WA CROP TECHNOLOGY CENTRE (ALBANY)

FAR AUSTRALIA

GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

Wednesday 30 September 2020

12:30PM – 4:30pm followed by refreshments
631 Kojaneerup West Road, Green Range

Lunch and afternoon refreshments kindly supplied by AGLINK DAVID GRAYS *Locals Supporting Locals*

The GRDC HRZ Farming Systems Project is led by DPIRD in collaboration with:

FAR AUSTRALIA · CSIRO · Department of Primary Industries and Regional Development, Government of Western Australia

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

Department of Primary Industries and Regional Development · MFMG · BRILLAG AGRONOMY & RESEARCH · CeRDI Federation University Australia · FAR AUSTRALIA · CSIRO · RiverinePlains · Stirlings to Coast Farmers · TechCrop · SARDI Research and Development · SFS Southern Farming Systems

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Help us keep COVID-19 away if you are visiting FAR Australia offices or trial sites by observing 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 of 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.

VISITOR INFORMATION

We trust that you will enjoy your day with us at the Crop Technology Centre (Albany) Field Day. Your health and safety is paramount, therefore whilst on the property we ask that you both read and follow this information notice.

HEALTH & SAFETY

- All visitors are requested to follow instructions from FAR Australia staff at all times.
- All visitors to the site are requested to stay within the public areas and not to cross into any roped off areas.
- All visitors are requested to report any hazards noted directly to a member of FAR staff.

FARM BIOSECURITY

- 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.

FIRST AID

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

LITTER

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

VEHICLES

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

SMOKING

- There is No Smoking permitted inside any marquee.

Thank you for your cooperation, enjoy your day.

WELCOME TO THE WA CROP TECHNOLOGY CENTRE (ALBANY) FIELD DAY

FEATURING HIGH RAINFALL ZONE FARMING SYSTEMS AND HYPER YIELDING CROPS (ALBANY PORT ZONE)

On behalf of both project teams, I am delighted to welcome you to the 2020 WA Crop Technology Centre (Albany) Field Day. The centre currently hosts two research projects – The GRDC's High Rainfall Zone (HRZ) Farming Systems project and the GRDC's new Hyper Yielding Crops (HYC) project.

Led by the Foundation for Arable Research (FAR) Australia, the Hyper Yielding Crops (HYC) Project is funded by the Grains Research and Development Corporation (GRDC) and aims to push the economically attainable yield boundaries of wheat, barley and canola. HYC builds on the success of the GRDC's four-year Hyper Yielding Cereals Project in Tasmania, which demonstrated that it is possible to significantly increase yields through sowing the right cultivars and effective implementation of appropriately tailored management strategies. As well as the five research centres across the Australia HRZ the project wants to engage with you to scale up the results and create a community network aiming to lift productivity. If you are interested in getting involved in the project then get in touch (see details in this booklet).

The research site also hosts the GRDC's HRZ Farming Systems project which is led by the Department of Primary Industries and Regional Development (DPIRD) in collaboration with FAR Australia and Commonwealth Scientific and Industrial Research Organisation (CSIRO). This project has the objective of optimising cropping in western HRZ regions. Research this season at Green Range is looking at first wheat following canola on clayed and unclayed ground. The canola trials being led by CSIRO are based near Kojonup.

With a decile one start to the season it has not been the easiest of seasons to show the upper end of potential here at Green Range, but very often it's the seasons that don't go according to plan where the greatest learnings occur.

What's happening on the WA Crop Technology Centre (Albany) in 2020?

Hyper Yielding Crops (HYC) Research (based on barley at this site)
There will be an opportunity to look at the following:

- Early stage barley screening (1st Stage Screen and Elite screening) - The phenology, disease resistance and standing power of new barley germplasm including new European winter barley germplasm that might offer advances in productivity – Is there something to reliably out-perform RGT Planet in the HRZ?
- G.E.M. (Genotype. Environment. Management) trials – What are the management package combinations (winter vs spring germplasm, N PGR's and Fungicide) that deliver the highest final harvest dry matters and harvest indices?
- What level of fungicide input is appropriate for a decile 1 start to the season when growing RGT Planet?
- Is there a point to pushing nutrition in a season with such a poor start? – Nutrition trials in RGT Planet are addressing that question.

