NEWSLETTER 46, APRIL 2022

The UWA Institute of Agriculture

A thriving crop of UWA postgraduate students have the AW Howard Memorial Trust to thank for giving their agricultural research projects the financial support to grow.
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THE UNIVERSITY OF WESTERN AUSTRALIA

IN THIS ISSUE

From the Director

Farmers across the WA grainbelt are sowing their crops, hopeful for another record-breaking harvest. Similarly, The University of Western Australia been busy planting seeds that will soon sprout new postgraduate students, research collaborations and achievements.

I am delighted to share that UWA was recently named the top university for Plant Science and Agronomy in the world by academic research portal *Research.com*. This exceptional ranking was based on the combined h-index and bibiometric indicators of our hard-working and dedicated researchers.

I recently returned from India – my first international trip in more than two and a half years. The visit was a wonderful opportunity to network with and deliver lectures to UWA's valued research partners such as ICAR - Indian Agricultural Research Institute, Amity University, Kerala Agricultural University and ICAR - National Bureau of Plant Genetic Resources.

The highlight of my visit was officially establishing the first joint PhD program between UWA and India. I was delighted to meet with The Academy of Scientific and Innovative Research (AcSIR) to secure this historic agreement.

The UWA Institute of Agriculture has many exciting events on the horizon. Lefroy Fellow Dr Kelsey Pool will deliver a special seminar on her latest research findings on 11 May (page 3), outstanding PhD candidates will present at our Postgraduate Showcase on 23 June (learn more about two of our presenters on pages 7 and 11), and our much-anticipated 16th annual Industry Forum is set for 20 July on the topic 'Navigating the Global Agricultural Marketplace in the Indian Ocean Rim'.

With great pleasure, I welcome you to our revamped newsletter. This engaging new design has brought us up to date with the latest UWA branding and is a fitting way to launch what promises to be a very forward-focused and productive 2022.

Hackett Professor Kadambot Siddique
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Western Australian College of Agriculture students with UWA Emeritus Professor Graeme Martin (centre) at the entrance to the farm.

Next generation inspired by farm tour

Swapping their classroom for sprawling paddocks at UWA Farm Ridgefield was a rewarding educational experience for a group of Western Australian College of Agriculture ATAR students.

Led by their teacher Louise Eastwood, the young group were treated to a farm tour and overview of the Future Farm 2050 (now Best Practice Farming Systems) Project by Emeritus Professor Graeme Martin.

Ms Eastwood said the purpose of the late 2021 excursion was for her students to see first-hand what new innovations were being explored through UWA research.

"The students could see that a few changes can make a big difference in your farming practice," she said.

"They became more aware of what demands there are on farmers to move towards a more clean, green and ethical approach, and learned about current innovative technologies being trialled to discuss in their assignments and exams."

The 'Enrich' Forage System project, led by The UWA Institute of Agriculture Associate Director Professor Philip Vercoe, quickly captured the students' attention.

The project demonstrates how perennial forage shrubs can be a valuable addition to pasture systems.

Ms Eastwood said the purpose of the late 2021 excursion was for her students to see first-hand what new innovations were being explored through UWA research.

"The favourite thing I learned was about using marginal land to graze on along with native plants to help with lambing and parasite control," student Alex said.

"This visit has made me think about the future of farming."

Student Tamara said her new knowledge would be valuable for her future career.

"The native bushes that provided shelter, were edible for the sheep and helped soil structure were interesting," she said.

"I also enjoyed seeing the New Farmhouse that is on stilts so it can move with earth tremors and was off-grid using renewable energy."

Dr Kelsey Pool next to the headstall, with her first CAD drawing.

Necessity the mother of invention for Lefroy Fellow

After searching in vain for a commercial headstall to comfortably restrain ewes for her research at UWA Farm Ridgefield, Lefroy Fellow Dr Kelsey Pool decided to take matters into her own hands.

Modelling her design off 40 to 50-year-old equipment that she previously used at the University of Sydney, and commercial head bales used for other forms of sheep husbandry, Dr Pool took an initial sketch to UWA workshop senior technician Andrew Sawyer.

"Basically, I needed a way to restrain the ewe comfortably to maintain animal welfare – meaning that the ewe should be able to eat, chew her cud – but still allow researchers access for ram semen sample collection," she said.

"Ideally we needed something that could also be packed down for transport between properties.

"I had a chat with Andy about stability, sizing and what kind of materials would be suitable, then turned up a few days later with a basic CAD I designed on my iPad."

From then, Dr Pool visited the workshop every second week for about two months to discuss any tweaks and look at what parts were being used.

"Andy is very innovative, and it was a lot of fun to watch my drawing progress into a physical object," she said.

"I enjoyed every stage of the process."

After using the headstall for her ram phytoestrogen trial last year, Dr Pool is currently using it for a new project looking at the effect of extreme climatic events on sheep reproduction.

Dr Kelsey Pool
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Dr Pool will deliver a special seminar on the latest achievements from the E.H.B Lefroy Research Fellowship at Bayliss Lecture Theatre on Wednesday, 11 May 2022.

Hear about how oestrogenic compounds in pasture change the ability of sheep to reproduce, how a commercially-available neurohormone can impact twin-lamb survival, and where we are headed with monitoring the physiology of the ovine fetus. **Registration is essential.**

Exciting new chapter for Ridgefield research

To unlock the full potential of research at UWA Farm Ridgefield, the Best Practice Farming Systems (BPFS) Project was established in January 2022.

The UWA Institute of Agriculture held a workshop late last year to reflect on what the Future Farm 2050 Project had achieved since its inception in 2009, and to consider what improvements could be made for the future.

It was attended by key stakeholders including UWA Emeritus Professor Graeme Martin, Pro Vice-Chancellor (Research) Professor Andrew Page, Pingelly farmer Tim Watts, IOA Institute Advisory Board member Bruce Mullan, Shire of Pingelly CEO Andrew Dover, and four of the Institute's research theme leaders.

The workshop identified several critical issues that were holding back the FF2050 Project.

Required changes included better integration with UWA Farm Ridgefield, prioritisation of research and innovation, greater clarity of purpose, appropriate infrastructure and stronger governance and accountability frameworks.

In response to these findings, it was agreed that the Institute would launch the BPFS Project.

The BPFS Project vision is best practice solutions for resilient farming systems, environmental stewardship and community engagement.

The Institute Director Hackett Professor Kadambot Siddique said the BPFS Project marked a new chapter for innovative research at UWA Farm Ridgefield.

"In the next five years, the BPFS Project will develop and support five Strategic Priorities that will require cross-disciplinary approaches," Hackett Professor Siddique said.

"These will focus on sustainable production systems, managing biodiversity and ecosystems, and communication and translation of our research and innovation and education offerings for societal benefit."

The BPFS Project Strategic Plan 2022-2027 is available online.

Left: High school students engaging with a hands-on activity at the 2021 Discovery Day.

Below: Girls in Engineering participants (front) with Associate Professor Sally Thompson (far left) and industry representatives (back) at the 2021 Discovery Day event.

Challenging STEM stereotypes to empower future ag engineeers

The trends towards greater mechanisation, automation, and precision in agriculture mean that engineering is more important for agriculture in Australia than ever before.

However, in agriculture, 32 per cent of the workforce is female, and in engineering, only 14 per cent.

Women are disproportionately underrepresented in the fields of Science, Technology, Engineering and Mathematics (STEM).

UWA's Student Equity program Girls in Engineering (GiE) is on a mission to overcome this gender imbalance.

The GiE outreach team inspires and empowers female students to take advantage of STEM study and its available career pathways.

The program's three core aims are to demystify what engineering means, challenge stereotypes of women in STEM fields, and ultimately increase female STEM enrolments – including in engineering and agricultural science.

A key focus for GiE is addressing the barrier of a lack of role models for women in STEM.

