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Front to back: Ly Le, Henry Nguyen and Tim Colmer in the UWA glasshouse where Ly is conducting her soybean experiments.

International collaborations in abiotic stress tolerance strengthened

Two agricultural research leaders from North America, Professor Henry Nguyen from the University of Missouri and Professor Vara Prasad from Kansas State University visited IOA in November.

Prof Nguyen is the Curators' Distinguished Professor of Plant Genetics and Endowed Chair in Soybean Genomics and Biotechnology at the University of Missouri. He has ongoing collaborations with several UWA researchers in the areas of salinity tolerance and waterlogging tolerance using the soybean germplasm. He is also an Adjunct Professor within IOA.

PhD Candidate, Ly Le Thi Thanh in the School of Agriculture and Environment and IOA, is examining salinity tolerance mechanisms in soybean in controlled-environment experiments. She is using a diverse set of soybean genotypes from Prof Nguyen's soybean breeding and research program.

Ly, who commenced her PhD in August was able to find out more information about the soybean lines during Prof Nguyen's visit and has plans to interact with him further throughout her studies. Ly is supervised by Prof Tim Colmer, Hackett Prof Kadambot Siddique, and Dr Lukasz Kotula.

Prof Nguyen also delivered a public lecture entitled 'Legume improvement for sustainable food production and human health'. He highlighted recent advances in the development of genomic resources and breeding for improving stress tolerance, adaptation to different climatic conditions, yield and nutritional quality in legume crops.

"Robust genetic resources for important grain legumes are available worldwide," Professor Nguyen said. "Investigation of the natural genetic variation for major traits associated with stress tolerance and yield will help to achieve higher genetic gains."

Prof Prasad is Director of the USAid Feed the Future Innovation Laboratory for Collaborative Research in Sustainable Intensification. He has ongoing collaborations with UWA researchers in the areas of climate change adaptation, heat, drought and salinity stress, and root architecture phenotyping.

During his visit, Prof Prasad delivered a special seminar on the concepts of sustainable intensification for improved food and nutritional security. He said sustainable intensification focuses on increasing agricultural production from existing farmland without any adverse environmental impact.

"For adoption and scaling of sustainable intensification practices it is critical to measure impacts across multiple domains (productivity, environment, economic, social and human condition) so that synergies and trade-offs of the system or its components can be quantified," Prof Prasad said.

Director's column

Hackett Professor Kadambot Siddique AM, CitWA, FTSE, FAIA, FNAAS, FISPP
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With harvest well and truly underway across the state I am pleased to see the latest crop estimates at 12.3mt according to the Grain Industry Association of WA's November Crop Report, a positive increase from September's 10.2mt estimate.

The UWA Institute of Agriculture (IOA) has been busier than ever in 2017. I reported in the August issue of IOA News that Agricultural Sciences at UWA jumped ten places to 14th in the world in the Shanghai Jiao Tong Academic Ranking of World Universities (ARWU). I am pleased to see UWA's strong position in agriculture science is also reflected in the 2017 National Taiwan University Ranking (**http://nturanking.lis.ntu.edu.tw**) where our ranking for Agriculture Science improved to 25th in the world.

A sixth research theme for IOA has been formalised. Dr Andrew Guzzomi and Professor Dilusha Silva from the Faculty of Engineering and Mathematical Sciences and IOA will lead the Engineering Innovations for Food Production research theme. This theme brings together ag-engineering-related teaching and research across UWA, and allows us to respond efficiently to new challenges and opportunities as they arise. A recognisable and identifiable agricultural engineering theme presents extensive opportunities for collaboration between farmers and agricultural machinery manufacturers with IOA in order to undertake research and development (R&D) focused on bringing about commercial innovation.

Already, Dr Guzzomi and Prof Dilusha and their team have joined IOA at stakeholder engagement events such as the Dowerin Field Days in August (see page 10) and Southern Dirt's TECHSPO event in September (see page 13).

As part of the ongoing collaboration we recently hosted two North American academics, Professor Henry Nguyen from the University of Missouri (see cover page) and Professor Vara Prasad from Kansas State University (see cover page). Both visitors interacted with staff and students and delivered lectures.

Students studying agriculture and related areas at UWA at the undergraduate, Master and doctoral levels continue to perform at a high level, representing the university locally and internationally (see pages 3, 5, 7, 9, 11, 14 and 16). I recently visited Pakistan to identify potential PhD candidates in all disciplines from Pakistan to UWA in collaboration with Higher Education Commission and various universities. To date, nine PhD candidates from University of Agriculture Faisalabad have completed their studies in agriculture and related areas at UWA and returned home (see page 16). A further eight students are expected join UWA early next year.

UWA graduates, students, staff and the broader community were invited to vote in the 2017 Alumni Fund People's Choice Award and I'm pleased that the Old Farmhouse Learning Hub Upgrade secured the most votes. The project will improve the learning environment for students undertaking in-the-field work at UWA Farm Ridgefield in Pingelly. Enhanced learning aids will more effectively support students in analysing data in the field, accessing lectures on site, and undertaking report writing in the evenings.

Finally, I would like to sincerely thank UWA Executive, IOA's Industry Advisory Board, Theme Leaders, UWA Farm Ridgefield Committees, IOA members and staff for their dedication and support to IOA throughout 2017. Season's greetings and best wishes for the New Year to you and your family.

Master students from Argentina (8 in Agricultural Science; 2 in Biological Science) were welcomed to UWA by Tony O'Donnell (Pro Vice-Chancellor and Executive Dean of Science) and the Faculty of Science.

Master of Agricultural Science students visit UWA Farm Ridgefield

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Enrolments in the Master of Agricultural Science at UWA continue to grow and we welcomed 25 new students in semester 2, 2017. These students originate from eight countries.

Seven of the eight students from Argentina hold Bec.ar Scholarships. The Bec.ar program invests in overseas training of Argentine professionals in science and technology of strategic relevance for future innovation and sustainable development in Argentina.

Dr Clare Mouat is the School of Agriculture and Environment's Masters Student Engagement Coordinator. She organised a visit to UWA Farm Ridgefield in September as part of her role to broaden the learning and community experience of our students. This was the first opportunity for many of the new students to travel beyond the Perth metropolitan area to experience rural WA.