WA HRZ Farming Systems Research (based on wheat at this site)

- Assessing the phenology, dry matter production, yield and profitability of winter vs spring wheat sown at the start of May under three levels of input.
- Comparison of the identical trial in wheat (7 varieties x 3 management levels on clayed and unclayed ground).
- Early stage wheat screening (Screen 1 and Elite screening).

Speakers at today's event
The event will feature a range of research trial demonstrations in barley and wheat. We are extremely fortunate to have secured the following line-up of speakers who will share their expertise in covering topics relevant to the WA HRZ Farming Systems and Hyper Yielding Crops projects:

Jeremy Lemon, DPIRD
Mark Seymour, DPIRD
Jens Berger, CSIRO
Phillip Mackie, Stirlings to Coast Farmers
Scott Smith, Host famer and HYC focus famer
James Rollason, FAR Australia
Jeremy Curry, DPIRD

Should you require any assistance throughout the day, please don't hesitate to contact a member of the FAR Australia team who will be more than happy to help.

Thank you once again for taking the time to join us today; we hope that you find the presentations useful, and as a result, take away new ideas which can be implemented in your own farming business. Have a great day and we look forward to seeing you again at future project events.

I would like to thank the GRDC for investing in these research programmes on display today. I would also like to acknowledge David Grays Aglink for agreeing to support lunch and afternoon refreshments following their own event earlier in the morning. Finally, on behalf of the project teams I would like to thank Scott Smith, our host farmer for the tremendous practical support given to the team.

Nick Poole
Managing Director
FAR Australia

Funding Acknowledgements
The Hyper Yielding Crops and High Rainfall Zone Farming Systems project teams would like to place on record their grateful thanks to the Grains Research & Development Corporation (GRDC) for its funding support for this event and featured projects.

What are these projects aiming to achieve and how did they originate?

Hyper Yielding Crops

Hyper Yielding Crops (HYC) builds on the success of the GRDC's four-year Hyper Yielding Cereals Project in Tasmania 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 (Phil Mackie from Stirlings to Coast farming group here in the West) will work with the 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 (rachel.hamilton@faraustralia.com.au)
Nick Poole – HYC Project Leader, FAR Australia (nick.poole@faraustralia.com.au)
Jon Midwood - HYC extension coordinator, Techcrop (techcrop@bigpond.com)
Phillip Mackie, WA HYC Project Officer, Stirling to Coast Farmers, (phillip.mackie@scfarmers.org.au)

CROP TECHNOLOGY CENTRE (ALBANY)
SITE PLAN 2020
FEATURING HYPER YIELDING CROPS & HIGH RAINFALL ZONE (HRZ) FARMING SYSTEMS

not to scale

Parking

WC

Track to site

Wheat Block

Wheat Block

HYC PGR x harvest date

5

1

HYC disease management x germplasm

FAR Barley Fungicide Trial

HYC elite screen

6

Nutrition for HYC barley

HYC Novel strategies

3

HRZ Unclayed

HRZ Clayed

HYC 1st stage screen

4

HRZ First stage wheat screen

2

HYC GEM

TIMETABLE

WA CROP TECHNOLOGY CENTRE FIELD DAY (ALBANY) 2020: WEDNESDAY 30 SEPTEMBER 2020

In-field presentations	Station No.	12:30	1:15	1:30	2:00	2:30	3:00	3:30	4:00	4:30
Mark Seymour, DPIRD	1	Lunch kindly supplied by David Grays	Welcome and opening address	1					2	Closing address and refreshments
James Rollason, FAR Australia	2			2	1					
Jeremy Lemon, DPIRD	3				2	1				
Jens Berger, CSIRO	4					2	1			
Phillip Mackie, Stirlings to Coast Farmers and Scott Smith, Host Farmer	5						2	1		
Jeremy Curry, DPIRD	6							2	1	
In-field presentations	**Station No.**	**12:30**	**1:15**	**1:30**	**2:00**	**2:30**	**3:00**	**3:30**	**4:00**	**4:30**

We would be obliged if you could remain within your designated group number throughout the day.