School of Engineering Associate Professor Sally Thompson, who is a co-leader of The UWA Institute of Agriculture's research theme Water for Food Production, said engineering was a "super rewarding" career for women.

"Engineers are influential, they do cool stuff, never stop learning, and they're well paid," Associate Professor Thompson said.

"Having girls meet female engineer role models in high school really helps increase their interest and confidence in following an engineering path.

"Our success in attracting girls to engineering at UWA is boosted hugely by the activities from Girls in Engineering."

The GiE Student Ambassador program facilitates gender-inclusive, hands-on activities for high school students, hosts on-campus STEM immersion Discovery Days and provides opportunities for participants to gain workforce experience with industry partners.

GiE Student Ambassador Sie-Anne Waisime is passionate about volunteering with the program.

"I want to be part of changing the perceptions girls have about engineering and get them excited about a challenging yet rewarding career," Ms Waisime said.

All female and non-binary UWA STEM students are invited to volunteer with GiE.

Addressing the need to increase women in STEM is a complex social issue that requires a collaborative solution.

If you are interested in being part of that solution, contact gieoutreach-ems@uwa.edu.au

BUMPER research harvest anticipated from AW Howard recipients

There was much cause for celebration when UWA School of Agriculture and Environment (SAgE) PhD candidate Julian van der Zanden received the AW Howard Memorial Trust Postgraduate Research Fellowship in late 2021.

"I certainly hope the recognition will lend some extra credence to my research and make future employers or collaborators more amenable to work with me," Mr van der Zanden said.

The Fellowship will assist his research, which aims to identify the genetic control of biosynthesis of selected secondary compounds in the annual pasture legume subterranean clover.

"Ultimately, I hope to decipher the genetic regulation of the secondary compounds to enhance the capacity to develop cultivars with novel benefits for animal health and welfare," he said.

"Such benefits will aid the profitability and the long-term sustainability of farming systems."

SAgE Honours student Ruby Wiese is using her AW Howard Memorial Trust Honours Scholarship to perform trials of a novel mechanical weed control method at the UWA Shenton Park Field Station.

While growing up on a farm in Narrogin, Ms Wiese was fascinated by the amount of time and effort her dad needed to spend on weed control.

"Weeds are good at adapting to, and evading, control methods, so the best solution for weed control is an integrated weed management system," she said.

"The goal for this project is to develop a novel mechanical control technology with a different mode of action, to contribute to an integrated management system.

"I have also always wanted to have a career with a focus on sustainability, so the prospect of researching new non-chemical weed control methods to ease the over-reliance on herbicides is really exciting for me.

Having submitted his thesis earlier this year, School of Engineering PhD candidate Wesley Moss said the AW Howard Memorial Trust Research Fellowship he received in 2019 was invaluable to his research journey.

Mr Moss investigated approaches for increasing the efficiency and sustainability of subclover seed harvesting.

The project combined his passion for agricultural engineering and interest in developing machinery for sustainable agricultural systems.

"I was especially excited to have been awarded this Fellowship because of the rich history associated with AW Howard," he said.

"Howard was the first subclover seed producer and pioneered the area where my research takes place."

Miranda Slaven's initial reaction to her AW Howard Memorial Trust Masters Scholarship was a mixture of excitement and relief.

"Excited that I can now gain experience conducting new analyses that I know will improve the validity of my thesis and be a beneficial skill in my future career, and relief that I now have the funds to do so," the SAgE researcher said.

Through her research, Ms Slaven hopes to inform methods by which soil organic carbon (SOC) accumulation can be optimised within agricultural systems.

"Such findings will be able to inform on-farm decision making to maintain or increase SOC and improve productivity," she said.

> "I was especially excited to have been awarded this Fellowship because of the rich history associated with AW Howard."
>
> Welsey Moss

"This will make a difference to the 'bigger picture' because, despite significant research into accumulating SOC, little consensus has been reached surrounding best practice and greater insight into the dynamics of SOC and the factors affecting it to be achieved."

SAgE PhD candidate Manish Sharma said he was thankful for the AW Howard Memorial Trust Tim Healey Memorial Scholarship.

In the first year of his research, Mr Sharma aims to analyse the agricultural potential of struvite (a recycled phosphorus fertiliser derived from human wastewater) as a sustainable phosphorus fertiliser.

His ultimate dream is to ensure that Australian fertiliser manufacturers will no longer need to buy phosphorus raw material from other countries.

"With the increasing demand for phosphorus fertiliser each year, existing rock phosphate reserve could be exhausted in 300 to 400 years," he said.

"Phosphorus recycling from current waste streams is a viable sustainable solution for future phosphorus demand."

Pictured on front page: (from left) Julian van der Zanden, Ruby Wiese, Wesley Moss, Miranda Slaven and Manish Sharma

Pictured below: Welsey Moss

Presenters and guests at the Food Quality and Human Health workshop in February.

Workshop whets appetite for research partnerships

Leading WA researchers served up a smorgasbord of thought-provoking presentations at The UWA Institute of Agriculture's recent workshop on Food Quality and Human Health.

The February event in the EZONE was organised by the Institute's research theme leaders Professor Trevor Mori from the UWA Medical School (Royal Perth Hospital Unit) and School of Molecular Sciences Associate Professor Michael Considine.

Following introductions from UWA Acting Deputy Vice Chancellor (Research) Professor Anna Nowak and the Institute Director Hackett Professor Kadambot Siddique, the special guests were treated to four presentations.

First on the menu was UWA Medical School Emeritus Professor Lawrie Beilin, who explored the evidence linking nutrition and cardiovascular disease.

Dr Amelia Harray, Dr Gina Trapp and Justine Howard delivered a joint presentation on the recent research achievements of the food and nutrition team at the Telethon Kids Institute and suggested potential collaborations with the UWA.

A talk from Professor Considine titled 'Low hanging fruit?' expanded on the challenges facing the need to increase consumption of fruits and vegetables.

Western Australian Centre for Rural Health Professor Sandra Thompson and dietician Tanya Dale jointly presented on what interventions were needed to improve nutrition in rural, remote, and Aboriginal contexts.

Professor Mori said the workshop encouraged all participants to consider and prioritise collaborative research in the future.

"The workshop was a strong first step towards our goal of fostering new research opportunities, cross-disciplinary collaborations and valuable partnerships within the research theme of Food Quality and Human Health within the Institute," he said.

"I am thankful to our speakers for their fascinating and thought-provoking presentations, and to all who took the time out of their busy schedules to attend."

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Director honoured with PAS Foreign Fellowship

A rare and prestigious honour from the Pakistan Academy of Sciences (PAS) was recently bestowed upon the Director of The UWA Institute of Agriculture.

In January, Hackett Professor Kadambot Siddique was formally elected a Foreign Fellow of the PAS.

Professor Siddique has been instrumental in establishing strong links in research and teaching of agriculture and related areas between Australia and Pakistan.

He has also collaborated and published several research papers with Pakistan scientists, particularly from the University of Agriculture, Faisalabad (UAF).

This includes formal collaborations between UWA and Pakistan institutions such as the UAF, Pakistan Agriculture Research Council, and Higher Education Commission of Pakistan.

PAS Foreign Fellows are chosen for their considerable contributions to science, with no more than three elected each year.

Professor Siddique said he was humbled and appreciative to receive the Fellowship.

"I am grateful to UAF Vice Chancellor Professor Iqrar Khan for nominating me," he said.

"The Pakistan Academy of Sciences is an organisation made up of world-renowned scientists, and it is a great honour to be recognised among them."

In a venture initiated by the Institute, 20 outstanding students from UAF have received a UWA-UAF joint scholarship to complete their PhD studies at UWA since 2009.

Hackett Professor Kadambot Siddique with UWA-UAF joint scholarship recipient Dr Azam Khan.

The scholarship program is part of the long-standing collaboration and Memorandum of Understanding between the two universities.

