Australian Native Rice Newsletter

July 2023

Australian Native Rice Newsletter, 2023, Edition 5.

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

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

Field trial at Coastal Plains Research Farm

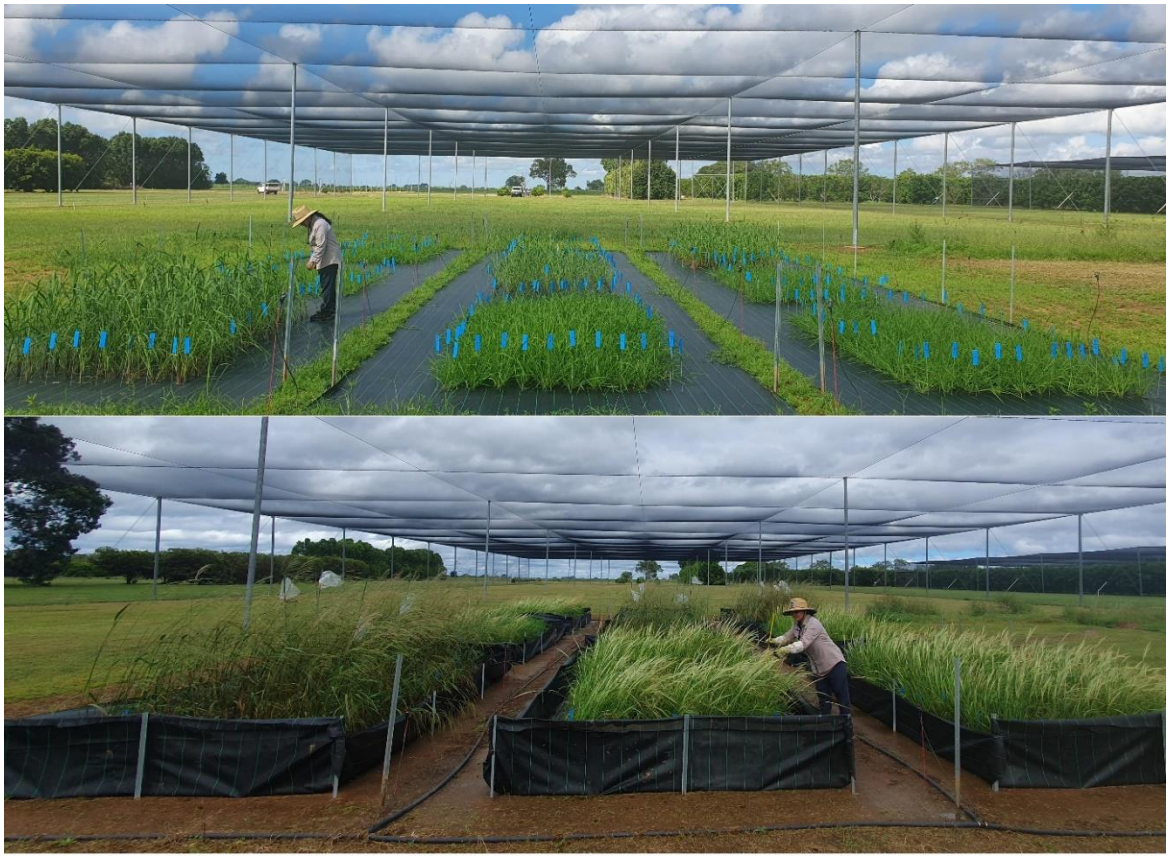
In January 2023 we established a replicated field trial with three species of Australian native rice at Coastal Plains Research Farm. NT Department of Industry, Tourism and Trade (NT DITT) and Charles Darwin University (CDU) staff established and managed the trial and the three species all grew well. We planted seedlings into small holes in weed matting. This enabled the collection of seed from the ground. Because these are wild species, the seeds shatter and fall from the heads as they gradually ripen.

This is a challenge for efficient harvesting. For this reason, when the plants started to flower, the sides of the weed matting were lifted to contain the seeds. The seeds were periodically harvested across the plots using a vacuum cleaner and then the remaining biomass was harvested in June.

The overall design of the trial included three replicate plots for each of the three species. Within each plot we also tested two collection methods. One method involved free-standing plants within a $1m^2$ subplot fenced with fabric. We then collecting every seed we could from the plants or from the ground within that fence. The second method involved bundling and tying together groups plants such that seed was trapped in the tied bundle of vegetation, and also within a fenced $1m^2$ subplot. This tying technique is used for harvesting *Oryza rufipogon* seeds in India, and was brought to the team by Gehan Abdelghany from her literature searching.

