FIELD DAY

INCREASING PRODUCTIVITY IN THE HRZ OF TASMANIA

Thursday 24th November 2022

Thanks to the following event sponsors:

The GRDC Hyper Yielding Crops project is led by FAR Australia in collaboration with:

Tasmania CTC trial site courtesy of: Botanical Resources Australia

SOWING THE SEED FOR A BRIGHTER FUTURE

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- Please be considerate of farm biosecurity. Please do not walk into farm crops without permission. Please consider whether footwear and/or clothing have previously been worn in crops suffering from soil borne or foliar diseases.

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- We have a number of First Aiders on site. Should you require any assistance, please ask a member of FAR Australia staff.

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- Litter bins are located around the site for your use; we ask that you dispose of all litter considerately.

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- Vehicles will not be permitted outside of the designated car parking areas. Please ensure that your vehicle is parked within the designated area(s).

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- There is No Smoking permitted inside any marquee or gazebo.

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If you are visiting FAR Australia offices or trial sites, please observe the following good hygiene practices to reduce the risk of infection with COVID-19:

- Sanitise your hands when entering the office or trials site and at regular intervals.
- Wash your hands regularly for 20 to 30 seconds. If soap and water is not available, use an alcohol-based hand sanitiser. Hand sanitiser does not replace washing your hands after using the bathroom.
- Avoid touching your eyes, nose and mouth.
- Cover your mouth and nose when coughing and sneezing with a tissue or cough into your elbow.
- Dispose used tissues into a bin immediately and wash your hands afterwards.
- Practice social distancing:
    - Keep a distance of 1.5 metres between you and other people.
    - Avoid crowds and large public gatherings.
    - Avoid shaking hands or any other physical contact.

Thank you for your cooperation.

INCREASING PRODUCTIVITY IN AUSTRALIA'S HIGH RAINFALL ZONES

FEATURING THE GRDC'S HYPER YIELDING CROPS (HYC)

On behalf of our investor, the **Grains Research & Development Corporation** along with the HYC project team, I am delighted to welcome you to our 2022 Tasmania Crop Technology Centre Field Day featuring Hyper Yielding Crops (HYC).

Hyper Yielding Crops is a national project led by Field Applied Research (FAR) Australia. Over the past three years, the HYC project has aimed to push the economically attainable yield boundaries of wheat, barley and canola. As well as the five research centres across the HRZs of Australia, the project has been successful in engaging with growers to scale up the results and create a community network with the aim of lifting productivity. If you are interested in getting involved in 2023, then please get in touch (see contact details in this booklet).

To make the programme as diverse as possible I would like to thank all our speakers who have helped to put today's programme together; in particular our keynote speaker Dr John Kirkegaard who has made the trip from the ACT to join us today. Dr Kirkegaard is a farming systems agronomist who applies his expertise in agricultural research to develop practical solutions to Australia's farming challenge – to produce more crop with less inputs while protecting the environment.

Finally I would like to thank the GRDC for investing in this research programme. Also a big thanks to Botanical Resources Australia our host farmers for their tremendous practical support given to the team and to today's Keynote speaker sponsor SeedForce, lunch sponsor Nutrien Ag Solutions and post event drinks sponsor Boortmalt.

Should you require any assistance today, please don't hesitate to contact a FAR Australia staff member. We hope you find the day informative, and as a result, take away new ideas which can be implemented in your own farming business.

Nick Poole
Managing Director and HYC Project Lead
FAR Australia

Hyper Yielding Crops

Hyper Yielding Crops (HYC) builds on the success of the GRDC's four-year Tasmania Hyper Yielding Cereals Project which attracted a great deal of interest from mainland HRZ regions. The project demonstrated that increases in productivity could be achieved through sowing the right cultivars, at the right time and with effective implementation of appropriately tailored management strategies. The popularity of this project highlighted the need to advance a similar initiative nationally which would strive to push crop yield boundaries in high yield potential grain growing environments.

With input from national and international cereal breeders, growers, advisers and the wider industry, this project is working towards setting record yield targets as aspirational goals for growers of wheat, barley and canola.

In addition to the research centres, the project also includes a series of focus farms and innovative grower networks, which are geared to road-test the findings of experimental plot trials in paddock-scale trials. This is where in the extension phase of the project we are hoping to get you, the grower and adviser involved.

HYC project officers in each state ***(Jill Lyall, Southern Farming Systems here in Tasmania)*** are working with innovative grower networks to set up paddock strip trials on growers' properties with assistance from the national extension lead Jon Midwood.

Another component of the research project is the HYC awards program. The awards aim to benchmark the yield performance of growers' wheat paddocks and, ultimately, identify the agronomic management practices that help achieve high yields in variable on-farm conditions across the country. This season, HYC project officers are seeking nominations for 50 wheat paddocks nationwide (about 10 paddocks per state) as part of the awards program.

For more details on the project contact:

Rachel Hamilton – HYC communications and events, FAR Australia
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Rohan Brill – HYC canola research lead
Email: rohan@brillag.com.au

Jon Midwood - HYC extension coordinator, TechCrop
Email: techcrop@bigpond.com

Jill Lyall Tasmania HYC project officer, Southern Farming Systems
Email: jlyall@sfs.org.au

Tasmania Crop Technology Centre 2022 Climate Update

Growing Season Rainfall to date

The current 2022 rainfall at Hagley was tracking below long-term trends up until October, before widespread range has occurred during October above average compared to long term trends. Up until the start of October the March – October rainfall was 500mm compared to long term median of 505 mm for the same time period. This is still less than the 2016 season which was renowned for being the wettest season on record. However, recent rainfall has taken the April to October total rainfall to 604mm.

Long-term growing season rainfall and yield potential

The long-term median rainfall for Hagley from April – November is 508 mm of rain. Using a French and Schulz equation, assuming 60mm is lost to evaporation, ignoring fallow rainfall, and a water use efficiency of 25kg/ha/mm in cereals a yield potential of > 12.5 t/ha should be possible in more than 50% of years. However, this assumes other climate factors light and temperature are non-limiting.