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Novel aquaculture diet UP TO SCALE

Give a man a fish and you feed him for a day.

Identify a more sustainable, high-quality protein source for aquaculture diets ... and you could help feed the world.

School of Biological Sciences and UWA Oceans Institute PhD candidate Isobel Sewell is investigating whether black soldier fly (BSF) larvae are a suitable alternative to fish meal in the diets of two Australian freshwater aquaculture species; barramundi and marron.

The Fisheries Research and Development Corporation-funded project is in collaboration with DPIRD and Future Green Solutions – a Perth-based BSF farm and biotechnical company.

Ms Sewell said the global production and supply of fish meal had begun to plateau over the past decade.

"My marron trial has produced some interesting results, suggesting the inclusion of BSF larvae promotes higher growth."

"Many carnivorous aquaculture species have large dietary protein requirements, often in the form of fish meal," she said.

"Considering the aquaculture industry is the fastest growing food production sector in the world, this becomes problematic as the supply of fish meal will be unable to meet growing demand.

"In response, we need to identify effective protein replacements to reduce dependency on marine capture fisheries."

Not only do the larvae have high protein and fat content that is comparable to fish meal, Ms Sewell said there were also significant environmental sustainability benefits.

"The larvae feed on organic waste, such as green waste and manure, which in turn is converted back into their biomass via the breakdown of protein, fats and energy," she said.

"Because of this, they can aid in the reduction of pollution potential and greenhouse gas emissions from agricultural industries."

Based at the UWA Shenton Park Field Station Aquaculture Facility, Ms Sewell is quantifying the potential of a BSF larvae diet by measuring the barramundi and marron's growth and wellbeing.

"Ultimately, we have discovered that BSF larvae are viable in freshwater aquaculture diets," she said.

"The barramundi had comparable growth rates to those on a commercial (BSF larvae-free) diet.

"My marron trial has produced some interesting results, suggesting the inclusion of BSF larvae promotes higher growth."

Although further analysis of biological data is required before publishing, Ms Sewell said the results were a "good start" in creating a potential aquaculture diet.

"I hope that the results will have novel outcomes with industrial, societal, environmental and commercial impact," she said.

Ms Sewell will present her PhD research findings at The UWA Institute of Agriculture's Postgraduate Showcase on Thursday, 23 June 2022.

Isobel Sewell
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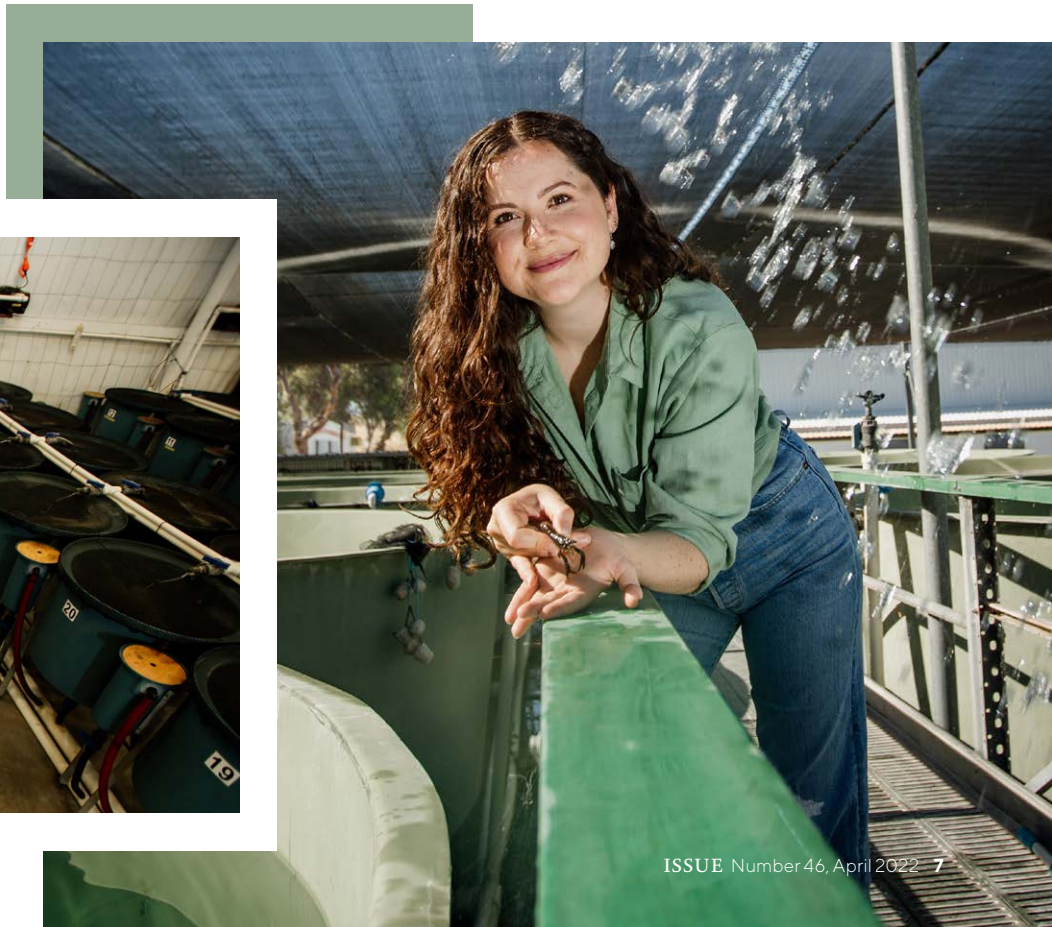


Isobel Sewell at the UWA Shenton Park Field Station Aquaculture Facility.

Photos: Corrina Ridgway

Father of Australian lupin industry honoured

Pottering about in the garden as a child was what 'planted the seed' for Dr John Gladstones' illustrious 40-year career as a plant scientist.

"I started growing radishes in the garden from the age of about five, and it became a bit of a mania from then on," he told *Farm Weekly*.

The Australian plant breeder was recently promoted to an Officer in the General Division of the Order of Australia.

The honour was for distinguished service to primary industry, particularly agriculture and viticulture, and as an author.

After completing his studies at UWA in 1959, Dr Gladstones was invited to return in a teaching capacity by Emeritus Professor Eric Underwood – then Director of The UWA Institute of Agriculture.

During his years at UWA and DPIRD (then named the WA Agriculture Department) Dr Gladstones helped establish lupins, subterranean clover and yellow serradella as feed crops.

He is recognised as the 'father' of the Australian lupin industry, having developed three crop varieties – Uniwhite, Uniharvest and Unicrop – while at UWA.

"The work with lupins was primarily focused on developing a stock feed that could also improve the soil - at that time there was no locally sourced vegetable protein," he said.

He also successfully collected, bred and selected varieties of subterranean clover.

Dr Gladstones is credited with being the first person to recognise the soil and climatic similarities between the Bordeaux wine region in France the WA Margaret River region – and in turn, helping establish a major industry.

Among his many achievements, he was inducted into the Royal Agricultural Society Western Australia's Agricultural Hall of Fame in 2000 and named 1992 WA Citizen of the Year in the professions category.

Virtual Grains Research forum puts UWA research on show

Filming in a green screen studio, live streams and virtual Q&As were among the inventive ways the Grains Research and Development Corporation captured audiences' attention at this year's all-virtual annual forum.

Due to COVID-19 restrictions and safety concerns, the 2022 GRDC Grains Research Update Perth was held online over six days in February and March.

GRDC West senior regional manager Peter Bird said the annual forum was "more accessible than ever" as it was free to attend and could be accessed by anyone across Australia.

UWA researchers were well-represented across the multiple day event.

On 22 February, Australian Herbicide Resistance Initiative research agronomist Dr Mike Ashworth presented on 'The interaction between wheat establishment timing and pre-emergent herbicides choice on annual ryegrass seed production'.