Currently, the biomass and grain samples from the trial are in the process of being cleaned and threshed to determine the yield. A second crop is being planned for planting in August 2023 and will include a planting density treatment. The results of these trials will be published and made available.

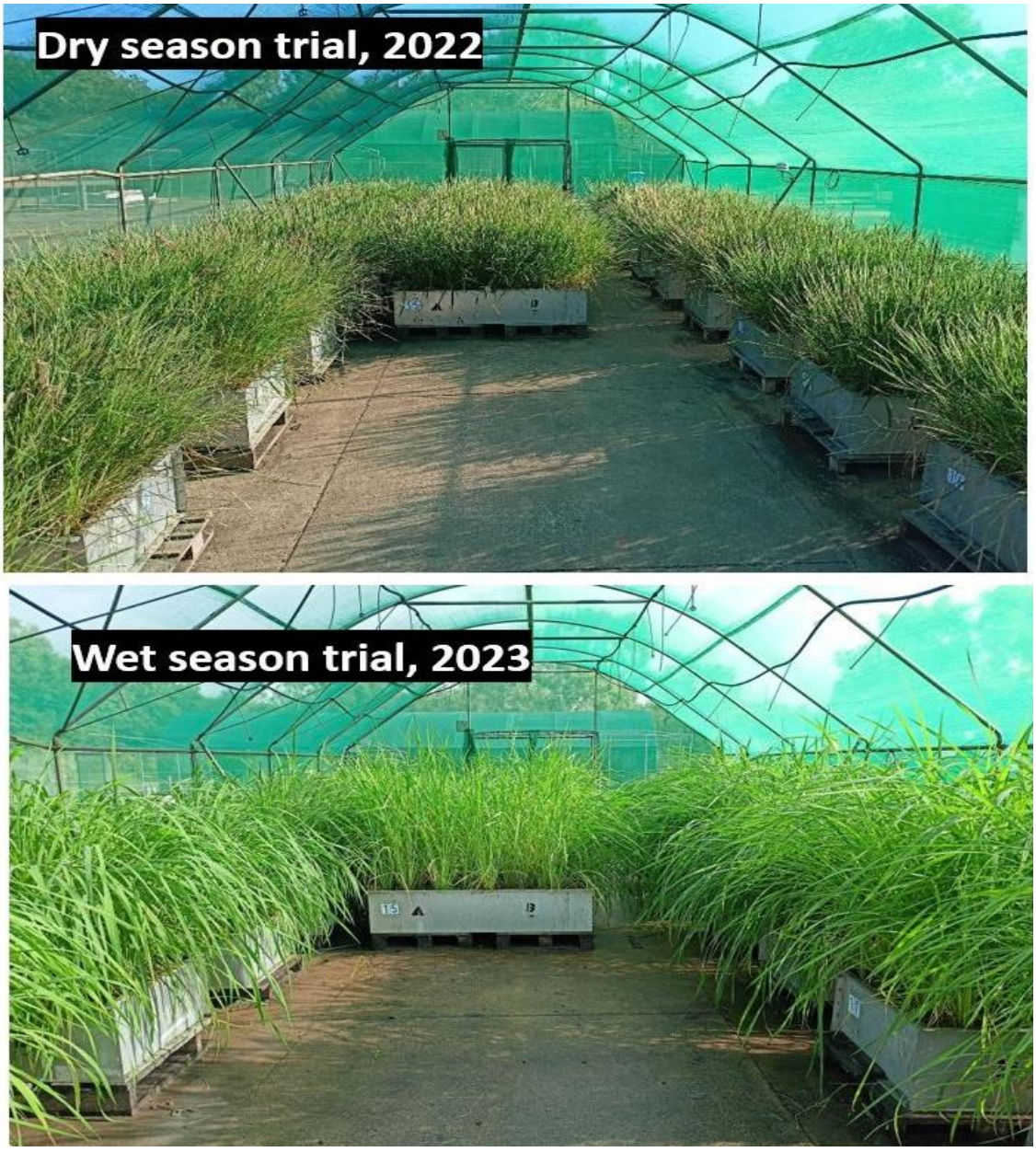
The great value to the project team of these trials has been to gain experience and insights for scaling up from nursery to field scale cultivation.



Replicated field trial with three native rice species growing at the NT DITT Coastal Plains Research Farm. Left to right: *O. australiensis, O. meridionalis, O. rufipogon*. (Source: Sean Bellairs).