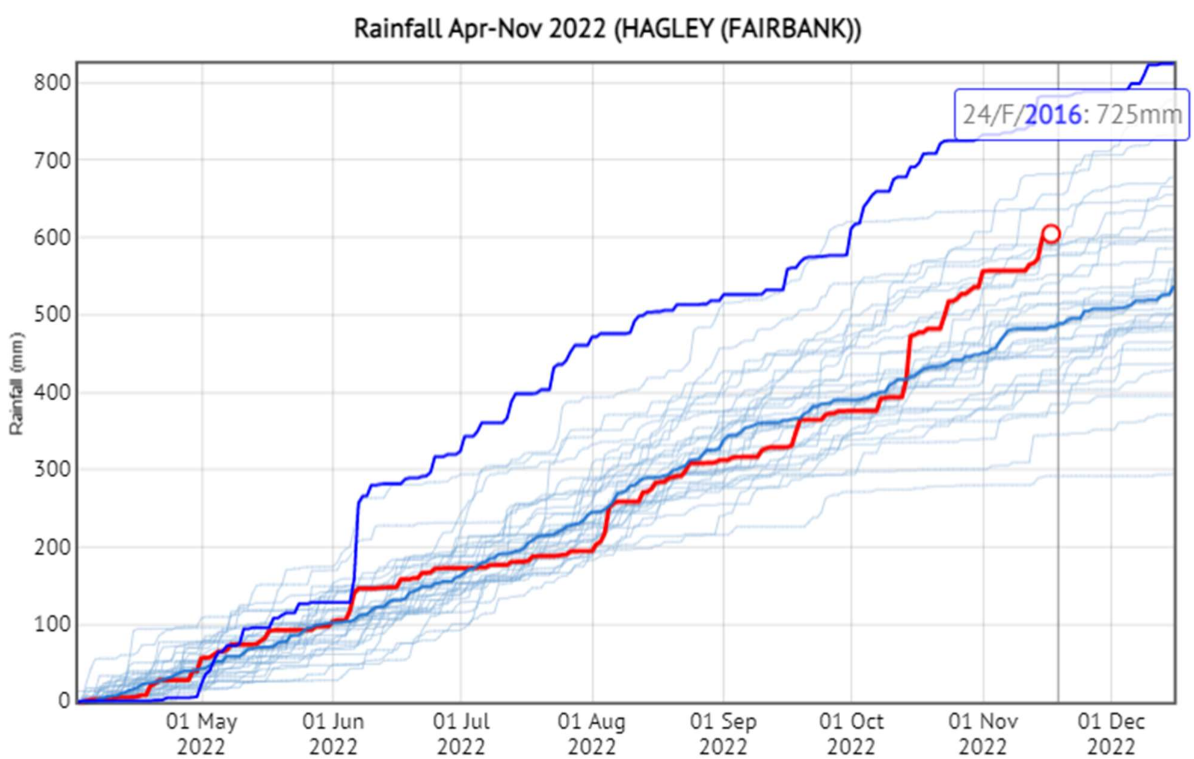

Figure 1. Long term rainfall (mm) trends for Hagley in the period from Apr – Dec. The dark line represents the **long-term median,** and red line the 2022 season tracking relative to other seasons light blue deciles. 2016 is highlighted. (DATA Source: Australian CLIMATE online 2022).

Solar Radiation and Temperature (figures 1 and 2)

In parts of the high rainfall zone solar radiation and temperature during the critical period (15 Oct – 15 Nov) are the limiting factors to yield more often than water supply. This was a defining feature of 2021, with temperature consistent or slightly warmer than long term trends, however solar radiation lower than average leading to reduced photosynthesis and grain number potential. As of Oct 1 in 2022 temperatures are slightly above long term trends, however solar radiation is significantly lower in 2022 see paper discussing this.

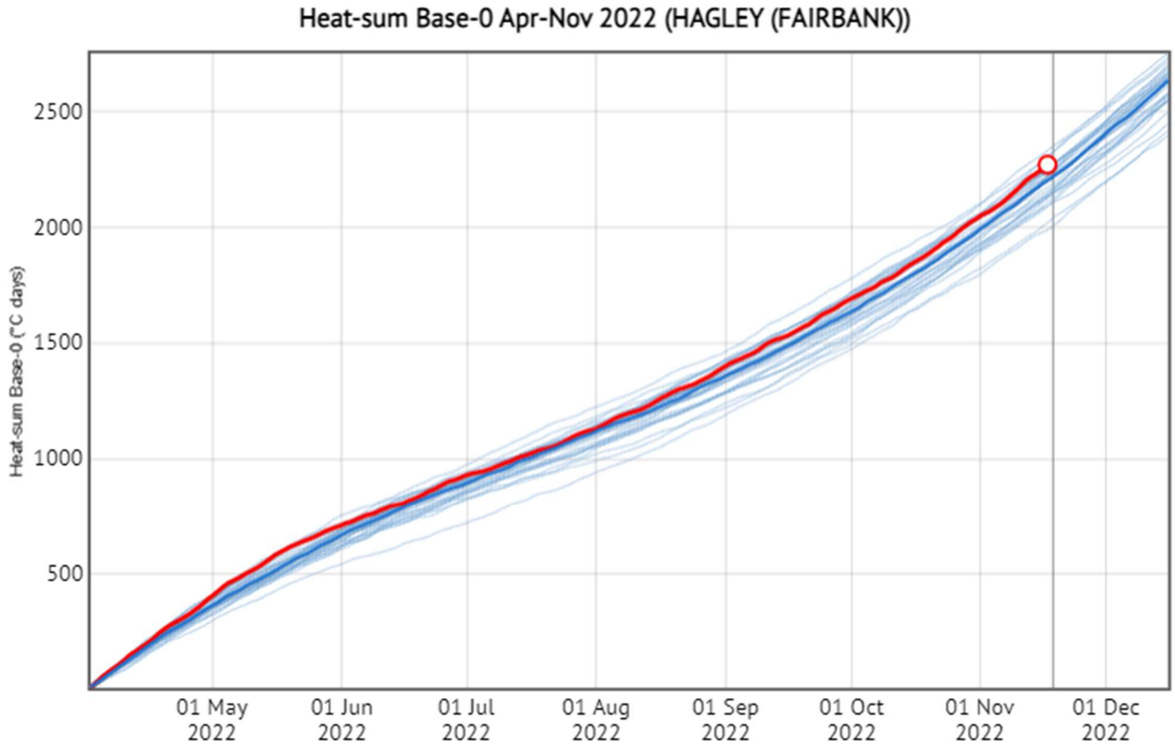

Figure 2. Long term **accumulated temperature** trends for Hagley in the period from Apr – Nov. The dark line represents the **long-term median,** and red line the 2022 season tracking relative to other seasons light blue deciles. (DATA Source: Australian CLIMATE online 2022).

