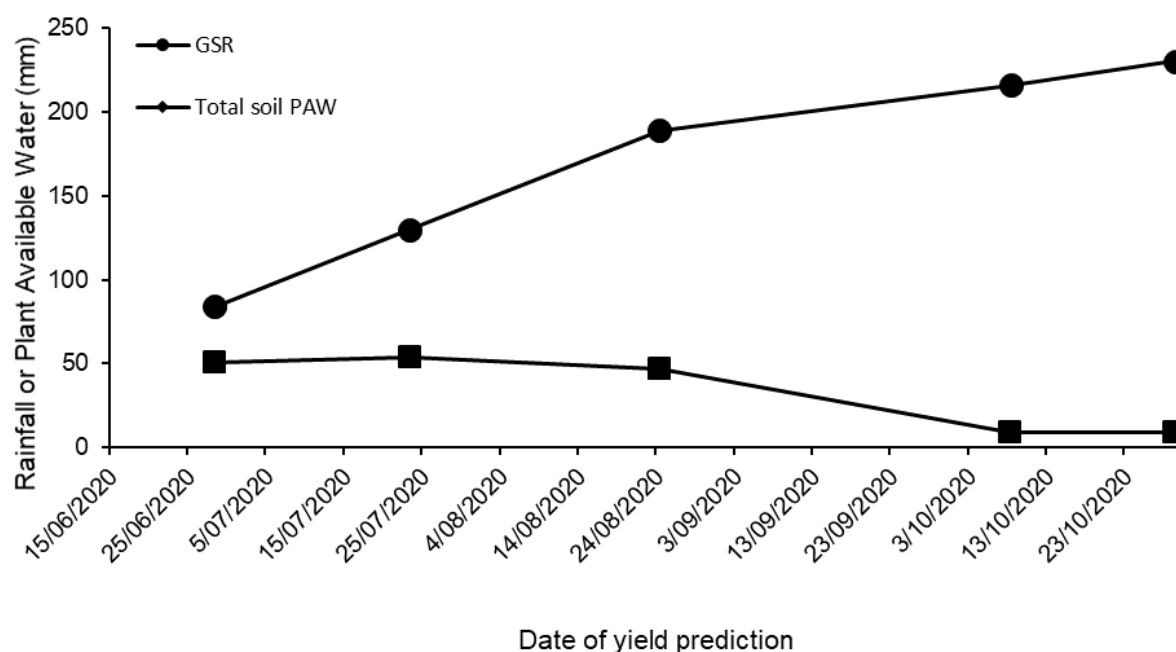|	Long-term rainfall average (mm)	2021 monthly rainfall (mm)	Rainfall difference (mm)
January	20	15	-5
February	22	11	-11
March	16	11	-5
April	29	6	-23
May	43	35	-7
June	47	43	-4
July	47	63	16
August	47	48	1
September	43	16	-26
October	35	20	-15
November	27	118	91
December	24	14.2	-10
Rainfall total	400	401	

Figure 2. Growing season rainfall (GSR) and plant available water (PAW) on simulation dates at Hart in 2021.
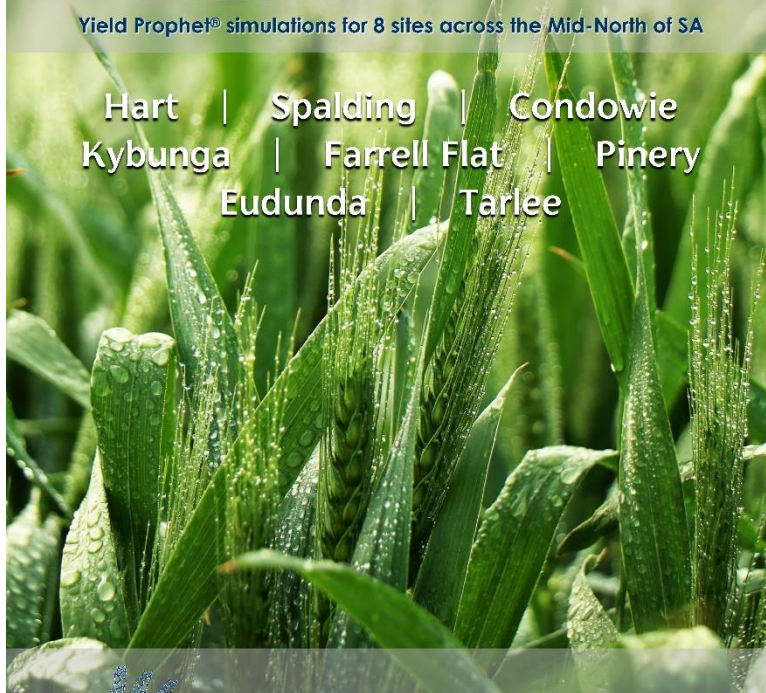
Acknowledgements

HART BEAT - yield predictions through the growing season for 8 Mid-North sites

HART BEAT

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

Hart | Spalding | Condowie
Kybunga | Farrell Flat | Pinery
Eudunda | Tarlee

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The *HART BEAT* newsletter, first introduced in 2009, is an initiative of the Hart Field-Site Group.

It is aimed at providing farmers and agronomists with regular updates of current and predicted crop and soil conditions as a season progresses.

We believe it will assist in making informed choices on the need for additional nitrogen and fungicide applications.

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.

Current (and historical) editions are all available online now, for free:

www.hartfieldsite.org.au