CROP SCIENCE SOCIETY
OF SA INCORPORATED

Welcome to the June issue of the Crop Science Society of SA newsletter; issue 347

Dear CSSSA Members,

Welcome to the June issue of the Crop Science Society of SA, issue 347.

In this month's newsletter we explore:

- Member in focus – James Chard
- Wheatcast; wheat yield forecasts for Australia
- Comparing Seeder Performance when establishing beans: *Genevieve Clarke (BCG), Glenn McDonald (University of Adelaide)*

We hope you are keeping well. Please contact us if you have any requests for content of information.

Kind regards,

Dan Petersen
President, Crop Science Society of South Australia

Member in focus – James Chard

As far as I can remember I have been exposed to the agricultural industry in some shape or form. In my very early days, I had experience with the livestock industry through the family beef farm and the dairy industry through my parents' rural store at Mount Compass. As I grew up and experienced all the agricultural industry had to offer, I decided to set my sights on agronomy.

Whilst studying a B. Ag. Sc at the University of Adelaide I was able to learn about pasture agronomy with the help of a senior agronomist working within the small seeds industry. After graduating in 2015 I found myself moving from the Fleurieu Peninsula and out of the family rural store to work as a Junior Agronomist with Growers Supplies at their Warooka branch.

My client base has expanded from the southern YP to now include the Adelaide Plains, Mid North and SA Mallee since starting at Growers Supplies.

I really enjoy developing sustainable and profitable cropping rotations for my clients. I often take the opportunity to grab my hand boom and spray different herbicide trials and demonstration plots that help further develop my knowledge. The ability to service this client base has been made easier as I now reside in Gawler with my Fiancé Sophie who is also involved with the ag industry as an animal nutritionist. Living closer to Roseworthy has allowed me to attend more CSS meetings in person and meet many new people who all have a passion for Industry.

Away from work I really enjoy playing golf; slowly the Handicap is coming down! I try to get away camping with friends during the off season and hope to explore more of Australia. I am an avid deer hunter ambitious to further develop my skills of back-pack hunting and field butchery.

CSS has been fantastic for keeping up to date with the industry and hearing from researchers and industry personnel. I have enjoyed my time in the industry, and I am excited for what Australian Agriculture will have on offer in the future.

James Chard

From website: https://research.csiro.au/digiscape/digiscapes-projects/wheat-yield-forecasts/#:~:text=Summary%3A%20This%20is%20an%20early,the%2015%2Dyear%20national%20average

Wheatcast™: wheat yield forecasts for Australia

Update May 2022: The @CSIRO national wheat yield forecast formerly known as Graincast™ has evolved and we're now calling the system Wheatcast™. As always, we welcome your questions and feedback about the information and how we're presenting it. Tweet @YieldGapAus using #Wheatcast, or submit this form.

Using innovative analytics, CSIRO's Wheatcast™ forecasting technology can forecast grain production at any scale from paddock to region to state to national. Each fortnight during the grain growing season, we provide select forecasts of Australia's wheat yield, at no cost. In 2021 we added some bells and whistles with maps of soil water, water-limited yield forecasts and their uncertainty, and state specific forecasts. Wheatcast's™ forecasting capability is an Australian first.

Daily rainfall, temperature and solar radiation data are sourced from the Bureau of Meteorology at 202 selected high quality observation stations. Soil data are sourced from the Australian Soil and Landscape Grid and matched to these weather stations. Soil water status and water-limited grain yield forecasts are calculated by the Agricultural Production Systems Simulator, APSIM®, a modular modelling framework developed to simulate biophysical process in farming systems. APSIM® contains a suite of modules that include a diverse range of crops and pastures, and soil processes including water balance and nitrogen transformations. We also use statistical analysis of past annual yields data to convert water-limited yield potential into actual yields achieved at national and state levels.

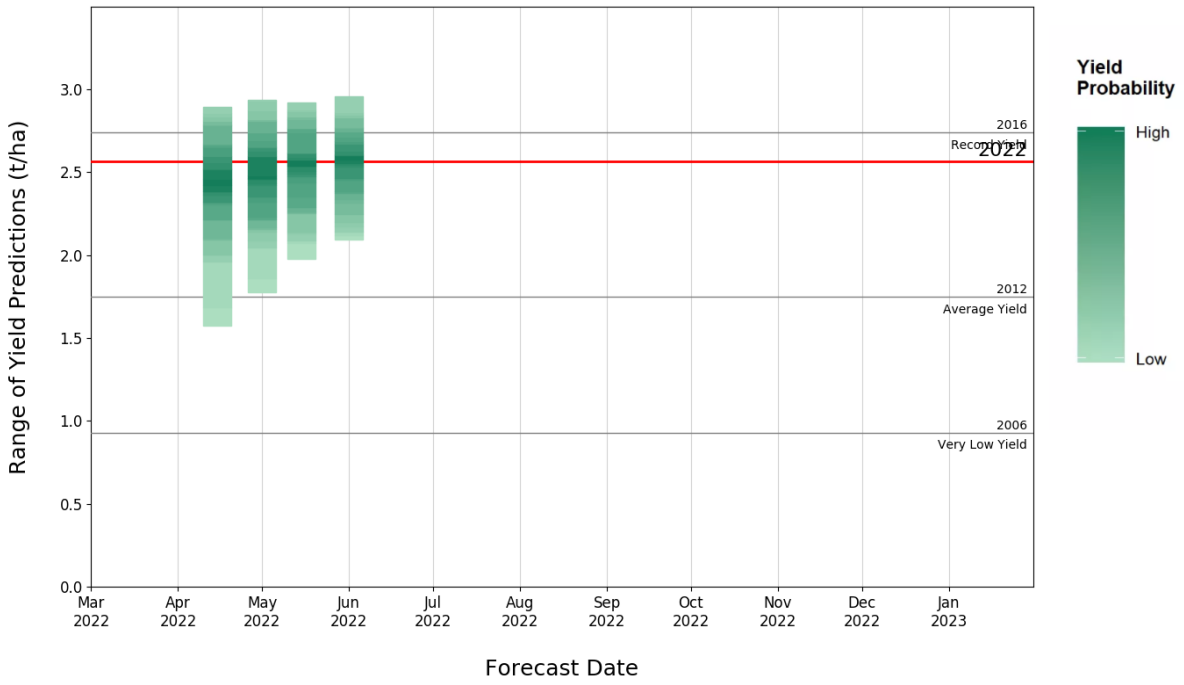
Our methodology is based on peer reviewed science. It was successfully tested in 2017 and has been going since 2018. We presented more information about the national wheat yield forecasting and a historic evaluation of forecast results from 1987 to 2016 at the Australian Agronomy Conference in Wagga Wagga, 25-29 August 2019. We invite you to read the conference paper.

