



Department of  
Primary Industries and  
Regional Development

Protect  
Grow  
Innovate

# DPIRD Broadacre Systems R&D Stakeholder Update

August 2025 Edition



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*Cover: DPIRD Broadacre Systems Executive Director Dr Kaara Klepper and Deputy Director General, Primary Industries Development, Cecilia Mcconnell.*

## Acknowledgment of Country

The Department of Primary Industries and Regional Development (DPIRD) acknowledges the Traditional Custodians of Country, the Aboriginal people of the many lands that we work on and their language groups throughout Western Australia (WA) and recognise their continuing connection to the land and waters. We respect their continuing culture and the contribution they make to the life of our regions, and we pay our respects to their Elders past, present and emerging.

## Department of Primary Industries and Regional Development

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# Broadacre Systems: setting direction for WA grain and mixed farming



*Dr Kaara Klepper,  
Broadacre Systems (DPIRD)*

**DPIRD has established a new Broadacre Systems directorate to lead a more integrated approach to research and development across Western Australia's grain and mixed farming industries.**

The directorate brings together the Grains and Farming Systems Innovation directorates, strengthening the department's ability to streamline R&D delivery and better align research with grower needs across the State.

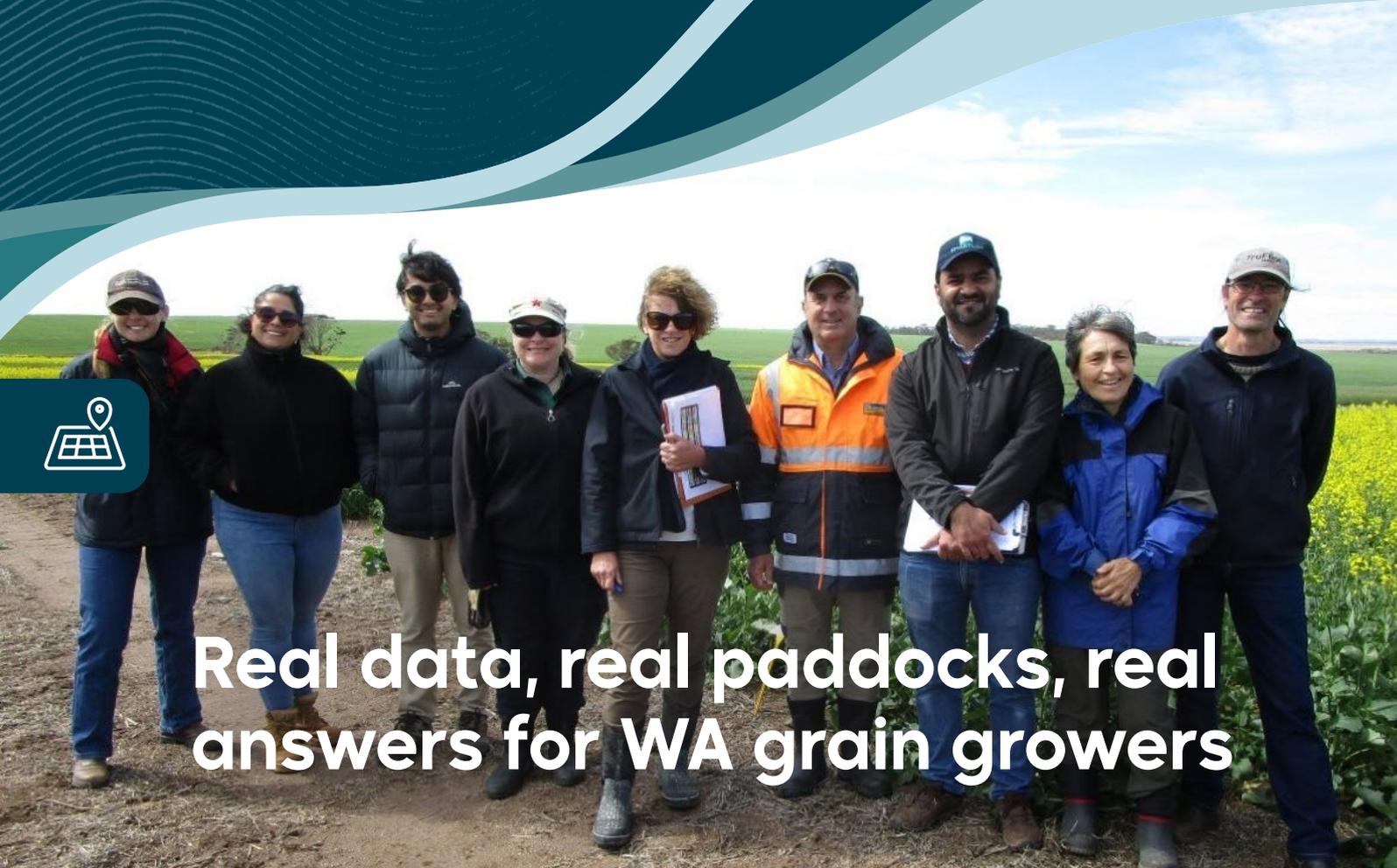
Dr Kaara Klepper has been appointed as Executive Director and will lead a united effort to address the shared challenges and opportunities facing broadacre agriculture. With a career spanning agronomy, soil science and environmental sustainability, Kaara brings strong strategic and technical expertise – along with a clear focus on building stronger connections between government priorities and the research that happens on the ground.