> "The forum was more accessible than ever before. It was free to attend and could be accessed by anyone across Australia regardless of their location."
>
> Peter Bird, GRDC West senior regional manager

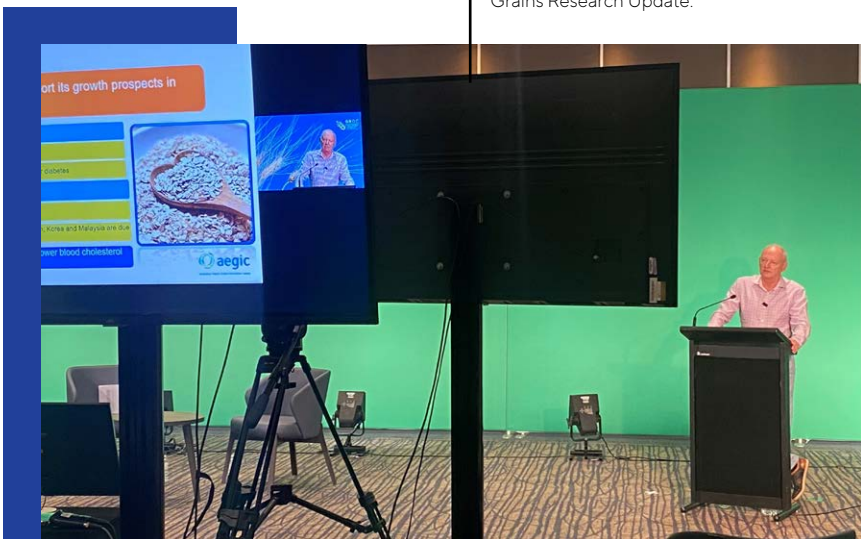
Later that day, UWA School of Agriculture and Environment Dr Elizabeth Peterson joined a panel discussion to explore the topic 'Fertiliser strategies in response to higher prices'.

New researcher snapshots were delivered by SAgE scientists Drs Caitlin Moore and Hira Shaukat on 'The power of flux towers for measuring crop productivity and water use' and 'Soil moisture mapping in agricultural fields using electrical conductivity sensing', respectively.

On the fourth day Dr Roberto Busi gave a 2021 herbicide resistance update from AHRI, outlining the most significant results from the field to the lab, followed by Dr Fiona Dempster's talk titled 'Yes, no, maybe – getting value from herbicide resistance testing.'

SAgE PhD candidate and DPIRD researcher Miranda Slaven provided a new researcher snapshot on electric weed control in Australia.

Final presentation came from The UWA Institute of Agriculture research fellow Dr Sheng Chen on his research into canola pre-breeding for heat tolerance, and UWA Professor Ross Kingwell from the Australian Export Grains Innovation Centre on 'Growing a future for oats'.



UWA Professor Ross Kingwell presenting in front of a green screen at the first virtual Grains Research Update.

"Not only do we speak the same 'language', but we also have differing perspectives and opinions, and this helps us develop stronger ideas."

Jaco Zandberg and Sam Harvie with the Young People in Agriculture, Fisheries and Forestry prize. Photo: Rosanna Candler

Partners combine forces to protect crops

Sharing a partnership in life and science has proven to be a winning formula for UWA PhD candidates Jaco Zandberg and Sam Harvie.

The pair jointly developed the idea that won Mr Zandberg the prestigious Young People in Agriculture, Fisheries and Forestry prize at the 2022 Science and Innovation Awards in February.

Mr Zandberg, from UWA's Crop Genomics Group within the School of Biological Sciences, was awarded the $22,000 grant to fund the development of a spray that uses 'ice-nucleating' bacteria to protect crops from frost damage.

Severe frost damage in grain crops costs Australian farmers an estimated $400 million annually.

The bacteria – known as *Pseudomonas* – produces proteins that raise the temperature at which water freezes in the environment.

It means frost damage can occur at temperatures as high as -2°C, rather than the -8°C to -10°C usually needed in the field.

Mr Zandberg said the project idea took shape when he and Ms Harvie, from the ARC Centre of Excellence in the Millar Laboratory, were discussing her Honours project.

"We wanted to invent a way to directly target the bacteria causing the frost damage," he said.

"It just so happened that Sam's honours work involved bacteria-specific vesicles that can package one organism's molecules and deliver it to another.

"This technology is used in vaccine research in the medical field, but not many people have applied the technology to agriculture."

Ms Zandberg said his proof-of-concept would explore whether those vesicles can be used to carry interference molecules that will temporarily shut down production of ice-nucleating proteins.

For the project, Ms Harvie will be responsible for all the vesicle work and plant trials.

"Having a partner who works in a similar field is incredibly valuable," she said.

"Not only do we speak the same 'language', but we also have differing perspectives and opinions, and this helps us develop stronger ideas."

Ultimately, Mr Zandberg and Ms Harvie hope to use their novel technology to develop an easy-to-use spray that can be applied when a frost event is forecast to suppress the ice nucleating activity.

"The spray will be designed specifically for growers and farmers to use easily and without the need for specialised equipment," he said.

"It would be the perfect addition to their frost management toolkits, reducing the devastating and costly damage caused by frost events."

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Transformative tour of UWA Farm Ridgefield by Noongar Elders

Garry Bennell at UWA Farm Ridgefield. Left: Presenting to the group at the entrance to UWA Farm Ridgefield.

A tour of UWA Ridgefield farm led by Noongar Elders Garry and Gloria Bennell changes the way you see the Country (Boodja).

When Garry looks out across the fields, he sees things Wadjellas (Europeans) don't.

Where we see fields of shimmering golden grain, curious trotting sheep, and recovering ecosystems set against glorious skies, Garry sees traces of his Ancestors written into the landscape in the curve of the hill, in the waterway where Waugal's whiskers dance in the wind, and in the strong rocks large and small.

All there under the watchful eyes of the tall Guardians (which we call Balgas, Grass Trees, Blackboys, or Xanthorrhoea).

Last year, Garry, Gloria, Shaneall, Khianna and Lily Bennell led a small group on a tour of UWA Farm Ridgefield from a Noongar perspective.

The visit began with a Welcome to Country at the gates of the farm.

Garry's Welcome, spoken in Noongar, shared a commitment to look after us whilst we are on Wilman Noongar Country.

Gloria joined in singing gently and tapping sticks with the song sounds connecting past, present, and future.

Hearing Noongar language sung and spoken on Country is profound; it is an act of reclamation, of resistance and of love.

"When you listen and learn from Noongar people, you see more, hear more, and know more about this Country."

Our responsibility as visitors is to join in looking after Country because if we all look after her, she will look after us.

UWA Farm Ridgefield researchers understand this well and are committed to restoration of ecosystems.

The group then boarded the bus to tour the farm, stopping when Garry asked and listening deeply to his stories and the sounds around us.

The first story came when we stopped to look at recent conservation work undertaken by the Best Practice Farming Systems Project.

The eucalypts are familiar to Gloria as she uses their leaves to make her well-known and very popular Warlung (healing) balm.

At the same site we saw what appeared to be a pile of rocks.

"When you listen and learn from Noongar people, you see more, hear more, and know more about this Country."

Garry moved to have a look and, after a while, explained that this is likely a waterhole used by his Ancestors.

When you listen and learn from Noongar people, you see more, hear more, and know more about this Country.

This Country always was and always will be Aboriginal Land, but when we come together from our different worlds to protect Country it can only go well.

Written by Dr Sue Bailey and Garry Bennell
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Dr Liz Barbour, Kevin Vinsen, Professor Cornelia Locher and Md Khairul Islam.

Below: PhD candidate Md Khairul Islam displaying the honey signatures from the HPTLC analysis.

Photos: Rosanna Candler

Looking to the stars to identify flavours of WA honey

What does astronomy have to do with different flavours of honey?