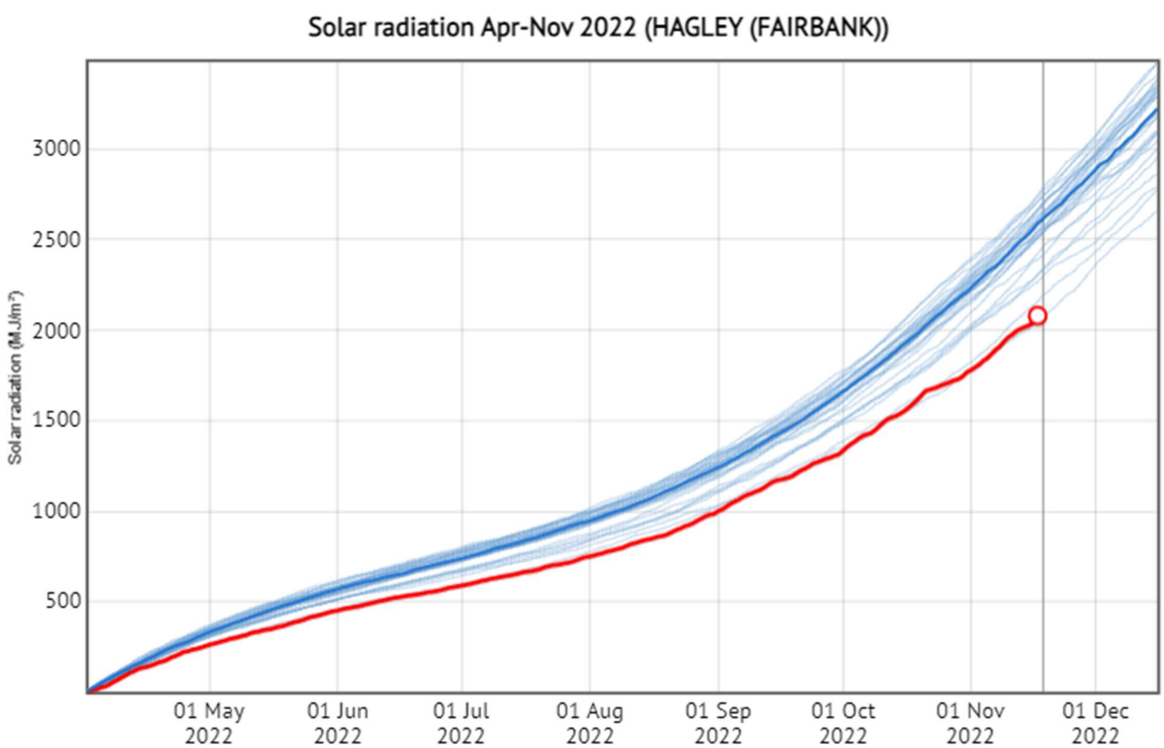

Figure 3. Long term **accumulated Solar Radiation** trends for Hagley in the period from Apr – Nov. The dark line represents the **long-term median,** and red line the 2022 season tracking relative to other seasons light blue deciles. 2021 is marked for comparison (DATA Source: Australian CLIMATE online 2022).

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Fertile farming systems underpin hyper-yielding crops

John Kirkegaard, CSIRO Agriculture and Food, Canberra

It's no mystery what's required!

The yield potential of high yielding crops is set by the availability of the key resources required for plant growth – light, temperature, water and nutrients (especially nitrogen). We have a good idea of how much, and when these resources are required for each tonne of yield expected.

1. *Light and temperature*

Bright, sunny but cool conditions during the critical period 3-4 weeks up to anthesis when grain number is set allows maximum photosynthesis and slows development so more grain is set.

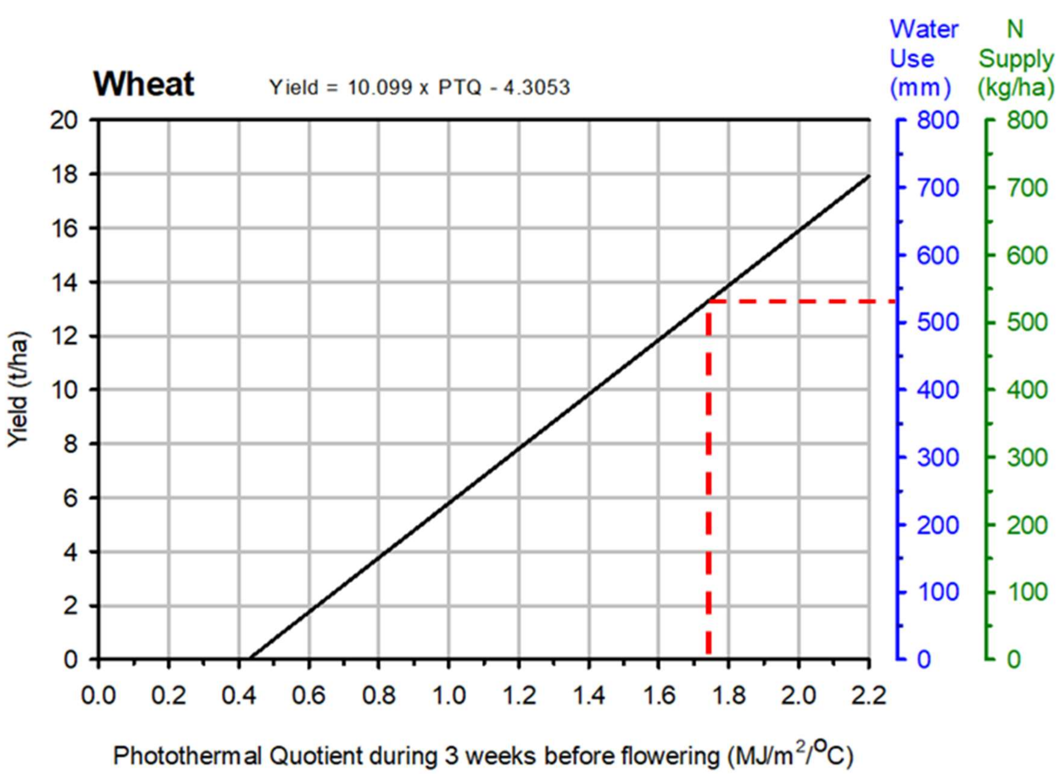
2. *Water supply*

The best crops produce 25 kg grain per ha for each mm of water supply to the crop. Water supply is stored soil water + plus rain/irrigation minus 60 mm lost to evaporation in the best crops.

3. *Nitrogen supply*

Cereal crops need to be supplied with (from the soil and fertiliser) 40 kg N/ha for every tonne of expected yield. So - a 10 t/ha wheat crop will need to be supplied with 400 kg N/ha from soil or fertiliser.

In the Figure below, we have developed a simple yield potential calculator that relates the availability of these resources to the potential yield of wheat.



At Hagley in Tasmania, the average PTQ for crops flowering in late October is 1.75 which supports a yield potential of ~**14 t/ha** (see red line). That yield requires 550mm of water supply and 550 kg N/ha N supply. The PTQ in the critical period will vary from year to year due to the weather.

Attaining hyper-yielding crops

The yield achieved will be determined by how well we can provide these resources at the critical times - while avoiding the "yield robbers" that will chip away at the potential – extreme temperatures, weeds, diseases.

Light and temperature are best optimised by sowing the right variety at the right time to ensure it flowers in the optimum window when the risk of heat, frost and drought is low, and when cool and sunny conditions are most likely. The HYC project has provided guidance on the best combinations.

Water supply in the high rainfall zone can limit yield in some seasons but reaching a total of 550mm from rainfall and stored soil water is often possible at Hagley (Ave Annual rainfall ~592mm).

