



## Australian Native Rice Newsletter, 2022, Edition 4.

Welcome to our Australian Native Rice Newsletter.

We produce a newsletter two to three times a year to communicate recent research on the commercialisation of Australian native rice. If you have questions, or wish to unsubscribe from the newsletter, please email: [nativerice@cdu.edu.au](mailto:nativerice@cdu.edu.au)

### Acknowledgement of Traditional Owners

We acknowledge the Traditional Owners of the lands where the Australian native rice project team undertake research, and we pay our respects to their Elders past, present, and emerging. This includes the Ang Gnarra, Larrakia, Turrbal, Yuggera and Wulna peoples.

### Australian native rice project background

In April 2020 we commenced a substantial project investigating the agronomy of Australian native rice. This project aims to lay the foundations for commercialisation of Australian native rice, particularly by Indigenous people and businesses, as a high-value, low-volume, culturally identified, nutritious food. Our goal is to develop agronomic knowledge about native rices for Indigenous enterprises interested in cultivation and commercialisation of native rices. Australian native rice has potential as a high value product suited for tourism, gourmet food, First Foods and restaurant markets, and value-added products.

The project will:

- Collect samples of wild grown populations of three species of Australian native rice, *Oryza meridionalis*, *O. rufipogon* and *O. australiensis*, from wetlands in the NT and Queensland, for cultivation trials,
- Investigate the agronomy of native rice using controlled trials to develop and validate optimum approaches to cultivating Australian native rice,
- Scale-up native rice cultivation trials with CRC partner Indigenous enterprises and communities in the NT and Queensland,
- Analyse and compare nutritional values of Australian and Canadian wild rice species,
- Develop new milling techniques for Australian native rice, and
- Apply learnings from the Canadian Indigenous wild rice industry to commercialise Australian native rice as a gourmet/health food/First Food and inputs to nutritional supplements.

You can read more about the project at:

Future Food Systems CRC Website <https://www.futurefoodsystems.com.au/commercialisation-of-native-rice-for-indigenous-enterprise-development-agronomy-and-value-adding/> and the

CDU Project website <https://www.cdu.edu.au/riel/research/australian-native-rice-commercialisation>

## TropAg 2022 Conference Report

A strong team of seven NT delegates from CDU and NT DITT headed to Brisbane on 30 October for the [TropAg 2022 conference](#). This team included Sean Bellairs, Gehan Abdelghany, Sonam Adhikari Rana and Penny Wurm from CDU, and Edward Mwando and Nick Hartley from NT DITT. TropAg is a biennial international conference organised by [QAAFI](#), UQ, with a focus on tropical and subtropical agriculture. This year TropAg Conference organisers collaborated with [CGIAR](#), [ACIAR](#) and [Harlan](#) to combine four meetings into a packed three days, over six themes:

1. Agribusiness, value chains and the bioeconomy.
2. Predictive agriculture.
3. Sustainable agrifood systems.
4. Healthy agriculture and food for healthy communities.
5. AgFutures – showcasing innovation and investment in Queensland agriculture.
6. Harlan – exploring the history of agriculture and the evolution conservation and use of genetic resources.

The NT commercialisation of native rice research team took a total of four posters to the conference:

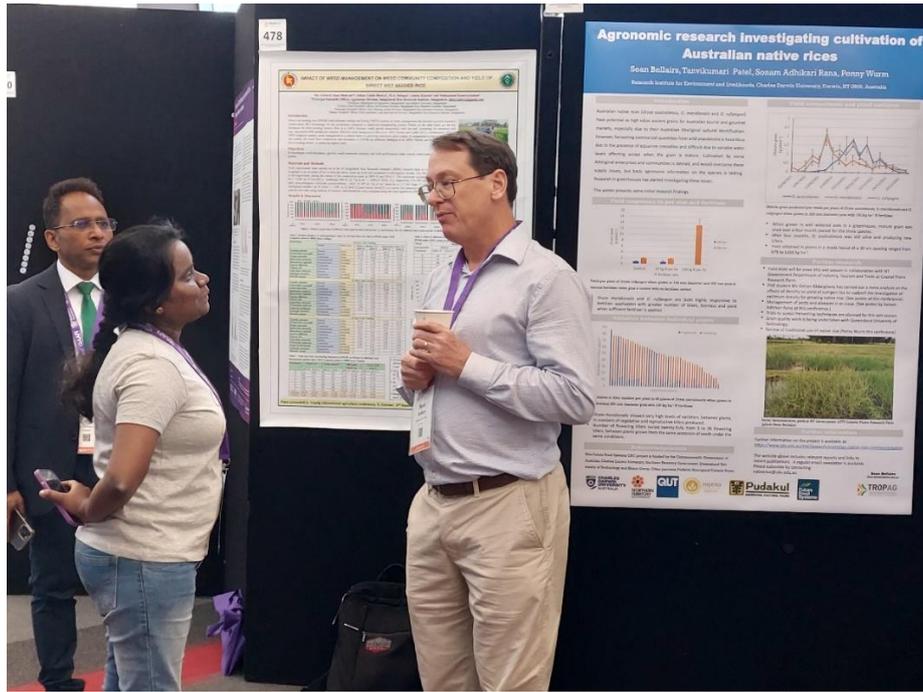
- Gehan Abdelghany - Effect of dense cultivation on the performance of cultigen rice: a meta-analysis.
- Sonam Adhikari Rana – Integrated pest management in Australian native rice trials.
- Sean Bellairs – Agronomic research supporting the cultivation of Australian native rices.
- Penny Wurm and Payi Linda Ford – Traditional use of Australian native rice.

Keynote presentation topics included high-tech closed systems agriculture to support city populations in a fascinating plenary presentation by Prof [Paul Gautier](#), Australian First Nations food production systems by Prof [Bruce Pascoe](#) and emerging understandings of a First Nations centre of food production on Mithaka Country in Queensland. The conference Chair Matthew Morrel explained that those of us in the tropics and subtropic are in the front line of climate and population impacts (see his [media release](#)).

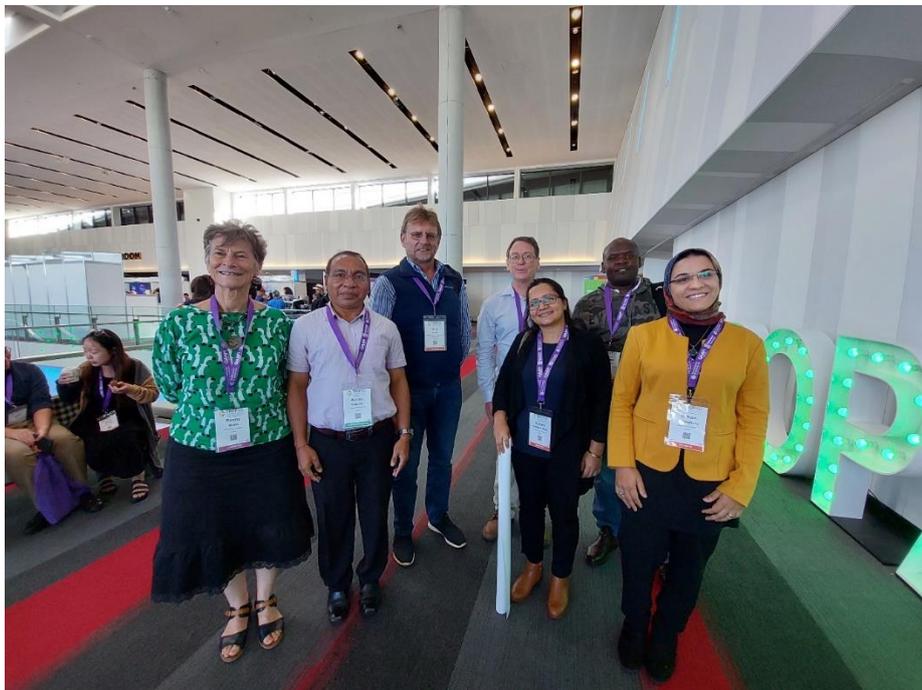
The conference was thrilling. Clusters of presentations on soil nitrogen management, integrated pest management and use of native plant species for First Nations enterprise development and benefit, were all extremely useful and timely for the *commercialisation of Australian native rice project*. There was a refreshing and fascinating theme through the conference on the importance of understanding the origins of agriculture and the importance of wild plant relatives and yet undomesticated species for the future of food production.