1 **GROUP 1**

2 **GROUP 2**

Thank you for your cooperation.

HRZ Farming Systems

Over the past decade there has been a trend towards more cropping in the High Rainfall Zone (HRZ) but yields are typically 1-3 t/ha below water-limited yield potential for wheat and 0.5-1.5 t/ha for canola in an average season. This presents a significant opportunity to lift the profitability of cropping systems in the HRZ, defined in Western Australia as arable areas with annual rainfall above 450mm. This GRDC project was created to support growers to overcome major constraints, adopt superior long-season varieties and develop management packages to express superior yield potentials. In this project, DPIRD, CSIRO and FAR Australia have combined their expertise in farming systems, bio-economic modelling, disease management, and systems agronomy to work with growers to develop high production packages for the HRZ.

Over the next three years the project team will focus on supporting growers to increase the value of the cropping phase in the HRZ farming system by 10%. This will be done by addressing both crop yield potential and the gap between potential and realised yield in wheat and canola crops grown in the HRZ of the Albany and Esperance port zones.

In 2019 the project team ran workshops at Dandaragan, Green Range and Esperance with farmers and advisers to help define the key elements of the HRZ and R&D needs to support increased productivity and profit. Issues, opportunities and priority questions identified have guided the establishment of the experimental program in 2020. Key priorities coming from these workshops included how to best manage agronomy when potential is increased with soil amelioration, how to lift production through a combination of early sowing, improved genotypes and appropriate agronomy in cereals, how to manage nutrition to target high yields in HRZ environments, and how to improve the harvest index (achieved yield from established biomass) in large and bulky HRZ crops.

The project team is also working closely with SEPWA and Stirlings to Coast Farmers who are running paddock-scale demonstration projects (under PROC-9175784). This provides regular engagement with growers and consultants and ensures promising results from small-plot trials are validated at a paddock scale using commercial machinery.

This project will deliver a better understanding of the yield potential of different combinations of germplasm (i.e. winter vs spring germplasm) and farming systems inputs, identify options to reduce the yield gap, and quantify the economic risks associated with potentially higher input farming systems. The intensively monitored field experiments and paddock-scale demonstrations provide a focus for extension activities to improve grower knowledge and cropping aspirations. We will work with leading growers and consultants to develop guidelines about the profitability and risks of incorporating new agronomic practices and more diverse crop sequences into HRZ farming systems.

By working together, we can refine and transform HRZ farming systems towards increasing the average yield by 2t/ha in cereals and 1t/ha in canola (i.e. the five-year stretch target set by GRDC for the HRZ).

For more information on cereals contact James Rollason (james.rollason@faraustralia.com.au) or Nick Poole (nick.poole@faraustralia.com.au) from FAR Australia.
For more information on canola contact Jens Berger from CSIRO (jens.berger@csiro.au) or Jeremy Curry from DPIRD (jeremy.curry@agric.wa.gov.au).

Department of
Primary Industries and
Regional Development

GOVERNMENT OF
WESTERN AUSTRALIA

Soil amelioration to achieve potential yield

Jeremy Lemon, senior research scientist, DPIRD Albany

- Understand yield potential and limitations of systems
- Explore paddock variability with yield maps and remote sensing
- Identify poor performing areas and diagnose constraints
- Address constraints with targeted amelioration

The water limited yield potential concept has been around for decades, well before the widely adopted French and Schultz equation published in 1984. There have been several modifications of the F&S concept to account for limitations and broaden its application across environments and crop species. Maximum Water Use Efficiency (WUE) values have increased with better agronomy and crop nutrition leading to a current value for winter cereals of about 24kg grain/ha/mm water. Lower values apply in constrained soils, poor rainfall distribution and warmer climates.