Nitrogen supply – reaching a total supply of 550 kg N/ha might seem impossible – and it probably is if we were to rely on fertiliser N alone. But the Table below shows how a fertile farming system can support these yields with acceptable levels of fertiliser N, while less fertile systems require higher N supply from added fertiliser.
Responses to added fertiliser plateau as N fertiliser added to the surface may be slow to become unavailable in cold or dry soils and is concentrated in surface layers where it may be prone to losses and leaching. Fertile soils with an organic N supply throughout the profile will usually have N and water available as the crop requires even if surface soils are dry or cold.

Source of N supply	**Fertile Soil** High SOM/Recent Pasture/Manure	**Less Fertile** Low SOM/long crop history
Soil N content pre-sowing	200	80
Soil mineralisation in-season	200	100
Fertiliser required	150	**370**
Total N supply (target)	**550**	**550**

We need Hyper-Yielding systems – not just crops.

Hyper-yielding crops can only be produced in Hyper-yielding systems.
This requires good management well before the crop is sown – in the long-term management of the soil, in the sequence of preceding crops and pastures, and in the pre-crop fallow.

A hyper-yielding system would comprise careful long-term management of soil fertility to maintain soil organic matter using pasture or legume phases, crop residues and limited tillage, addition of manures and composts to ensure both chemical, biological and physical fertility. Maintaining a positive nutrient balance with additional fertiliser reduces the "mining" of soil nutrients.

Ensuring a diverse crop sequence will ensure healthier roots systems, improve water and nutrient use efficiency, reduce stubble-borne disease and weed control costs, and facilitate minimum tillage and stubble retention to help maintain soil organic matter. Managing residue and weeds in the pre-crop fallow should also reduce the green bridge for pests and diseases and facilitate the timely sowing of high-yielding crops. Any high-performing athlete knows that a great deal (if not most) of the success in winning the race comes from the preparation and planning that goes in well before the starting gun is fired. Fertile farming systems will certainly be needed to underpin the consistent performance and capitalise on the sound in-crop agronomy advice that is emerging in the Hyper-yielding Crops Project.

Low input spring barley yields greater than 10t/ha are possible in TAS with new genetics

Kenton Porker[1], Darcy Warren[1], Nick Poole[1], and Brett Davey[2].
[1]Field Applied Research (FAR) Australia; [2]Southern Farming Systems (SFS).

Take home messages

- Peak spring sown barley yield of 10.98t/ha was achieved in 2021; 10t/ha can be consistently achieved across diverse management regimes in Planet[A].
- Fungicide management is easier in spring sown barley compared to autumn sowing barley.
- New European spring barley cultivars show promise.
- Low applied N inputs are achieving high yields in the spring barley rotation position

Spring sown barley to increase yield and improve farming system profitability

Most of the common yield constraints to spring sown barley are consistent with the autumn sown situations. However, the management solutions required to address them differ in timing and intensity and will be discussed using key results from the 2021 trial program.

Disease management is one of the most important management components of growing high yielding barley crops in seasons that favour higher yield potential. Tasmania, with its southerly latitude, has a cooler climate and much longer growing season relative to other Australian states. This means flowering occurs later, and crops capitalise on longer days of sunshine. Tasmania has one of the highest yield potentials in Australia but equally high disease pressure.

The climatic conditions for spring sown barley are more favourable in Tasmania compared to other regions of Australia and may be a more profitable farming system than autumn sown barley. Other benefits include its suitability in rotation to diverse Tasmanian farming systems and other areas with a similar climate. For example, spring planted barley can be grown as a summer crop that is harvested in January or February. This means there is opportunity to grow another crop, such as autumn-sown fodder. There are some major climatic differences that will influence management and germplasm decisions. The obvious climatic differences between autumn/winter sown and spring sown barley are temperature, day length and rainfall patterns (Figure 1). Incoming solar radiation also increases with day length.

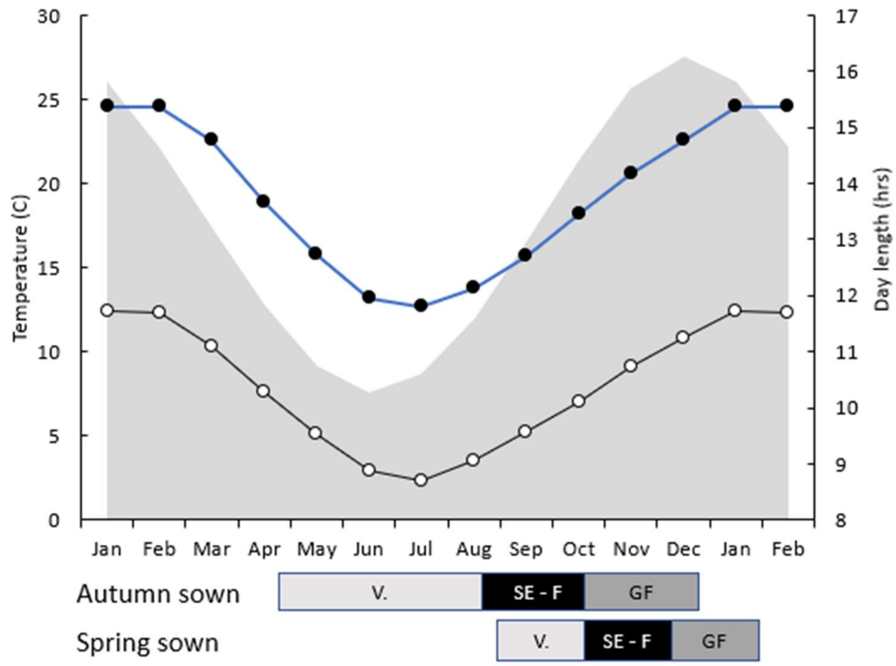


Figure 1. *Schematic comparison of crop life cycle, vegetative (V), Stem elongation to flowering (SE-F), and grain filling (GF) in spring barley sown in autumn and spring. The mean max temperatures (●) and mean minimum temperatures (○) and shaded area represent the day length (hrs) at Hagley Tasmania.*

