



Professor Jacqueline Batley studies disease resistance in the oilseed crop canola.

UWA Scientist awarded Nancy Millis Medal for Women in Science

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Professor Jaqueline Batley from the UWA School of Biological Sciences and IOA has been awarded the prestigious 2019 Nancy Millis Medal for Women in Science.

The Nancy Millis Medal recognises mid-career female scientists who have demonstrated exceptional leadership and established an independent research program in the natural sciences. The medal honours the contributions made to science by the late Professor Nancy Millis AC MBE FAA FTSE and recognises her importance as a role model for aspiring female scientists in Australia.

Through her breakthrough research on the genetics of the oilseed crop canola,

Professor Batley has made significant contributions in the field of agriculture. She studies the DNA of plants in order to identify which genes lead to greater crop resilience. This research will enable breeders to produce better crops with resistance to disease and climatic conditions.

“If we can improve the quality and quantity of crop production, this will have huge benefits globally”, Professor Batley said. “A major factor of famine is crop failure so if we can work out ways to improve crop production security this will have huge benefits to populations and the agriculture industry across the globe.”

Professor Batley said she was honoured to receive the Nancy Millis Medal and hoped it would encourage young women to see the amazing benefits of a career in STEM.

“Nancy Millis was inspirational and a great role model and I hope I can be a role model to other aspiring female scientists,” Professor Batley said. “Science is so very important in our lives. It means what we discover is based on fact – not just an idea, and improves our lifestyles, our health and our knowledge.”

UWA Vice-Chancellor Professor Dawn Freshwater said Professor Batley was a great role model for aspiring female scientists. “STEM is one of the fastest growing fields with so many opportunities, yet women are still under-represented,” Professor Freshwater said. “This is a fantastic example of the impact talented women can make to science and how they can inspire the next generation.”



Director's Column

Hackett Professor Kadambot Siddique, AM, CitWA, FTSE, FAIA, FNAAS, FISPP, FAAS
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I am pleased to welcome several visiting researchers to IOA and UWA this year, including our recent visitors from Nagoya University, Japan (see page 16) and University of Tabriz, Iran (see page 14). I have travelled overseas recently to strengthen UWA's collaborations in

India (see pages 6, 14), South Africa (see page 11), and Timor-Leste (see page 10). I am also excited by the launch of a new collaborative research project with the Australian Potash Limited, Sulphate of Potash for WA Farmers (SOPWA) project (see page 2).

I would like to congratulate several IOA researchers on being awarded prestigious prizes and honours in recent months. IOA researcher Professor Graeme Martin was inducted into the French Academy of Agriculture (see page 8) and Professor Jacqueline Batley was awarded a Nancy Millis Medal for Women in Science (see page 1). Dr Rex Scaramuzzi, an Adjunct Professor within IOA, was presented with the Marshall Medal (see page 12), which is the highest honour that can be awarded in the field.

UWA was well represented at the annual GRDC Grains Research Updates, Perth, in February this year. Seven UWA students involved in grains related research were awarded scholarships to attend, from the Australian Grains Innovation Capacity Building Project, as part of their Careers in Grain initiative. Several academics presented their research and IOA provided information to attendees at our display booth (see page 9).

The School of Agriculture and Environment hosted their first Postgraduate Retreat

in Point Peron, which was attended by 60 PhD and Masters students, with academics and an industry panel providing insights on how to successfully navigate through postgraduate studies (see page 15). The 2019 Postgraduate Showcase: Frontiers in Agriculture, which highlights the research progress and achievements of UWA's top PhD students in agriculture and resource management, is scheduled for Wednesday 5 June in the Bayliss Lecture Theatre at UWA.

Another important event to mark in your calendar is the annual Industry Forum. On behalf of IOA and the Industry Advisory Board, I am pleased to announce that this year's Industry Forum topic is *Social License in Agriculture*, and is scheduled for July this year (further details to come).

Finally, I would like to wish Mrs Diana Boykett, IOA Communications Officer, all the best as she goes on her maternity leave. I also welcome four new staff members to IOA this year, including Associate Professor Sally Thompson in the Water for Food Production theme, Professor Dilusha Silva and Dr Andrew Guzzoni in the Engineering Innovations for Food Production theme, and Ms Laura Skates as the new Communications Officer.

SOPWA project launched

Hackett Professor Kadambot Siddique, kadambot.siddique@uwa.edu.au



L-R: Mr Jim Walker (APC Chairman), Mr. Clint Della Bosca (Chairman of WANTFA), Hon. Alannah MacTiernan (WA Agriculture Minister), Hon. Joel Fitzgibbon (Federal Shadow Minister for Agriculture), Hackett Professor Kadambot Siddique, Dr David Minkey (WA No-Tillage Farmers Association Executive Officer), and Dr Zakaria Solaiman (UWA).

On the 20th March this year, a new research collaboration between IOA, the Western Australian No-Tillage Farmers Association (WANTFA), and the resources development company Australian Potash (ASX: APC) was launched.

The Australian Potash Limited, Sulphate of Potash for WA Farmers (SOPWA) project will compare commonly used muriate of potash (MOP) with sulphate of potash (SOP) produced in Western Australia. The full effects of both potassium sources on crop yield, quality, safety and value will be assessed with a two-year controlled environmental study and broadacre field trials.

RAID networking event for postgraduate students

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There is a growing interest among the research community to contribute to international development, across a number of disciplines. The Researchers in Agriculture for International Development (RAID) was formed in 2013, as a program of the Crawford Fund with support of the Australian Centre for International Agricultural Research (ACIAR).



The organisers and speakers of the RAID networking event (L-R): David Windsor, Eloise Biggs, Christian Berger, Emeritus Professor Lynette Abbott, Professor Tim Colmer, Ana Manero, Dr Deborah Prichard, Professor Richard Bell, Alicea Garcia, Hackett Professor Kadambot Siddique and Rodrigo Pires.

On March 7th 2019, RAID hosted a seminar and networking event at the OceanWorks space, UWA Oceans Institute, attended by over 40 people – ranging from members of the public and students to highly-regarded experts in the field. The event was organised by WA RAID Representatives Ana Manero, Alicea Garcia, and Rodrigo Pires.

“We wanted to create an opportunity for researchers in Western Australia to network with like-minded researchers,” Ana said. “Events like this are a chance for students to learn more about agriculture and international development, and see how they can get involved”.

Managing Director and CEO of Australian Potash, Matt Shackleton, said the unique relationship between UWA and WANTFA will benefit the WA agricultural sector enormously. “We look forward to meeting more farmers over the course of these trials. They are the end

user of our product, and we want to understand their needs for a locally produced SOP fertiliser.”