The breadth of topics, and the quality of presentations provided a heady mix of stimulation and food for thought. It was also daunting because of the challenges facing the world in the face changing climate, new and emerging biosecurity threats and an 8 billion and growing human population to feed.

For further details about the conference and access to resources such as copies of slide shows, access to podcasts and link to media releases go to [News | TropAg \(tropagconference.org\)](#).



Sean Bellairs (right) describing to conference delegates some of the fascinating but agronomically challenging attributes of Australian native rice (poster to his left) (Source: Penny Wurm).



NT Team at the TropAg conference in November 2022. L-R Penny Wurm (CDU), Acacio Guterres (CDU PhD candidate studying rice-vegetable cropping sequences in Timor-Leste, who presented at the conference), Nick Hartley (NT DITT), Sonam Rana (CDU), Sean Bellairs (CDU), Edward Mwando (NT DITT), Gehan Abdelghany (CDU). (Source: Penny Wurm).

## Face to face FFS-CRC meeting in Queensland

FFS-CRC meeting held on 3<sup>rd</sup> November 2022 at Gardens Point Campus Queensland University of Technology (QUT). Meeting was very productive starting with the introduction and about where we are in the project followed by presentation given on native rice related trials by QUT, CDU and NT DITT, and remaining milestones to March 2024. After the meeting there was a tour of the QUT facilities by Linh Hoang for the meeting participants.



FFS-CRC meeting at QUT 2022. L-R Linh Hoang (QUT), Gehan Abdelghany (CDU), Penny Wurm (CDU), Brett Williams (QUT), Sean Bellairs (CDU), Nick Hartley (NT DITT), Edward Mwando (NT DITT), Sagadevan G. Mundree (QUT) and Sonam Adhikari Rana (CDU). (Source: Sonam Adhikari Rana).



Penny Wurm observing native rice and other plants at the QUT ecology lab (Source: Sonam Adhikari Rana).

## Native rice stall at Daminmin Festival

Australian native rice stall at Daminmin Festival at Pudukul Aboriginal Cultural Tours on 22<sup>nd</sup> July. On the first day of the festival many children were keen to know where rice comes from and enthusiastically processed the grains using the thresher to separate awns. Several tourists were keen to know where native rice is grown, how it is harvested, if they can find it in markets soon and what are the challenges to produce in large scale to be able to supply in the state level supermarkets. We were also asked questions about the project activities and the nutrition of native rice. People were particularly interested to know whether the nutrition was higher than in the cultigen rice and whether the reddish coat of the native rice adds any nutritional value to the rice. (Yes, the red coat is likely to add antioxidants.)



Native rice stall at Daminmin Festival (Source: Sean Bellairs).

### Variation in *Oryza meridionalis* plants

This year we analysed some of the more detailed measurements of the plants from the yield trial that was harvested in December 2021. Among the surprising observations was the amount of variation between plants of the same seed lot when grown under the same conditions. We expected more variation in the Australian native rice than in a commercialised cultivar, but the level of variation was quite extreme, particularly in *Oryza meridionalis*.

*Oryza meridionalis* showed very high levels of variation, between plants, in the numbers of vegetative and reproductive tillers. When grown under similar conditions (in 250 mm diameter pots in savanna topsoil with the equivalent of with 150 kg ha<sup>-1</sup> N fertiliser) the number of flowering tillers varied from 3 to 70 per plant or twenty-fold from plant to plant. All plants were from the same accession of seeds collected from the Adelaide River floodplain. Furthermore, some plants produced very high numbers of vegetative tillers, but no flowering tillers during the trial which ran from April to December, whereas others produced very high numbers of flowering tillers.