New genetics show promise

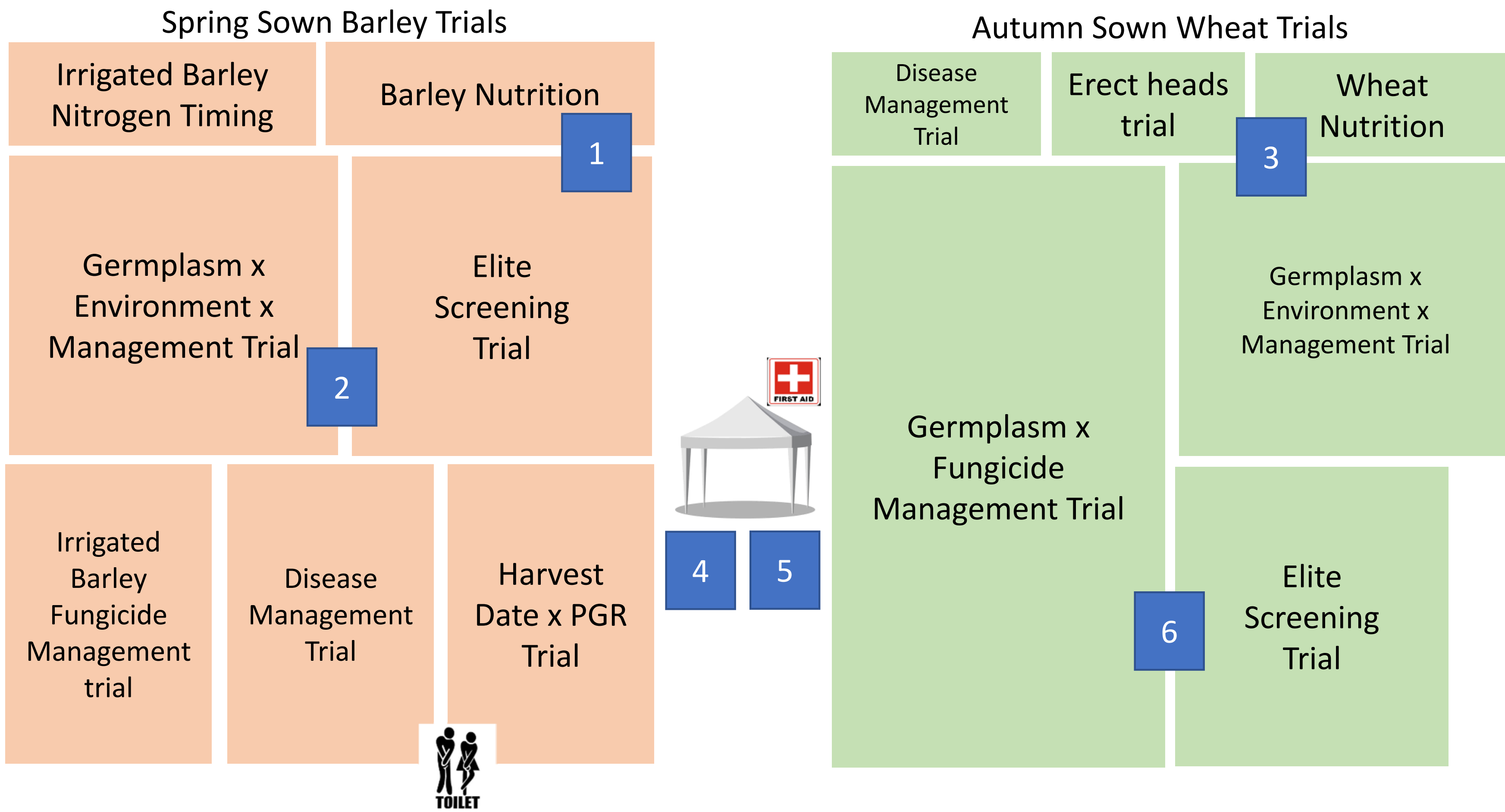
Much of the focus of improving cereal productivity in recent years has been sowing slower developing germplasm earlier. However, unlike wheat, this system has not yet delivered the expected yield gains for barley in the higher rainfall areas from autumn sowing. Currently, the quicker developing spring barley varieties suited to low–medium rainfall zones, such as Rosalind^{A} and RGT Planet^{A}, are also the highest yielding in the higher rainfall zones irrespective of their sowing date. The impressive yields achieved from spring planting in 2020 and 2021 highlight later sown spring-sown barley as another high-yielding sequencing option. Yields of 10t/ha and above were consistently achieved in RGT Planet^{A} and the emerging spring variety Laureate in 2021 across a variety of managements, whereas the spring wheat Zanzibar averaged 7.60t/ha. Spring barley is yielding higher than spring wheat at this sowing date. This is contrary to autumn planted crops where wheat yields are generally greater than that of barley.

Genetic gain for barley in Australia is reported to be 21 – 35 kg/ha/yr (Cosani and Sadras, 2022) however this does not consider the introduction of European germplasm or the new agronomic system's we have developed under Hyper yielding conditions. One example is the spring sown system in Tasmania and the early sown winter barley system. We have demonstrated a fourfold improvement in genetic and agronomic gain of 121kg/ha/yr of release through our quest to bring new European germplasm and new agronomy to Australia (figure 2).

TASMANIA HYC RESEARCH CENTRE

2022 SITE MAP:

Featuring the GRDC's Hyper Yielding Crops



Keynote speaker kindly sponsored by: Seed Force

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SITE ENTRY

TASMANIA HYC RESEARCH CENTRE

TIMETABLE

TASMANIA CROP TECHNOLOGY CENTRE FIELD DAY (HAGLEY): THURSDAY 24 NOVEMBER 2022

Thanks to our keynote speaker sponsor: Seed Force AN RAGT COMPANY

Featuring the GRDC's Hyper Yielding Crops

In-field presentations	Station No.	10:00	10:30	11:00	11:30	12:00	1:00	1:30	2:00	2:30	3:00
Dr John Kirkegaard, CSIRO Agriculture & Food *Fertile farming systems for hyper yielding crops – what are the key ingredients?* Seed Force	1	Coffee followed by opening address: Tim Bateman, GRDC Grower Relations Manager South and Nick Poole, FAR Australia's Managing Director and HYC Project Lead				Lunch kindly sponsored by: Nutrien Ag Solutions					Closing address and afternoon refreshements BOORTMALT
Kenton Porker, FAR Australia *Farming system benefits of spring barley, how and why is it easier to manage and achieve 10t/ha?*	2										
Darcy Warren and Daniel Bosveld, FAR Australia *Advances in N and canopy management in HYC.*	3										
Jon Midwood, TechCrop and Jill Lyall, Southern Farming Systems *Hyper Yielding Crops: Capturing yield potential through innovation and benchmarking.*	4										
Dr John Kirkegaard, CSIRO Agriculture & Food *Dr Kirkegaard will be joined by Nick Poole and Kenton Porker for a Q&A session and general discussion around hyper yielding farming systems.*	5										
Nick Poole, FAR Australia *New germplasm for hyper yielding crop opportunities - what characteristics are we looking for?*	6										
***Nick Poole** will lead a short tour of trials perhaps not featured throughout the course of the day in order to provide an opportunity for further discussion and Q&As.*	7										
In-field presentations	**Station No.**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**1:00**	**1:30**	**2:00**	**2:30**	**3:00**