Alongside Matt Shackleton, other speakers at the launch included Jim Walker (APC Chairman), Dr David Minkey (WA No-Tillage Farmers Association

The RAID event brought together leading researchers from a number of institutes and organisations. Presenters gave an overview of their own experiences working in international developed and provided useful insights to the audience. Speakers included:

- Dr Deborah Prichard (Curtin University)
- Professor Richard Bell (Murdoch University)
- Dr Eloise Biggs (UWA School of Agriculture and Environment)
- Hackett Professor Kadambot Siddique (Director IOA, representative on the Australia-Africa Universities Network Steering Committee)
- Emeritus Professor Lynette Abbott (UWA School of Agriculture and Environment, Crawford Fund WA Committee Coordinator)
- David Windsor (WA Chair AG Institute Australia)
- Professor Tim Colmer (UWA School of Agriculture and Environment, and Pro Vice Chancellor (Research))

In addition to senior professionals, Christian Berger, a Geographical Science (Honours) Student at UWA, shared his experience doing fieldwork in Timor-Leste. In 2018, Christian was a winner of the Crawford Fund Student Awards, which supported his travel and research costs.

“Living in the rural area of Timor-Leste puts into perspective what humans really need: to put food on the table for our families and to be loved by those close to us,” Christian said.

RAID plans to host their next event later in 2019, all are welcome.

Find out more about RAID at www.raidaustralia.net and the Crawford Fund at www.crawfordfund.org

Executive Officer), Hackett Professor Kadambot Siddique (IOA), the Hon. Joel Fitzgibbon (Federal Shadow Minister for Agriculture), and the Hon. Alannah MacTiernan (WA Agriculture Minister).

ALBA – a new Joint Venture to breed annual pasture legumes

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Dr Phillip Nichols and Mr Bradley Wintle joined UWA in January on a 10-year Joint Venture (JV) between UWA and PGG Wrightson Seeds to develop new annual pasture legumes. This is the result of a transition of the annual pasture legume breeding program from the Department of Agriculture and Regional Development (DPIRD) to private industry, a process initiated nearly four years ago. The JV, known as Annual Legume Breeding Australia (ALBA), will have a focus on subterranean clover, the most important annual pasture legume in both Australia and globally, but will also include balansa clover, Persian clover, arrowleaf clover and purple clover. Other pasture legume species may also be included in the future.

The formation of ALBA returns pasture legume breeding in Western Australia back to its original home at UWA, where the first breeding of subterranean clover commenced in 1949 by Dr John Millington. This program was transferred to DPIRD in 1986, where it became the largest and most successful annual pasture legume breeding program globally.

The new ALBA breeding program aims to further breed innovative plant varieties to address the pasture and crop-rotation requirements for increased livestock and crop production, and to explore national and international opportunities for product development and sales. As well as improved yield and persistence the JV will be looking to incorporate resistance

to redlegged earth mites and a range of clover diseases, in addition to other novel traits that can add value to the livestock

industries. The program is based at UWA's Shenton Park Field Station, where initial selection will be undertaken. Elite lines will then be evaluated widely across southern Australia and internationally for biomass and persistence under various farming systems.

A major advantage that UWA brings to the JV is the opportunity to bring ground-breaking science solutions to the breeding program in the form of innovative breeding technologies and new traits. This provides a platform for Honours, Masters and PhD projects on topics aligned with the overall objectives of the JV.



Dr Phil Nichols and Brad Wintle in subterranean clover breeding plots at UWA Shenton Park field station.

Aerobiological study of fungal spores

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UWA student Aria Dolatabadian, who is completing his PhD in Plant Biology from the School of Biological Sciences supervised by Professor Jacqueline Batley, Professor David Edwards, and Professor Martin Barbetti, was recently awarded a Convocation Postgraduate Research Travel Award.

As part of this award, Aria travelled to Poland in November 2018 to meet Professor Malgorzata Jedryczka (The Institute of Plant Genetics, Polish Academy of Sciences, Poznan, Poland) who is an expert in aerobiology and

aeromycology. The main purpose of his travel was to gain experience in aerobiology and molecular detection of fungal spores in the air using the SPEC system (a system of disease forecasting in oilseed rape (canola) that allows us to

monitor the presence and concentration of spores in air samples) and spore trapping equipment.

Whilst in Poznan, Aria visited other institutes including the Plant Breeding and Acclimatization Institute and Institute of Bioorganic Chemistry of the Polish Academy of Sciences, to become familiar with fungal spore molecular detection techniques and fungal protein crystallisation methods.

Ecological Civilization of the University Alliance of the Belt and Road

Adjunct Professor Neil C. Turner,
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Lanzhou University (LZU) was the organiser and host for the Forum on Ecological Civilization of the University Alliance of the Belt and Road held at Lanzhou University, Gansu Province, China in 2018. The aim of the forum was to bring together ecologists and agroecologists to develop cooperative programs and projects as part of China's Belt and Road Initiative. There were over 200 scientists and several presidents of universities from South, Central and West Asia, North and East Africa. Adjunct Professor Neil Turner was an invited keynote speaker asked to highlight the very successful cooperation between LZU and UWA over the past 13 years.

Since 2005, 15 staff from UWA have visited LZU Laboratory for Arid and Grassland Ecology, while about 5 others have visited the College of Pastoral Agricultural Sciences and Technology at LZU, and 18 staff and students from LZU have visited UWA. While the number of visitors from UWA to LZU has varied from 1 to 6 in any one year, the cumulative number of

In addition, he attended and presented at the Biotalent Conference, which was held from 7th – 9th November in Poznan.

Aria also gave three lectures; at the Polish Phytopathological Society, Institute of Plant Genetics, and Plant Breeding and Acclimatization Institute, for students and researchers.

“As my research mainly focuses on plant-pathogen interactions, the travel has assisted me in improving my knowledge and skills in using the SPEC system in *Leptosphaeria maculans/biglobosa* population studies in addition to my original project,” Aria said.



Adjunct Professor Neil Turner presenting his invited talk at the Ecological Forum in Lanzhou University. Photo credit: Professor Youcai Xiong.

visitor-days exceeds 650. While equivalent statistics are not available for staff and student visitors from LZU to UWA, visits have been as brief as 1-2 days for the presidential delegation from LZU to periods of 6 months, 1 year and 2 years.

These exchanges have resulted in the organisation of the 2nd International Workshop on Ecosystem Assessment and Management in 2010, the establishment of the Centre for Dryland Agriculture in 2013, the development of new joint

projects, exchange of germplasm, lecture courses for graduate students, and the publication of over 100 joint papers.