These results showed the enormous variation in the wild species, and this is potentially of benefit for selection of traits for breeding.

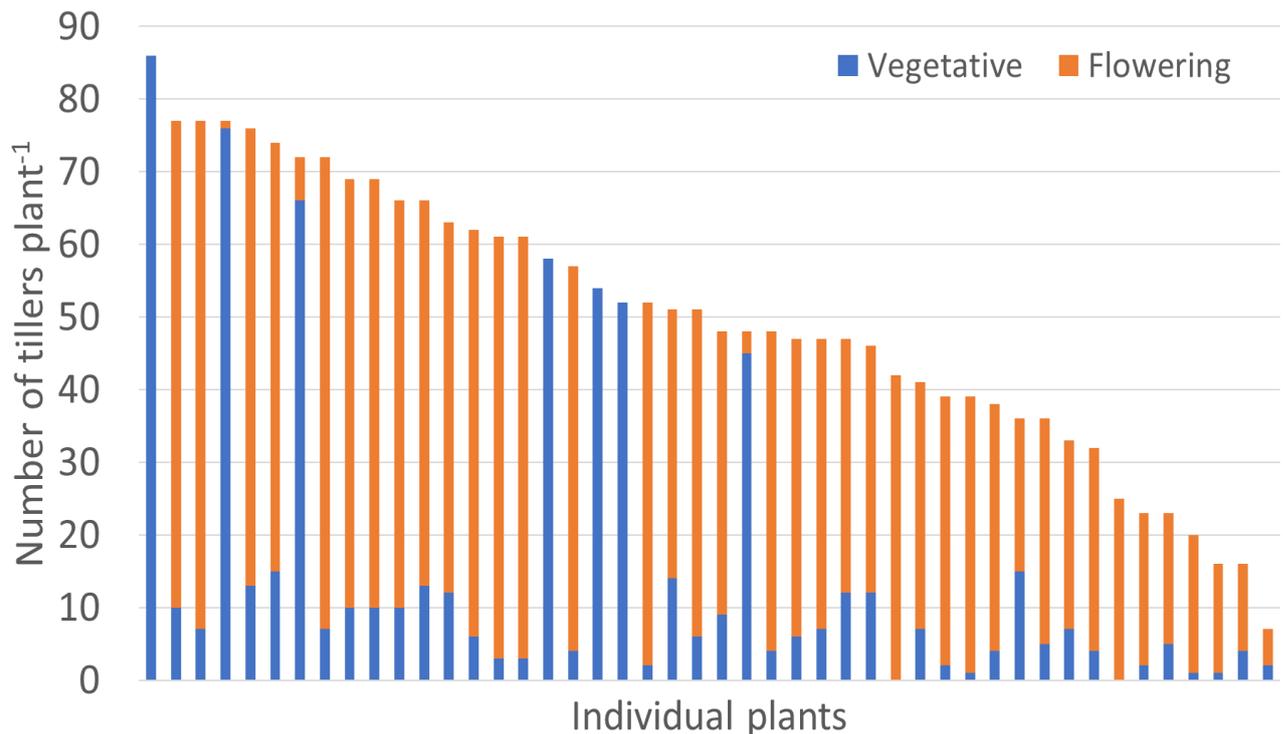


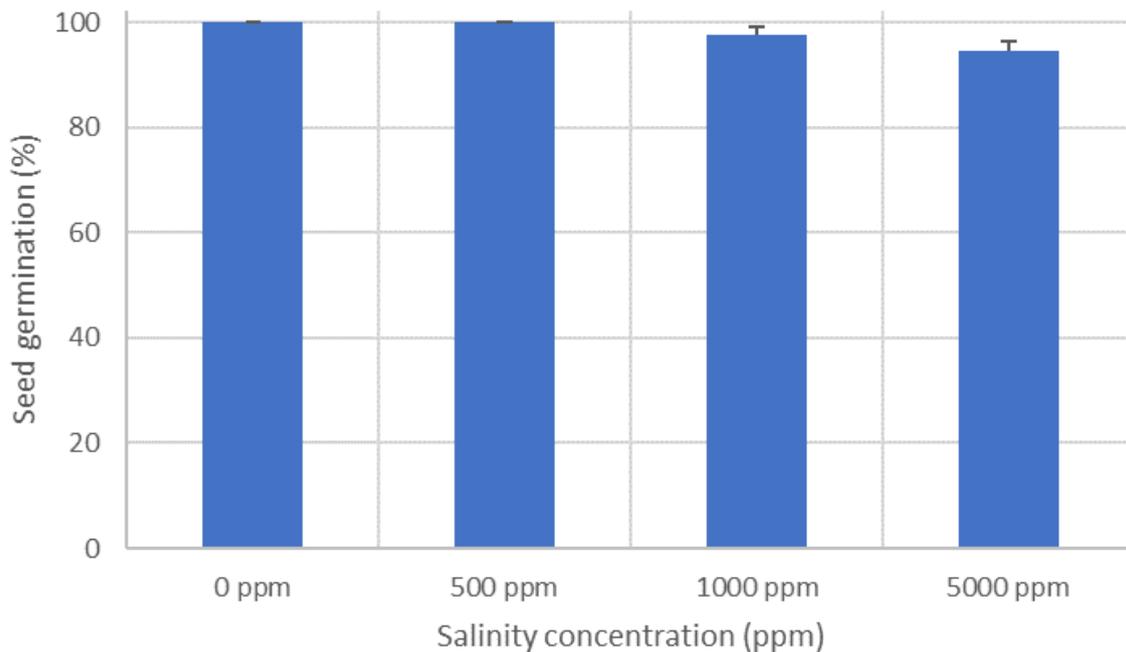
Figure: Variation in tiller number per plant for 46 plants of *Oryza meridionalis* from the same seed lot. All plants were grown individually in 250 mm diameter pots with savanna topsoil and 150 kg ha<sup>-1</sup> N fertiliser. (Source: Sean Bellairs)

### Salinity tolerance of *Oryza rufipogon* seedlings

CDU student Alicia Dawson carried out a project investigating the salinity tolerance of *O. rufipogon* during seed germination. Seeds were incubated in concentrations of salt ranging from 0 ppm to 5000 ppm sodium chloride (NaCl). Germination rates were high, and the proportion of germinating seeds was unaffected by salt between 0 and 1000 ppm NaCl. Even at 5000 ppm NaCl the effect of salt on germination proportion was not significant.