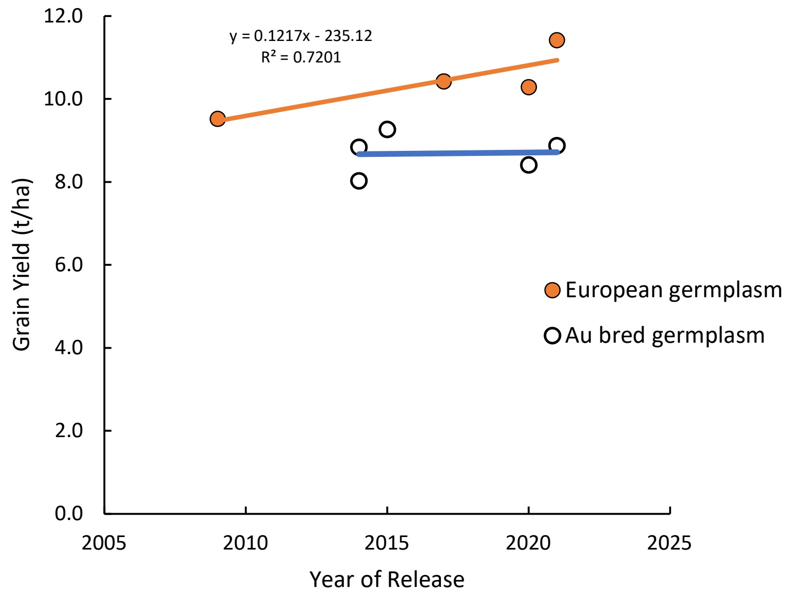


Figure 2. *Rate of genetic gain in the new and emerging agronomic system of spring sown barley with minimal inputs developed in Tasmania HYC.*

Disease management – achieving more yield with Planet[A]

RGT Planet[A] has been the most reliable spring barley and remains the yield benchmark from all sowing dates, including early sowing, due to its yield potential and standability. Its biggest 'Achilles' heel' is disease and it needs an extremely robust fungicide program.

Since the growing season is shorter and crops develop faster, spring sowing has the added advantage of reducing disease pressure and lodging which, in turn, reduces expenditure on fungicides and plant growth regulators (PGRs). In 2021, there was no significant response to fungicide for grain yield or grain quality from spring sowing (Table 1).

Table 1. *Influence of fungicide management on grain yield (t/ha).*

Treatment				Yield		% of mean
	GS00	**GS30**	**GS39-45**	t/ha		%
1	---	---	---	10.57	-	98.7
2	Systiva	Prosaro® 300mL/ha	Radial® 840mL/ha	10.77	-	100.5
3	---	Prosaro 300mL/ha	Aviator® Xpro® 420mL/ha	10.82	-	100.9
4	---	---	Aviator Xpro 420mL/ha	10.57	-	98.6
5	---	---	Revystar® 750mL/ha	10.61	-	99.0
6	---	---	Radial 840mL/ha	10.59	-	98.8
7	---	Prosaro 300mL/ha	----	10.82	-	100.9
8	--	Tilt® 500 250mL/ha	----	10.76	-	100.4
9	Systiva	---	Radial 840mL/ha	10.66	-	99.5
10	---	Prosaro 300mL/ha	Radial 840mL/ha	10.73	-	100.1
11	---	Aviator Xpro 420mL/ha	Radial 840mL/ha	10.92	-	101.9
12	--	Prosaro 150mL/ha	Radial 420mL/ha	10.81	-	100.9
	Mean			10.72		100.0
	Lsd 0.05			ns		ns
	P Val			0.256		0.251

The above results show that spring sown barley is incredibly robust, the canopy develops rapidly and disease develops later and has less impact on grain yield. Despite up to 20% of the leaf area affected with net form of net blotch and scald in untreated plots, there was no yield response to the addition of fungicides. These results are consistent with those produced at the 2020 site and demonstrate intensive fungicide inputs, and more expensive SDHI chemistries, may not be required to the same degree as autumn sown systems.

Other aspects of spring barley canopy management and new varieties

Other aspects of canopy management include managing lodging, head loss and brackling in barley. Laureate is an emerging spring cultivar for Tasmania, however it appears to require different considerations to Planet[A]. Canopy management was important in Laureate, lower nitrogen rates had a bigger influence on grain yield in Laureate than higher seeding and N rates due to increased lodging (Figure 3):

- High seeding density (360 seeds/m^2), and high N rate (140kg N) yielded 8.2t/ha,
- Lower density (150 seeds/m^2) and low N rate (70kg N/ha) yielded 10.3t/ha.

Whereas in Planet[A] (data not shown), higher yields were achieved at higher plant densities and high fungicide inputs, irrespective of N strategy, highlighting Planet[A] is less disease resistant but more tolerant to lodging than Laureate. In the quicker developing variety Rosalind, higher yields were achieved at higher plant densities, irrespective of N and fungicide strategy. This highlights the importance of higher seeding densities in shorter, faster developing cultivars under spring sown conditions to compensate for less tillering.