See our fortnightly forecasts posted below or follow @YieldGapAus or #Wheatcast on Twitter.

Australia wide Wheatcast™ wheat yield forecast, 1 June 2022

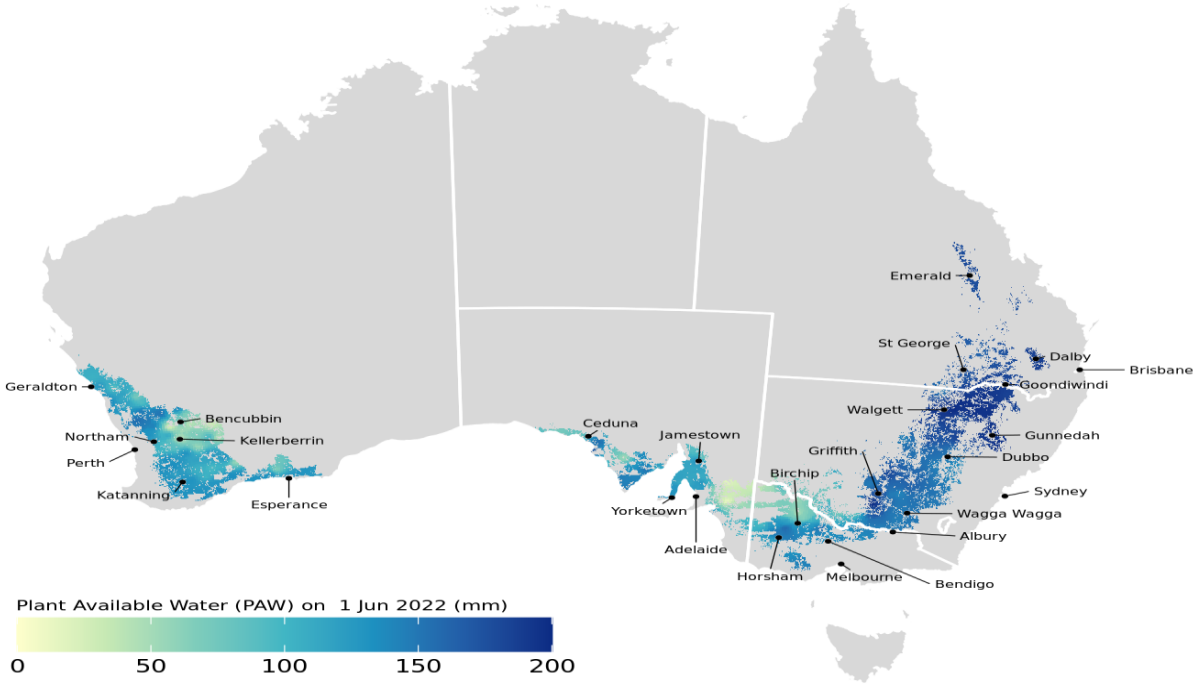
Summary: This is an early forecast of the 2022 national wheat harvest. It's based on data up to 1 June 2022. While there is some uncertainty about the final national yield outcome for this season, the median expectation for 2022 is 2.57 t/ha which is above the 15-year national average. The forecast is largely driven by the past 30 years' weather data, the timing of the break of the season (15 May) across the 202 sites, and the current median Plant Available soil Water (PAW). Currently, PAW is 133 mm, with a range of 14 - 200 mm, across the 202 sites used to make this forecast.

Australia's national wheat yield	Wheatcast™ forecasts			
	Median yield	Chance of exceeding the long term average	Median sowing date	Median plant available soil water
Long term average 1.82 t/ha	2.57 t/ha	100%	15 May	133 mm



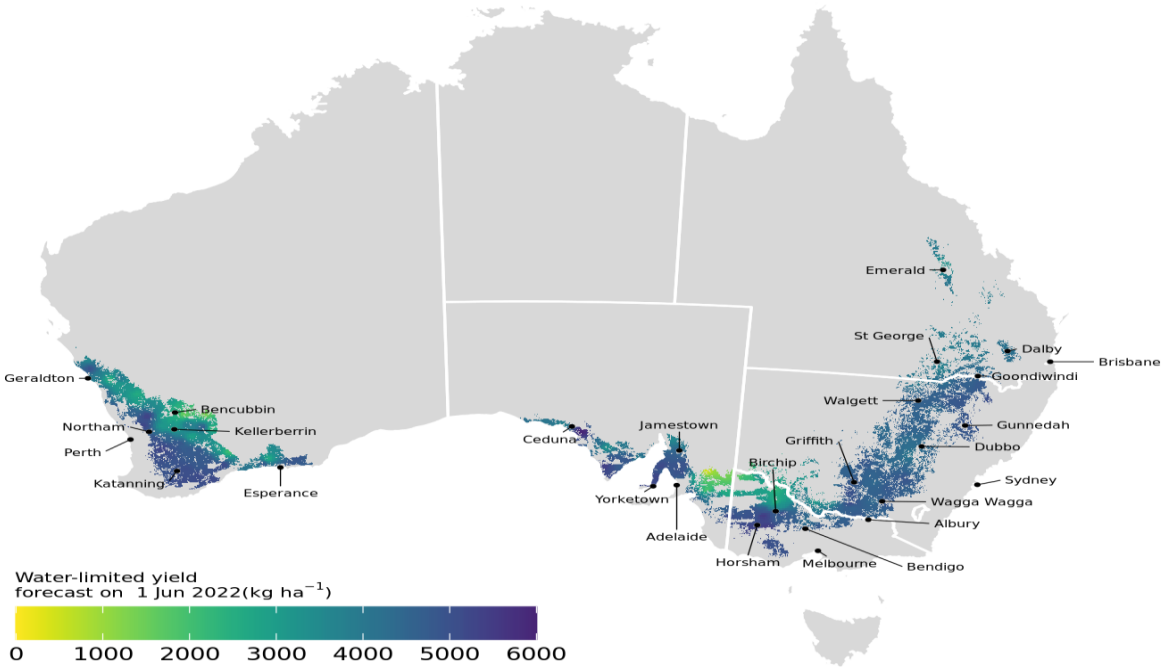
Each green band shows the Australia wide wheat yield forecast at the fortnight indicated on the horizontal axis. They show the whole range of possible outcomes with the most probable indicated by the darkest green shading. The red line shows the expected median value for this year's yield at the latest fortnight's forecast. Compare the red line to the years 2006 (which was very low yielding), 2012 (had an average yield) and 2016 (a record yield).