Broadacre Systems is one of three new R&D-focused directorates at DPIRD, alongside Animal Systems and Intensive and Irrigated Plant Systems. These changes are designed to align the department's science with rapid advances in technology, shifting global markets and evolving industry needs.

Julia Smith, Executive Director of Animal Systems, brings extensive leadership experience from her long-standing career with the department and will now oversee R&D across the livestock and aquaculture sectors.

Sam Oakden, appointed to lead Intensive and Irrigated Plant Systems, brings national experience in food and agricultural innovation to support WA's horticulture and irrigated cropping industries.

The new executive team is working closely with staff and stakeholders across the State to shape a targeted, collaborative and future-focused R&D agenda – one that positions WA's \$10 billion primary industries to thrive in a fast-changing world.



# Real data, real paddocks, real answers for WA grain growers

*Members of the project team at the Medium Rainfall South Farming Systems Trial Site (Lake Grace) in 2024 (left to right) Stephanie Boyce, Lea Obadia, Sud Kharel, Kristy Hunter, Brenda Shackley, Rod Bowey, Waseem Ashfaq, Imma Farre and Marty Harries.*

## **What if you could fine-tune your cropping system to boost profit, cut input costs and manage risk — all backed by data from WA's own farming conditions?**

That's exactly what DPIRD research scientists are delivering through the WA Farming Systems Project.

With more than 18 staff contributing across the wheatbelt and metropolitan areas, DPIRD is leading this major five-year initiative in partnership with GRDC – and the initial results are revealing critical insights to support more profitable decision-making.

At large-scale trial sites in Merredin, Lake Grace and Northampton, researchers are testing over 40 cropping treatments to assess how rotation, nitrogen inputs and sowing strategies interact under real-world conditions.

Now two years in, the findings are providing early insights with practical relevance for growers and advisers.

At Lake Grace, wheat grown after pasture legumes or fallow in 2024 delivered stronger yields, more vigorous crop growth and higher grain protein – demonstrating the value of strategic break crop choices.

At Merredin, all treatments following fallow produced a higher yield with less nitrogen fertiliser due to residual soil nitrogen from the previous year. This result points to opportunities for input savings in lower rainfall zones.

In Northampton, an unusually wet 2024 season led to significant nitrogen leaching. High fertiliser application led to a higher yield in canola and wheat, compared to low nitrogen treatment. This highlights the importance of responsive nitrogen management in high rainfall years.

The project is also exploring how changes in sowing timing and crop sequencing can influence weed pressure, soil fertility and greenhouse gas emissions – key considerations for building more sustainable and competitive grain production systems.