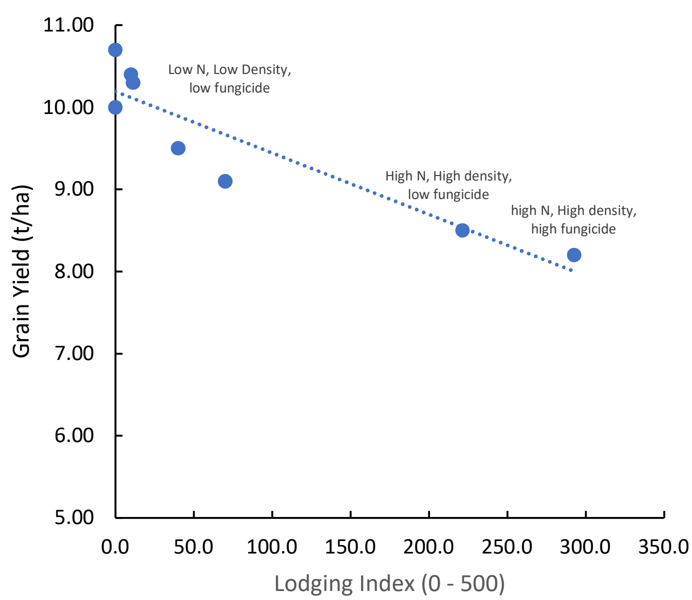
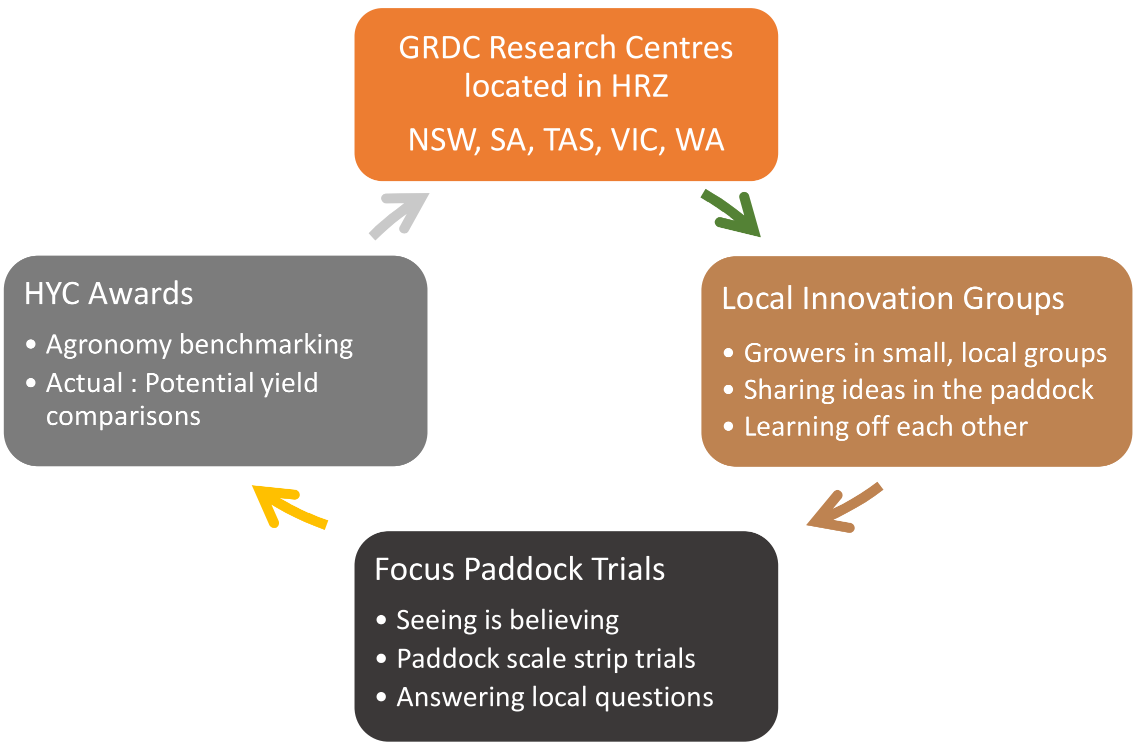


Figure 3. *Relationship between lodging and grain yield in Laureate under different management intensities at Hagley, 2021.*

GRDC Hyper Yielding Crops TAS

Jon Midwood, TechCrop

In 2020 the GRDC Hyper Yielding Crops project started. The project is being conducted in Victoria, Tasmania, South Australia, New South Wales, and Western Australia, with each state hosting a GRDC Centre of Excellence. These sites have been selected to run research trials to help determine some of the major factors growers and advisors can use, in their specific environment, to achieve optimum yields through variety and agronomic management of wheat, barley and canola. The following graphic shows the various outputs from the project and how they are inter related with each other:



In combination with the research centres there is a large emphasis on local grower involvement in the project and so in the TAS, Southern Farming Systems (SFS) have been contracted to run this part of the project. As the graphic above shows, this involves the setting up of local grower led innovation groups, facilitating and setting up Focus paddock scale trials and gathering information and measurements for the local HYC Award paddocks. Jon Midwood (TechCrop) oversees this part of the project, in a national role, alongside Nick Poole as project leader.

Innovation groups

In 2021 SFS ran three innovation groups in the TAS region, 2 in the Midlands and one group in the NW. All groups had a spring crop walk during August, where the groups met out in a paddock and discussed not only the crops they looked at on the day, but also the specific questions the groups had and whether they could answer the question with a simple paddock strip trial. The layout, assessments and treatments of these strip trials were facilitated by the SFS project officer and as a result a number of different trials were setup.
The following are details from one of these Focus paddock trials.

Focus paddock trials:

1. ***Fungicide timing paddock trial***

Research question: What is the impact on yield from a third foliar fungicide application at GS60 on extending disease control, increasing green leaf area retention and controlling any head diseases.

Paddock details

Crop	Cereal: Wheat
Variety	Accroc
Sow Rate	150.00 kg/ha
Sow Date	16-May
Harvest Date	31-Jan
Harvest Yield	10.93 T/ha
Stubble Management	Incorporated
Previous crop	Beans
Row spacing	229mm

Fungicide Treatments

Treatment	Product	Actives	Rate/ha	Growth Stage
1. Control - Grower practice	Prosaro	PTZ + TEB (Gp 3 + 3)	0.3	GS32
	Aviator Xpro	PTZ + Bixafen (Gp3 + 11)	0.5	GS39
2. Trial treatments	Prosaro	PTZ + TEB (Gp 3 + 3)	0.3	GS32
	Aviator Xpro	PTZ + Bixafen (Gp3 + 11)	0.5	GS39
	Avior Gold	EPZ + Amistar (Gp3 + Gp7)	0.32	GS60

Results

Measurement type	Control (Grower)	Treatment 2	Sig Diff (p<0.05)
Yield (t/ha)	10.93	11.84	Yes
Protein (%)	9.5	9.0	No
Screenings (%)	1.94	2.18	No
Test weight (kg/hL)	76.6	76.6	No

Conclusion
The season was a decile 6 and rainfall exceeded the long term average in each month during the spring. The application of Avior Gold (Azoxystrobin and Epoxiconazole) at the start of flowering gave a significant yield increase of nearly a tonne per ha.

HYC Awards

Award paddocks were nominated from the Innovation groups initially, with the aim being to collect and record specific wheat paddock information and to provide an agronomic benchmarking report which compares that paddock to all the others entered, both regionally and nationally. Nominated paddocks had their validated yields compared to a biophysical 'potential yield' for that paddock, which allows for the variability of soil types, rainfall, temperature and radiation across all regions. All agronomic information such as sowing dates, variety, crop development timings, soil data – pH, soil organic carbon, N, P, K etc., and in-season applications were collected by the project officer from SFS. Paddock yields, harvest maturity samples, harvest index calculations and grain samples were also collected for analysis. Reports were sent out to all participating growers allowing them to benchmark their agronomy from over 50 factors and compare it to other growers in their region.

The winner for the highest yield in TAS in 2021 was Frank Archer with a 13.3 t/ha crop of Accroc wheat sown on 19 April, following Potatoes in 2020.

Frank also won the award for the highest yield as a percentage of the potential yield in TAS. His 13.3 t/ha crop of Accroc wheat was 125% of the 10.6 t/ha calculated potential for his paddock.