The farm visit enabled staff and students to interact in the field. Participants viewed and discussed annual pastures, alternative perennial forages, calm animal handling techniques with merino sheep, and energy requirements of ewes with suckling lambs.

Student Guido Ramirez Caceres is interested in grain legumes and how to maximise their use as break crops thus reducing growers' dependence on nitrogen fertilisers. He said what caught his attention at Ridgefield was the diversity of pasture species.

"WA growers have such diversity in their toolbox to set up long-term rotations which can increase productivity and profit without compromising soil quality," Guido said.

The 25 new students this Semester add to the 29 students who commenced in semester 1, 2017. The strong student numbers mean that a larger number of students will undertake projects in 2018 – research and training of significance for agricultural industries in Australia and globally.

Water in the critical zone at UWA Farm Ridgefield

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As part of her world tour with the Darcy Lecture Series in Groundwater Science, Professor Kamini Singha, Associate Director of the Hydrologic Science and Engineering Program at the Colorado School of Mines, USA, visited UWA in August 2017.

Professor Singha presented a fascinating talk - 'The Critical Role of Trees in Critical Zone Science: An Exploration of Water Fluxes in the Earth's Permeable Skin' - a topic that is highly relevant in Australian ecosystems and its various land uses.

During her visit, Dr Matthias Leopold from the School of Agriculture and Environment and IOA and Dr Sarah Bourke from the School of Earth Sciences organised a field trip to the Avon River Critical Zone Observatory (AR-CZO), based on UWA Farm Ridgefield near Pingelly. The AR-CZO serves as a platform for national and international collaboration in the space of ancient soils and modern land use is part of the international critical zone exploration network (CZEN).

Interesting discussions around water use, water residence time in ancient sediment storages and nutrient depletion in soils as part of a modern agricultural land use system were held. Ms Rachel Hamilton and colleagues from Rockwater, a hydrogeological and environmental consulting firm joined the visit and provided additional valuable information from a groundwater industry perspective.

Professor Singha's visit was inspirational and showed once more the great potential for targeting cross-disciplinary questions within the critical zone science framework. Collaborative projects are currently being developed.

Matthias Leopold, Paul Drake, Sarah Bourke and Kamini Singha discussing the influence of the ancient weathering profile in front of a laterite outcrop at the AR-CZO.

ADOPT: forecasts and better understanding of adoption of agricultural innovations

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There is ongoing and potentially increasing demand for forecasts and better understanding of adoption of agricultural innovations.

The idea for the Adoption and Diffusion Outcome Prediction Tool (ADOPT) was born in 2007 when the CRC Future Farm Industries, encouraged by Dr Mike Ewing, made it clear that they wanted adoptability to be central to their R,D &E planning.

A multidisciplinary team of researchers including Prof David Pannell, Adjunct Prof Rick Llewellyn, CSIRO and Dr Roger Wilkinson (Vic DPI) realised that despite a large body of literature and well-developed understanding of adoption and diffusion, there was no tool readily available to help agricultural R,D&E practitioners apply all of this understanding to future innovations.

They also realised that to distil the mass of multidisciplinary approaches to adoption decision making into a simple-to-use quantitative tool would take a brave effort and this may be the only chance to find a funding organisation prepared to take the risk.

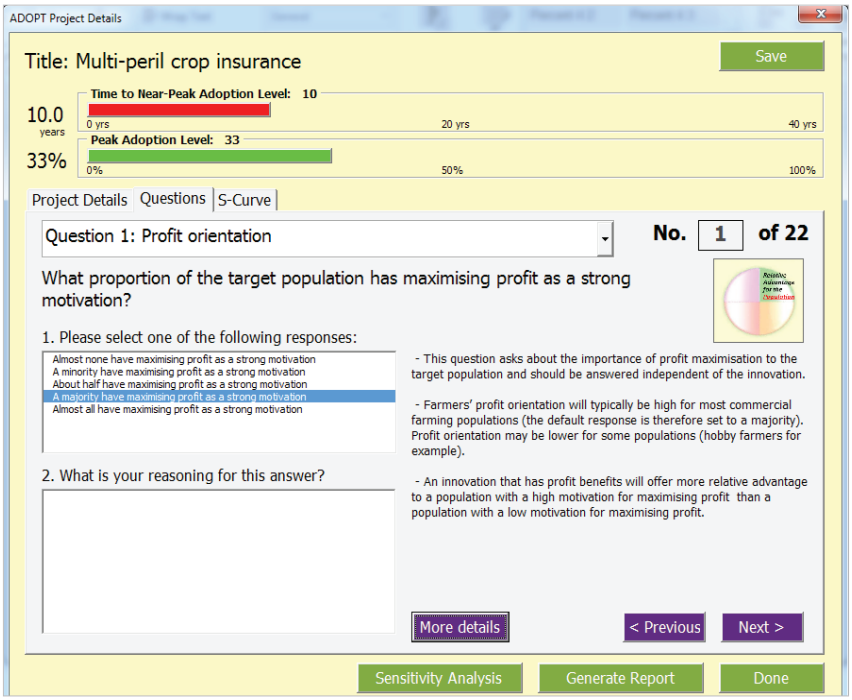
ADOPT is the result of such an attempt, providing predictions of a practice's likely rate and peak level of adoption as well as estimating the importance of various factors influencing adoption. It employs a conceptual framework that incorporates a range of variables, including variables related to economics, risk, environmental outcomes, farmer networks, characteristics of the farm and the farmer, and the ease and convenience of the new practice.

Users of ADOPT respond to 22 questions related to: a) characteristics of the practice that influence its relative advantage, b) characteristics of the population influencing their perceptions of the relative advantage of the practice, c) characteristics of the practice influencing the ease and speed of learning about it, and d) characteristics of the potential adopters that influence their ability to learn about the practice.

ADOPT provides a prediction of the diffusion curve of the practice and sensitivity analyses of the factors influencing the speed and peak level of adoption. The tool is also designed to increase the conceptual understanding and consideration of the adoption process by those involved in agricultural research, development, extension and policy.

Since its release ADOPT has reached over 1200 registered users across multiple industries and in smallholder farming contexts. Demand has come from the individual local project team level up to use by corporations investing in research and development investment, including those seeking to make more informed research development and extension investment decisions; developing delivery strategies to maximise impact from innovations; conducting cost benefit analyses for R,D&E investment or; simply aiming to improve understanding of factors that may influence the impact of a new practice or technology.