As the project progresses, the team will continue to build the dataset and develop decision support tools that translate these findings into practical recommendations – helping farmers plan with greater confidence and adapt to seasonal and market challenges.

With more seasons ahead, this work is laying the foundation for more resilient and profitable cropping systems across the WA grainbelt.

Want to know more?

WA Farming Systems project



*Aerial photo of the Medium Rainfall North Farming Systems Trial Site (Northampton) in August 2023.*

## Quick facts:



- **\$20.4 million** investment
- **3 trial sites**  
Northampton, Lake Grace, Merredin
- **40+**  
rotation x nitrogen treatments per site
- **Aims to deliver**  
new tools for low/medium rainfall growers



# Have you checked out DPIRD's new website?



## Season 2025 support now live

**WA grain growers navigating the challenges of a dry start to the season can now access a wide range of seasonal information and tools in one place, via the new Season 2025 landing page on DPIRD's website.**

The page, located under the agriculture tab on the homepage, is designed to streamline access to DPIRD's latest climate information, decision support tools and technical resources.

It draws together updates across key areas including weather, soils, pests and diseases – helping grain growers stay informed and consider their options as the season unfolds.

Growers can access the Bureau of Meteorology's seasonal outlooks and maps, including rainfall forecasts and deciles, temperature predictions and climate drivers.

The page also features DPIRD's monthly Seasonal Climate Outlook newsletter, which includes commentary on key climate indicators and maps covering rainfall, soil water and seasonal breaks for the South West Land Division.

Live data from more than 190 DPIRD weather stations is available through the hub, providing real-time readings on rainfall, temperature, dew point, wind speed and direction.

For in-season crop protection, there is a direct link to the PestFacts WA newsletter, which delivers regular updates on pest and disease activity across the grainbelt.

The Season 2025 hub also connects growers with the WA Rural Support Directory, which includes links to mental health services, financial counselling and support programs.

The Season 2025 page is regularly updated with trusted information, practical advice and tools to assist landholders in responding to changing conditions throughout the growing season.

**To find out more visit:**

**Season 2025**





# DPIRD launches digital tool to boost barley disease control

A powerful new digital tool is now at the fingertips of WA barley growers, helping them make smarter decisions and protect crops against one of the crop's most persistent fungal threats — net blotch disease.

The NetBlotchBM app, developed by DPIRD through the National Disease Modelling project with GRDC co-investment, is already shaping up to be a game-changer in managing both net-form and spot-form net blotch.

This disease is a widespread issue in WA barley crops, reducing yield and grain quality, and costing growers time and profit.

DPIRD principal research scientist Jean Galloway said the app was designed to give growers and consultants a clear, practical way to compare different management strategies and see the likely return on investment from fungicide use and other decisions.



*GRDC Manager Diseases (National) Alan Little, DPIRD principal research scientist Jean Galloway, DPIRD research scientist Dr Harry Eslick and GRDC Senior Manager Crop Protection Emma Colson with the newly released NetBlotchBM app.*





“The app puts the power in the hands of growers. It helps them assess their own situation – from paddock history and variety choice to seasonal outlook and market prices – and explore how different strategies might perform,” she said.

By allowing users to tailor inputs to their own conditions, NetBlotchBM helps growers better understand the factors that drive disease pressure and profitability. Decades of data from Australian production systems has been carefully analysed and optimised for decision support.

The app supports fungicide decisions based on economic return – not just disease risk – which is especially valuable in tight seasons or lower barley prices.

Available now via the App Store and Google Play, NetBlotchBM brings research and modelling directly to the paddock – ensuring DPIRD’s long-standing investment in disease management continues to deliver real benefits for WA grain growers.

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## Want to know more?

