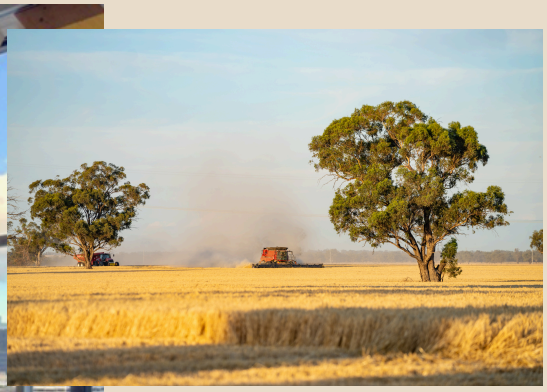
ARC TRAINING CENTRE FOR FUTURE CROPS

2026

PARTNER UPDATE



ARC TRAINING CENTRE FOR FUTURE CROPS DEVELOPMENT

Australian Government
Australian Research Council

Australian National University

Adelaide University

ACHIEVEMENTS

The Future Crops Training Centre has completed three successful years of operations that have resulted in a full cohort of Research Students and Innovation Fellows, training delivery and collaboration with our industry and research partners. With a full team and some students approaching the end of their candidature, this report communicates our progress, achievements and future opportunities.

ALL
21
CORE PROJECTS FILLED

9
ALIGNED HDR STUDENTS

6
INNOVATION FELLOWS RECRUITED

5
PROFESSIONAL INTENSIVE COURSES DELIVERED

3 CENTRE AFFILIATES RECRUITED

2 ADDITIONAL CHIEF INVESTIGATORS

FUTURE LEADERS

2 HDR COMPLETIONS

1 HDR EMPLOYED BY INDUSTRY

3 EMPLOYED AT PLANT SYNBIO AUSTRALIA

3 FELLOWS ON EXTERNAL FUNDING

$33M
ADDITIONAL FUNDING FOR FUTURE CROPS INITIATIVES

$75M
OTHER INITIATIVES ADJACENT TO CENTRE

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IMPACT

The Future Crops Training Centre is training the next generation of future leaders. Centre Innovation Fellows Hendry Susila, Julian Greenwood and Emily Buddle have acquired their own independent funding; Mel Pickering, Carrie Shen and Natalie Tsang have taken positions at Plant Synbio Australia (PSBA); and our first HDR graduate Yiting Xie is working in industry with Sugar Research Australia. Students are undertaking industry codesigned projects and have valuable experience in working with industry.

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STUDENTS UNDERTAKING PLACEMENTS WITH INDUSTRY PARTNERS

4

ADDITIONAL INTERNSHIPS WITH OTHER ORGANISATIONS

6

STUDENTS UNDERTAKING ENGAGED RESEARCH WITH PARTNERS OR OTHER ORGANISATIONS

COHORT AND COMMUNITY OF PRACTICE

INTERDISCIPLINARY TRAINING

RESEARCH AND INDUSTRY NETWORKS

PLACEMENTS AND INTERNSHIPS

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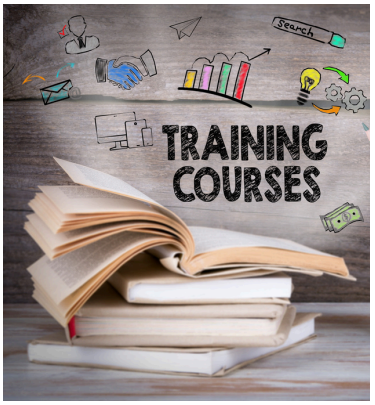
OBJECTIVES

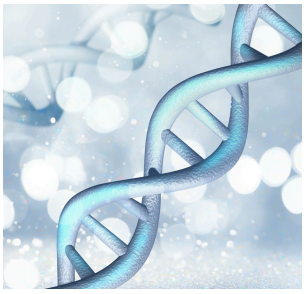
The ARC Training Centre for Future Crops Development has been established to **train a new generation of researchers and leaders to build new capabilities for agriculture.** This **$10M initiative over five years** is made possible by the support of the Australian Research Council, the Australian National University, the University of Adelaide and our Partner Organisations.

Program 1 – Capacity and Capability is training a new generation of researchers and leaders who are equipped with knowledge and skills across: the grains industry and regulatory landscape of new breeding technologies, the practice of responsible research innovation for future technologies, handling of regulated plant material, and science communication and engagement. Centre graduates will have engaged with industry partners, completed placements and developed professional skills crucial for our future workforce.



Program 2
Socio-economic considerations and opportunities for innovation in alignment with community needs. This program aims to empower us to fulfil the potential of new technologies through a practice of responsible research innovation and societal engagement.

Program 3
New genetic technologies and crop genome-engineering is generating a national research capability and applying to cutting-edge industry projects to develop more resilient, better quality and higher yielding future crops.



Program 4
Trait development and field trial evaluation is innovating to fast-track crop development pipelines. This program is developing technologies to accurately characterise gene-edited plants, more efficiently trial genetically modified plants and develop new machine learning phenotyping tools to assess plant performance in the field.