The paper 'Predicting farmer uptake of new agricultural practices: A tool for research, extension and policy' was published in Agricultural Systems in September 2017 and has been in the top ten most downloaded papers with over 3200 downloads.



Breeding technology and capacity for future wheat improvement at UWA showcased

Over 70 scientists, breeders and industry representatives discuss wheat breeding opportunities. Credit: Karina Price.

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Over 70 scientists, breeders and industry representatives all with a key interest in wheat production came together on 9 November 2017 at UWA for a day of rapid fire presentations, facilities tours and brainstorming/networking sessions.

The event was hosted by The ARC Centre of Excellence in Plant Energy Biology (PEB) and involved research across the UWA Schools of Agriculture and Environment, Molecular Sciences, Biological Sciences and IOA. External visitors included representatives from DPIRD, GRDC, Australian Export Grains Innovation Centre (AEGIC), GIWA, AGT and InterGrain.

The day-long showcase included presentations highlighting UWA's root phenotyping capacity, wheat peptide/protein biomarker collection and molecular phenotyping approaches and a breeder led discussion on the challenges facing selection choices in the modern commercial breeding climate. GRDC and DPIRD representatives also spoke on the new opportunities for engagement of UWA researchers with their organisations.

Attendees toured UWA's cutting edge research facilities including the UWA Plant Growth Facilities, the Centre for Microscopy, Characterisation and Analysis and PEB's molecular and mass spectrometry research laboratories.

For the final activity, small groups with diverse members representing UWA, government and commercial attendees were challenged to develop novel approaches to address a key industry need. These groups then reported back to the larger group, which stimulated a large amount of conversation and questions. The success of the day was highlighted by the keen interest in future follow-up events that are now being planned for 2018.

Inaugural Calenup research scholarship

PhD Candidate Daniel Kidd from the UWA School of Agriculture and Environment and IOA is the inaugural recipient of the Calenup postgraduate research scholarship.

Daniel is investigating soil and climatic constraints to pasture production in southern Australia. He will focus on serradella (*Ornithopus*) germplasm as previous work has showed this species to be far more phosphorus (P) efficient than subterranean clover and therefore requires less P application to reach maximum yield. This could represent a substantial saving in the fertiliser budget for growers but we first need to investigate if we can improve the adaptive range of this species.

Daniel will also explore tolerance among *serradella* cultivars to high manganese and aluminium, both individually (in hydroponics) and in combination (soil from the field in the glasshouse).

"Serradellas are generally known for being aluminium tolerant but are regarded as sensitive to manganese, however there is little information on any cultivar differences that may exist," Daniel said.

"A field experiment to validate the detailed results gained from the hydroponics and glasshouse work would be extremely valuable and the Calenup Research Fund has enabled me to do one."

Daniel will conduct the field work at the Merredin Research facility run by DPIRD using specific paddocks which are high in aluminium. These paddocks have limed and unlimed sections making it easy to compare the effects of aluminium and low pH on the target species.

PhD Candidate Daniel Kidd receives the Calenup Research Scholarship from Dr Irwin Barratt-Leonard.

This research will provide a greater understanding of the tolerance range of *Ornithopus* species to the edaphic and climatic conditions encountered in WA ley and permanent pasture systems.

He is supervised by Assoc/Prof Megan Ryan, Prof Tim Colmer and Dr Richard Simpson (CSIRO) and the research is funded by the Rural and Regional Development for Profit (RRD4P) project, MLA and AWI.

Flooding tolerance of the pasture legume messina

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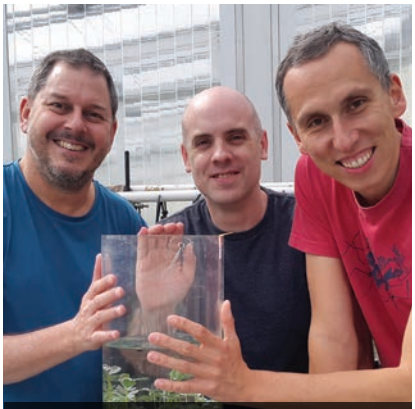
Dr Gustavo Striker from the University of Buenos Aires, Argentina recently visited UWA for collaborative research on submergence tolerance of the new forage legume 'messina' *(Melilotus siculus)*, supported by an AW Howard Memorial Trust Grant In-aid. Dr Striker is an Adjunct Senior Lecturer at UWA and he has several joint journal papers with UWA staff, from earlier visits in both directions.

Messina is a new annual pasture legume for saline and waterlogging prone soils, developed by Dr Phil Nichols, DPIRD and collaborators at SARDI, with the first variety released this year. Tolerance mechanisms enabling messina to thrive in waterlogged conditions had been studied previously at UWA, but tolerance of complete submergence had only been considered in one small study. Dr Striker's visit enabled 15 diverse accessions of messina to be evaluated for submergence tolerance.

Growth and physiological responses of messina when completely submerged, partially submerged, waterlogged, or in control conditions, were tested in a large glasshouse experiment at UWA. Understanding submergence tolerance will provide information on the potential risk to young messina stands of short-term overland floods in low-lying valley floors, as well as provide additional basic knowledge of the interesting physiology of this annual pasture legume species.

Dr Striker said their observations are that messina can tolerate short-term submergence, although genotypes differ particularly in their recovery growth post-submergence.



Tim Colmer, Gustavo Striker and Lukasz Kotula (left-to-right in photo) showing one of the many submergence tanks containing messina plants v used in the experiment.

In addition to his dedicated work on the messina experiment, Dr Striker delivered a seminar on rhodes grass and met the new cohort of students from Argentina in the Master of Agricultural Science. His visit builds further on the UWA-UBA links which were formalised via a MoU in 2016.

International Symposium on Crop Roots and Rhizosphere Interactions

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The International Symposium on Crop Roots and Rhizosphere Interactions was successfully held in Yangling, the birthplace Chinese agriculture from 9–13 October 2017.

Co-organised by Northwest A&F University (NWAFU) and UWA, the conference brought together over 200 researchers including some world-leading root researchers from Australia, China, Germany, Morocco and US, plus some 100 postgraduate students from NWAFU. Dr Yinglong Chen from IOA and the UWA School of Agriculture and Environment was the symposium convenor and made great efforts in organising this joint symposium.