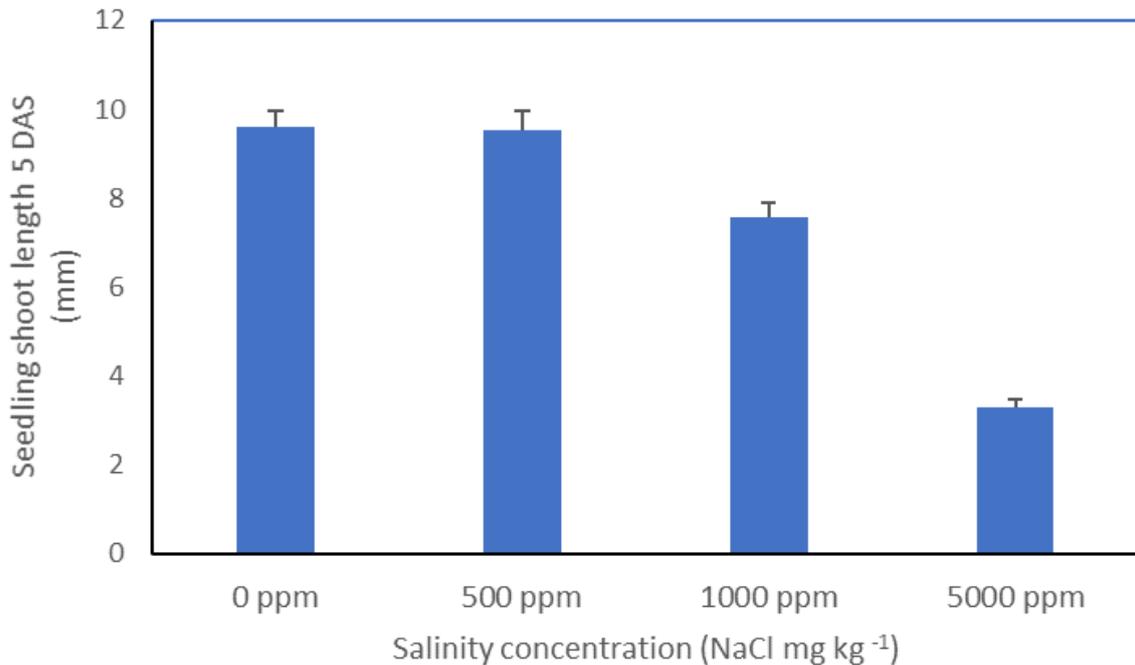


Native rice seeds being incubated at different salt concentrations (Source: Alicia Dawson).



*Oryza rufipogon* seeds (above) being incubated at salt concentrations of 0 ppm NaCl to 5000 ppm NaCl and (below) the levels of germination achieved (mean  $\pm$  s.e.) (Source: Alicia Dawson)

However salt concentrations above 1000 ppm NaCl did affect the initial growth of *O. rufipogon* seedlings, with growth five days after sowing being reduced at 1000 ppm compared to the control; and being much reduced at 5000 ppm (Figure 2).



*Oryza rufipogon* seedling shoot length five days after sowing, when incubated in different salinity concentrations (mean  $\pm$  s.e.) (Source: Alicia Dawson).

### Visit by Dr Ian Cowie to the CDU Campus for a tour of the native rice nursery

We were delighted to welcome Dr Ian Cowie to campus for a tour of the native rice nursery studies. Ian recently retired as Director and long-term research scientist at the NT Herbarium. Ian was the lead author of *Floodplain Flora: a flora of the coastal plains of the Northern Territory, Australia*, which was a godsend to floodplain ecologists when it arrived in 2000. It includes a key to the native rices of the NT. Ian was extremely helpful in the 1990s when the naming of native rices was in transition, disputed and didn't originally include *O. meridionalis*. Ian's advice on negotiating the floodplains and native rice taxonomy has been invaluable. We were relieved to learn that he plans to stay in Darwin for at least part of each year.

Citation: Cowie I.D., Short P.S. Osterkamp-Madsen M. (2000). *Floodplain Flora: a flora of the coastal plains of the Northern Territory, Australia*. Flora of Australia Supplementary Series No. 10. ABRIS, Canberra and NT PWS, Darwin.

## **PhD project - Agronomic investigations of Australian native rice to support Indigenous enterprise development (NT)**

**Principal investigator:** Mrs. Gehan Abdelghany (PhD research candidate)

**Aim:** To develop agronomic knowledge about Australian native rices to support commercialisation by Aboriginal enterprises. This information will provide scientific support for evidence-based crop management.

**Introduction:** The larger project of native rice commercialisation is being implemented and managed via several smaller sub-projects. These smaller projects vary in size from a full 3-year PhD research comprised of chapters, to small pilot studies.

### **Description of thesis chapters:**

**Chapter (I):** Review paper on the commercialization of Australian native rice.

**Aim:** This review provides new perspectives on the potential commercialization of Australian wild *Oryza* species by; (i) summarizing the factors that suggest Australian *Oryza* species as promising candidates for establishing a rice industry based on wild species; (ii) identifying the key challenges that could hinder the development of this industry; (iii) using American wild rice as a case study to review the key factors for establishing a successful wild rice industry; and (iv) establishing a conceptual framework for developing a sustainable rice industry with wild *Oryza* species.