At the conclusion of the forum, the collaboration between LZU and UWA was extended for a further 5 years. For more information, see the report by Professor Kadambot Siddique on page 12 of the December 2018 edition of the IOA Newsletter, available at www.ioa.uwa.edu.au/publications

This skill is valuable as *L. maculans* is the most devastating fungal pathogen of canola in Australia. During his travel, Aria was trained in how to run the Burkard spore trap, how to perform microscopic observations to study *Leptosphaeria* species spores and learnt new techniques in molecular detection of different *Leptosphaeria* species.

“At the Institute of Bioorganic Chemistry of the Polish Academy of Sciences, I got an

insight into methodological aspects of high-resolution crystallography of macromolecules such as *Leptosphaeria* proteins, thanks to Professor Mirosław Gilski,” he said.



Burkard spore trap used for trapping spores of plant pathogenic fungi in the air.

IOA Director honoured for his work in Kerala

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Hackett Professor Kadambot Siddique received an Excellence Award for Community Service from the World Malayalee Council (WMC) at their Global Business Summit in Cochin, Kerala, India, on 13th January this year. The WMC works towards an international brotherhood of people of Kerala origin to bolster their cultural, artistic and social uniqueness and give resilience and understanding towards other cultures with which they have to co-exist and interact.



The award reflected the role Professor Siddique played in the Kerala Government initiative, "Rebuild Kerala" – in particular in the agriculture sector following recent flooding in the southern Indian state. It also honoured his broader achievements in global agricultural science. At the WMC summit Professor Siddique delivered a key note address entitled "Future Smart Food Crops for Zero Hunger".

While in Kerala Professor Siddique attended an International Workshop and Exhibition on Agro-processing and Value Addition. He delivered an invited keynote address on "Rebuilding Kerala Agriculture- towards resilience". Professor Siddique met with the Kerala Minister for Agriculture and relevant Secretaries in the Ministry and discussed ongoing collaborations between UWA and Kerala especially with Kerala Agricultural University (KAU) and Kerala Veterinary and Animal Science University (KVASU).

During the visit to KAU Professor Siddique met with the Vice Chancellor KAU and delivered lectures to agricultural science and climate change science students.

Managing subterranean clover red leaf syndrome (soybean dwarf virus)

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Recent research by The University of Western Australia (UWA) and the Department of Primary Industries and Regional Development (DPIRD) has uncovered the cause of subterranean clover red leaf syndrome.

Dr Kevin Foster (UWA), Associate Professor Megan Ryan (UWA), Mr. Paul Sanford and the Diagnostic Laboratory Services (DPIRD) investigated outbreaks of subterranean clover red leaf syndrome throughout southwestern Australia. The research was funded by Meat and Livestock Australia (MLA), Australian Wool Innovation (AWI), DPIRD and UWA.

"The red leaf outbreaks in 2017 caused considerable concern amongst livestock producers," Dr Foster said. "The syndrome causes leaves to redden from the leaf margins inwards, and can result in stunted plants and even premature plant death".

The UWA-DPIRD research team tested for the presence of viruses within subterranean clover and other plant species from 22 growers in 15 locations (with a total of 6749 samples), using molecular diagnostic protocols designed by Diagnostic Laboratory Services.

The results of this survey showed conclusively that Soybean dwarf virus (SbDV) was the primary cause of the red leaf syndrome. SbDV is primarily spread by aphids and predominantly infects legumes species but does not infect grasses.

Barry Marshall MicroBlitz Intern program

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The inaugural UWA 2019 Barry Marshall MicroBlitz Internship has provided eight enthusiastic female science students with an internship placement, to be trained in cutting edge science and public outreach.

The program was officially launched at the UWA Sunken Gardens in early February this year, and was attended by Nobel Laureate Professor Barry Marshall, ex-Chief Scientist of WA Professor Lyn Beazley, Professor Andrew Whiteley, and Professor Simon Biggs. The interns include Maddy Compton, Alice Ingram, Lauren James, Zlindt See, Sasha John, Danielle Ameduri, Caitlin MacRitchie, and Gaai Srinivasan.

The internship involves a two-week placement at two UWA research centres:



The MicroBlitz interns with Professor Barry Marshall, Professor Andy Whiteley, ex-Chief Scientist of WA Lyn Beazley, and Ben Moreira-Grez (MicroBlitz Lab Manager).

the Marshall Centre for Infectious Diseases Research and Training and the MicroBlitz labs. Through intensive training, the interns learnt about microbiology techniques, antibiotic resistance, PCR, Next Generation Sequencing and some essential bioinformatics.

The interns are now tasked with developing science outreach activities in the environment-human health space,

and delivering these activities to middle-school students. Professor Whiteley said “this all-female cohort of interns will act as fantastic ambassadors for STEM outreach and Women in Science”.

The program is funded by the WA Government’s Department of Jobs, Training, Science and Innovation and administered by the Marshall Centre and MicroBlitz project teams.

“Understanding the cause of the red leaf syndrome is an excellent first step, and we hope to be able to continue this research,” Dr Foster said. “We want to identify the key vector aphid species, determine the susceptibility and sensitivity of a range of pastures species in the field, and test the efficacy of insecticides for reducing spread”.

Producers are being advised to check their pastures in autumn and winter for aphids that may infect sub clover plants. A detailed SbDV factsheet with more information is now available on the DPIRD website, to help livestock producers identify and manage the impacts of subterranean clover red leaf syndrome. Find it at: <https://www.agric.wa.gov.au/crop-diseases/subterranean-clover-red-leaf-syndrome-caused-soybean-dwarf-virus>



Reddening of leaves begins on the outer leaf margins, eventually spreading across the whole leaf inwards before causing necrosis. Unlike some nutrient deficiencies, it is uncommon for the petiole to exhibit reddening. Photo courtesy of Ben Congdon (DPIRD).

UWA researcher honoured in France

Professor Graeme Martin,
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Professor Graeme Martin has been inducted into the Académie d'Agriculture de France (AAF; www.academie-agriculture.fr), joining a few other Australians, such as Professor Jim Quirk, who was in the discipline of soil science at UWA when Professor Martin was an undergraduate.

The AAF is directly descended from the Société d'Agriculture de la Généralité de Paris, founded in 1761 by Louis XV. Professor Martin's induction was supported by Professor Michel Thibier, formerly the Attaché for Science at the French Embassy in Canberra. After his induction, Graeme made a 40-minute presentation on "La Ferme du Futur 2050 (FF2050)" and then entertained questions for a further 30 minutes. The FF2050 project was warmly received and led to discussion of a potential French partner in the international network of future farms (the 'Global Farm Platform' supported by the Worldwide Universities Network).