The aim of this symposium was to provide a platform for debating key issues and strategies relevant to yield and stability of crops under environmental stresses by enhancing our understanding of root architecture, physiology, rhizosphere interactions, and their functions.

Six themes were discussed at the symposium: Crop root traits and functions, Crop root responses to environment stresses, Rhizosphere microbes, Novel methods and technologies in root study, Root models and simulations, and Applications in crop breeding programs.

IOA director Hackett Prof Kadambot Siddique served as the Executive Co-chair together with Professor Pute Wu, Vice President of NWAFU. Professors Hans Lambers, Neil Turner and Jairo Palta from IOA presented their research giving UWA excellent exposure and publicity during this event.

In total, there were 20 keynote speeches, 14 invited presentations, 16 talks at Youth Forum, and 27 posters. Selected papers from the workshop will be published in a special issues of an international journal.

Brenton monitors wheat plots to determine how different wheat varieties respond to frost.

Research to unlock the mystery of frost impact on wheat

PhD Candidate Mr Brenton Leske from UWA's School of Agriculture and Environment and IOA is one of the inaugural recipients of DPIRD's Grains Research Scholarships, intended to boost the productivity and competitiveness of the WA grains industry.

His research seeks to better understand how different wheat varieties respond to frost to help the development of more robust, higher yielding varieties, less susceptible to frost in the future.

The research builds on his involvement in research projects undertaken by DPIRD, supported by the GRDC, which examined the impact of frost on the yield components of different varieties.

Brenton said while previous studies had established relationships between frost and yield responses, from which varietal frost rankings have been developed, relatively little was known about which physiological responses to frost influence grain yield.

"The underlying reasons for why one variety is more sensitive to grain loss under frost than another is not well understood," he said.

"I aim to identify mechanisms that contribute to wheat plants being more susceptible or tolerant to frost damage." Fifteen wheat varieties have been sown at the frost prone Dale nursery, selected out of a group of 70 from a previous DPIRD trial Brenton was involved in.

The trial had eight sowing dates from 15 April to 22 June, to ensure the varieties, with a range of maturities, flower across the window from July to September when frost events are likely.

An additional population of 173 lines developed from a cross between Calingiri and Wyalkatchem is also being evaluated, due to the differences in frost sensitivity of the parents.

This population will help validate past research which identified genetic regions affecting frost susceptibility, particularly loss of grain numbers.

Plants are being monitored to examine the correlation between frost and a range of yield traits, including biomass, grain size, grain number and yield.

Brenton said a particular focus of his research would be on the interrelationship between plant sugar levels and frost susceptibility.

"I'm interested in how frost damage affects the wheat's photosynthetic capacity to convert light and water into sugar, biomass and finally yield," he said.

"There has been an assumption amongst growers that higher sugar concentrations lower the freezing point of sap. Preliminary results from a colleague's trial last year showed this to have a negligible effect.

"Part of the project is to assess the sugar content in different varieties and to examine the correlation between tissue sugar contents and frost induced sterility."

Another key area of the project is an evaluation of the presence or absence of selected hormones such as abscisic acid (ABA), which relates to plant stress.

"ABA regulates the closure of leaf stomates, used for transpiration, which could have implications for how wheat responds to frost. I expect ABA regulation to be different amongst varieties and there might be implications for frost damage and recovery processes."

From left to right: The team of experts working together on the worm research project include Shimin Liu (UWA), Junhua Liu (China), UWA Erwin Paz Munoz (Chile), Umar (Pakistan), Shamshad Ul Hassan (Pakistan), Johan Greeff (DPIRD), Xiaoxia Li (China) and Qirui Hou (China).

Global experts come together on worm research in sheep

Adjunct Assoc/Prof Shimin Liu and DPIRD researcher Dr Johan Greeff are leading an international team of experts in research to minimise the impact of worm infections on sheep.

The multidisciplinary research team brings together geneticists, parasitologists, nutritionists, immunologists and microbiologists from UWA, Curtin University, La Trobe University, and at Chinese universities the Northwest Agriculture and Forest University and Nanjing Agricultural University.

They are investigating the role of genetics, nutrition, parasites, the immune system and gut microbes in resistance to intestinal worms, and in the causes of diarrhoea in sheep using the renowned Rylington Merino worm resistant flock.

Dr Greeff said the aim of the research was to improve the productivity and welfare of Australia's sheep flocks.

"Worm infection is the single biggest threat to grazing sheep and goat production systems worldwide," Dr Greeff said.

"Apart from production losses due to high worm numbers, it also causes diarrhoea which is a major factor for breech strike in Australia.

"However, selecting sheep for increased worm resistance can also result in an increase in diarrhoea indicating resistant animals can become hypersensitive to worm larvae."

Dr Greeff said the research focussed on understanding the biology between worm resistance, high worm burden diarrhoea and hypersensitivity diarrhoea in sheep.

"The first phase of the work has been completed, with relevant measurements and tissue samples collected which are being analysed by the research team," Dr Greeff said.

Prof Graeme Martin from the UWA School of Agriculture and Environment and IOA said the implications of this work travel well beyond the Australian and global sheep industries, because drench resistance and diarrhoea are international problems in small ruminants.

"International collaborators and research students are therefore attracted to join this excellent project run by DPIRDthe department," Professor Martin said.

The research was carried out on the Australian Wool Innovation breech strike flock.

UWA joins CRC-P for developing Northern Australia

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UWA researchers will join collaborators from the Northern Australia Crop Research Alliance (NACRA) in a three-year, $3 million federally funded research project to develop cropping systems for cotton, grain and forage.

Informed by knowledge of international market requirements and driven by agricultural cropping industry players, NACRA identified that in order to meet market demand for food and fibre crops in the future, three specific areas of crop R&D must be targeted: crop genetics, agronomy, and cropping system requirements.

The UWA team, led by Dr Janine Croser from the Centre for Plant Genetics and Breeding (PGB) and IOA will focus on the crop genetics component of the project.

"We will develop innovative pre-breeding tools for rapid genetic improvement of crops such as chia and quinoa for the northern agricultural regions," Dr Croser said.

"This research builds on earlier research at PGB with The Chia Company."

A PhD student will work with Dr Croser's team on the project when they commence their studies at UWA next year.