As scientists at the Cooperative Research Centre (CRC) for Honey Bee Products have discovered – there is much to gain from unexpected research partnerships.

Under the supervision of School of Allied Health Associate Professor Cornelia Locher, UWA PhD candidate Md Khairul Islam is working with the International Centre for Radio Astronomy Research (ICRAR) to identify the unique chemical signature of different Western Australian honey varieties.

As CRC for Honey Bee Products chief executive Liz Barbour explained, the flavour profile of a honey is dependent on the different plants that the bee feeds on.

"Plant nectars all contain different phenolics, such as flavonoids, and also a whole range of other compounds," Dr Barbour said.

"The bee will take that nectar into the honey, and the chemical signature stays there."

Given that bees typically feed on many different flowers – and with more than 250 plants for WA bees to choose from – beekeepers have previously been unable to confirm the exact flavour signature of their honey.

CRC for Honey Bee Products food chemist Mr Islam said the most challenging aspect of his PhD so far had been identifying the nectar source of the honeys.

"Honeys collected from natural sources will never be 100 per cent mono-floral, because we can't restrict the movement of bees in nature," he said.

"So far, we have been able to identify the key nectar signature of some iconic WA honeys using High Performance Thin Layer Chromatography (HPTLC) such as jarrah, marri, red bell and coastal peppermint.

"Internationally, our method has already been adopted by analytical industries and applied to routine quality control or analysis of honeys."

ICRAR data intensive astronomer Kevin Vinsen quickly saw the parallels between the honey profiles and star spectroscopy.

Mr Vinsen suggested they use a machine learning technique to interpret the different analysis images of the non-sugar fraction of honey generated by HPTLC to identify their unique chemical signatures, quickly and accurately.

"When you look at a star, it has a light curve, which shows you the intensity of the photons across different wavelengths," he said.

"With the honey, what we're seeing is the intensity of the chemical signature across a range."

Mr Islam will present his research into the authentication and quality control of WA honeys at The UWA Institute of Agriculture's Postgraduate Showcase on Thursday, 23 June 2022.

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UWA Botany graduate Cassandra Howell at UWA Farm Ridgefield. Photo: Emerita Professor Lynette Abbott

Restoration research lands UWA graduate top award

By developing innovative strategies for restoring degraded land, Cassandra Howell hopes to improve the productivity and long-term sustainability of farms.

UWA Bachelor of Philosophy major in Botany graduate Ms Howell was recently awarded the coveted Noel Fitzpatrick Medal at the annual Young Professionals in Agriculture virtual forum.

The forum, hosted by the Ag Institute Australia (WA Division) and Department of Primary Industries and Regional Development, showcased the work of the next generation of scientists in agriculture and natural resource management.

Ms Howell presented her research on the use of compost and biochar to restore degraded saline soil, both alone and in combination.

She found that both ameliorants improved soil condition, reducing pH and increasing nitrate, phosphorous and potassium.

"I hope that my research can help to create positive outcomes for both the environment and for farmers and their land," she said.

"Degraded land often has little productive value, while also providing minimal habitat or other benefits for biodiversity.

"By developing new strategies for restoration, such as using organic amendments, I hope to improve productivity and long-term sustainability, while also reconnecting fragmented landscapes and supporting biodiverse vegetation and wildlife."

Ms Howell said she felt both surprised and very proud to win the award.

"I love doing my research and it was such a privilege to get the opportunity to present it to such an engaged audience," she said.

"I was really excited that the award is something that I can share with everyone who has contributed to the research and supported me throughout my time at university.

"It was a particular honour to receive this, as Noel Fitzpatrick was such a passionate supporter of agriculture in WA, and he was also a Georgian (St George's College alumni) like me."

Ms Howell plans to publish her research and take some well-earned time off before starting her PhD at UWA.

At the forum, UWA Agricultural Science Masters graduate Sai Kiran Veluru presented his plant pre-breeding research.

His project aimed to increase genetic variation in the narrow gene pool of canola and develop a population for hybrid breeding.

The findings from Mr Veluru's research will help plant breeders identify genes that generate genetic gains in canola breeding programs.

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Plastic pollution publication recognised by Choice

A book co-edited by UWA Professor Nanthi Bolan on the global environmental challenge of particulate plastic contamination recently won the 2021 Choice Outstanding Academic Title award.

According to the American Library Association, the Choice award "reflects the best in scholarly titles... and brings with it the extraordinary recognition of the academic library community".

Renowned soil scientist Professor Bolan from the UWA School of Agriculture and Environment and The UWA Institute of Agriculture was the lead editor and contributed 10 chapters to the book *Particulate Plastics in Terrestrial and Aquatic Environments*.

Professor Bolan said the award was both pleasing and gratifying for the international group of authors.

Global plastics production has increased 60-fold since the 1960s to more than 300 million tons per year.

Professor Bolan said particulate plastics were a major source of pollutants in soil and marine ecosystems.

"The manufacture of plastic as well as its indiscriminate disposal and destruction by incineration pollutes atmospheric, terrestrial, and aquatic ecosystems," he said.

"Synthetic plastics do not break down. Rather, they accumulate in the environment as macro, micro and nano-plastics."

The book demonstrates the eco-toxicity of particulate plastics using case studies and offers management practices to mitigate particulate plastic contamination in the environment.

Professor Nanthi Bolan
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"Lentils are one of the foundational legume rotation crops for more than 600,000 households in the mid-highlands of Ethiopia."

A basket of dried lentils in an African market.

Partnership to secure future of lentil crops in Ethiopia

The increasing risk of losing lentil crops to virus and other diseases is a devastating prospect for smallholder farmers in Ethiopia.

UWA is leading a new five-year Australian Centre for International Agricultural Research (ACIAR) project that will address the biotic stresses – viruses, foliar and soil-borne diseases – that threaten Ethiopian lentil crops.

Project leader Professor Martin Barbetti from the UWA School of Agriculture and Environment and The UWA Institute of Agriculture said lentils were an important part of the Ethiopian diet and a high-value cash crop with great cultural importance.

"Lentils are one of the foundational legume rotation crops for more than 600,000 households in the mid-highlands of Ethiopia," Professor Barbetti said.

"In some areas, they contribute 50 to 100 per cent of the cash earned by smallholder growers, enabling them to purchase necessary fungicides and fertilisers, pay children's school fees, and buy other less expensive food legumes.

"Additionally, lentil straw is a highly valued animal feed and can be sold for additional income."

Professor Barbetti said disease outbreaks in Ethiopian crops were becoming more frequent and concerning due to climate changes.

"Traditionally, lentils were sown at the end of the rainy season to avoid severe epidemics of rust and root rot," he explained.

"However, changing seasonal conditions have had a disastrous effect on lentil productivity and local farmer incomes.

"More frequent drought periods have fostered major virus disease outbreaks and untimely rainfall in November has favoured major soilborne disease and rust epidemics."

The research team includes members of the Ethiopian Institute for Agricultural Research, Ethiopian Regional Agricultural Research Institutes, International Center for Agricultural Research in the Dry Areas (ICARDA), and New South Wales Department of Primary Industries.

They will work with Ethiopian smallholder lentil growers to maintain and improve their current lentil cropping practices, cereal crops in rotation, and livelihoods.

Professor Barbetti said ICARDA would provide lentil germplasm with high resistance to target diseases.

"Together with farmers, we will co-design new farming practices that consider crop protection, genetics, agronomy, livestock nutrition and farming system analysis," he said.

"Critical to this will be the adoption of the new practices for the management of virus, soilborne and foliar diseases as a precursor to reducing the risk of lentil crop failure and increasing productivity and profitability of the farming system."

In recent years lentil has become an important pulse crop in southern Australia.

Australia currently produces about 300,000 tonnes of lentils annually, contributing to approximately 10 per cent of global trade.