Professor Martin then went to the French Agency for Food, Environmental and Occupational Health & Safety (ANSES) to meet the Comité d'Experts Spécialisé en Santé et Bien-être des Animaux (CES SABA), a group of primarily veterinarians who help the government of France to manage major risks in the livestock industries. As a context for the discussion, Professor Martin used the umbrella concept of 'clean, green and ethical animal production' that has been

the foundation for teaching and research at the University of Western Australia since about 2002. In this presentation of the concept, Professor Martin focused on issues in animal ethics and welfare that impact Australia's livestock industries. Mme Karine Petit (Chargée de Projet Scientifique), the coordinator of the committee and the meeting, said "Everybody has appreciated the exotic, scientific, interesting and most of all lively presentation!"



Mr Gérard Tendron (Secrétaire Perpétuel of the Academy; left) reading Professor Graeme Martin's citation during his welcome into the French Academy of Agriculture, watched over by Mme Dominique Parent-Massin (Vice Secretary of the Academy).

Students impressed by new technologies at UWA Ridgefield Farm

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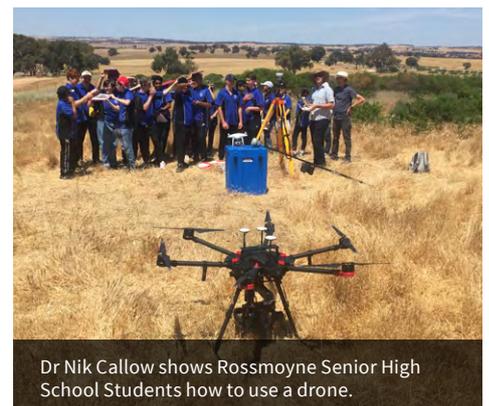
Year 9 Geography students from Rossmoyne Senior High School had a fantastic field day at UWA Farm Ridgefield, Pingelly, in November last year. The students were joined by Professor Graeme Martin, Dr Nik Callow, and Ridgefield Farm Manager Richard McKenna.

Professor Martin and Mr McKenna talked to the students about the changing nature of farming and the aims of the Future Farm 2050 Project, to facilitate multi-disciplinary research

and development in sustainable future farming systems. They emphasised the role of farmers as great innovators and custodians of the land, and the importance of understanding regional development and engaging with regional communities.

The students also learnt about new technologies being used in agriculture, from innovative seeding machinery to unmanned aerial vehicles (drones). Dr Callow discussed how drones can be used to assess frost damage by collecting spectral

data, and the students were excited to see a live demonstration of the drone flying above them on the farm!



Dr Nik Callow shows Rossmoyne Senior High School Students how to use a drone.



Guido Ramirez Caceres, Martina Badano Perez, and Estefania Poropat in front of the UWA Institute of Agriculture booth at GRDC Grains Research Updates.

UWA highlights at 2019 Grains Research Updates

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UWA was well represented at the 2019 Grains Research and Development Corporation (GRDC) Grains Research Updates in Perth, held at Crown Perth, Burswood on 25th – 26th February 2019.

The GRDC Grains Research Updates are Western Australia’s premier annual grains industry event, and the two-day program showcased the latest research, technology, market development and management innovations to improve the productivity of the WA grains industry. The UWA Institute of Agriculture had a booth display at the venue which attracted interest from farmers, industry and students.

Seven UWA students were awarded scholarships from the Australian Grains Innovation Capacity Building Project to attend the event, as part of their Careers in Grain initiative, including Estefania Poropat, Facundo Cortese, Enoch Wong, Jinyi Chen, Md Sultan Mia, Mohammad Golam Kibria, and Brenton Leske.

“Attending the Grains Research Updates was a great opportunity to witness how important the integrated approach is towards meeting higher productivity and profitability goals,” Estefania Poropat said. “From local farmers, researchers and business partners to international ones, this is definitely a proper environment for innovation in such a forward-thinking industry”.

Several UWA researchers presented excellent talks during the conference, including

- Professor David Pannell (A stocktake of knowledge on soil amelioration tools)
- Dr Ken Flower (Ten years of different crop rotations in a no-tillage system – what happened to plant diseases and nematode pests)

- Dr Roberto Busi (A ‘focus farms’ survey in the Kwinana West reveals herbicide resistance levels in champion farmers’ paddocks: what’s next?)
- Dr Andrew Guzzomi (A response tyne for site-specific fallow weed control)

In his talk, Dr Guzzomi shared a video showing exactly how the response tyne works. The machine has been designed using a cultivator bar where tynes are raised above the ground in a standby position, ready to chip the weeds out of the ground the moment they are detected with weed-sensing technology. This innovative new technology is likely to have many benefits for WA grain growers.

“The ‘rapid response’ tyne system is designed to chip out weeds at densities of one plant per 10 square metres, while travelling at 10 kilometres per hour,” Dr Guzzomi said. “The system’s ability to handle a vast range of weeds, at varying growth stages, is likely to reduce the number of ‘passes’ required to manage fallow weeds, compared with current herbicide practices”.

A copy of all presentations is available at www.giwa.org.au/2019researchupdates.



The Winners of the Young Professionals in Agriculture Forum Jefferson Allan (Curtin University), Ci Sun (UWA), and Ya-Chun Yu (UWA), with David Windsor of AIA, and Natalie Moore, Dr Ben Biddulph, and Jackie Bucat of DPIRD. Photo credit: Peter Maloney (DPIRD).

Young Professionals in Agriculture Forum

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Five outstanding early career researchers showcased their work at this year's Young Professionals in Agriculture Forum, an annual event hosted by the Ag Institute Australia (AIA) WA Division and the Department of Primary Industries and Regional Development (DPIRD).

The 1st Place prize and the Noel Fitzpatrick Medal went to Jefferson Allan, who presented his 2018 Honours research related to the pathogen *Sclerotinia sclerotiorum*, with Curtin's Centre for Crop and Disease Management.

The 2nd and 3rd Place prizes went to two UWA students who completed their Master of Agricultural Science degree at UWA in December 2018:

- Ci Sun was awarded 2nd Place for her talk and paper on 'The effect of flowering-time adaption on wild radish (*Raphanus repanistrum* L.) in competition with wheat (*Triticum aestivum* L.)'.
- Ya-Chun Yu was awarded 3rd Place for her talk and paper on 'The iron toxicity tolerance of important forage legume species in Australia and the relationship between iron toxicity tolerance and waterlogging tolerance of these plants'.

"This forum provides a good opportunity for us to deliver our research findings and learn from other young professionals with different topics," Ci Sun said. "It is also very important to meet and network with people from many aspects of agricultural industries in Western Australia".

Before the winners were announced, former UWA student and 2012 Young Professionals in Agriculture Forum winner Dr Ben Biddulph (DPIRD) gave a guest speech reflecting on his career path and providing advice to the early career researchers in the audience.