Influences of planting density and nitrogen rates on yield of Australian native rice
Gehan Abdelghany (PhD student)

Two Australian native rice species, *O. meridionalis*, and *O. rufipogon* were used to investigate the effects of two nitrogen (N) rates and four planting densities on the above-ground biomass, grain yield, and yield components. This green-house experiment was conducted at CDU research shade houses in Darwin during the dry season (May-September, 2022), and wet season (January- April, 2023). The experiment was conducted using galvanised steel (metallic) tanks 150 cm length × 72 cm width× 35 cm depth, with each tank divided in half, to allow two density treatments per tank. In the dry season, the results suggested narrow spacing may produce higher grain yield. There are more tillers per unit area, and a larger total above-ground biomass.



Gehan Abdelghany's PhD research trial cultivating two Australian native rice species under four density levels and two nitrogen rates at CDU research shade-house facility (Source: Gehan Abdelghany).

NT Department of Industry, Tourism and Trade Coastal Plains Field day
Sonam Adhikari Rana

Our native rice field trial was on display when the NT DITT invited people to join for a field walk through the various trials at Coastal Plains Research Farm (CPRF). Attendees from Charles Darwin University were Dr. Penny Wurm, Acacio Da Costa Guterres, Gehan Abdelghany, Dr. Sean Bellairs and Sonam Adhikari Rana. Approximately 60 people from various backgrounds and places joined the field walk. Other trials and presentations at the field day included a vanilla, jack fruit, finger lime and dragon fruit trials.

Many people were keen to know about native rice. This high interest in native rice is typical, so we are confident there is a market, if we can work on production and processing. General questions that were asked included how is it is grown, what it tastes like, and if it will be available in the market soon? The CDU and NT DITT native rice project team were kept busy answering attendee's queries.

Standing in front of the native rice field trial area, Dr. Sean Bellairs provided overall information about the native rice project and Sonam Adhikari Rana presented observations on the biological and chemical pest control treatments applied in the nursery and the Australian native rice trials field area. A biological control approach has been found to be most suitable for managing pests in the nursery area. DITT biosecurity staff have also been providing pest and disease identification services to the project – thank you in particular to Dr Stan Belgarde and Dr Praise Frezzel Tadel.

Another NT DITT event this year where we represented the native rice project was via a poster presentation at the NT DITT stall at the 2023 Northern Australia Food Futures Conference (foodfuturesntfarmers.org.au).

In front of the native rice field trial area at CPRF, Dr. Sean Bellairs (top) giving information about the overall native rice project at CPRF and Sonam Adhikari Rana (bottom) talking about pest management on native rice trials at the nursery and field area (Photo source: Veronica Toral-Granda).