Dr Janine Croser will lead the UWA team in the cropping genetics component of the project.

17th International Student Summit

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Undergraduate Agriculture Science student Mr Joshua Clune recently represented UWA at the 17th International Student Summit in Taichung, Taiwan.

Joshua Clune presents on the role students have on communities of practise and agricultural sustainability.

The conference theme explored 'Students Taking Action to Address Inequality through Greater Access to Resources and Knowledge in Order to Promote Sustainable Agriculture'.

Joshua is a second-year student from Geraldton who is completing his Bachelor of Science, with a double major in Agriculture Science and Genetics. His presentation 'Communities of Practise and Agricultural Sustainability: The Role of Students', examined how students can work alongside Grower Groups for the benefit of students and growers.

The 2017 International Student Summit was hosted by Taiwan's National Chung Hsing University and gave undergraduate students from 24 countries a unique opportunity to meet and present ideas on how they can contribute to the development of sustainable agriculture through activities related to promoting education, food security, agriculture and environment.

Students also have the opportunity to learn more about the agriculture and culture in the host country by participating in field trips to local farms and places of interests.

The summit was initiated 17 years ago by Tokyo Agricultural University to promote and foster student leadership in agriculture and environmental sciences. The Japanese University sponsored Joshua's travel to Taiwan. Last year, students Ming Fung Chua and Lachlan Hunter represented UWA at the summit in Tokyo.

Next year's summit will be held in Tokyo, and once again two UWA student will be given the opportunity to present and attend. The theme of the 2018 conference is 'Students Taking Actions to Increase Youth Involvement in Sustainable Agriculture and Close the Gap between Actors in the Food System'.

For more information about this opportunity, please contact Dr Louise Barton.

Technology the focus at Dowerin Field Days

Technology was the focus of IOA's display at this year's Dowerin Field Days in August, where staff and students once again joined in the DPIRD exhibition.

Co-leader of IOA's Engineering Innovations for Food Production research theme Dr Andrew Guzzomi from the School of Mechanical and Chemical Engineering attended the field days to interact with attendees about his research and UWA's plans to launch a Master of Agricultural Engineering.

UWA PhD candidate Candy Taylor is in her third year and spoke to attendees about her research on lupins. Candy is working on the genetic control for flowering time and pod shattering in narrow-leafed lupins. There is currently minimal diversity for flowering time in lupins in Australian varieties. If flowering time diversity was increased, yield potential could be increased in a wider number of environments. Candy is also mapping where in the genome the two loci selected to reduce pod shattering in Australian varieties. Candy detailed her research to the Hon Alannah MacTiernan, Minister for Regional Development, Agriculture and Food and Field Day attendees.

UWA Honours Student Andrew Henson also took the opportunity to recruit farmers to participate in his study on understanding the willingness of farmers to pay for a range of grower group services.

This year, Schools Partnership Coordinator Sasha Peppinck, from UWA's Aspire program joined IOA's display. Sasha spoke to potential students from schools and Agricultural Colleges in the region about studying at UWA, the courses available and pathways to get there.

Candy Taylor shares her research findings with Minister MacTiernan.

UWA acknowledges Noongar Elders on Gnaala Karla Boodja

Noongar families joined staff and students from UWA in an Acknowledgement of Gnaala Karla Boodja ceremony followed by lunch hosted at UWA Farm Ridgefield on Saturday.

UWA Farm Ridgefield, a 1600 hectare farm near Pingelly, is located on Gnaala Karla Boodja with Noongar people tracing their connections back 45,000 years.

Noongar Elders Merv Abraham and Gary Bennell performed the Welcome to Country at the Old Farmhouse in front of a group of 30 people including their family members, the Pingelly community and UWA staff and students.

UWA Deputy Vice-Chancellor (Community and Engagement) Professor Kent Anderson unveiled a sign acknowledging that UWA Farm Ridgefield is situated on Gnaala Karla Boodja, and that the Noongar people remain the spiritual and cultural custodians of the land, and continue to practise their values, languages, beliefs and knowledge.

Adjunct Senior Lecturer Dr Susan Bailey from IOA who organised the event alongside the Elders has worked steadily over the past five years to build relationships and trust through a community development process.

"This Acknowledgement is an important foundation for UWA's commitment to understanding and working alongside Noongar people," Dr Bailey said.

"This includes challenging non-Indigenous people to recognise Indigenous knowledge, culture and values."

Community development is an important part of UWA's vision to imagine the best-practice farm of 2050, and build and manage it now. Vibrant rural communities are essential component of sustainable agriculture.

L to R: Kent Anderson, Sue Bailey, Gary Bennell, Merv Abraham, Gloria Bennell, Khianna Bennell and Shaneall Bennell.

Professor Harvey Millar named WA Scientist of the Year

Professor Harvey Millar, Director of the ARC Centre of Excellence in Plant Energy Biology and a Professor at UWA's School of Molecular Sciences has been named Western Australia's Scientist of the Year. The announcement was made by Premier Mark McGowan at the WA Premier's Science Awards ceremony in August.

Professor Millar is a plant protein biochemist, whose focus is on the function of proteins that enhance the energy efficiency of plants in harsh environments.

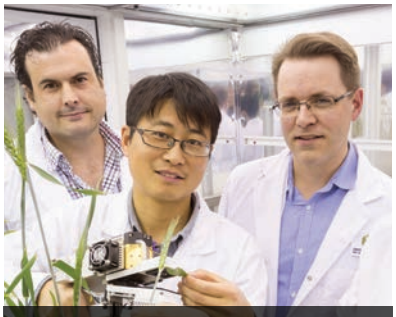
"I work on proteins in plants. Why proteins? Because it is the little things that make big things grow. Our future bio-economy will see the use of plants, not just as food, but as sustainable resources for new industries," Professor Millar said.

He said his team has made progress, built the know-how and built the collaborations to engineer energy efficient plants for the future.

"This is something that we are really dedicated to and the opportunities that this will raise for us in the future," Professor Millar said.

"I hope there is a desire in Western Australia to engage in the science because of what it can achieve for the future."

In an unprecedented decision, two WA scientists were named 2017 Scientist of the Year. Professor Millar was named a joint winner alongside Professor Christobel Saunders, head of UWA's School of Surgery.