As part of the DPIRD project Disease Epidemiology, Modelling, and Delivery of Management Decision Support Tools, DPIRD research scientists Jason Bradley and Harry Eslick presented a webinar on managing net blotch diseases in barley, addressing fungicide resistance, and demonstrating the use of the NetBlotchBM decision support tool. **Check out the webinar:**

[Managing NetBlotch disease](#)





# WA plant detectives sharpen skills to stop crop threats early

**DPIRD researchers and diagnosticians are levelling up their diagnostic skills to stay ahead of the fungal diseases threatening WA's grains and horticultural industries.**

Last month, plant pathologists from across the state rolled up their sleeves for an intensive three-day fungal ID workshop at Edith Cowan University, Joondalup – gaining sharper tools to protect the crops that power WA's regional economy.

Led by international expert Megan Romberg from the United States Department of Agriculture, the workshop focused on the art and science of fungal identification.

From dissecting diseased plant tissue to examining spores and fruiting bodies under the microscope, researchers immersed themselves in the practical skills that help diagnose crop issues quickly and accurately.

These skills are vital for DPIRD plant pathologists working in the grains and horticultural industries who often receive urgent requests from agronomists to assess mysterious symptoms on plants, rule out exotic threats and recommend effective management.

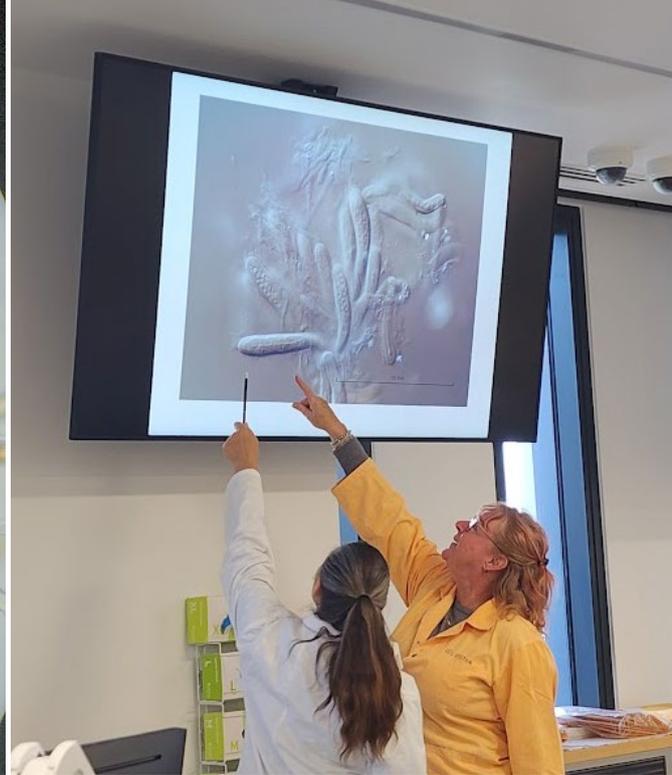
This hands-on training will directly benefit WA growers.



*DPIRD staff took part in hands-on fungal ID training to enhance field diagnostics and biosecurity capability.*



*DPIRD research scientist Zia Hoque looking down microscope at fungal ID workshop*



*The workshop focused on morphological identification of fungi through direct examination of host samples, fruiting body formations and spore structures.*

By improving how quickly and accurately plant pathologists can identify the fungi causing disease, it helps reduce crop losses, avoid unnecessary treatments and support more confident decisions.

The workshop was organised by DPIRD staff bringing to WA a training opportunity originally delivered in the eastern states as part of the Australian Plant Pathology Society program.

The workshop didn't just cover the basics. DPIRD's team of plant pathologists explored fungal taxonomy, learned advanced microscopy techniques, used diagnostic stains to highlight tricky structures, and matched their findings against international databases.

This detective work builds the foundation for high-confidence fungal IDs – which are often later confirmed through molecular testing.

For DPIRD's regional researchers, the benefits are immediate.

With new tools and techniques now at their fingertips, staff from Northam, Esperance, Kununurra, Bunbury and Albany are better equipped to respond quickly and effectively when issues crop up.