Plant Available Water Capacity (PAWC) is the ability of soil to store and release water to crops. With uneven rainfall distribution, low PAWC leads to crop water stress between rainfall events, especially during the crucial grain filling period. Poor root growth, both density and depth, from soil constraints lowers PAWC and reduces potential yield. Common soil constraints generally caused by farming include topsoil and subsoil acidity, soil water repellence and subsoil compaction. These can be ameliorated relatively easily. Inherent soil constraints such as deep coarse sand, ironstone layers, subsoil sodicity and water logging are more difficult (ie expensive) to ameliorate.
Yield Mapping is a great tool to identify zones of good and poor production across a paddock. Yield mapping allows you to quantify the peak production zones and relate these yields to water limited yield potential answering part of the question “Am I achieving yield potential?” Satellite based NDVI and NDRE show relative biomass during the growing season which can be used to check problem areas early.

Yield Mapping also identifies poor production zones needing investigation to determine the causes.

Soil constraints are relatively easy to diagnose with simple resources such as a spade (or crow bar) hand or mechanical soil auger, soil penetrometer or hand probe, pH indicator solution, water, hand texturing layers and commercial laboratory analyses. With constraints identified, amelioration options can be discussed with growers who have tried things or consultants.

Ensure multiple constraints are addressed often with a combination of practices. Amelioration needs to be targeted to responsive zones to ensure a good return and avoid wasting money or even reducing yields with the wrong practice for the soil type. A remaining limitation is confident delineation of responsive zones. While remote or proximal sensing can be used to identify zones, constraints still need to be ground truthed in your environment with appropriate diagnosis.

Before launching into a full scale investment, test strips are well worth the effort on your place to see which soils respond well and which areas are better off left alone. A further tool to evaluate potential returns from amelioration is ROSA (Ranking Options for Soil Amelioration). This spreadsheet tool is available from jeremy.lemon@agric.wa.gov.au. It compares expected cropping returns from a range of soil amelioration options on major WA soil groups by geographic area.

Table 1: Simple diagnosis of soil constraints

Soil constraint	**Simple diagnosis**	**Value of remote sensing**
non wetting	paddock observation, soil 'wedge' test in summer	in specific situations, aerial imagery, NDVI
topsoil acidity	0-10 cm lab pH test, pH indicator	correlation with soil tests for specific farms
subsoil acidity and Al toxicity	profile sampling and analyses	gamma and EM when correlated
surface crusting	paddock observation, dispersion test	NDVI, visual imagery, yield mapping,
texture contrast/ water logging	paddock observation, dig holes	gamma and EM when correlated, seasonal NDVI
low PAWC/deep sand	dig holes, Visual Soil Assessment	NDVI, visual imagery, yield mapping
cemented laterite/rock subsoil	dig holes, Visual Soil Assessment, crop observations, early maturing patches	NDVI
'nutrient drought'	Is it real? White sand horizons, profile nutrient analyses	
wheeling subsoil compaction	penetrometer, visual observation of holes and pits	yield mapping? Associated with soil types
sodic dense subsoils	hand digging or soil pits, dispersion testing	EM fairly good, Google Earth good at times
high subsoil salts	profile conductivity testing	EM fairly good
boron toxicity	crop observation, profile B analysis	EM has some application

Green Range (Albany Port Zone)

The trial site has been established on a sandy soil over clay into the canola stubble. The area of the paddock where the trials are positioned has been clayed (12 months ago) and there is an area of the paddock adjacent to the planned trial site that has remained un-ameliorated.

Optimising high rainfall zone cropping for profit in the Western and Southern Regions (DAW1903-008RMX)

Trial 1. April sown germplasm (winter v spring) x management interaction trial Clayed vs Unclayed

Objectives: To assess a comparison of early sown winter and spring wheat germplasm managed under different levels of management (Late April sown).

Individual objectives specific to the trial are:

- Assessing the phenology, dry matter production, yield and profitability of winter vs spring wheat sown in late April.
- To examine the effect of defoliation in winter and spring wheat on dry matter removed, final dry matter, phenology, grain yield and profitability.
- To compare the performance of feed and milling winter wheats sown in April.