WA Scientist of the Year, Prof Harvey Millar (far right) together with members of his research team who are improving plant energy efficiency. Credit: James Campbell.

Premier Mark McGowan said of the winners, "Professors Millar and Saunders both embody the very best of Western Australian aptitude and innovation, and have national leadership roles in their respective fields of plant science, and cancer research and treatment."

Genomics studies combat water stress in wheat

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PhD candidate Md Sultan Mia from the UWA School of Agriculture and Environment and IOA is investigating the effect of water stress in bread wheat using genetic and genomics tool to identify candidate genes and proteins in the tolerant genotypes.

Global wheat production is often hampered by several biotic and abiotic stresses like heat, drought, salinity and diseases. Among those stresses, drought is by far the most detrimental limiting the yield potential of a crop.

Effect of drought can be evident in various degrees during different growth periods of wheat including early establishment period, pre-anthesis periodvegetative stage, and as well as post-anthesis periods. Understanding the underlying mechanism of tolerance and identifying candidate genes and proteins will help to breed stress-resilient genotypes.

As part of his PhD studies, Sultan investigated wheat genotypes previously reported to have varying degree of drought tolerance, and determined their comparative performances and nature of gene action under post-anthesis water stress.

He has subsequently developed Near isogenic lines (NILs) targeting the drought tolerance related QTL from those genotypes following molecular marker assisted heterogenous inbreed family lines method coupled with embryo culture based on a fast generation cycling technique.

Next generation transcriptome sequencing and proteomic analyses of those NILs will help to identify candidate genes and proteins responsible for tolerance in those genotypes.

Sultan's research is supervised by Prof Guijun Yan and Dr Helen Liu with support from Ms Xingyi Wang and Ms Pratima Gurung.

Sultan takes physiological measurements under post-anthesis water stress treatment in bread wheat.

Myanmar Scientists visit Perth to develop Pulse Strategy

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As part of an ACIAR-funded initiative to assist the Myanmar government to write their Pulses Sector Development Strategy, a group from Oil Seed Crops and Food Legumes Division, Department of Agricultural Research Myanmar (DAR) — Dr Tun Shwe, Dr Mar Mar Win and Dr Tin Maung Aye — visited UWA in September.

Adjunct Senior Lecturer Elizabeth Petersen, Advanced Choice Economics, is leading the initiative and organised the trip. Myanmar national, Ms Khin Lay Kyu who will commence her PhD studies on completion of language training joined the delegation which visited the facilities for pulse research at UWA with Prof William Erskine.

Pulses production (chickpea, mung bean and pigeon pea, cowpea and other pulses) in Myanmar has grown at an incredible pace since the country liberalised economic policies in 1988. In 2016, pulses production was 6.4 million tonnes. Myanmar is an important global exporter of pulses, making up approximately 12 per cent of total global exports of pulses by volume, and 19 per cent by value. Pulses are their largest exported agricultural commodity and make up a significant component of domestic consumption both in terms of human consumption and animal feed.

As pulses are an important contributor to national accounts, smallholder livelihoods and national nutrition, the Government of Myanmar has developing this Myanmar Pulses Sector Development Strategy to ensure the orderly modernisation of the sector with maximised and equitable benefits.

The vision of the Strategy is an inclusive, regionally and globally competitive, sustainable and adaptable sector contributing to the socio-economic well-being of all members of the pulses supply chain contributing to development of Myanmar's national economy.

L to R Dr Liz Petersen, Dr Tun Shwe, Dr Mar Mar Win, Prof Willie Erskine, Dr Tin Maung Aye and Ms Khin Lay Kyu.

Engineering innovations for food production on show in Katanning

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UWA's engineering innovations for food production were on show at Techspo, a technology expo held in Katanning in September. The expo, organised by the Southern Dirt grower group (southerndirt.com.au), focused on Dirt, Data and Droids, and included informational booths, conference talks, and machinery exhibitions.

UWA was well represented by IOA members and students from Faculty of Engineering and Mathematical Sciences and Faculty of Science.

Professor Lorenzo Faraone from the School of Electrical, Electronic and Computer Engineering and IOA presented his research on field-portable sensors for farming in the 21st century at the conference. Professor Faraone and his team are working on the on-farm application of near-infrared (NIR) and short-wave-infrared (SWIR) spectroscopic instruments by making them cheaper, smaller, lighter, use less power and more mechanically robust than similar instruments currently available. Agricultural applications of such sensors are numerous and will include soil analysis, fruit/produce analysis, environmental monitoring, food authentication, assessment of plant water-stress, biomass quantification and many more.

Dr Joel Kelso from the School of Computer Science and Software Engineering detailed the Australis wildfire simulation system, software which will enable users to predict the spread of all large wildfires in Western Australia. By entering the current fire location along with the current and forecasted fire ground weather the system automatically calculates fire spread using algorithms that account for fuel load, type, wind

Reigniting collaborations to improve lamb survival

Assoc/Prof Dominique Blache
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Dr Raymond Nowak back in WA to re-establish collaboration on lamb survival.

Dr Sabine Schmoelzl from CSIRO Armidale Chiswick, NSW and Dr Raymond Nowak from the Institut Nationale de la Recherche Agronomique (INRA) Tours, France visited UWA's Animal production group this October.

Their visit, which was sponsored by INRA CSIRO linkage grant, was part of a series of visits to establish collaborations on lamb survival and its underlying causes with leading research and teaching institutions around Australia.

Current research around the thermoregulation of the young, the strength of the mother-young bond and the development of the lambs was discussed with Professor Shane Maloney and Dr Nathanaël Yates from the School of Human Sciences and IOA, and Dr Dominique Blache from the UWA School of Agriculture and Environment and IOA. The development of new approaches and new technologies to investigate the long term standing issues surrounding lamb survival was also discussed.