That means faster support for growers, better decisions in real time, and stronger lines of defence against emerging disease threats.

The workshop was attended by DPIRD researchers Andrea Hills, Ahmed Saad, Daniel Hüberli, Jason Bradley, Masood Anwar, Kylie Chambers, Miriam Connor, Zia Hoque, Roopali Bhoite, Hieu Tran, Elaine Gough, Kim Saligari, Wossen Mengesha, Baki Bhuiyan, Dominic Wright, Craig Webster, Nick Pain, Stefan Harasymow, Julie McClements, Mirjana Banovic and Erin Hampson.



# Future-fit wheat: boosting zinc for healthier grain and stronger exports

**New research is enhancing the zinc content of WA wheat, helping farmers grow more valuable, nutrient-rich grain to meet the growing global appetite for healthier food.**

Zinc is a vital micronutrient for both crop performance and human health, but modern wheat varieties grown in Australia often fall short.

Years of breeding for yield, disease resistance and processing quality have come at the cost of declining grain mineral content.

Combined with WA's naturally zinc-deficient soils, the result is grain that contains less zinc than desirable for nutrition and potentially, market value.



*DPIRD research scientists Dr Roopali Bhoite and Rosemary Smith review trials at DPIRD's Merredin Research Station*



*High-zinc wheat lines were trialled at DPIRD’s Merredin Research Station in 2023 and 2024.*

To tackle this challenge, DPIRD researchers – led by Research Scientist Dr Roopali Bhoite – are exploring genetic biofortification, a breeding approach that naturally boosts zinc uptake and its movement into the grain through superior genetics.

The aim is to develop wheat varieties that can efficiently translocate zinc from the soil and deliver it to the grain.

A selection of high-zinc wheat lines, having genes from wild relatives and landraces from the global HarvestPlus program, was trialled at DPIRD’s Merredin Research Station in 2023 and 2024 on alkaline, zinc-deficient sandy-loam soils.

Using inductively coupled plasma mass spectrometry (ICP-MS), researchers analysed the zinc content in wheat grain, stems and rachis.

They found that the best-performing lines on WA soils were more efficient at mobilising zinc from the plant into the grain.

Ten donor lines showed consistently high zinc efficiency compared to standard WA cultivars.

These lines are now strong candidates for use in local breeding programs to produce biofortified wheat varieties suited to WA conditions.

Looking ahead, this work paves the way for wheat that is not only productive and resilient, but also more nutritious.

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# Growing the next generation of ag leaders



**DPIRD is supporting the next generation of agricultural leaders through PhD research tackling real-world challenges.**

By building expertise in areas like grain quality and non-chemical weed control, we're investing in science and scientists that keeps WA growers ahead.

## Next-gen weed control tech gives WA growers the edge

The race is on to futureproof WA's grain production systems, and DPIRD is investing in next-generation weed control to keep growers ahead of the game.

A new co-funded PhD project, led by DPIRD research scientist Miranda Slaven, is exploring the real-world potential of non-chemical weed control technologies in broadacre cropping – a move that could reshape how the grains industry manages one of its most persistent challenges.

As herbicide resistance escalates and pressure mounts to reduce chemical use, finding effective, sustainable alternatives is becoming a top priority.

This research is setting out to assess and optimise the use of thermal and mechanical methods, like electricity, lasers, targeted tillage and water jets, for inter-row weed control in broad-scale cropping systems.

While these technologies are being trialled overseas, there has been little investigation into how they perform in Australian conditions.

This research is helping to fill that gap, using field and pot trials across a range of cropping environments to evaluate their effectiveness against common problem weeds such as annual ryegrass and wild radish.

By focusing on the inter-row space, where the risk to crops is lower, the project is identifying promising tools that could complement current integrated weed management strategies.

In addition to measuring weed kill, Miranda is assessing the impacts of soil type, seed bank dynamics and moisture levels on each method, while also exploring their integration with precision agriculture and autonomous systems.

The goal is to determine if commercial development of this machinery makes sense for Australia – and if so, how quickly growers could expect to access it.