"It's important to develop strong linkages and relationships with growers, and seek out mentors who will support you to reach your full potential," Dr Biddulph advised. "Learning to work with different people is equally as important as the science you do, as the capacity of the team is much greater than the sum of the individuals".

The forum was followed by the AIA WA Division general meeting. For more information, go to www.aginstitute.com.au

Conservation Agriculture – the Timorese way

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In March this year, Professor Kadambot Siddique, Professor William Erskine and Dr Amin Mugera travelled together with Dr Eric Huttner and Dr James Quilty of the Australian Centre for International Agricultural Research (ACIAR) to Timor-Leste. There, they met with members of the Abatoan Conservation Agriculture group, including Dr Rob Williams and Mr Luis Almeida.

The Conservation Agriculture group was formed following initial research by the ACIAR-UWA led Seeds of Life project, as a follow-up to a Food and Agriculture Organisation of the United Nations (FAO) led project which has since finished. The current ACIAR-funded Agriculture Innovations for Communities (AI-Com) project is evaluating mucuna (velvet bean) adoption with the associated cattle grazing management.



Future of food panellists with University of Pretoria Senior Executives.

Future of food in Africa

Hackett Professor Kadambot Siddique, kadambot.siddique@uwa.edu.au

Given the unprecedented changes at a global scale, and the persistent challenges facing the African food system, *what will the future of food be on the continent?* In December last year Hackett Professor Kadambot Siddique was invited by University of Pretoria, South Africa, to be a panel member to explore this question from a global, continental and national perspective. Other panel members included Professor Louise Fresco (President of the Executive Board: Wageningen University & Research), Dr Lindiwe Sibanda (Vice President: Alliance for a Green Revolution in Africa), Prof Patrick Caron (Chair, Panel Experts on Food Security and Nutrition, FAO and Director Montpellier University of Excellence), and Ms Bongwiwe Njobe (Chair, Global Forum in Agricultural Research and Innovation). The moderator of the panel discussion was Professor Alice Pell (Dean's Advisor for International Relations in the College of Agriculture and Life Sciences, and the College for Veterinary Medicine at Cornell University, USA).

There are several drivers emerging that may radically affect the development of global food systems: climate change and its impacts, growing malnutrition in all its forms (including obesity and the non-communicable diseases associated), environmental degradation,

inequality, and the rise of nationalism. Collectively, these drivers make the future more uncertain than before. In Africa, food systems remain a key challenge at the intersection of hunger, poverty and health. Women and children are particularly at risk. Grain yields

remain well below the world average (yield gap). Low productivity, inadequate policies, and chronic underinvestment are at the heart of Africa's food and nutritional insecurity and the prevalence of extreme poverty. However, Africa has the potential to become the world's agricultural powerhouse.

While at the University of Pretoria, Professor Siddique met with the Vice Chancellor, Deputy Vice Chancellor and key leaders and discussed ongoing collaboration between UWA and the University of Pretoria. Professor Siddique also participated in the launch of African Research Universities Alliance (ARUA) Centre of Excellence (ACoE) in Food Security at the University of Pretoria. ACoE is a partnership between Universities of Pretoria, Nairobi and Ghana.

Professor Siddique was elected as the Fellow of African Academy of Sciences (AAS) during the general assembly in Pretoria.

Maize farmers on the south coast of Timor-Leste have adopted mucuna for its benefits in weed suppression and soil fertility from nitrogen fixation. The mucuna will be rolled/crimped or slashed and a follow-up crop of maize will be sown into the mucuna debris for the 'small' rainy season.



Standing in a lush field of mucuna (velvet bean) at Abatoan, Timor-Leste, is the community Conservation Agriculture group led by Mr. Felix.

Marshall Medal winner

Professor Graeme Martin, graeme.martin@uwa.edu.au

Dr Rex Scaramuzzi, an Adjunct Professor within the UWA Institute of Agriculture, long-time colleague of Professor Graeme Martin and Emeritus Professor David Lindsay, was presented with the Marshall Medal at Fertility 2019 in Birmingham by the President of the Society for Reproduction and Fertility, the premier body for the discipline the UK.

FHA Marshall (1978-1949) is generally considered to have originated the field of reproductive biology in animals at the University of Cambridge, in the School of Agriculture, at the turn of the last century. The Marshall Medal is the highest honour that can be awarded in the field. It was established in 1963 and is awarded to outstanding contributors to the study of fertility and reproduction.

Dr Scaramuzzi graduated in agricultural science (with Honours) and a PhD at the University of Sydney. He then worked at prestigious research centres in the USA and the UK before returning to Australia in 1975 to join CSIRO as a

Senior Research Scientist. At CSIRO, he researched in animal production and also co-supervised doctoral students until 1993, by which time he had risen to Senior Principal Research Scientist and Program Manager. From 1988 to 1992, he served on ARC discipline panels for the biological sciences, including a 2-year period as deputy chair. He then joined the Royal Veterinary College at the University of London as Professor of Veterinary Physiology. He won a prestigious Marie Curie Professorship from the European Union that allowed him to work at L'Institut National de la Recherche Agronomique (INRA) in France from 2007 until 2010.



Adjunct Professor Rex Scaramuzzi (right) receiving the Marshall Medal from Prof Colin Duncan, President of the Society for Reproduction and Fertility.

Fertility 2019 is the premier meeting for the discipline in the UK and brings together reproductive biologists and specialists in fertility from around the globe. Graeme Martin attended to witness the Marshall Medal being awarded to Dr Scaramuzzi, and also presented an invited paper in a symposium on puberty and seasonality in which he focused on the work of Dr César Rosales Nieto who graduated from UWA in 2014 and now works at the Universidad Autónoma de San Luis Potosí in Mexico, having recently completed a Fulbright Fellowship at Michigan State University in the USA.

Research on Cassava in Laos

Ming Fung Chua, 21659297@student.uwa.edu.au

Ming Fung Chua, a Masters of Agricultural Sciences student, was recently granted a fellowship award as a Graduate Research Student in the field of cassava at the International Centre for Tropical Agriculture (CIAT), Vientiane, Laos.

The award allowed Ming to embark on a 3.5 month visit to Vientiane to conduct field trials and gather data as part of her dissertation on the yield response of

cassava on potassium (K) fertilisation in Laos. She was joined by her supervisors Dr Imran Malik (CIAT) and Associate Professor Erik Veneklaas (UWA) and by

other CIAT staff, including the Director General Dr Ruben Echeverría who visited the Lao office on 25th January this year.

“Currently, farmers do not have a guide to how much K is required to benefit the yield of cassava,” Ming said. “By conducting this research in local settings, I hope that the farmers will be more likely to adopt the outcomes of my research”.