Map of current Plant Available Soil Water



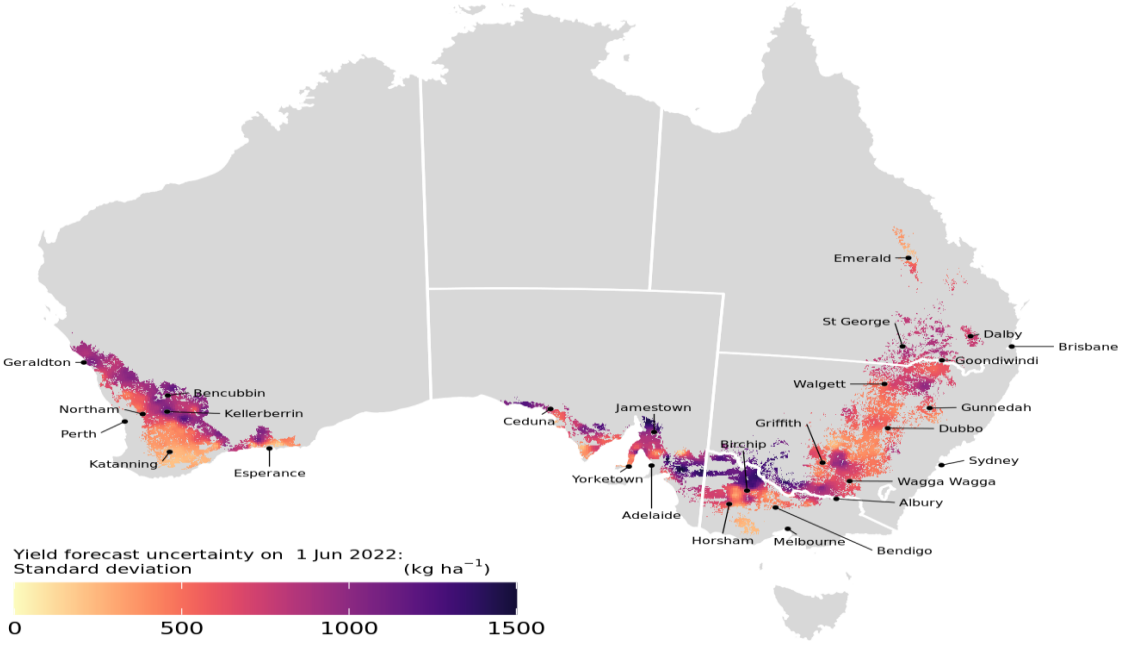
Map showing Plant Available Soil Water (mm) in the Australian Grain Zone as of the 1 June 2022. The map is based on zero-till, stubble retained, full control of summer weeds and a healthy crop last winter.

Map of forecast water-limited wheat grain yields



Map showing forecast of water-limited wheat grain yield potential as of the 1 June 2022. The map assumes median rainfall and temperatures up to crop maturity. This map should be viewed together with the map of the forecast uncertainty.

Map of current uncertainty of forecast water-limited wheat grain yields



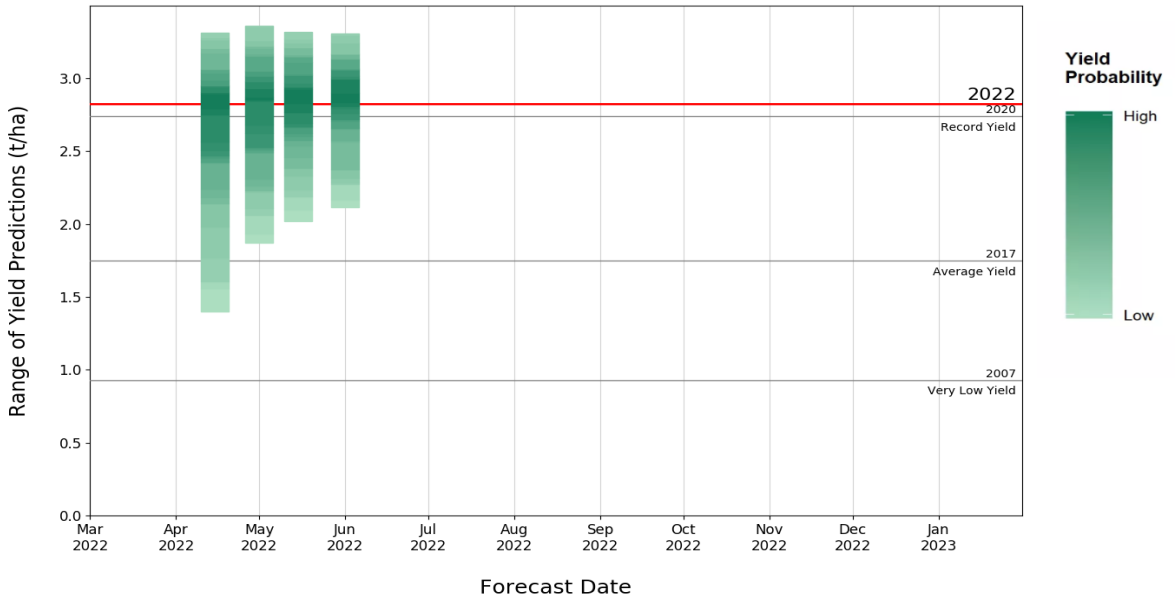
Map showing uncertainty around the median water-limited wheat grain yield potential predictions. Uncertainty is expressed (in kg/ha) as the standard deviation around the mean. It is to be expected that uncertainty will be progressively reduced as the season progresses.