This project will enhance the overall capacity of the Australian lentil industry to address current and future disease issues.

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Picture-perfect sunset marks dawn of PhD project

The picturesque charm of conducting research at UWA Farm Ridgefield in the glow of a golden sunset was not lost on PhD candidate Callum Connolly.

In February, Lefroy Fellow Kelsey Pool snapped this photo of Mr Connolly and PhD candidate Rida Malik hard at work outside the Avery's Shearing Shed.

The pair were separating sperm cells from the seminal plasma.

"We had to first centrifuge the samples and then use a pipette to separate the aqueous layer from the solid layer," Mr Connolly explained.

"The process relates to my PhD because the sperm we were processing belongs to rams that will be used in our heat stress project.

"I've had the great opportunity to work in the field already because the ram trial will shine a light on how our rams are coping with the heat already and help me direct my research."

Mr Connolly said he was just over a month into his postgraduate research when the photo was taken.

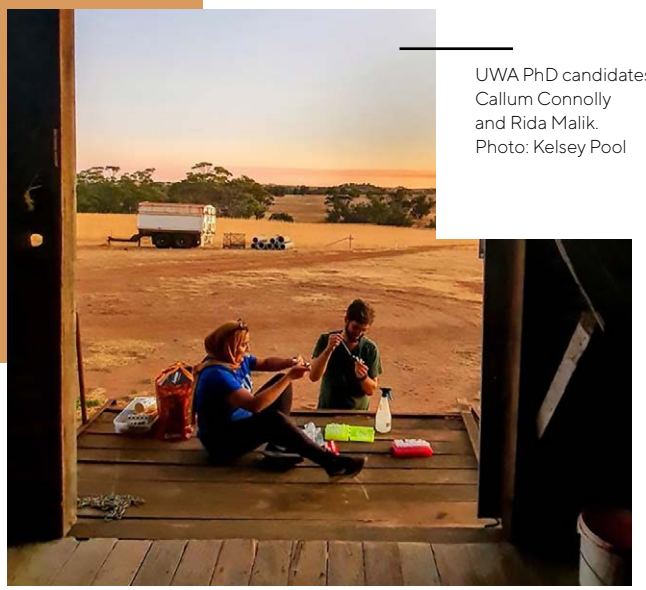
"In addition to writing my project proposal and the ram trial, I am also working on getting my honours thesis published and conducting an experiment on light intensity in fruit flies," he said.

His supervisors include The UWA Institute of Agriculture's Sustainable Animal Production Systems research theme leaders Professsor Shane Maloney and Associate Professor Dominique Blache, Dr Pool and Dr Serina Hancock from Murdoch University.

Mr Connolly said his PhD research project would be substantially harder, if not impossible, if Ridgefield was not available.

"Being able to experience an actual farm is incredibly interesting, especially when the support staff are so welcoming," he said.

"Ridgefield has been an incredibly useful resource, as I move forward in my PhD, I hope to utilise it more. I can't wait to see what other opportunities are available at the farm."



UWA PhD candidates Callum Connolly and Rida Malik. Photo: Kelsey Pool

Dr Waseem Abbas presenting his research to a group including the Australian High Commissioner to Pakistan.

Grain preservation through insect respiration

By Guanhao Cheng

How insects respire has been largely overlooked in grain storage research, but UWA graduate Dr Waseem Abbas believes it could be the key to an eco-friendly alternative to chemical fumigation.

For his PhD research, Dr Abbas focused on how knowledge of insect respiration could be combined with controlled atmospheres (CA) as an innovative form of pest control.

He was among 20 outstanding students from The University of Agriculture Faisalabad (UAF) to receive a UWA-UAF joint scholarship (initiated by The UWA Institute of Agriculture) to complete their PhD studies at UWA since first established in 2009.

On his return to Pakistan in August 2021, Dr Abbas presented his findings to the Australian High Commissioner to Pakistan Geoffrey Shaw and special guests at UAF.

During the presentation, he highlighted how his research could increase global food security and reduce chemical pollution in storage practices.

"I shared the potential of CA as an eco-friendly alternative and how my research in this area informed by largely ignored insect respiration physiology provides leads to upscaled CA on an industrial scale," he said.

"The High Commissioner was pleased that priority had been given to research problems, which could significantly impact the agricultural landscape of Pakistan.

"Moreover, he appreciated the enhanced focus on non-chemical alternatives to protect the environment."

Associate Professor Theo Evans, Professor Phil Withers, Professor Yonglin Ren and Dr Wei Xu supervised Dr Abbas' PhD.

The visit from the High Commissioner was also a chance for the strong ties between the UAF, UWA, and Australian Centre for International Agricultural Research to be reinforced.

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UWA PhD graduate Dr Azam Khan with his canola experiments. Photo: Rosanna Candler

Dream to transform economy grows roots at UWA

By applying the knowledge of crop disease resistance that he gained at UWA, Dr Azam Khan is determined to boost his home country Pakistan's economy.

Dr Khan recently completed his PhD project, which identified genetic resistance to the fungal pathogen *Sclerotinia Sclerotiorum* in canola.

"My research aims to improve oilseeds' plant health and oil quality," he said.

"Yield can be rescued from devastating pathogens through continuous research and development of crop disease resistance."

Dr Khan was among 20 outstanding students from The University of Agriculture Faisalabad (UAF) to receive a UWA-UAF joint scholarship (initiated by The UWA Institute of Agriculture) to complete their PhD studies at UWA since 2009.

The scholarship program is part of the long-standing collaboration and Memorandum of Understanding between the two universities.

By improving the cultivation of oilseeds in Pakistan, Dr Khan plans to reduce the "huge gap" between supply and demand of edible oil.

"From July to March last year, 2.917 million tonnes of edible oil was imported into Pakistan," he said.

"Local production of edible oil during this period is estimated at almost one-tenth of this amount, just 0.374 million tonnes.

"By improving oilseed crop yield in Pakistan, I hope to significantly reduce this huge import bill and contribute to strengthening the national economy."

Dr Khan completed his postgraduate studies under the guidance of UWA supervisors Professor Martin Barbetti, Professor Wallace Cowling, Professor Jacqueline Batley and Dr Mingpei You.

After almost five years and publishing three research papers, Dr Khan returned home to Pakistan in December.

"I enjoyed working with a diverse team of plant pathologists, plant breeders and molecular biologists," he said.

"This cross-disciplinary team helped me develop skills for data analysis and interpreting it using different perspectives."

Dr Khan described the skills and confidence he gained in Australia as "invaluable" to his current role as Assistant Professor at UAF.

"I am educating and training youth for enhancing agriculture productivity by focusing on plant health, yield, and quality of seed and product," he said.

"When I first arrived in 2017, I was unsure of data handling and high impact scientific writing.

"Now, I feel like a motivated new researcher. I am more confident in project planning and execution than before. My experience at UWA also enabled me to look forward to international collaboration for the wider benefit of agriculture and the country."

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Hybrid meeting experiment a 'resounding success'

Attendees of the ASPS 2021 annual meeting at UWA. Photo: Dr Mark Waters

The Australian Society of Plant Scientists (ASPS) overcame the obstacle of COVID-19 restrictions to successfully hold its 2021 annual meeting in a hybrid in-person and online format.

The School of Molecular Sciences (SMS) Senior Lecturer Dr Mark Waters and members of his lab organised the WA meeting at UWA.

Dr Waters said the experimental approach was a resounding success.

"After a hiatus in 2020, we wanted to test a hybrid meeting model with in-person meetings at seven different nodes, combined with a nationwide webinar session that all nodes could join virtually," he said.

The new model helped increase attendance due to the minimal travel and accommodation costs.

A grant from the Company of Biologists allowed ASPS to offer reduced registration rates for members, and free registration for student members.

About 400 attendees, more than half of which students, joined the meeting across seven locations.