TRAINING HIGHLIGHTS

Selected highlights from Centre HDR students

See all the research from our students here

Ava Wilkinson, PhD Candidate - Transforming Markets for Future Crop Technologies

A major highlight has been completing a research internship with GrainGrowers, a national organisation supporting the profitability and sustainability of Australian grain growers through policy and advocacy, grower engagement, and investment in future-focused activities. This experience allowed me to work directly with practitioners involved in agricultural innovation and policy processes, providing first-hand insight into how evidence informs decision-making and how growers, industry bodies, and policymakers interact. The internship has significantly strengthened the practical relevance of my PhD and is shaping how I design my research to better support the development and uptake of future crop technologies. Another highlight has been presenting my work at leading European conferences and doctoral workshops, including the Naples Forum on Service (Sorrento, Italy) and the Interdisciplinary Market Studies Workshop (Stockholm, Sweden). These opportunities enabled me to share early ideas, receive constructive feedback, and build international collaborations, while gaining global perspectives on agricultural transformation.

Reshma Roy, PhD Candidate - Unlocking the Potential of Brassica carinata: A Super Crop for the Future

My PhD research focuses on improving the adaptability of Brassica carinata to Australian agricultural systems using genetic and phenotypic approaches. In 2025, I completed the major experimental components of my PhD and transitioned into the thesis writing phase. This included finalising-controlled environment and multi-year phenotyping experiments, consolidating datasets, and integrating molecular, phenotypic, and statistical analyses to support clear research outcomes.

A key research highlight was the successful generation, and characterisation of early flowering CRISPR-Cas edited *B. carinata* lines targeting flowering-time regulators. These gene-edited lines demonstrated accelerated flowering compared with wild-type plants, supporting the feasibility of developing early flowering carinata ideotypes suitable for use as cover crops and bio industrial feedstocks in Australian farming systems. This work provides a strong foundation for future translational research and industry uptake.

Sadia Majeed, PhD Candidate - Unlocking the Hidden Power of Photosynthesis in Canola

I have recently completed a pod photosynthesis experiment in canola, examining how pods contribute to overall plant productivity. With the additional support of the Agility Fund, I hope to complete key analyses, including transcriptomics, carbon and nitrogen profiling, and sugar, starch, and lipid measurements across different stages of pod development. These results will form the basis of an important manuscript planned for publication this year.

Another highlight is the identification of homozygous overexpressor (OE) lines with enhanced photosynthetic capacity. We are currently testing their performance, and if additional funding can be arranged, we aim to sow these lines in a GM field trial, which could potentially be the first GM canola lines with improved photosynthesis, opening new opportunities for crop productivity research.

Benjamin Kurya, PhD Candidate - Use of gene editing to introduce agronomically desirable traits in barley

Barley growers in Australia face two major problems: increasing fertilizer cost and weed competition. Ben's PhD research addresses both problems using modern breeding techniques. Ben created barley plants that have the potential to tolerate common post-emergence herbicides used by barley growers using gene technology and precision breeding tools regarded as non-GMO. This can allow cheap and effective weed management under no tilt farming systems. Bens' second objective is focused on harnessing the potential of plant hormones (strigolactone D53 gene) known to improve nitrogen use efficiency in plants. Ben has characterised barley plants with an altered strigolactone D53 gene under reduced fertilizer rate and the results suggest these plants can grow with less fertiliser than normal barley. Essentially, modifying this gene will allow barley to be grown with less fertiliser which will translate into reduction in fertilizer consumption in barley paddocks. Altogether, Ben's research is delivering practical solutions to farmers nightmare in Australia. Bens PhD isn't just helping growers it is helping the environment as well.

RESEARCH OUTPUTS

Selected research outputs across the Centre, many developed in collaboration with Partner Organisations

Plant Material

Brassicas

Gene-edited *Brassica carinata* for early flowering and maturity

Transgenic carinata lines for oil content and quality

Transgenic canola with enhanced photosynthetic capacity ready for field assessment

Gene-editing of pathogen susceptibility genes in canola to explore new options for Blackleg resistance

Transgenic lines for research on pod shatter in Brasscias

Wheat and Barley

Gene-edited barley with mutated architecture traits to introduce increases in agronomic performance

Edited elite wheat cultivars knocking out HKT to study effect of high sodium accumulation in commercial cultivars

Barley knockdown mutants to study basis of head loss resistance

Glasshouse verified herbicide-tolerant mutant wheat lines (selected from earlier field screen); gene-edited elite cultivars for screening of desired edits and herbicide tolerance

Chickpea

Wild species identified as valuable sources of traits to genetically improve Chickpea for acid soils tolerance

Technologies, Datasets and Insights

Plant Transformation and gene-editing systems for multiple crops tested and optimised

Wheat, Rice, Canola transgenic lines expressing Cas9 for high-throughput testing to edit genes or loci of interest

Defined conceptual domain of market-shaping

Importance of clearly defining sustainability goals so that genomic technologies can be more effective aligned with measurable outcomes

Genomic large language models to investigate interactions influencing complex traits

Models to classify plants into pre-flowering reproductive phases across greenhouse and semi-field conditions

Stable transmission of edits across next generation using Virus-Induced Genome Editing

Novel machine learning approach exploring how agricultural biotechnology is discussed across scientific literature

Knowledge of common DNA sequences in plant transformation vectors which already exist in non-GMO plants

PUBLICATIONS

56 Total

12 Industry co-authored

Below are a number of selected publications from the Centre.
For the complete list please visit Our Publications on the website.