- Next forecast run: 18 June 2022.
- Next forecast posted: 19 June 2022.

New South Wales Wheatcast™ wheat yield forecast, 1 June 2022

Summary: This is an early forecast of the 2022 NSW wheat harvest. It's based on data up to 1 June 2022. While there is moderate uncertainty about the final NSW yield outcome for this season, the median expectation for 2022 is 2.82 t/ha which is above the 15-year NSW average. The forecast is largely driven by the past 30 years' weather data, the timing of the break of the season (14 May) across the 63 sites, and the current median Plant Available soil Water (PAW). Currently, PAW is 154 mm, with a range of 28 - 200 mm, across the 63 sites used to make this forecast.

New South Wales wheat yield	Wheatcast™ forecasts			
	Median yield	Chance of exceeding the long term average	Median sowing date	Median plant available soil water
Long term average 1.84 t/ha	2.82 t/ha	100%	14 May	154 mm



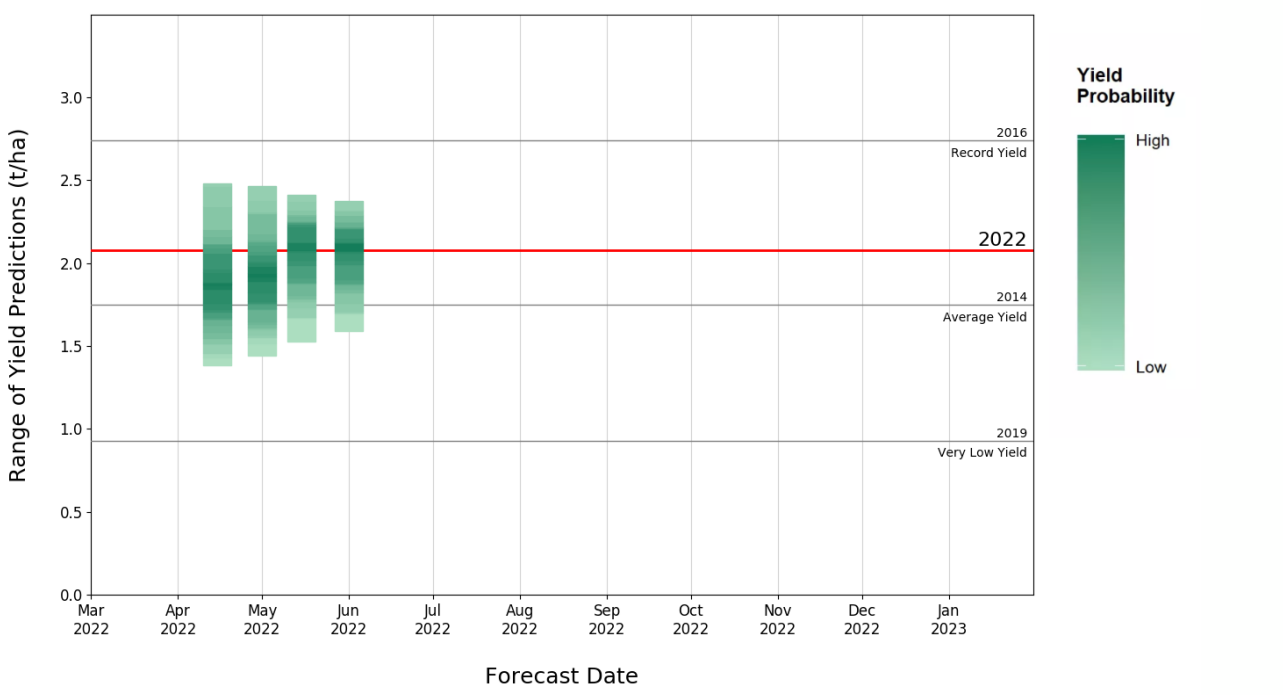
Each green band shows the New South Wales wheat yield forecast at the fortnight indicated on the horizontal axis. They show the whole range of possible outcomes with the most probable indicated by the darkest green shading. The red line shows the expected median value for this year's yield at the latest fortnight's forecast. Compare the red line to the years 2007 (which was very low yielding), 2017 (had an average yield) and 2020 (a record yield).

- Next forecast run: 18 June 2022.
- Next forecast posted: 19 June 2022.

Queensland Wheatcast™ wheat yield forecast, 1 June 2022

Summary: This is an early forecast of the 2022 QLD wheat harvest. It's based on data up to 1 June 2022. While there is moderate uncertainty about the final QLD yield outcome for this season, the median expectation for 2022 is 2.08 t/ha which is above the 15-year QLD average. The forecast is largely driven by the past 30 years' weather data, the timing of the break of the season (9 May) across the 10 sites, and the current median Plant Available soil Water (PAW). Currently, PAW is 178 mm, with a range of 162 - 189 mm, across the 10 sites used to make this forecast. PAW has declined by 14 mm since the last forecast.