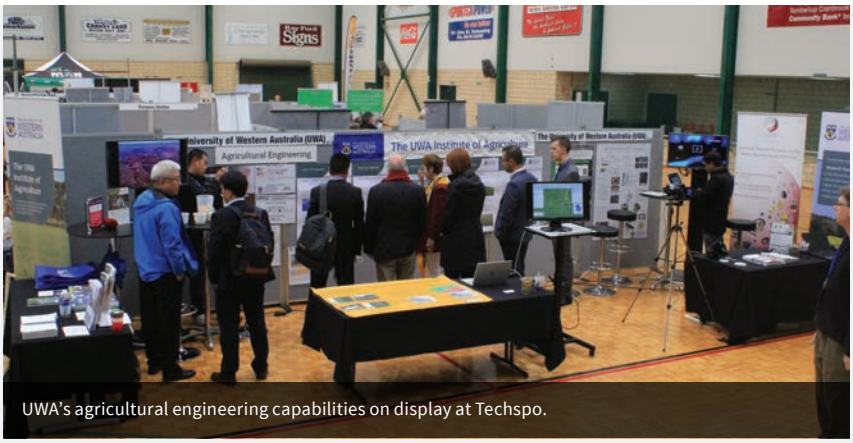
Prof Graeme Martin described the UWA Farm Ridgefield's model to the visitors who were especially interested in how the farm engages with the large consortium of farms known as the Global Farm Platform under the World University Network (WUN).

Prof Phil Vercoe discussed the use of Australian native shrubs in our grazing systems and the role they play in filling the autumn feed gap and providing valuable nutrients, minerals and plant secondary compounds, which we know have antimicrobial and anthelmintic properties. In particular, they discussed grazing behavioural aspects of the system and the possible mechanisms behind the anecdotal evidence that the shrubs improve lamb survival.

Assoc/ Prof Blache said having Dr Nowak back at UWA was a good reminder of the productive collaboration they started four years ago. "It was also very exciting to discuss new innovative approaches to further explore the physiological basis of lamb survival with Dr Schmoelzl," Assoc/ Prof Blache said.

direction, speed and slope and rapidly generated maps. The software will be incredibly useful for rural communities, in particular rural firefighters, providing up-to-date local information.

Dr Andrew Guzzomi from the School of Mechanical and Chemical Engineering and IOA discussed how global food production will become increasingly dependent on advances in engineering. Dr Guzzomi also discussed the significant challenges around efficiently restoring vast areas of degraded land resulting from agriculture, mining and desertification and introduced



UWA's agricultural engineering capabilities on display at Techspo.

the audience to the Seed Flamer, an innovative solution to increasing seed germination.

Also representing UWA at the event were postdoctoral fellow Dr Carlo Peressini, PhD Candidate Monte Masarei, research assistant Elvin Teo, Future Farm 2050 Project Leader Professor Graeme Martin, Future Farm 2050 Project Officer, Mrs Debra Mullan, and IOA Communications Officer Diana Boykett.

Agricultural masters student awarded travel scholarship

Assoc/Prof Frances Hoyle
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Master's student Anna Timmins from the UWA School of Agriculture and Environment was awarded a 2017 Agribusiness Connect International Travel Scholarship.

Funding for the scholarship comes from the State Government's Science and Agribusiness Connect initiative, through the Government of Western Australia's Royalties for Regions program.

Anna will travel to Canada to work with Professor Miranda Hart from the University of British Columbia on soil microbial diversity using targeted molecular techniques.

During the two week trip, Anna will learn techniques to identify soil fungi using DNA analysis. She will also get the opportunity to learn how to determine the correct primers for analysis of specific groups of fungi associated with nutrient acquisition.

Anna will use her new found knowledge of these methods to assist with her Master of Agriculture Science research, which focuses on discerning the biological, physical and chemical changes to soil properties and function associated with agriculturally inverted soils on the Esperance sandplain in WA. Supported by SoilsWest, Anna will be working with David Hall and Tom Edwards from DPIRD to assess a range of strategies targeting the management of non-wetting soils at the Esperance Downs research station.

Anna said significant yield increases due to soil profile inversion have been measured at the site however the fate of the organic topsoil in terms of carbon dynamics, nutrients and microbiology have not yet been investigated.
"The molecular DNA techniques I learn in Canada will assist in determining potential contributions to nutrient supply from particular groups or organisms," Anna said.

"Ultimately this work will contribute to the grower being able to make more informed decisions on soil management techniques based on their impact on soil properties relevant to grain production."
Anna is excited about the opportunity to work with DPIRD and UWA and plans to present some of her findings to growers and scientists at a regional seminar in Esperance next year.

Anna Timmins with David Hall doing root assessments in the field.

New MOOC on best practice farming for 2050

IOA has launched a new Massive Open Online Course (MOOC), on discovering best practice farming for a sustainable 2050.

The MOOC, Discover Best Practice Farming for a Sustainable 2050, uses the foundations of UWA's Future Farm 2050 Project to introduce online students to sustainable agriculture and the many different disciplines needed to tackle the issue of feeding and clothing the world while maintaining the natural resource base.

Future Farm 2050 Project Leader Prof Graeme Martin from UWA's School of Agriculture and Environment and IOA said the seven-week course is based on a clear vision: to imagine best practice farming for 2050, and start to implement these strategies now, while making sure it will still be profitable.

"At UWA, we're doing just that with the Future Farm 2050 Project, set on a mixed-enterprise farm in Pingelly, Western Australia, and we want share and learn how others do the same in their part of the world," Prof Martin said.

"Although this course is based on agriculture, it's not only about farming. It is a multidisciplinary course that addresses a wide range of issues confronting the industry, including rural communities, rural infrastructure and conservation of biodiversity in agriculture."

By completing this course, participants will understand that feeding and clothing humanity requires a multi-pronged approach and will be able to explain best

practices of sustainable farming and apply them in new contexts.

UWA's Deputy Vice-Chancellor, Community and Engagement, Prof Kent Anderson, who officially launched the MOOC at UWA's Centre for Education Futures in October, said in this digital age, the way we are learning is changing and online education is critical for universities.

"We no longer need to be seated in the same lecture theatre to learn and connect with passionate, like-minded individuals," Prof Anderson said.

"The MOOC allows unlimited participation and open access via the web to connect with and educate individuals all around the world whilst also raising the international profile of UWA."

The MOOC is scheduled to run every four weeks. To sign up to the course or more information, visit **coursera.org/learn/best-practice-farming-sustainable-2050**.

Debra Mullan and Graeme Martin launch MOOC.

Dr Monika Murcha has identified specific gatekeepers involved in regulating energy production.

Plant biologist wins 2017 Young Tall Poppy Award

Plant biologist Dr Monika Murcha, a Future Fellow at the ARC Centre of Excellence in Plant Energy Biology has been recognised as WA's brightest emerging scientist at this year's Young Tall Poppy Science Awards.