As Laos is a developing country that is moving towards commercialization and helping farmers out of poverty, the increase in cassava yield will in turn also help to benefit Laotian farmers to start providing and supplying to markets for the population. Ultimately, increased yields will supply food to help feed the increasing population while at the same time improving the livelihoods of smallholder and family farms.



L-R: Dr Imran Mailk, Associate Professor Erik Veneklaas, Ming Fung Chua, CIAT staff Laothao Youbee and NAFRI (National Agriculture and Forestry Research Institute) staff Phanthasin Khanthavong at site of field trials.



Dr Asad Prodhan works on one of the Australian native plants that thrives on low-P soils.

Can we tackle the costly phosphorus-inefficiency in Australian agriculture?

Dr Asad Prodhan, asad.prodhan@uwa.edu.au

Associate Professor Patrick Finnegan, patrick.finnegan@uwa.edu.au

Emeritus Professor Hans Lambers, hans.lambers@uwa.edu.au

Phosphorus (P) is an essential plant nutrient that is generally insufficient in Australian soils. Australian agriculture runs on only 25% P-efficiency, which means that Australian farmers need to apply four times more P fertiliser to get one unit P in their produce. For pastures, it is about 20%.

Australian P-fertiliser demand is met both by domestic and external supplies. While Australia supplies 75% of its need for P-fertilisers, it imports all of

the phosphate-rock to manufacture them. These circumstances may render Australian agriculture vulnerable to global economic and political instability.

Whilst P-fertilisers can boost crop yields, the excessive application of P-fertilisers also increases the input costs and impacts the natural environment through pollution of waterways and depletion of finite phosphate-rock. This leads to a double-burden of P, i.e. the cropping system demands intensive P input, but its application raises concerns. To tackle this conundrum, farmers need crops and pastures that are more efficient in acquiring and utilising P.

Recent research led by Dr Asad Prodhan, Associate Professor Patrick Finnegan, and Emeritus Professor Hans Lambers at

UWA used a radically different approach to find ways to improve P-efficiency in crops. They envisioned that plants that naturally evolved on low-P soils hold the clue. After decade-long studies, they have discovered the traits that allow plants to grow in soils that have only 5% of the P in arable land. Now, it is the right time to explore our crop germplasm for the presence of these traits and develop P-efficient crops.

Making the agriculture industry in Australia and around the globe more P-efficient, and therefore more sustainable and profitable, is now within reach.

This research is supported by the Australian Research Council (grant no DP140100148).

UWA-India collaboration strengthened

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In February this year, Hackett Professor Kadambot Siddique traveled to New Delhi, India, to represent UWA Vice Chancellor Professor Dawn Freshwater at various meetings at Amity University (AU), Jawaharlal Nehru University (JNU), and the Indian Council of Agricultural Research (ICAR).

The inaugural session of the Inbush Era World Summit was held at AU in Noida on February 20th, with the theme “Honoring the Past, Treasuring the Present, Shaping the Future – Global Leaders of Today & Tomorrow”. During the summit, AU honoured UWA Vice Chancellor Professor Dawn Freshwater with the Amity Global Academic Excellence Award, which Professor Siddique received on Professor Freshwater’s behalf.

While at AU, Professor Siddique met with Professor Gurinder Singh (Group Vice Chancellor, AU), Dr Aseem Chauhan (Chancellor, AU), Dr Ashok Chauhan

(Chairman, AKC Group of Companies) and other senior executives. Professor Siddique signed an agreement between UWA and AU on a collaborative pathway (3+2 in Business) in postgraduate studies.

Prior to the Inbush Era World Summit, Professor Siddique met with senior executives of JNU, to discuss their ongoing partnership with UWA. Key areas for future collaboration between JNU and UWA were identified, including joint research and PhD training on plant/crop science, socio-economics, human health and nutrition, and computer science, AI, and data management.



Professor Kadambot Siddique exchanges the joint agreement with Professor Gurinder Singh, Group Vice Chancellor Amity University.

“The Memorandum of Understanding signed between UWA and JNU in 2016 has been very successful,” Professor Siddique said. “It has resulted in several joint publications and funding applications, co-supervision of PhD students, special lectures, and the appointment of Professor Ashwani Pareek [School of Life Sciences, JNU] as an Adjunct Professor at UWA”.

Professor Siddique also met with senior management of ICAR, New Delhi, which is the peak federal government body managing agriculture research, development and higher education in India. ICAR represents more than 200 research institutions, 175 farmer training centers and over 70 agricultural universities.

“UWA is the only university from Australia which has established an ongoing active collaboration with various ICAR institutions over the years,” Professor Siddique said. “This includes the Memorandum of Understanding signed in 2007, and the letter of intent and appreciation which was signed during the Vice Chancellor’s visit to New Delhi in April 2017”.

The active connection between UWA and India has been highly successful and promises many exciting future collaborations, particularly in joint research and PhD training.

Investigating Barley

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Dr Nic Taylor, nicolas.taylor@uwa.edu.au

Dr Ali Bandehagh is a researcher visiting Dr Nic Taylor’s research group at UWA for one year from the Department of Plant Breeding and Biotechnology, at the University of Tabriz, Iran. Dr Bandehagh’s research in Iran focuses on investigating the molecular basis of salinity tolerance in canola. This work combines proteomics approaches with crop breeding under abiotic stresses.

Although canola is a moderately salt tolerant species, its growth, seed yield, and oil production are markedly reduced under salt stress, particularly during the early vegetative growth stages.

“Our results show that a major fraction of detected proteins are involved in oxidative stress response and energy production,” Dr Bandehagh said. “These results suggest that energy production-related proteins play an important biochemical role in the adaptation of canola to high salinity conditions.”



Postgraduate students in the School of Agriculture and Environment enjoying the beautiful weather with an early morning kayaking lesson.

First SAGE Postgraduate Retreat a great success

Daniel Kidd, daniel.kidd@uwa.edu.au

The first Postgraduate Retreat for the UWA School of Agriculture and Environment was held during 18th – 19th February at Point Peron. It was attended by 60 PhD and Masters students and was run by the Postgraduate Research Committee. The theme of the retreat this year was centred on how to successfully navigate through postgraduate studies.

The retreat opened with a thought provoking industry panel, with guest speakers providing insights into the skills and development they needed to get into their preferred career path. The panel included

- Nathan Craig (West Midlands Group)
- Peter Hutton (Research Scientist, Western Dairy)
- Brian Chambers (South West Catchments Council)
- Elizabeth Petersen (Advanced Choice Economics and Department of Primary Industries and Regional Development)
- Johanna Pluske (UWA and Principal Consultant of SciEcons Consulting)

Following this, Dr John Terry gave some useful tips on looking after your physical and mental health while completing your PhD, and Dr Jo Edmondston from the Graduate Research School discussed the recent implementation of the Viva voce (oral defence). The afternoon was reserved for exploring the natural wonders of the Point Peron marine reserve before a couple of light refreshments and dinner while watching the sunset. The night was not over as the student quiz night kept everyone on their toes!