The meeting included research presentations from the UWA School of Agriculture and Environment and The UWA Institute of Agriculture researchers Dr Yinglong Chen and Dr Caitlin Moore, and Dr Monika Murcha from SMS. Along with her fellow Peter Goldacre awardees across Australia, Dr Joanna Melonek's UWA-based talk was simulcast to all nodes via Zoom webinar.

Jan Anderson award-winner Dr Kim Johnson from La Trobe University chose to present her work in the form of a documentary-style video that featured interviews with her research collaborators.

"This approach was both entertaining and refreshing and would not have been realistic in a traditional meeting environment," Dr Waters said.

The WA meeting featured a small poster session, a sponsors' exhibition, prizes for student presentations and a social mixer and dinner.

Based on positive feedback, Dr Waters said ASPS was considering holding a similar hybrid meeting biennially, alternating with a traditional meeting in an Australian capital city.

"Many attendees expressed appreciation of the opportunity to actually experience a proper meeting, without the expense and trouble of travel," he said.

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Teens create farm maps from drone footage

A group of high school students learned about the important role drone technology can play in agricultural systems during a workshop for the Santos Science Experience in January.

UWA School of Agriculture and Environment senior research officer Roberto Lujan Rocha led the course.

"It was about showing students the importance of maximising food production to feed our growing population without causing further destruction of our ecosystem," Mr Lujan Rocha said.

"Specifically, each student created a map that spatially predicts the variable rate application of fertiliser nitrogen.

"We can use drones to efficiently collect multispectral data of each square meter of the farm and then produce a prescription map that reflects which areas of the farm would be responsive to nitrogen application. The benefits are environmental and economical."

Mr Lujan Rocha said he looked forward to running the workshop again.

"It was exciting for me to see them doing the final click in their computers and seeing them feel that sense of achievement with real data collected with a drone," he said.

North Albany Senior High School student Finn Lynam said it was a great experience.

"We asked about different fields we could use the data processing methods we learnt, and Mr Lujan Rocha said it could be applicable to engineering – and that's something I really want to do," he said.

Roberto Lujan Rocha
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Roberto Lujan Rocha with a drone that can be used to collect multispectral data.

Childhood guides PhD ambition to enhance food security

Tshering Samdrup in Dochula, Bhutan.

A powerful memory comes to mind when Tshering Samdrup considers why he focused his UWA postgraduate research on improving the livelihoods of smallholder farmers in developing countries.

"I come from a farming family in eastern Bhutan that makes a living off a less than five-acre land," Mr Samdrup said.

"They cultivated almost everything on that small parcel of land for self-consumption and sold the little surplus that remained.

"I remember my parents carrying a basket of cucumbers to sell in the nearby markets, which was hours away. By the end of the day, it would fetch roughly around AU $1.25 to $2. That was 30 years ago, but not much has changed in terms of access to markets."

Mr Samdrup was recently awarded the Australian Agricultural and Resource Economics Society Crawford Fund grant to assist with completing his PhD at the UWA School of Agriculture and Environment.

His thesis aims to provide an in-depth understanding of the link between foreign direct investment (FDI), contract farming, and food security in developing countries.

Investment in agriculture is an important and effective strategy to enhance agricultural productivity, reduce poverty and achieve food security.

With limited funds available, Mr Samdrup said the governments of developing countries were increasingly turning to FDI to plug their investment shortfall.

"Although there is positive relationship between FDI and economic growth, the relationship between FDI and food security is less clear," he said.

Mr Samdrup's research project includes a case study of the biggest FDI in Bhutan to date: hazelnut farming.

"The venture is intended to generate the income of smallholder farmers, help convert fallow lands into thriving orchards and help regenerate the environment," he said.

"Many Bhutanese farmers started cultivating hazelnut trees on their farms but are yet to earn steady and stable income from the nuts."

Previously working at the International Centre for Integrated Mountain Development in Nepal also inspired Mr Samdrup's research.

"Investment in agriculture is an important and effective strategy to enhance agricultural productivity, reduce poverty and achieve food security."

"The organisation helped farmers in the Himalayas to enhance livelihoods, improve agriculture, adapt to changing climates, and efficiently manage natural resources," he said.

"I have seen how smallholder farmers struggled to survive amidst numerous ordeals emanating from markets, policy, and climate change impacts.

"I hope my research findings helps those in policymaking circles to make a difference."

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"I like to think that to this day our work has assisted with these emerging and key challenges by providing strategies for correct management of scarce water especially in areas where salinity is a long-term limiting factor to crop production."

World-renowned soil scientist made lasting impact

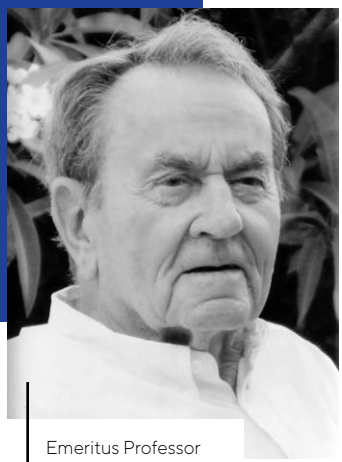
Vale James (Jim) Quirk 1924-2022

Emeritus Professor James (Jim) Quirk was a dedicated and innovative soil scientist whose research was, in many ways, before his time.

In 1963, Professor Quirk was appointed a Foundation Professor at UWA and served as Head of the Department of Soil Science and Plant Nutrition for more than a decade.

His scientific body of work specialised in fundamental and applied science of the surface and colloid chemistry of soils, clay minerals and oxides, particularly in relation to soil structure and plant nutrient availability.

Professor Quirk graduated with first class honours from the University of Sydney in agricultural chemistry.



Emeritus Professor James (Jim) Quirk.

He worked at the CSIRO in Adelaide before completing his PhD at the University of London, England.

Professor Quirk held many titles during his distinguished career as a soil scientist, research manager, university administrator and PhD supervisor.

In 1974 he was appointed Director of the Waite Agricultural Research Institute at the University of Adelaide.

He served in the governing bodies of several universities, including the professional board at UWA, and was the Australian universities' representative on the Commonwealth Wheat Industry Research Council.

Among his accolades, Professor Quirk was awarded the Farrer Memorial Medal for contribution to the Australian Wheat Industry, the Mueller Medal for contribution to the natural sciences, and appointed an Officer of the Order of Australia in 1983.

Following his retirement to Perth, Professor Quirk reflected on his research achievements in the European Journal of Soil Science.

"In a world where demand for food is increasing, greater agricultural productivity is essential," he wrote.

"Coupled with this is the impact of climate change and the pressing imperative to use marginal water resources.

"I like to think that to this day our work has assisted with these emerging and key challenges by providing strategies for correct management of scarce water especially in areas where salinity is a long-term limiting factor to crop production."

Forum fortifies research connection between UWA and China

Agricultural scientific and technological collaboration between Australia and China is stronger than ever following a recent forum sponsored by UWA.

The International Workshop on Crop Production and Soil Safety was held in December 2021.

It was sponsored by UWA, the Inner Mongolia Academy of Agriculture and Animal Husbandry Sciences (IMAAAHS) and Inner Mongolia University (IMU), and jointly hosted by The UWA Institute of Agriculture and the key laboratory of Degraded Farmland Ecological Restoration and Pollution Control in Inner Mongolia Autonomous Region.

UWA School of Agriculture and Environment Professor Guijun Yan co-chaired the event with IMAAAHS Professor Zhanyuan Lu.

More than 100 experts and scholars from industry, tertiary and research institutions attended online and in-person.

Professor Yan was among numerous academics to present at the forum, which also featured talks from UWA research scientist Helen Liu, Guizhou University Professor Baoan Song, Chinese Academy of Agricultural Sciences agronomist Peiwu Li and more.

Professor Yan's keynote report focused on his personal experience with plant genetics and breeding.