Optimizing seedling number per hill and nitrogen rates

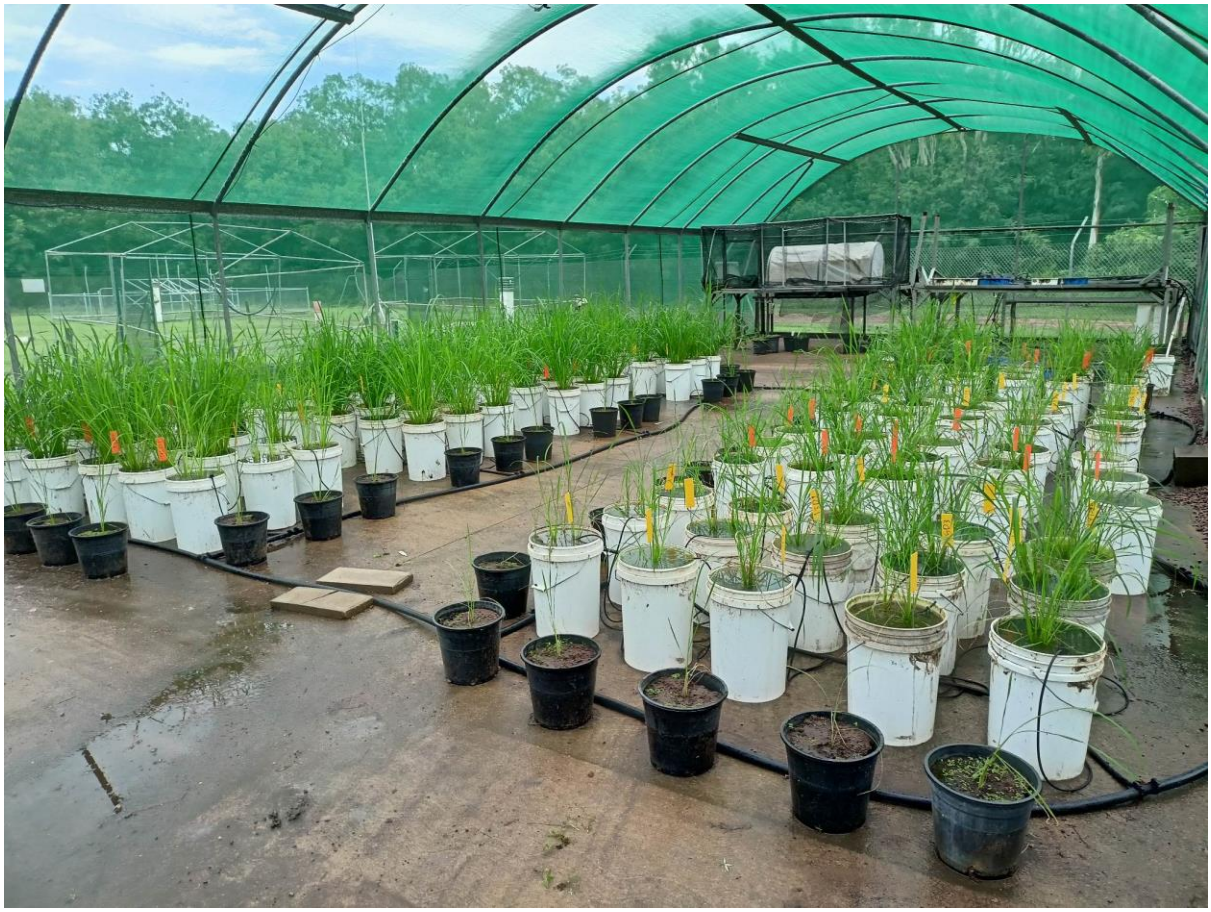
Gehan Abdelghany (CDU PhD student)

This pot trial was conducted by PhD research candidate Mrs. Gehan Abdelghany to investigate the characteristics of native rice productivity under different N supplies and seedling densities per hill, and to explore the optimum combination of nitrogen level, and seedling number per hill. Ultimately this information will enable growers to simultaneously improve rice grain yield, quality, and N use efficiency. The results of the current research will help to adjust the appropriate gradients for nitrogen rate, and seedling number per hill.

The treatments consisted of five N levels (0, 75, 150, 200, and 250kg $ha^{-1)}$ and three hill planting densities (1, 2 and 3 seedlings per hill) and two Australian native rice species, *O. meridionalis*, and *O. rufipogon*.

Measurements included determining grain yield and yield components (plant height, tiller number per hill, panicle number per hill, spikelet number per panicle, grain filling percentage, 1000 grain weight, above-ground biomass). As well, N efficiencies, including agronomic efficiency, and N use efficiency; and grain quality attributes were measured by QUT, including protein content, and amylose content.

Sample processing is underway and results should be available by the end of this year.



Gehan Abdelghany's PhD trial to investigate the optimum fertilizer regime and number of seedlings per hill for two Australian native rice species at CDU research shade house facility during wet season (December-May 2023) a month after transplanting of two species of native rice seedling (*O. meridionalis* and *O. rufipogon*). (Source: Gehan Abdelghany).

Daminmin Festival at Pudakul on 30th June and 1st July 2023

Pudakul Aboriginal Cultural Tours held their 2023 Daminmin Cultural Festival in Wulna-Limulngan Country near the Adelaide River, and we attended with a native rice information stall.

The Daminmin Festival is named after the creator turtle who made the landscape on the Adelaide River floodplains where we collect native rice for the project. Native Rice Commercialisation Project team got a chance to update interested visitors on developments and support the project's long-term enterprise partner, Pudakul, in this venture. More than 60 visitors stopped by the stall for a chat to ask about native rice or join the newsletter emiling list. In contrast to last year's response towards native rice, these years most of the visitors already knew about native rice and some of them even knew about the history of native rice.

One question has been commonly asked, "What does it taste like?" An attractive nutty flavour and aroma, and changes from a red-brown to lavender-brown when cooked, was our answer.

Using the hand thresher and trying to get the most grains without awns continued to be a favourite activity for children.

Thanks to Lynette Kenyon (Business Manager) and Graham Kenyon (Business Owner and Traditional Owner) for being such warm and generous hosts.