For the early risers there was the option of yoga, kayaking or beach activities.

By mid-morning we were all back to learn how to write a scientific paper with Emeritus Professor David Lindsay and how to give effective presentations with Professor Graeme Martin. Dr Penny Hawken gave us her tips on preparing posters and how to make social media work for you, and early career researcher Dr Abbie Rogers shared some reflections on her PhD studies and career path. The retreat ended with some Q&A between the students and Graduate Research Coordinators before returning to Perth.

It was a fantastic experience for all involved, with all attendees learning something new, stepping out of their comfort zone, and making new friends. Special thanks go to all the postgraduate representatives (Daniel Kidd, Asjad Tariq, Atbin Mahabbati and Adriana Picado), postgraduate co-ordinators (Associate Professor Roberta Bencini, Dr Ram Pandit, Dr Eloise Biggs and Dr Dominique Blache), and SAgE administration staff (particularly Deb Swindells, Julia Jiang and April Harris) for organising the event. The students are already looking forward to the next retreat in 2020!

As a visiting researcher at UWA, Dr Bandehagh will work to unravel biochemical and physiological aspects of salt stress in barley.

Dr Bandehagh is investigating the impact of this abiotic stress in barley in order to; identify key elements of the salinity response; identify the metabolic response of barley to salt; provide a comparison to what has previously shown in wheat; and to provide a potential-putative mechanism for the metabolic changes during salinity stress.



Barley seedlings under control (left) and NaCl (200 mM) treatments (right).



The Hon Richard Court AC, Australian Ambassador to Japan, visited NU in February 2019 to discuss the JDP and more broadly Australia-Japan cooperation in education and science.

Nagoya University and UWA Joint PhD Degree

Professor Tim Colmer,
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Four Professors and three students from Nagoya University (NU) in Japan visited UWA in March this year.

UWA hosted a mini-workshop on ‘Root plasticity as a strategy of rice plants for adaptation to various soil stressed environments’ on 19th March. Professor Akira Yamauchi (Graduate School of Bioagricultural Sciences, NU) spoke on the functional roles of root plasticity in crop growth and productivity, and Professor Yoshiaki Inukai (International Center for Research and Education in Agriculture, NU) spoke on the genetic basis for root development and plasticity expression. About 50 people attended this session.

The UWA and NU Joint PhD Degree (JDP in Agricultural Science and related

disciplines) commenced on 1 April 2019. Three students have commenced with NU as their home University, and one student with UWA as their home will soon also commence.

The delegation comprised supervisors and commencing PhD students from NU, as well as the NU JDP coordinator Professor Mikio Nakazono. The students attended a workshop on ‘How to Write your Research Proposal’ at UWA Graduate Research School, and had planning meetings with their NU and UWA joint supervisors. A tour of relevant research facilities available at UWA also contributed to the planning of the various PhD research projects.

Professor Nakazono held discussions with Professor Carolyn Oldham (Acting Dean of the Graduate Research School, GRS) and the GRS team, which were very beneficial

for the collaboration and administration of the JDP. The delegation also enjoyed catching up with Professor Tony O’Donnell (Dean of Science) who has been a strong supporter of the JDP initiative.

Professor Nakazono commented: “We always feel so welcome when we visit UWA. We enjoyed our various meetings and it was very nice for us to discuss our JDP with Professor Robyn Owens (DVCR) and Professor Simon Biggs (Senior DVC). NU is pleased with our current research collaborations with UWA and we wish to capture the great potential to grow these further with our joint supervision of PhD students. Our JDP will also be an excellent experience for the students”.

The JDP will not only benefit our students and our two universities, but it will also add to the strong relationship of Australia and Japan. Staff from the Australian Embassy in Tokyo participated at our Memorandum of Agreement signing ceremony and gave a presentation at our scientific workshop, held at NU in December 2018. In February 2019, the Australian Ambassador to Japan, The Hon Richard Court AC, visited NU to discuss the importance to Australia of our cooperation with Japan in education and science. Science and education are both important also for industry and trade. Our two universities are currently engaging industry in the student exchanges and discussing possible future research projects of interest within the framework of JDP.

Find out more about the Graduate School of Bioagricultural Sciences at NU at: www.agr.nagoya-u.ac.jp/index-e



UWA recently hosted a delegation of staff and students from Nagoya University involved in the Joint PhD Program which will commence 1 April 2019. (Left-to-right): Dr Yinglong Chen, Mr Tsubasa Kawai, Prof Kadambot Siddique, Prof Tim Colmer, Prof Akira Yamauchi, Prof Simon Biggs, Prof Mikio Nakazono, Prof Yoshiaki Inukai, Ms Yumika Watanabe, Dr Kosala Ranathunge. (Prof Satoshi Ohkura and Ms Yuri Kitagawa also visited UWA during the same week).

New Staff

Dr Andrew Guzzomi,
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Dr Andrew Guzzomi has been appointed within the School of Mechanical Engineering as the inaugural agricultural engineer under the University's Be Inspired recruitment campaign.

Andrew's multidisciplinary collaborations with researchers and industry have led to various innovations for the agriculture industry. In 2016 he was awarded WA Innovator of the Year for co-inventing

flash flaming technology and recently led the engineering of the GRDC targeted tillage project (pictured). In 2018 he won a 40under40 and WA Tall Poppy Science Award for helping establish agricultural engineering at UWA. He co-leads the IOA's Engineering Innovations for Food Production theme and is driving the development of a new UWA Agricultural Engineering Masters Program.

Professor Dilusha Silva,
dilusha.silva@uwa.edu.au



Professor Dilusha Silva has been appointed as a Research Professor in the Microelectronics Research Group, within the School

of Electrical, Electronic and Computer Engineering.

Dilusha has been working in the area of optical sensing for over 20 years, with applications to agriculture, medicine, remote sensing, and defence. Since completing his PhD in 2003, he has extensive experience working both in industry and academia, and maintains a strong industrial relevance in all his research activities. Dilusha co-leads the IOA's Engineering Innovations for Food Production theme, and he intends to expand and deepen the Agricultural applications of his research in this new position.

Associate Professor Sally Thompson,
sally.thompson@uwa.edu.au



Associate Professor Sally Thompson has been appointed as an ecohydrologist in the Environmental Engineering Department, within the School of Civil,

Environmental and Mining Engineering.