Queensland's wheat yield	Wheatcast™ forecasts			
	Median yield	Chance of exceeding the long term average	Median sowing date	Median plant available soil water
Long term average 1.58 t/ha	2.08 t/ha	100%	9 May	178 mm



Each green band shows the Queensland wheat yield forecast at the fortnight indicated on the horizontal axis. They show the whole range of possible outcomes with the most probable indicated by the darkest green shading. The red line shows the expected median value for this year's yield at the latest fortnight's forecast. Compare the red line to the years 2019 (which was very low yielding), 2014 (had an average yield) and 2016 (a record yield).

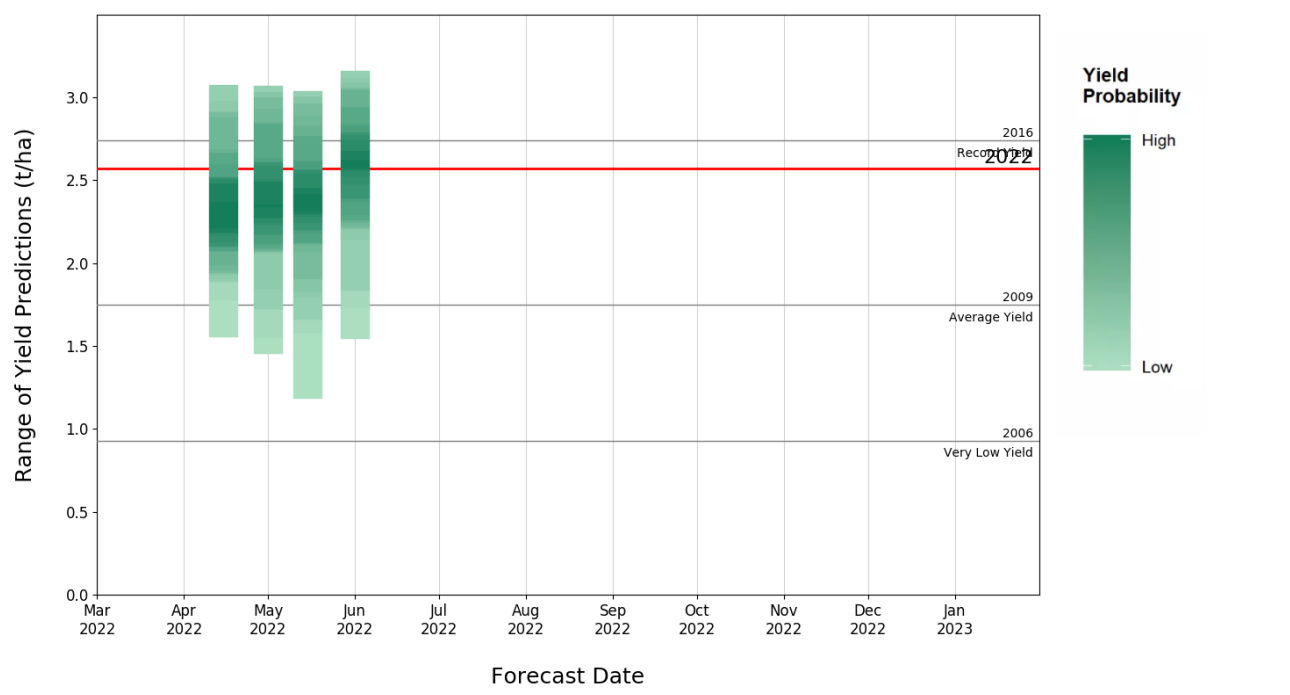
- Next forecast run: 18 June 2022.
- Next forecast posted: 19 June 2022.

South Australia Wheatcast™ wheat yield forecast, 1 June 2022

Summary: This is an early forecast of the 2022 SA wheat harvest. It's based on data up to 1 June 2022. While there is much uncertainty about the final SA yield outcome for this season, the median expectation

for 2022 is 2.57 t/ha which is above the 15-year SA average. The forecast is largely driven by the past 30 years' weather data, the timing of the break of the season (1 June) across the 39 sites, and the current median Plant Available soil Water (PAW). Currently, PAW is 104 mm, with a range of 14 - 175 mm, across the 39 sites used to make this forecast. PAW has increased by 26 mm since the last forecast.

South Australia's wheat yield	Wheatcast™ forecasts			
	Median yield	Chance of exceeding the long term average	Median sowing date	Median plant available soil water
Long term average 1.87 t/ha	2.57 t/ha	93%	1 June	104 mm



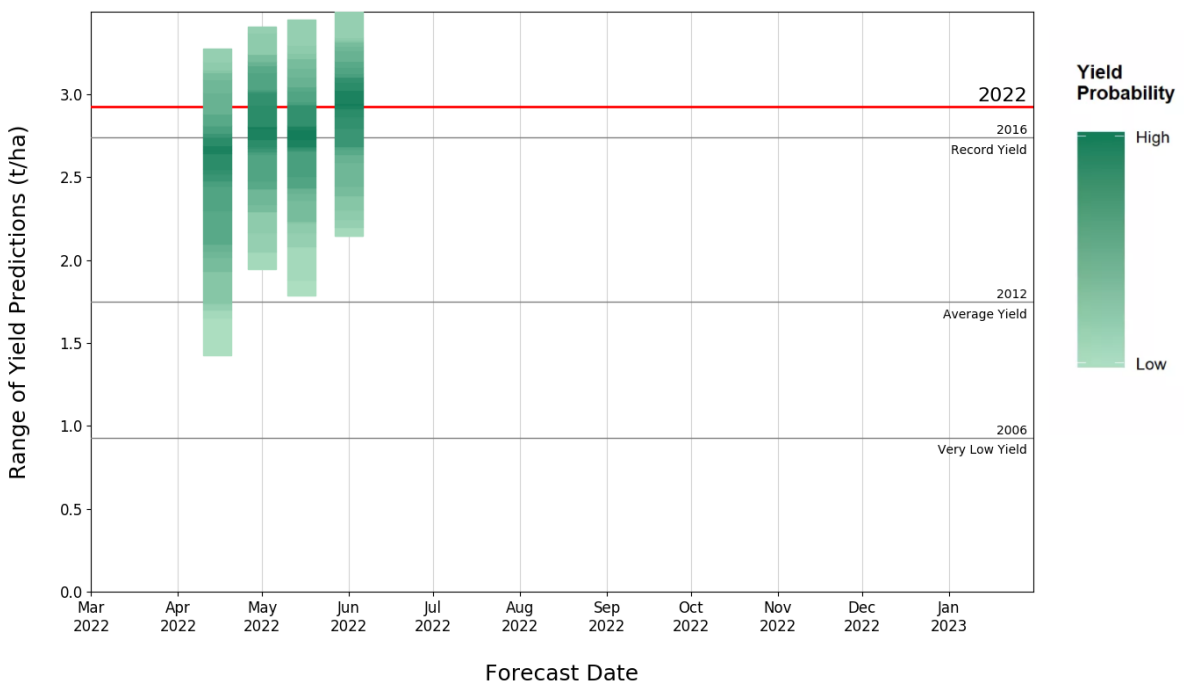
Each green band shows the South Australia wheat yield forecast at the fortnight indicated on the horizontal axis. They show the whole range of possible outcomes with the most probable indicated by the darkest green shading. The red line shows the expected median value for this year's yield at the latest fortnight's forecast. Compare the red line to the years 2006 (which was very low yielding), 2009 (had an average yield) and 2016 (a record yield).