Bowerman, Andrew F; Byrt, Caitlin S; Roy, Stuart John; Whitney, Spencer M; Mortimer, Jenny C; Ankeny, Rachel A; Gilliham, Matthew; Zhang, Dabing; Millar, Anthony A; Rebetzke, Greg J; Pogson, Barry J	Potential abiotic stress targets for modern genetic manipulation	2023	Plant Cell
Mahmood, Muhammad Arslan; Greenwood, Julian R.	A prime example of precisely delivered DNA	2023	Trends in Genetics
Neelam Gogoi, Hendry Susila, Joan Leach, Markus Müllner, Brian Jones, Barry J. Pogson	Developing frameworks for nanotechnology-driven DNA-free plant genome-editing	2025	Trends in Plant Science
Zhang J, Susila H, Majeed S, Estavillio GM, Raman H, Pogson BJ, Furbank RT.	Pod photosynthesis: a new frontier for developing stress-resilient and high-yielding crops	2025	Plant Cell Physiol
Wenzl C, Buddle EA, Ankeny RA.	Problematic use of sustainability claims in recent scientific literature on crop gene technologies: toward improving practices and communication	2025	Plant J
Ivanov M, Buddle EA, Ankeny RA.	Regulation as key to fulfilling the promises of agricultural genomics: Going beyond bottlenecks in plant gene technology development	2025	Plant J
Xie Y, Roy SJ, Schilling RK, Berger B, Liu H.	Hyperspectral-based classification of individual wheat plants into fine-scale reproductive stages	2025	Plant Methods
Piyumal Demotte, Muthukumaran Panchaksaram, Hashara Kumarasinghe , Nhan Ly-Trong, Mario dos Reis, Bui Quang Minh	IQ2MC: A New Framework to Infer Phylogenetic Time Trees Using IQ-TREE 3 and MCMCTree with Mixture Models	2025	EcoEvoRxiv
Buddle EA, Lawi GFK, Leach J.	"They ignore social issues": understanding the diversity of perspectives on plant gene technologies in Indonesia	2025	Plant Cell Rep
Bowerman AF, Moore M, Yadav A, Zhang J, Mortimer MD, Plšková Z, Tee EE, Au EK, Collinge DP, Estavillo GM, Howitt CA, Chan KX, Rebetzke GJ, Pogson BJ.	Modulation of SAL retrograde signalling promotes yield and water productivity responses in dynamic field environments	2026	New Phytol

ACKNOWLEDGEMENTS

Thank you to all of our partners who have helped shaped the vision for this Centre and contributed to its success in training the next generation of leaders

The Australian Research Council Training Centre for Accelerated Future Crops Development IC210100047 is funded by the Australian Government, the Australian National University, Adelaide University and Partner Organisations:

Advanta Seeds, Australian Crop Breeders, Australian Grain Technologies (AGT), Australian Plant Phenomics Network (APPN), Australian Seed Federation (ASF), Bioplatforms Australia (BPA), Commonwealth Scientific and Industrial Research Organisation (CSIRO), Department of Primary Industries and Regional Development NSW (NSW DPIRD), Diversity Arrays Technology (DArT), Grain Trade Australia (GTA), Grains Research and Development Corporation (GRDC), Cluster of Excellence on Plant Sciences (CEPLAS), InterGrain, John Innes Centre UK, KWS, Longreach Plant Breeders (LPB), National Institute of Agricultural Botany UK (NIAB), NuFarm, South Australian Research and Development Institute (SARDI).

The Centre is also grateful to individuals from the following organisations that have collaborated or engaged with the Centre, supported our students or worked with us to develop new initiatives:

Office of the Gene Technology Regulator (OGTR), Food Standards Australia New Zealand (FSANZ), Grain Growers, Corteva, University of Nottingham, Google Sydney, Universitas Gadjah Mada (UGM), Badan Riset dan Inovasi Nasional (BRIN), International Rice Research Institute (IRRI), Oil Crops Research Institute (OCRI) China, Virtual Irrigation Academy (VIA), Birchip Cropping Group, Grasslanz, Enza Zaden, Wageningen University & Research (WUR), National Collaborative Research Infrastructure Initiative, the Bundjalung Tribal Society, Market Shaping and Innovation special interest group (MASHIN), Chickpea Breeding Australia.

We would like to acknowledge all those on the supervisory panels of our HDR students for the contributions they are making to our future leaders, thank you.

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New collaborations

Check us out on Social media!

https://futurecropscentre.edu.au

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