Sally completed her undergraduate studies at the University of Western Australia in 2003, and then worked as a consulting engineer for several years before doing her PhD at Duke University. She has spent the last seven years in the Department of Civil and Environmental Engineering at the University of California, Berkeley, where she conducted research and taught hydrology as an Assistant Professor. Sally is glad to be back in sunny Perth and to join IOA as a co-leader of the Water for Food Production theme.

Laura Skates,
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Laura Skates has been appointed as Communications Officer for the IOA.

Laura completed her Bachelor of Science (Botany and Conservation

Biology) with Honours at UWA in 2014, before starting her PhD in the UWA School of Biological Sciences, supported by Kings Park Science and the BayCEER Laboratory of Isotope Biogeochemistry in Bayreuth, Germany. Laura was the Media Officer for the UWA Postgraduate Students' Association last year, and is a keen science communicator. She looks forward to sharing the research, development and communication activities of IOA.

AWARDS AND INDUSTRY RECOGNITION

NAME	AWARD
Professor Jacqueline Batley	Nancy Millis Medal for Women in Science, from the Australian Academy of Science
Adjunct Professor Rex Scaramuzzi	Marshall Medal, from the Society for Reproduction and Fertility (UK)
Professor Graeme Martin	Inducted into the Academie d'Agriculture de France
Hackett Professor Kadambot Siddique	Excellence Award for Community Services, World Malayalee Council
Hackett Professor Kadambot Siddique	Elected Fellow of the African Academy of Sciences
Dr Michael Walsh and Dr John Broster	Weed Science Society of Australia Outstanding Paper Award – Weed Technology

VISITORS TO IOA

NAME OF VISITOR	VISITOR'S ORGANISATION AND COUNTRY	HOST DETAILS	DATES OF VISIT
Nur Fatimah Mohd Yusoff	Universiti Putra Malaysia	Professor Jacqui Batley	September 2018 - June 2019
Ali Zamanmirabadi	University of Zanjan, Iran	Professor Jacqui Batley	September 2018 - September 2019
Aitian Ren (Visiting PhD student)	Lanzhou University, China	Emerita Professor Lynette Abbott	2019 - 2020
Wang Xue (Visiting PhD student)	College of Animal Science, Inner Mongolian Agricultural University, Huhhot, Inner Mongolia, China	Professor Graeme Martin	2018 - 2019
Dr Yang Yanyan (Visiting Associate Research Fellow)	Institute of Animal Husbandry, Inner Mongolia Academy of Agricultural and Animal Husbandry Sciences, Inner Mongolia, China	Professor Graeme Martin	2018 - 2019
Dr Xiaoyan Niu (Visiting Associate Research Fellow)	Shanxi Academy of Agricultural Science, Taiyuan, Shanxi, China	Professor Graeme Martin	2018 - 2019
Dr Georgget Banchemo Hunzicker	Programa Nacional de Carne y Lana, INIA La Estanzuela, Colonia, Uruguay	Professor Graeme Martin	2019
Dr Ali Bandehagh	Department of Plant Breeding and Biotechnology, Faculty of Agriculture at the University of Tabriz, Iran	Dr Nic Taylor	2019
Professor Hiroshi Matsumoto, Professor Takeshi Nishiyasu, Professor Satoru Takahashi, Professor Jun Ikeda	University of Tsukuba	Professors Phi Vercoe and Wallace Cowling	12 March 2019
Dr Chunming Bai (Visiting Research Academic)	Liaoning Academy of Agricultural Science, China	Professor Kadambot Siddique and Dr Yinglong Chen	March 2019 - February 2020
Muhammad Shafi (Visiting Research Student)	University of Agriculture, Peshawar, Pakistan	Professor Kadambot Siddique and Dr Zakaria Solamain	January 2019 - July 2019

POSTGRADUATE RESEARCH STUDENTS

STUDENT NAME	TOPIC	SCHOOL	SUPERVISOR(S)	FUNDING BODY
Omnia M. M. H. Arief	Ecophysiological studies on <i>Lupinus albus</i> L.	UWA School of Biological Sciences and IOA	Professor Hans Lambers	Mission Sector, Ministry of Higher Education, Egypt
Sofina Maharjan	Payment for Environmental Services as an instrument for facilitating adoption of Conservation Agricultural Practices	UWA School of Agriculture and Environment and IOA	Associate Professor Fay Rola-Rubzen; Dr Ram Pandit	John Australia Awards/ Alwright Fellowship
Doraid Esho Amanoeel Alkhisaybi	Grazing Saltbush (<i>Atriplex spp.</i>) to mitigate loss in sheep productivity caused by vitamin E and Selenium deficiencies	UWA School of Agriculture and Environment and IOA	Dr Dominique Blache	Hackett Postgraduate Scholarships
Gereltsetseg Enkhbat	Diversity of <i>Trifolium subterraneum</i> ssp. <i>yannicum</i> for waterlogging tolerance and morphological traits	UWA School of Agriculture and Environment and IOA	Professor William Erskine; Professor Megan Ryan; Dr Phillip Nichols; Professor Yoshiaki Inukai and Assistant Professor Takao Oi (Nagoya University)	RTP scholarship
James Kelly	The application of portable spectroscopy for on-site wheat grain analysis and varietal determination	UWA School of Molecular Sciences and IOA	Dr Nic Taylor	RTP scholarship and GRDC Research Scholarship

UWA IOA 2018 Publications

(Not yet reported)

Peer Reviewed Journals

Abbott LK, Macdonald LM, Wong MTF, Webb MJ, Jenkins SN and Farrell M (2018). Potential roles of biological amendments for profitable grain production – A review. *Agriculture, Ecosystems and Environment* **256**: 34-50.

Amir AA, Kelly JM, Kleemann DO, Durmic Z, Blache D and Martin GB (2018). Phyto-oestrogens affect in vitro fertilization and embryo development in

sheep. *Reproduction, Fertility and Development* **30**: 1109-1115. DOI: 10.1071/RD16481

Ayalew H, Liu H, Bomer A, Kobijiski B, Liu C and Yan G (2018). Genome-wide association mapping of major root length QTLs under PEG induced water stress in wheat. *Frontiers in Plant Science* doi: 10.3389/fpls.2018.01759

Baresel JP, Nichols P, Charrois A and Schmidhalter U (2018). Adaptation of ecotypes and commercial

varieties of subterranean clover (*Trifolium subterraneum* L.) to German environmental conditions and its suitability as living mulch. *Genetic Resources and Crop Evolution* **65**: 2057-2068 doi: 10.1007/s10722-018-0672-z

Busi R, Goggin DE, Heap IM, Horak MJ, Jugulam M, Masters RA, Napier RM, Riar DS, Satchivi NM, Torra J, Westra P, Wright TR (2018). Weed resistance to synthetic auxin herbicides. *Pest Management Science* **74**: 2265-2276.

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