**Status:** Completed and published.

**Further information:** Paper can be downloaded from <https://doi.org/10.3390/agronomy12010042>.

**Chapter (II):** Effects of dense cultivation on the yield performance of rice (*Oryza sativa* L.): A meta-analysis of field trials

**Aim:** The objectives of this systematic review were to (1) quantify the effect of dense cultivation on rice yield relative to sparse planting; (2) identify management factors that contribute to the yield gap between dense and sparse planting and (3) explore whether yield gains or losses under high-density planting are controlled by rice type. This information will provide scientific support for evidence-based crop management

**Status:** Drafted and underway to be submitted.

**Chapter (III):** Productivity and grain quality of Australian native rice as influenced by planting density and nitrogen rate

**Aim:** This research aims to determine the effect of varying nitrogen application rates and planting density on rice-grain quality and yield of two Australian native rice species, and to provide useful knowledge for achieving high-quality wild rice production.

**Status:** Harvesting of trial carried out in the dry season 2022 was completed with preliminary results now available on wild rice productivity under greenhouse conditions. Setting up of the wet season 2023 trial is underway.

**Chapter (IV):** Optimizing seedling number and fertilizer regime: a way forward to harness productivity potential of Australian wild *Oryza* species

**Aim:** The goals of this study were to investigate the characteristics of population productivity under different nitrogen supplies and transplant densities, and to provide a theoretical basis for choosing a suitable combination of both, ultimately to simultaneously improve rice grain yield and nitrogen use efficiency of two Australian native rices.

**Status:** Setting up of wet season 2023 trial is almost completed.

**Chapter (V):** Options for optimizing agronomic treatments for commercial production of Australian native rice.

**Aim:** This chapter will integrate the agronomic findings and grain quality findings from the experimental chapters with information about input costs and sources of value addition, to provide advice on the commercial potential of native rice for a range of grower groups.

**Status:** Synthesis of the whole PhD chapters

#### **Other PhD research-related activities in 2022:**

- Presentation of recorded presentation, “Agronomic Investigation of Australian Native Rice to Support Indigenous Enterprise Development” at “**Future of Food Summit** Conference”, 1-2 Dec 2022, Queensland University of Technology, Brisbane, Australia. A smart new Future of Food: Working together for a more profitable, planet-friendly agrifood sector - Future Food Systems.
- Poster presentation, “Effect of dense cultivation on the performance of cultigen rice: a meta-analysis” at “TropAg Conference”, 31 Oct – 2 Nov 2022, Queensland University of Technology, Brisbane, Australia.
- Participation in “Charles Darwin University Higher Degree by Research Conference as a presenter, 8-10 June 2022, Charles Darwin University, Australia
- Awarded Charles Darwin University certificate for being a finalist in 3 minute PhD thesis competition.
- Interviewed by ABC Darwin broadcaster (Mitchell Abram) on 11<sup>th</sup> August 2022 showcasing Gehan’s PhD research work. Link to interview: (<https://www.dailymotion.com/video/x8e4rwu>) and [https://www.abc.net.au/news/2022-10-01/nt-native-rice-harvested/101329844?utm\\_campaign=abc\\_news\\_web&utm\\_content=link&utm\\_medium=content\\_shared&utm\\_source=abc\\_news\\_web](https://www.abc.net.au/news/2022-10-01/nt-native-rice-harvested/101329844?utm_campaign=abc_news_web&utm_content=link&utm_medium=content_shared&utm_source=abc_news_web)

**Further information, please see the native rice website at the bottom of the newsletter, or contact:** Gehan Abdelghany (gehan.abdelghany@cdu.edu.au; 0436109234)

**Supervisors:** Sean Bellairs (CDU), Penny Wurm (CDU), Linh Thi My Hoang (QUT).



Gehan Abdelghany monitoring the yield data and yield components of two Australian native growing under varying density levels and nitrogen fertiliser rates at Charles Darwin University nursery (Aug – Nov 2022).

Sources:

Top - Gehan Abdelghany  
Bottom - Sean Bellairs

### Further information

You can read more about the CDU native rice project activities at

<https://www.cdu.edu.au/riel/research/australian-native-rice-commercialisation>

To subscribe to our Australian native rice newsletter, or if you have any questions, please email: [nativerice@cdu.edu.au](mailto:nativerice@cdu.edu.au)