- Next forecast run: 18 June 2022.
- Next forecast posted: 19 June 2022.

Victoria Wheatcast™ wheat yield forecast, 1 June 2022

Summary: This is an early forecast of the 2022 VIC wheat harvest. It's based on data up to 1 June 2022. While there is moderate uncertainty about the final VIC yield outcome for this season, the median expectation for 2022 is 2.93 t/ha which is above the 15-year VIC average. The forecast is largely driven by the past 30 years' weather data, the timing of the break of the season (14 May) across the 29 sites, and the current median Plant Available soil Water (PAW). Currently, PAW is 131 mm, with a range of 50 - 159 mm, across the 29 sites used to make this forecast.

Victoria's wheat yield		Wheatcast™ forecasts		
Long term average	Median yield	Chance of exceeding the long term average	Median sowing date	Median plant available soil water
2.02 t/ha	2.93 t/ha	100%	14 May	131 mm



Each green band shows the Victoria wheat yield forecast at the fortnight indicated on the horizontal axis. They show the whole range of possible outcomes with the most probable indicated by the darkest green shading. The red line shows the expected median value for this year's yield at the latest fortnight's forecast. Compare the red line to the years 2006 (which was very low yielding), 2012 (had an average yield) and 2016 (a record yield).

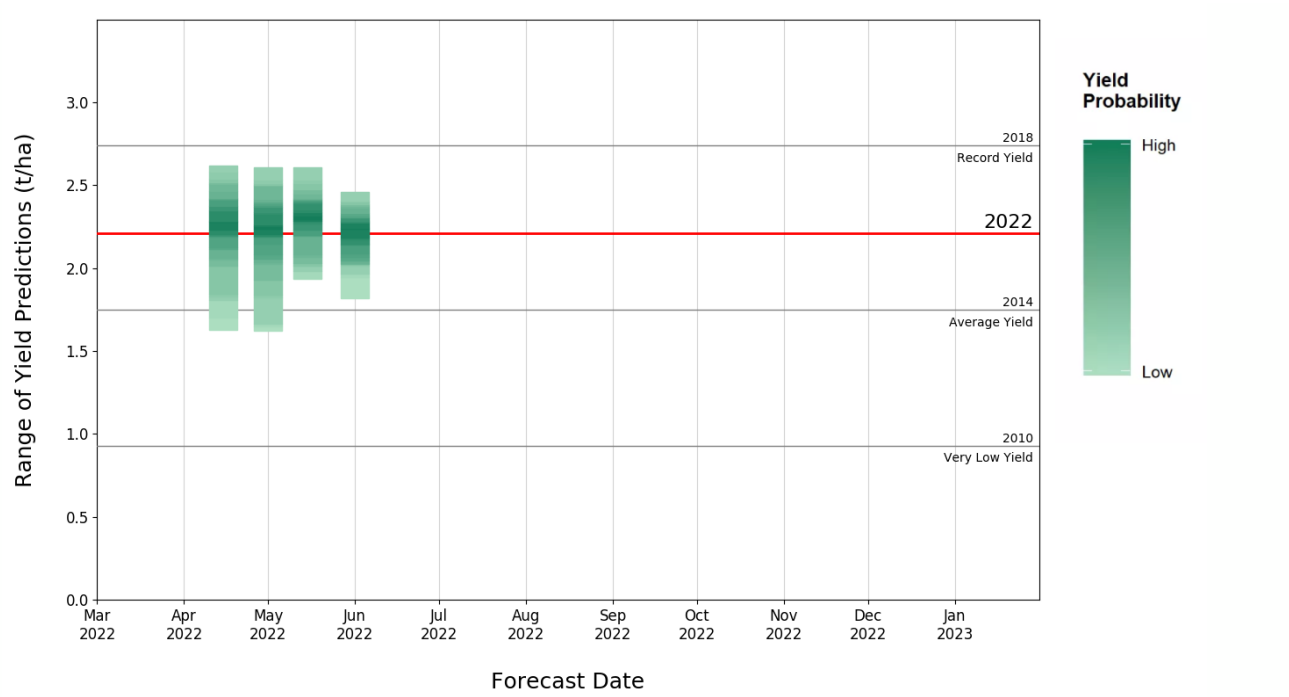
- Next forecast run: 18 June 2022.
- Next forecast posted: 19 June 2022.