Trial 2. Wheat April sowing germplasm screening trial – winter and spring (not taken to yield).

Objectives: To assess elite breeders' lines for late April sowing opportunities.

Individual objectives specific to the trial are:

- Assessing the phenology, standing power, disease resistance of earlier generation winter and spring wheat candidates sown in the early-mid April sowing window.
- To select the promising candidates for inclusion in future agronomy studies that would be taken to yield.
- To compare the performance of feed and milling winter wheats sown early.

Hyper Yielding Crops (FAR2004-002SAX)

Trial 1. HYC 1st Stage Screen

Objectives: To examine the phenology, disease resistance and standing power of new barley germplasm established in the traditional early May sowing window relative to current practice.

Individual objectives specific to the trial are:

- Evaluating the phenology response of new two and six row winter barley germplasm relative to current spring controls and new European spring cultivars.
- Evaluate foliar disease resistance profile and any viral responses.
- Evaluate plant type characteristics related to stand ability, row type, tillering capacity, and head retention.

Trial 2. HYC Elite Screen

Objectives: To examine the yield potential of new winter and spring germplasm grown under HYC Management packages against spring and winter controls in the traditional early May sowing window.

Individual objectives specific to the trial are:

- Examining the yield potential of a new range of two and six row winter barleys never before tested in the Australian HRZ region.
- Determine Harvest Index and Biomass benchmarks in the HRZ under current best practice (on selected lines).
- Inform experimental direction for elite screening (HYC Elite Screen) and management considerations.

Trial 3. HYC G.E.M Trial series

Objectives: To assess the performance of winter and spring barley germplasm managed under four different management intensities (early May sown) at two levels of fungicides.

Individual objectives specific to the trial are:

- Assessing the phenology, dry matter production, yield and profitability of current winter versus spring barley sown in early May.

- To examine the effect of defoliation in winter and spring barley on dry matter removed, final dry matter, phenology, grain yield and profitability.
- Determine why the harvest index of winter barley is lower than spring barley and whether that constraint can be removed.

Trial 4. HYC Disease Management germplasm interaction

Objectives: To develop profitable and sustainable approaches to disease management in HRZ barley.

Individual objectives specific to the trial are:

- Monitor the effectiveness of fluxapyroxad (Systiva) for early disease control in barley.
- To evaluate whether newer germplasm (improved resistance) or new fungicide chemistry allows a reduction in the number of fungicide applications whilst increasing barley profit (reducing the number of fungicides is seen as a key measure for slowing down resistance development in cropping systems.

Trial 5. HYC PGR x harvest date interaction

Objectives: To assess the value of PGRs with delayed harvest in HRZ regions.

Individual objectives specific to the trial are:

- Most evaluations of PGRs conducted on trials looking at yield effects (HI prevention of lodging) rather than brackling. Are PGRs more beneficial when harvest is delayed in the HRZ in the prevention of brackling?
- Inform PGR use for subsequent seasons and the effect of PGRs on yield.

Trial 6. Nutrition for Hyper Yielding Barley

Objectives: To assess the value of higher nutrition input for barley.

Individual objectives specific to the trial are:.

- Assess whether growers are currently under fertilising barley crops in the region and N requirements required to reach target yields of 10 – 12 within each region.

Trial 7: Novel management strategies to reset barley development

Research objectives:

Background: The ability to slow down or reset crop development within season opens new management possibilities not previously explored in annual grain crops. If successful, this approach would be transformative and offers growers the ability to plant irrespective of seasonal break timing and then manipulate phenology to better match the season, improving the likelihood of increasing and stabilising yields, reducing risk, and improving the ability to match limiting inputs such as nitrogen to a more stable crop potential. These approaches could be particularly attractive to barley growers in the HRZ where suitable winter germplasm are not yet available. This raises a number of research questions.

Research questions:

- Are we better to increase seeding rate and reset phenology in faster spring Barley sown early to capitalise on root growth, greater carbohydrate reserve, and initiate more tillers rather than utilise current winter germplasm options sown early in the HRZ?
- Is spring barley more sensitive to changes in plant density than winter barley?

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