Industry stands to benefit with practical, evidence-based insights that will guide adoption and prepare growers to respond to mounting challenges such as herbicide bans, rising resistance and changing market demands.

The work supports key WA Government priorities around sustainability and innovation, positioning WA growers to take advantage of global advances in agricultural technology without compromising profitability.



*DPIRD research scientist  
Miranda Slaven.*

## Contact:

**Miranda Slaven**

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This project is being delivered through a PhD co-funded by UWA, DPIRD, GRDC and the Edward and Frank Moss HDR Scholarship in Agriculture.



*DPIRD is trialling the Zasso™ XPower machine for inter-row electric weed control as part of its research into next-generation weed management options.*

## New research reveals critical window in wheat sprouting risk

Esperance based DPIRD research scientist and UWA PhD candidate Jeremy Curry is leading a project to help Australian growers reduce losses from pre-harvest sprouting (PHS) in wheat and protect grain value.

The research, Genetic and physiological control of germination to explain pre-harvest sprouting risk of wheat under variable maturation environments in Australia, is uncovering when wheat is most vulnerable to sprouting and how risk is influenced by both genetics and seasonal conditions.

Pre-harvest sprouting remains a significant quality issue for WA growers, occurring when rain occurs close to harvest and stimulates germination of the mature grains.



*Jeremy's research has found that crops undergoing partial maturation drying are more vulnerable to pre-harvest sprouting.*

Jeremy's research is focused on understanding how PHS risk changes throughout grain development, maturation drying and after-ripening.

Field trials in Esperance in 2023 and 2024 tested three wheat genotypes under rainout shelters to measure how grain moisture and germination response shifted during key stages of maturation. Grain samples from these trials are undergoing molecular analysis at UWA.

The early results are challenging assumptions.

Grain that is partially dried – not yet at harvest maturity – appears to be more prone to sprouting than fully matured grain.

This reveals a critical risk window that growers may be able to manage through agronomy, such as by aligning variety choice with sowing date decisions.

The research also highlights the importance of seasonal conditions during grain development in influencing the strength of resistance to PHS by altering expression of grain dormancy that prevents precocious germination.

This knowledge will support more reliable recommendations for variety selection, sowing time and harvest prioritisation.

The next phase of the study will explore how wheat lines with different gene variants perform across various maturation environments, helping researchers and breeders better understand the genes linked to lower sprouting risk.

### Contact:

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The project is supported by DPIRD, GRDC, UWA, InterGrain and CSIRO.



*DPIRD research scientist and UWA PhD candidate Jeremy Curry.*



# Journal papers 2025



## Crop Protection

Cook D, Taylor AS, Gardiner PS, Pires RN, McKirdy HLR, Holmes KW, Spafford H (2025) Potential economic impact of grapevine phylloxera (Hemiptera: Phylloxeridae) on Western Australian winegrapes. *Australian Journal of Grape and Wine Research*.



Fagan-Jeffries EP, Miles MM, Atkin-Zaldivar TC, Howe AG, Subramaniam S, Chambers DM, Tadle FPJ, Adnan SM, Sivasubramaniam V, Woodward A, Spafford H, Thistleton B (2024). Hymenopteran parasitoids of fall armyworm (*Spodoptera frugiperda* (J.E. Smith)(Lepidoptera: Noctuidae)) in Australia, with the description of five new species in the families Braconidae and Eulophidae. *Austral Entomology* 63(2): 136-174



Hodgson LM, Lopez-Ruiz FJ, Gibberd MR, Thomas GJ, Zerihun A (2025) Field-Scale Gene Flow of Fungicide Resistance in *Pyrenophora teres f. teres* and the Effect of Selection Pressure on the Population Structure. *Phytopathology*® 115:1, 85–96.