Western Australia Wheatcast™ wheat yield forecast, 1 June 2022

Summary: This is an early forecast of the 2022 WA wheat harvest. It's based on data up to 1 June 2022. While there is some uncertainty about the final WA yield outcome for this season, the median expectation for 2022 is 2.21 t/ha which is above the 15-year WA average. The forecast is largely driven by the past 30 years' weather data, the timing of the break of the season (15 May) across the 61 sites, and the current median Plant Available soil Water (PAW). Currently, PAW is 118 mm, with a range of 25 - 155 mm, across the 61 sites used to make this forecast.

Western Australia's wheat yield		Wheatcast™ forecasts		
Long term average	Median yield	Chance of exceeding the long term average	Median sowing date	Median plant available soil water

Western Australia's wheat yield			Wheatcast™ forecasts	
1.73 t/ha	2.21 t/ha	100%	15 May	118 mm



Each green band shows the Western Australia wheat yield forecast at the fortnight indicated on the horizontal axis. They show the whole range of possible outcomes with the most probable indicated by the darkest green shading. The red line shows the expected median value for this year's yield at the latest fortnight's forecast. Compare the red line to the years 2010 (which was very low yielding), 2014 (had an average yield) and 2018 (a record yield).

- Next forecast run: 18 June 2022.
- Next forecast posted: 19 June 2022.

What Wheatcast™ can't do

It should be noted that:

1. The forecasts are based on a mix of known conditions to the date of publication and the probable conditions to harvest based on the previous 30 years.
2. Extreme events such as severe frosts, heat shocks, floods and hail storms can have significant local implications that are not included in the forecasts and may result in lower than forecast yields if they are more widespread than usual.
3. The forecasts do not account for large scale outbreaks of pests or diseases which may also result in lower than forecast yields.

Your feedback

The Wheatcast™ team run wheat yield forecasts fortnightly during the growing season and we will post forecasts for Australia as a whole and for individual states on this page. We'd love to hear your feedback about the information and how we're presenting it. Please complete the form here or tweet it using #Wheatcast to let us know what you think.

CROP SCIENCE SOCIETY OF SA INCORPORATED

COMPARING SEEDER PERFORMANCE WHEN ESTABLISHING BEANS

Genevieve Clarke (BCG), Glenn McDonald (University of Adelaide)

TAKE HOME MESSAGES

Precision planters will place beans more evenly than conventional seeders.

- More even placement did not result in equivalent yields at lower sowing rates.
- Precision planters are a large investment for an unpredictable return.

BACKGROUND

Seeder selection and setup is known to have an impact on crop establishment. In years with a dry start such as 2021, differences between seeders, seeder setup and tweaks are likely to become evident when conditions are challenging.

BCG has run trials investigating crop establishment using different seeder types, sowing rates and row spacings over the past four seasons with the aim of optimising plant establishment in Wimmera and Mallee environments. Part of this work has involved comparison of conventional and precision (singulation) seeding systems.

More commonly used in summer crops, precision planters for winter grains have been limited. Seed size, shape and high sowing rates contribute to the challenges of being able to adapt this technology. In theory, precision planters are able to evenly distribute seeds along a row providing equal area for each seed to draw resources from, allowing for optimal yield from each plant. With such distribution, the question is: will this allow for sowing rates to be dropped without compromising yield equivalent to a conventional seeder?

The research conducted by BCG and across the broader project through South Australia and Western Australia has returned varying results across environments and seasons. Research has focussed on lentils, canola and faba beans focussing on higher value seed crops to investigate whether savings in seed cost might justify investment in new machinery.

A faba bean trial at Rupanyup in 2020 found bean yield was established at 16 plants/m^2 with more even seed placement achieved using a precision seeder than conventional. Larger plants showed some biomass compensation at lower plant densities however this did not necessarily translate into equivalent compensation in yield (Clarke and McDonald 2020). For Rupanyup, 2020 was a decile 6 season with a good break, dry winter and average spring.

This research aims to provide further data around the effects of row spacing, plant density and seeder type on bean establishment and yield in the Wimmera over a different season.

AIM

To determine the effect of sowing density, row spacing and seeder type on plant establishment and yield in faba beans in the Wimmera.

PADDOCK DETAILS

Location: Wallup
Crop year rainfall (Nov – Oct): 256mm
GSR (Apr – Oct): 198mm
Soil type: Clay
Paddock history: Chickpeas

TRIAL DETAILS

Crop type: Faba beans (Bendoc)
Sowing date: 7 May 2021
Replicates: Four
Harvest date: 30 November
Trial average yield: 3.4t/ha

TRIAL INPUTS

Fertiliser: Ammonium polyphosphate @ 50L/ha at sowing
Seed treatment/inoculant: P Pickle T @ 200mL/100kg

METHOD

A replicated field trial was established in a split plot design with seeder type/row spacing as the main plot and plant density as the sub plot. Assessments included establishment rate, establishment counts, interplant distance measurements, flowering biomass, NDVI, yield and quality.

Table 1. Trial treatment outline.

Seeder type	Row spacing	Plant density (plants/m^2)
Conventional disc	12 inch	10
Precision disc	15 inch	15
		20
		30

RESULTS AND INTERPRETATION

Establishment and seed placement

Dry conditions at sowing favoured the disc seeder however extended dry conditions after sowing meant plants did not begin to emerge until one month following sowing. Establishment rate and seedling depth did not differ significantly between the two seeders. Final establishment counts found all treatments

established below the target density, averaging around 90% of the intended rate. This is likely due to dry conditions and relatively shallow seed placement (Table 2).

Table 2. Mean established plants (plants/m^2) and percentage of target density achieved across density treatments.

Target density (plants/m^2)	Established plants (plants/m^2)	Percentage of target density (%)
10	9^a	86
15	14^b	91
20	17^c	87
30	27^d	89
Sig. diff.	<0.001	
LSD (P=0.05)	1.5	
CV%	13	

The number of established plants differed between seeder type, with the precision planter establishing higher overall plant numbers at 17.5 plants/m^2 compared to 15.6 plants/m^2 for the conventional seeder (P=0.019). This difference, while significant could be the result of seeds sown at a rate calculated from an average grain weight under the conventional treatment compared to actual seed number as distributed by disc singulation.