Having grown up in a remote country area of mainland China in the 1960s, he pursued a research career in agriculture to improve the lives of Chinese peasant farmers.

Since completing his PhD at The University of Auckland in 1996, he has held academic positions at UWA for more than 25 years.

"The relationship between UWA, IMU and IMAAAHS has been strengthened through this forum," Professor Yan said.

"This is of great significance to the development of agricultural science and technology exchange and cooperation between Australia and China."

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Awards and industry recognition

Name	Award
The University of Western Australia	First place in the research.com Top Plant Science and Agronomy University ranking
H/Prof Kadambot Siddique	Foreign Fellow of the Pakistan Academy of Sciences
Prof Nanthi Bolan	Choice Outstanding Academic Titles Award
Adj/Prof Jeff Camkin	International Eminent Scientist 2021 – International River-Basin Foundation and the River Water User Association (India)
Maddie Mellawage	2021 Sir Eric Smart Masters Scholarship
Wenyi Xu	2021 Sir Eric Smart Masters Scholarship
Jaco Zandberg	2022 Science and Innovation Award (Young People in Agriculture, Fisheries and Forestry prize)
Cassie Howell	Noel Fitzpatrick Medal at the Agriculture Institute of Australia (WA) Young Professionals in Agriculture Forum
Eloise Boland	WA Livestock Research Council 2022 Sponsorship
Georgia Walsh	WA Livestock Research Council 2022 Sponsorship

New IOA appointments

Name	Position	Start date
Prof Madan Pal Singh	Adjunct Professor	1 February
Prof Meththika Vithanage	Adjunct Professor	6 February
Dr Nathan Craig	Adjunct Lecturer	1 March
Dr Kevin Foster	Honorary Research Fellow	8 March
Dr Yufeng Zou	Adjunct Associate Professor	7 April

New postgraduate (PhD) research students

Student name	Topic	School	Supervisor(s)	Funding body
Jaco Zandberg	Multi-omic analysis of the canola-blackleg interaction	School of Biological Sciences	Prof Jacqui Batley Dr Phillip Bayer Dr Nicolas Taylor	Co-funded University Postgraduate Award
Samantha Harvie	Measuring the protein storage efficiency during wheat grain development to optimise nitrogen applications	School of Molecular Sciences	Prof Harvey Millar Dr Hui Cao Dr Katharina Belt	Grains R&D Corporations Postgraduate Scholarship Sir Eric Smart Scholarship for Agriculture Research
Audrey Tascon	The demand and supply of non-market value information	UWA School of Agriculture and Environment	Dr Abbie Rogers Prof Michael Burton	Research Priorities Fund University Postgraduate Award
Callum Connolly	Preliminary measurements of sperm quality in Ridgefield rams for future projects	School of Human Sciences	Prof Shane Maloney Assoc/Prof Dominique Blache Dr Kelsey Pool Dr Serina Hancock	The Edward Moss PhD Scholarship in Agriculture

Research grants

Title	Funding period	Funding body	Investigators
Effect of mineral magic amorphous silica on moisture retention, wheat and canola growth, nutrition and yield in sandy soils	2022-2024	Mineral Magic	H/Prof Kadambot Siddique Dr Zakaria Solaiman Prof Nanthi Bolan
Alleviating herbicide damage to crops by using fulvate and manganese	2022-2025	ARC Linkage	Prof Zed Rengel Prof Petra Marschner Mr Paul Storer
Unleashing the hidden chemical diversity in Australian fungi	2022-2024	ARC Linkage	Dr Yit-Heng Chooi Assoc/Prof Andrew Piggott Dr Ernest Lacey
Engineering safer pastures for livestock	2022-2026	ARC Linkage	Prof Jacqueline Batley Dr Yit-Heng Chooi Prof Philip Vercoe Prof Megan Ryan Dr Derek Woodfield
Role of Si in improving wheat growth in acid soils	2022-2022	Maxsil	Prof Zed Rengel
The potential of biomineral fertilisers to increase soil carbon sequestration	2022-2026	MLA	Dr Zakaria Solaiman H/Prof Kadambot Siddique Prof Phil Vercoe Prof Nanthi Bolan
Setting new standards for honey bee nutrition in Australian ee tock	2022-2025	AgriFutures Australia	Dr Julia Grassl
Quantifying nitrogen losses and the effect on crop productivity and greenhouse gas emissions from the application of lime and sulphate of ammonia fertiliser under Western Australian farming systems	2022-2023	GRDC	Assoc/Prof Louise Barton Prof Zed Rengel Mr Paul Damon Dr Fiona Dempster Assoc/Prof Matthias Leopold
Adopting HPTLC honey testing for industry use	2022-2023	CRC for Honey Bee Products	Prof Cornelia Locher
Australian seed scaling initiative: Large-scale deployment of diverse, enhanced seed mixes using customised precision seeding technologies	2022-2025	CRC Programmes	Dr Todd Erickson Monte Masarei Dr Andrew Guzzomi
Maintenance of high plant diversity in phosphorus-impoverished ecosystems	2022-2024	ARC Discovery	E/Prof Hans Lambers Dr Kosala Ranathunge Prof Treena Burgess
BeefLinks: Producer insights for adoption outcomes across WA BeefLinks	2021-2024	MLA	Dr Fiona Dempster Prof Phil Vercoe Dr Fay Rola-Rubzen Ms Tammie Harold Assoc/Prof Marit Kragt Dr Abbie Rogers Dr Amin Mugera
Engineered clay-polysaccharide nanocomposites for efficient nutrient delivery	2022-2026	ARC Linkage	Prof Nanthi Bolan Prof Ajay Karakoti Prof Ajyan Vinu
Soil biological mechanisms underpinning the effects of biological amendments on soil health, productivity and resilience	2022-2025	Federal Government Soil Science Challenge	E/Prof Lynette Abbott H/Prof Kadambot Siddique Prof Nanthi Bolan Dr Sasha Jenkins Dr Zakaria Solaiman Dr Bede Mickan Dr Marit Kragt Assoc/Prof Louise Barton Assoc/Prof Matthias Leopold The University of Adelaide Western Sydney University

UWA IOA 2022 Publications

Peer Reviewed Journals
Previously unreported

Barrientos S, Zarco-Perello S, Piñeiro-Corbeira C, Barreiro R and Wernberg T (2021). Feeding preferences of range-shifting and native herbivorous fishes in temperate ecosystems. *Marine Environment Research* **172** doi: 10.1016/j.marenvres.2021.105508

Barrow NJ, Debnath A and Sen A (2021). Effect of phosphate sorption on soil pH. *European Journal of Soil Science* **71** doi: 10.1111/ejss.13172

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Dang P, Li C, Huang T, Lu C, Li Y, Qin X and Siddique KHM (2021). Effects of different continuous fertilizer managements on soil total nitrogen stocks in China: A meta-analysis. *Pedosphere* **32** 39-48 doi: 10.1016/S1002-0160(21)60059-0

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He H, Zhang Z, Peng Q, Chang C, Su R, Cheng X, Li Y, Pang J, Du S and Lambers H (2021). Increasing nitrogen supply to phosphorus-deficient Medicago sativa decreases shoot growth and enhances root exudation of tartrate to discharge surplus carbon dependent on nitrogen form. *Plant and Soil* **469**: 193-211 doi: 10.1007/s11104-021-05161-y

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UPCOMING EVENTS

Lefroy Fellow Research Seminar

Wednesday, 11 May 2022
Bayliss Lecture Theatre, UWA

GIWA Pulse Forum

Wednesday, 22 June 2022
The University Club of WA

Postgraduate Showcase: Frontiers in Agriculture

Thursday, 23 June 2022
Bayliss Lecture Theatre, UWA

Industry Forum: Navigating the Global Agricultural Marketplace in the Indian Ocean Rim

Wednesday, 20 July 2022
The University Club of WA

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