The following are an example of some of the agronomic benchmarks produced in the HYC Awards report for TAS in 2021:

Agronomic Factor	Top 25% Award paddocks	Remaining 75%
Yield (t/ha)	12.7	9.8
N applied (kg N/ha)	169	176
N applied per tonne yield (kg N/t)	13.4	18.3
Fungicides ($/ha)	72	48
Fungicides ($/t)	5.7	4.8
Crop biomass (t/ha)	26.3	21.2
Harvest index	53%	51%
Head count (m2)	660	553
Grains per head	33	36
1000 grain weight	45	43

Key take home messages from TAS Award data 2021:

- In 2021 top 25% average yield increased by 1.8t/ha compared to 2020, whereas the remaining 75% yielded the same at an average of 9.8t/ha
- Accroc gave the highest and 2nd highest paddock yield. Manning had the lowest average yield, but two of the three paddocks were grazed.
- Wheat following potatoes or poppies were approx. >2t/ha higher yielding than following a wheat in 2021.
- The higher yielding group spent $24/ha more on fungicides and made one more application on average than the remaining 75%. They also all used a PGR.
- The higher yielding group had approx. 5t/ha higher crop biomass at harvest and higher head counts by ~100/m2
- GSR, GS radiation, spring rainfall or available water holding capacity of the soil, didn't appear to have been the reason for the differences in yield in 2021.

Please contact Jill Lyall (0447 122783) for information about being part of this exciting project or to enter a wheat crop as a HYC award paddock in 2022.

The primary role of Field Applied Research (FAR) Australia is to apply science innovations to profitable outcomes for Australian grain growers. Located across three hubs nationally, FAR Australia staff have the skills and expertise to provide 'concept to delivery' applied science innovations through excellence in applied field research, and interpretation of this research for adoption on farm.

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SOWING THE SEED FOR A BRIGHTER FUTURE

HYC Disease Management Germplasm Interaction

Darcy Warren, Brett Davey and Nick Poole

Background

Clearly, the best way to avoid fungicide resistance is not to use fungicides! However, in high disease pressure regions such as Tasmania, this would be an unprofitable decision with autumn sown cereals. When a cultivar's genetic resistance breaks down or is incomplete, it is imperative that growers and advisers have access to a diverse range of effective fungicides (in terms of mode of action) for controlling leaf disease. Hence, we need to protect the longevity of fungicide active ingredients.

In order to protect them, one of the most effective measures is to minimise the number of fungicide applications applied during the season. Within the Hyper Yielding Crops, we have been putting this to the test looking to explore the profitability of combining more disease resistant germplasm with reduced fungicide input. The following results generated in 2021 illustrated the vast differences in yield response to fungicide application at upper yield levels of 13-15t/ha.

Objectives

To develop profitable and sustainable approaches to disease management in HRZ wheat.

Individual objectives specific to the trial were:

- Monitor the effectiveness of flutriafol in furrow for early disease control in wheat.
- To evaluate whether newer germplasm or new fungicide chemistry allows a reduction in the number of fungicide applications whilst increasing profitability (note: reducing the number of fungicides is seen as a key measure for slowing down resistance development in cropping systems).
- Examine whether there is germplasm (varieties tested) that has sufficient early season disease resistance to replace the need for the Timing 1 (T1) spray applied at GS31-32.

Key results from 2021

- *Yields of 14t/ha and above were achieved with three varieties of wheat - Big Red, RGT Cesario and RGT Accroc with untreated plots of RGT Cesario and Big Red yielding 13.52 and 13.68t/ha.*
- *Although the untreated crops of RGT Cesario and Big Red were lower yielding than treated plots there was no statistically significant yield response to fungicides in these varieties with a maximum 0.5t/ha response in Cesario and 0.7t/ha response in Big Red.*
- *These responses to fungicides compared to the more susceptible RGT Accroc giving a maximum of 3t/ha to fungicide, intermediate susceptibility of Anapurna giving a maximum of 2.57t/ha.*

- *These larger responses to fungicides were the result of higher infection levels of Septoria tritici blotch (STB) and late leaf rust infection which were far less significant in Cesario and Big Red.*
- *The response to four units of fungicide in Revenue, the most susceptible cultivar for both STB and leaf rust was almost 4t/ha and the yield penalty for dropping to 2 units of fungicide was a minimum of 0.7t/ha.*
- *With RGT Cesario the yield increase associated with moving from a single flag spray to 4 units of fungicide was only 0.22t/ha (not significant) valued at $66/ha at $300/t, which was approximately the cost of the extra fungicide units (seed treatment and two foliars) and their application.*
- *With Big Red two units of fungicides (IDM 2-unit approach – GS31 and GS39) gave a 0.28t/ha advantage (not significant) over one spray at flag leaf (GS39).*
- *Where leaf rust was more severe than early STB the 2-spray straddle approach of a later first and second spray (GS33 & GS55-59) were more successful than the 2 spray IDM approach which had earlier spray timings GS31 and GS39.*
- *Flutriafol application in furrow reduces the overall response to subsequent fungicide programmes, but not sufficiently to affect the overall level of foliar fungicide input required (data not shown).*

Treatments

Five levels of fungicide input were applied to eight cultivars based on five timings: at sowing (seed
treatment SDHI Systiva based on fluxapyroxad, GS31, GS33, GS39, GS59.

1 unit of fungicide was applied at GS39 – flag leaf fully emerged on the main stem.
2 units IDM (Integrated Disease Management approach) was applied at GS31 and GS39 – 1st node and flag leaf.
4 units were applied at sowing (Systiva s.t.) and GS31, GS39 and GS59 – head emergence.
2 units Straddle applied at GS33 (third node) and GS55-59 (head 50-100% emerged).

Disease levels

Disease levels were primarily Septoria tritici blotch (STB) and leaf rust, although stripe rust was also present in Trojan and Tabasco. Stripe rust in Tabasco has never been observed in Tasmania since it was first tested in 2016 at the Hyper Yielding Crops research centre.

Table 1. *Influence of fungicide management strategy and variety on grain yield (t/ha) – SAGI Predicted yield analysis.*

	Management Level					
	Untreated	**1 Fungicide Unit**	**4 Fungicide Units**	**2 units IDM approach**	**2 units Straddle approach**	**Mean**
Cultivar	Yield t/ha	Yield t/ha	Yield t/ha	Yield t/ha	Yield t/ha	**Yield t/ha**
Trojan (s)	3.86	4.94	6.20	4.90	6.51	**5.28**

Scepter (s)	6.14	5.78	6.10	5.77	5.85	**5.93**
Big Red (w)	13.68	14.10	13.96	14.38	14.30	**14.08**
RGT Cesario (w)	13.52	13.80	14.02	13.76	13.52	**13.72**
Anapurna (w)	11.02	12.24	13.59	12.79	12.86	**12.50**
RGT Accroc (w)	11.41	13.07	14.41	12.94	13.81	**13.13**
Revenue (w)	8.52	10.18	12.44	11.20	11.71	**10.81**
Tabasco (w)	11.13	13.41	12.96	12.98	13.03	**12.70**
Mean	**9.91**	**10.94**	**11.71**	**11.09**	**11.45**	
LSD Cultivar x Fung. P=0.05	0.98t/ha (all wheats)					

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Notes

Notes

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