Differences in seed placement between the two seeder types were visually distinguishable with much more even distribution of seed in precision planter treatments (Figure 1).

Figure 1. Conventional seeder narrow spacing 20 plants/m^2 target (left) and precision planter narrow spacing 20 plants/m^2 target (right).

Interplant distance measurement assessments reflected this observation with much lower variation in seed placement found in precision planter treatments than conventional (Table 3).

Table 3. Mean variability in seed placement (CV%) across seeders.

Seeder type	Variability in seed placement (CV%)
Precision	38[a]
Conventional	93[b]
Sig. diff.	<0.001
LSD (P=0.05)	5.6
CV%	12

Biomass and yield

Biomass at flowering indicated that only plant density was having an effect, with the highest biomass at the highest plant density target of 30 plants/m^2 (Table 4). Yield also reflected plant numbers, with the target densities decreasing in yield with plant numbers (Table 4).

Table 4. Biomass at flowering (t DM/ha) and yield (t/ha) across different target densities.

Target Density (plant/m^2)	Flowering biomass (t/ha)	Yield (t/ha)
30	2.1[a]	4.0[a]
20	1.6[b]	3.5[b]
15	1.5[b]	3.2[c]
10	1.1[c]	2.9[d]
Sig. diff.	**<0.001**	**<0.001**
LSD (P=0.05)	**0.3**	**0.2**
CV%	**23.1**	**6.7**

The precision planter yielded higher than the conventional seeder, averaging 3.5t/ha and 3.3t/ha respectively (P= 0.001). This may be linked to the higher plant establishment achieved by the precision planter and the trend of higher plant density and yield (Figure 2).

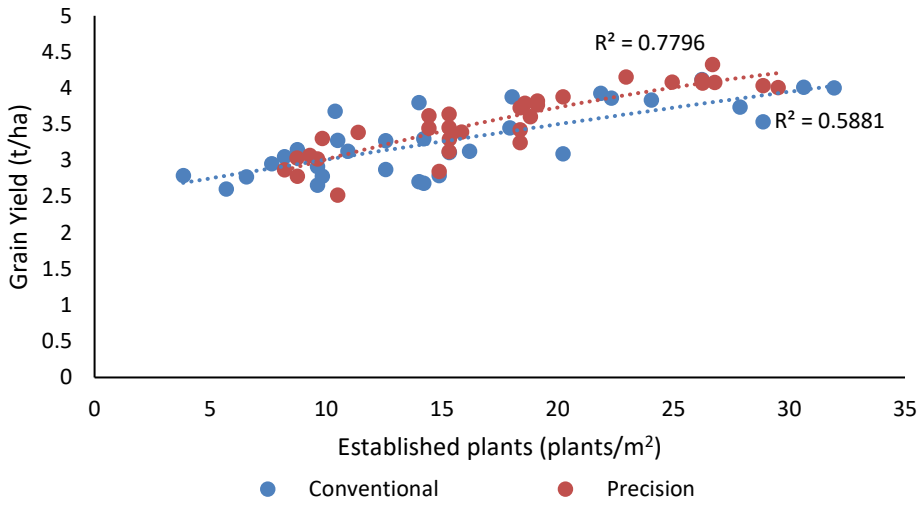


Figure 2. Established plant number (plants/m²) against grain yield (t/ha) across treatment plots of different seeder types.

Plant size increased at densities below 30 plants/m² target but were similar at lower density (Table 5). The small difference between plant size is likely due to the late start and dry seasonal conditions limiting early biomass production and the ability of faba bean plants to compensate for low plant density.

Table 5. Mean plant size (g DM at flowering) across densities.

Target density (plants/m²)	Plant size (g DM at flowering)
10	9.4[a]
15	9.5[a]
20	8.5[ab]
30	7.8[b]
Sig. diff.	**0.024**
LSD (P=0.05)	**1.2**
CV%	**19**

COMMERCIAL PRACTICE AND ON-FARM PROFITABILITY

Different seasonal conditions have a large impact on plant growth and yield. With a tough start and slow early growth, higher plant numbers resulted in greater biomass production and higher yield; the crop had limited ability to compensate for low plant numbers. Whereas, in 2020, with good early moisture for establishment and growth, yield was optimised at only 16 plants/m², just over half that of this year. Difficulty in predicting seasonal potential at sowing limits the ability to match sowing rates to the season. The compensation response of low plant numbers and row spacing for yield is also difficult to predict.

Results from similar research last season are consistent with this season in that grain yield was strongly influenced by plant density. When selecting a sowing rate, it is important to calculate the seed cost at

different rates. This season, the highest sowing density yielded highest as well as resulting in the highest return (Table 6).

Table 6. Partial gross margin (income minus seed cost) for sowing densities. Faba bean seed at a price of $0.59/kg based on PIRSA gross margin guide 2021 and grain price of $490/t (22 December Murtoa).

Target density (plants/m^2)	Established density (plants/m^2)	Seed cost ($/ha)	Grain yield (t/ha)	Net income ($/ha)
10	9^a	31	2.9^d	1390
15	14^b	46	3.2^d	1522
20	17^c	62	3.5^b	1653
30	27^d	92	4.0^a	1868

While row spacing had no effect on yield this season, understanding the ideal row spacing for your system and how this will affect competition and disease should be considered when deciding whether it is practical to manage.

Investment in machinery is a big business decision and should be made to suit the system, the grower and economics. The need for support to transition into precision planters has been identified as a major factor in adopting and retaining the system.

REFERENCES

Clarke G., and McDonald G., 2020, *2020 BCG Season Research Results, 'Sowing for Optimised Establishment*' pp 99-107. https://www.bcg.org.au/sowing-for-optimised-establishment/

ACKNOWLEDGEMENTS

This research was funded by the GRDC as part of the 'Optimising plant establishment, density and spacings to maximise crop yield and profit in the southern and western regions' project (9176134) in collaboration with The University of Adelaide.