Guo W, Schreiber M, Marosi VB, et al. (2025) A barley pan-transcriptome reveals layers of genotype-dependent transcriptional complexity. *Nature Genetics* 57, 441–450



Xu L, Wang P, Zhang X, Zhang Q, Wang P, Xu Y, Li C, Zhang W (2025). Natural variations in a barley aldehyde oxidase 1 gene affect seed germination and malting quality. *The Crop Journal*, 13(1), 299–303



He J, Ning K, Naznin A, Wang Y, Chen C, Zuo Y, Zhou M, Li C, Varshney R, Chen Z-H. (2025). Technological Advances on Imaging and Modelling of Leaf Structural Traits: A Review on Heat Stress in Wheat. *Journal of Experimental Botany*.



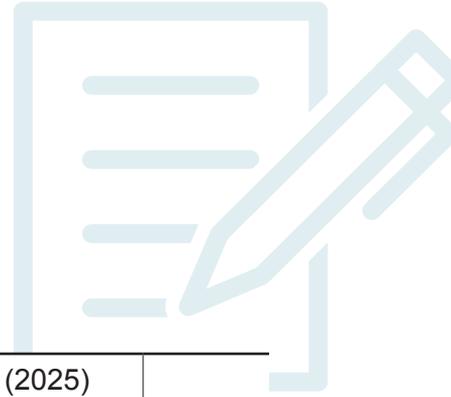
Tong C, Jia Y, Hu H, Zeng Z, Chapman B, Li C (2024). Pangenome and pantranscriptome as the new reference for gene family characterisation – a case study of basic helix-loop-helix (*bHLH*) genes in barley. *Plant Communications*, 6(1).



Feng H, Du Q, Jiang Y, Jia Y, He T, Wang Y, Chapman B, Yu J, Zhang H, Gu M, Jiang M, Gao S, Zhang X, Song Y, Garg V, Varshney RK, Wei J, Li C, Zhang X, Li R (2025). *Hordeum* I genome unlocks adaptive evolution and genetic potential for crop improvement. *Nature Plants*, 11(3), 438–452.



## Genetic Improvement



**Crop Science and Grain Production**

Iqbal N, Brien C, Jewell N, Berger B, Denison RF, Denton MD (2025) Chickpea displays a temporal growth response to *Mesorhizobium* strains under well-watered and drought conditions. *Physiologia Plantarum*



Zhou Y, Toh R, Iqbal N, Ryder M, Li J, Denton MD (2025) Biological Nitrification Inhibition by Australian Tussock Grass and Its Impact on the Rhizosphere Ammonia-Oxidizing Microbiome. *Grasses* 3(4), 297–306.



**Soil Science and Crop Nutrition**

Wickramarachchi K, Betti G, Azam G (2025) Effect of Clay Amendment and Strategic Deep Tillage on Soil Water Dynamics and Plant Growth Under Controlled Environments. *Plants* 2025, 14(5), 799



Hall D et al. (2025) Trenching and compost sustain grain yield increases over nine years on deep sands but at a cost.



LEFT: Surface of reconstructed soil columns representing different soil amelioration techniques.



RIGHT: DPIRD Research Scientist Kanch Wickramarachchi measuring evapotranspiration during the early growth stage of a wheat crop in deep spaded field.



# Where to hear about our work



15–19  
September 2025

8th International Food Legume  
Research Conference and 5th  
Australian Pulse Conference  
Pan Pacific, Perth



15–19  
September 2025

15th International Society for Seed  
Science Conference  
Fraser's, Kings Park, Perth



*DPIRD research scientists Ahmed Saad (left), Kith Jayasena and Daneil Huberli attended the Australasian Plant Pathology Society Conference in Sydney.*



# Reach out to the team



## Broadacre Systems

Executive Director: Dr Kaara Klepper



## Crop Protection

Manager: Dr Helen Spafford



## Soil Science and Crop Nutrition

Manager: Chris Gazey



## Crop Science and Grain Production

Manager: Dr Bob French



## Genetic Improvement

Manager: Dr Darshan Sharma



## Industry Development

Manager: Alex Edward



## Field Research Operations

Manager: Dr Gavin Sarre