The Daminmin Festival has established as an annual event and we recommend is as a welcoming and beautiful week end of culture, information and food.

From the left: Dr. Penny Wurm giving information; top, Gehan Abdelghany in front of the native rice stall; Dr. Sean Bellairs attending interested little visitors; Sonam Adhikari Rana with the thresher (Source: Sonam Adhikari Rana, Sean Bellairs and Gehan Abdelghany).

Shattering and panicle bagging of Australian native rice
Gehan Abdelghany (PhD student)

As a part of her two PhD nursery trials of Mrs. Gehan Abdelghany highlighted above, hundreds of panicles (flowers) were bagged. Unlike *Oryza sativa* (commercial rice varieties), the wild populations of rice species shatter easily (i.e. panicles drop their seeds to the ground gradually over weeks rather than al together like grass crops bred for cultivation) and required careful handling. Therefore, panicles of two Australian native rice (*O. meridionalis* and *O. rufipogon*) were bagged during nursery experiments. Panicle bagging is necessary to prevent seed loss due to shattering, and to prevent mixing of seed from different treatments. Panicle bagging was conducted at the late vegetative stage (i.e.70 days after transplanting). The sampled tillers were tied loosely to a bamboo stake (5 cm x 2 m) to prevent plants from encroaching from one treatment to another to facilitate panicle bagging. Bagging was conducted using nylon net bags. These bags provide ample ventilation to facilitate anther dehiscence and pollination, and also were well aerated which prevented mould formation on glumes. The net bags were pinned to the bamboo pole. The bagged panicles were then harvested when the seeds shattered. This enables a precise estimation of total yield production, in the presence of shattering, if the total number of panicles was also counted.

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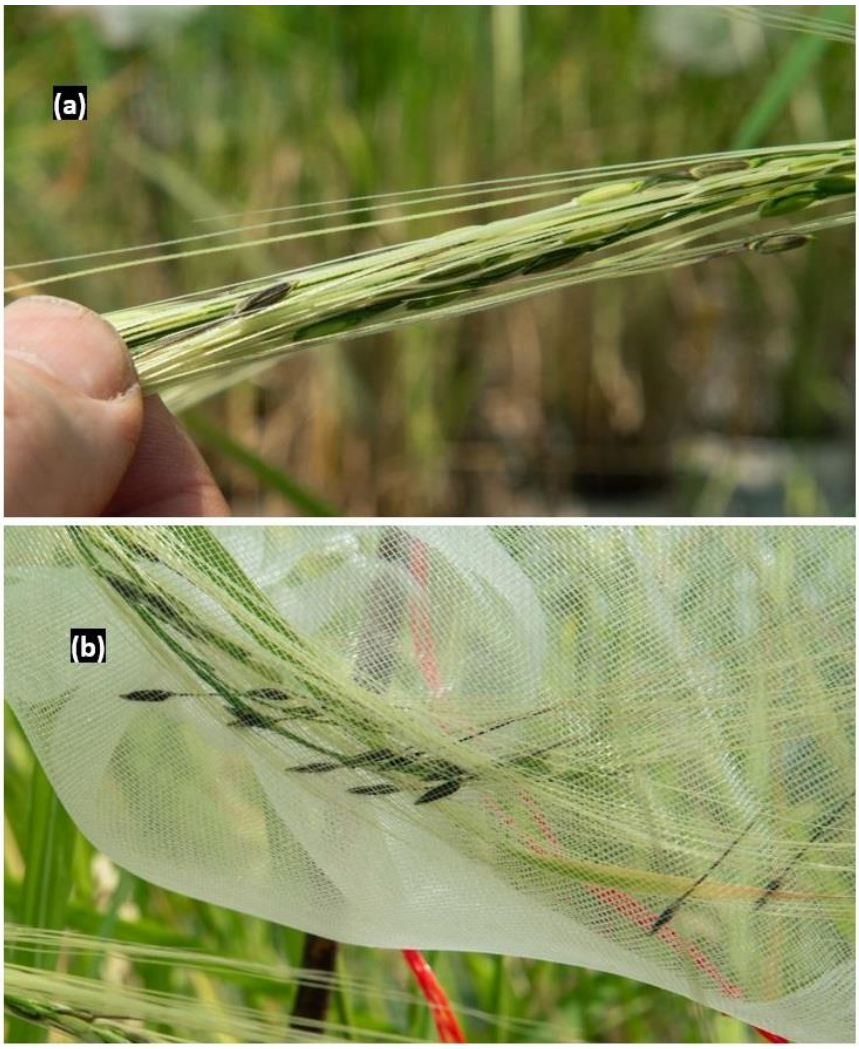

Shattering (seed shedding) in Australian native rice. (a) panicles dropping their seeds, (b) bagged panicle with shattered seeds within the bag (Source: Adnan Reza).

Native rice presentation at Charles Darwin University Conference

Mrs. Gehan Abdelghany attended the Charles Darwin University Higher Degree by Research Conference, 21-23 June 2023 in Darwin, Australia. She presented a 15-minute talk entitled "Yield responses of native *Oryza* species to plant density and nitrogen rate in Northern Australia".

Gehan Abdelghany, presenting a chapter of her PhD research work on the agronomy Australian native rice (Source: Penny Wurm).

Visit to native rice trials by Lorraine Williams

On 6th March 2023, we were delighted to welcome Lorraine Williams to tour the two PhD nursery trials of Mrs. Gehan Abdelghany at CDU research shade house facility. Lorraine collaborated with the team on inaugural pilot projects funded by RIRDC/AgriFutures, investigating the commercialisation of native rice with Pudakul Aboriginal Cultural Tours (see report on the Native Rice webpage).

Guests L-R: Acacio Guterres (CDU PhD), Dr Bev Sithole (AARPNET), Lorraine Williams (ARPNET)

ACIAR Visits CDU campus

The entire panel of ACIAR Commissioners, including FFS CRC Board Chair Ms Fiona Simpson and ACIAR CEO Professor Andrew Campbell, spent a day and a half in Darwin and a morning at CDU discussing agriculture developments. They were on their way to Timor-Leste. ACIAR CEO requested a short presentation about the FFS CRC native rice project be included in the discussion, which was presented by Penny Wurm on behalf of the team. ACIAR are currently funding a project on commercial opportunities for the use of native plants or traditional crops in Timor Leste. That project is co-led by Dr Bev Sithole and Lorraine Williams (ARPNet). ACIAR are interested in connecting their international partners with project involving First Nations people's knowledge and experience in Australia.

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2024 NEW PhD Scholarship Opportunity: Commercialisation of native rice for Indigenous enterprise development: Agronomy and value-adding

3 years full-time appointment
Base RTP scholarship $29,863 pa indexed annually
Top up Scholarship of $6,000 pa from Future Foods Systems CRC
Casuarina Campus

CDU – NTG scholarship opportunity in *Commercialisation of native rice for Indigenous enterprise development: Agronomy and value-adding*
About the Opportunity
Seeking a PhD student for a project investigating the agronomy and commercialisation of native rice. This project builds on a previous research project, on the 'Commercialisation of native rice for Indigenous enterprise development', which was funded by the Future Food Systems CRC. This project will investigate agronomic issues associated with planting, nutrition, water efficiency, harvesting and/or milling of Australian native *Oryza* species. There is flexibility in the specific areas of focus, depending on the interests of the student. Project outcomes will support First Nations enterprises interested in the commercialisation of Australian native rice through cultivation.

The opportunity will include a minimum 3-month HDR internship with a research end-user to gain industry experience and develop connections. The details of the internship will depend on the final project plan.

For further information:

- visit our project website at Australian native rice commercialisation | Charles Darwin University (cdu.edu.au) for a full list of project partners
- contact a member of the CDU team Dr Sean Bellairs (sean.bellairs@cdu.edu.au) or Dr Penny Wurm penny.wurm@cdu.edu.au
- contact a member of the NT Department of Industry Tourism and Trade (NT DITT) team Dr Sohail Mazhar (muhammadsohail.mazhar@nt.gov.au) or Dr Edward Mwando (edward.mwando@nt.gov.au)

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Volunteers and Casual Staff in the last 6 months:

We'd like to express our thanks to the following people for their support and enthusiasm for the project:

Acacio da Costa Guterres

Doug Wade

Dr Mohamed Rashwan

Dr Nataliya Kandyba

Ruby Hatfield

Core research team

QUT

Dr My Linh Hoang

Professor Sagadevan Mundree

CDU

Dr Sean Bellairs (Project Lead)

Dr Penny Wurm

Sonam Adhikari Rana

Gehan Abdelghany (PhD student)

NT DITT

Dr Edward Mwando

Nick Hartley

Jarred Sack

Pudakul Aboriginal Cultural Tours

Graham Kenyon

Lynette Kenyon

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