Dr Murcha's research is driven by the need to increase global food production for a rising population. She is focused on developing super-efficient plants that can thrive with limited fertiliser and survive changing environments.

"By starting at the source of energy within a cell, the mitochondria, we can control the plant's energy source," she said.

Dr Murcha has identified specific gatekeepers that can regulate the rate at which the mitochondria take in protein and regulate energy production.

"I'm now trying to find the master regulators of these gatekeepers; factors that regulate mitochondrial activity and energy production," she said.

"By identifying these specific regulators in mitochondria, we hope to modify mitochondrial energy production which will change plant growth and development, leading to bigger biomass, higher seed yields and increasing germination rates."

The Tall Poppy awards are run by the Australian Institute of Policy and Science and recognise up-and-coming scientists who combine world-class research with a passionate commitment to communicating science. Many Young Tall Poppies go on to achieve even greater things and become inspiring leaders in their field.

Displaying a keen enthusiasm for science outreach, Dr Murcha has given practical demonstrations to school students during National Science Week, including using the virtual plant cell 360 virtual reality experience.

She has also been helping promote women in STEM and particularly encouraging women to continue their careers following maternity leave through networks such as Athena SWAN and Women in Science.

L to R: Muhammad Rafay Muzamil, Muhammad Shoaib Khan, Umair Hassan Khan, Wassem Abbas, Tamsal Murtza, Muhammad Azam Khan and Shamshad Ul Hassan.

Pakistani PhD scholars join UWA Agriculture

The University of Agriculture Faisalabad (UAF) is one of Pakistan's leading universities. UWA signed a Memorandum of Understanding with UAF in 2008 and announced a number of joint PhD scholarships for outstanding students from UAF to undertake their PhD studies at UWA.

To date, nine students from UAF have completed their PhD program in agriculture and related areas (including one in English Literature) and returned to Pakistan. The MOU was extended for a further five years in 2015, and since then an additional seven students have joined UWA for their PhD program with eight more expected to join in 2017-18.

Students Umair Hassan Khan, Shamshad Ul Hassan, and Muhammad Shoaib Khan are in their first year of PhD studies in the School of Agriculture and Environment and supervised by Profs Phil Vercoe and Graeme Martin. Umair is researching the rumen epithelium for sheep in a project that will help reduce feed cost, improve the health and reproductive status of sheep.

Shamshad's research focuses on molecular and cellular components of the sheep's immune system. The Australian sheep industry faces huge economic losses annually due to gastrointestinal worms. These worms not only emaciate the animal but cause scouring which soils the wool and leads to decreased production. His research will help select those animals that naturally resist parasite infection.

Shoaib's research aims to reduce methane emissions from livestock, one of the big contributors of greenhouse gas emissions. In particular, he is studying the role of essential oil compounds in methanogenesis.

Muhammad Azam Khan and Waseem Abbas are researching was to control disease and pests in the grains industry. Azam aims to understand the genes responsible for resistance against the fungal pathogen *Sclerotinia sclerotiorum* in canola, a disease that causes over $10 million losses per annum in Australia. He is supervised by Prof Martin Barbetti, Prof Wallace Cowling and Dr Mingpei You.

Waseem is using respiration physiology to improve the control of stored grain pests. Altering the air mixture can render the atmosphere unfit for pests thus reducing post-harvest grain damage. He is supervised by Assoc/Prof Theo Evans and Prof Philip Withers.

Second year PhD candidate Muhammad Rafay Muzamil is investigating the politics of climate change adaptation and its implications for rural livelihoods in Khyber-Pakhtunkhwa province of Pakistan. He is supervised by Professor Petra Tschakert and Dr Bryan Boruff.

Tamsal Murtaza is working on white leaf spot disease, a significant foliar disease that can cause 30% losses in highly susceptible canola varieties in Australia. Under the supervision of Prof Martin Barbetti and Dr Mingpei You, Tamsal is also modeling the current and future climate effects of white leaf spot on canola.

Staff Awards and Industry Recognition

AWARDS AND INDUSTRY RECOGNITION

NAME	AWARD
Prof Stephen Powles	American Chemical Society International Award for Research in Agrochemicals
Hackett Prof Kadambot Siddique	Global Research Leadership in Agriculture Award, Indian Council of Food and Agriculture, India
Prof Harvey Millar	WA Scientist of the Year 2017
Prof Rajeev Varshney	Elected Fellow, American Association for Advancement of Sciences
Ms Candy Taylor	Farrer Memorial Travelling Scholarship, NSW Department of Primary Industries
Prof Tim Colmer	Australian Society of Plant Scientists JG Wood Lecture at ComBio2017
Mr Daniel Kidd	Calenup Postgraduate Research Scholarship
E/Prof Lyn Abbott	Soil Science Fellowship
Prof Wallace Cowling	Member of the Program Committee, IRC 2019 Berlin, Germany
Dr Monika Murcha	Tall Poppy Award

VISITORS TO IOA

NAME OF VISITOR	VISITOR'S ORGANISATION AND COUNTRY	HOST DETAILS	DATES OF VISIT
Prof Christian Zorb	Universität Hohenheim, Germany	Prof Tim Colmer	October 2017–March 2018
Prof Ole Pedersen	University of Copenhagen, Denmark	Prof Tim Colmer	13 November–8 December 2017
Prof Mikio Nakazono	Nagoya University, Japan	Prof Tim Colmer	27 November–5 December 2017
Prof Chisato Takenaka	Nagoya University, Japan	Prof Tim Colmer	27 and 28 November 2017
Prof Mitsutaka Taniguchi	Nagoya University, Japan	Prof Tim Colmer	29 November–1 December 2017
Dr Maryam Abbasi	Dept of Biology, Islamic Azad University, Iran	Hackett Prof Kadambot Siddique	1 Feb 2018–31 Jan 2019
Dr Tun Shwe, Dr Mar Mar Win and Dr Tin Maung Aye	Oil Seed Crops and Food Legumes Division, Department of Agricultural Research (DAR) Myanmar	Dr Elizabeth Petersen Prof William Erskine	21–23 September 2017
Dr David Herridge	University New England, Armidale, NSW	Prof William Erskine	6 October 2017
Dr Eric Huttner	Australian Centre for International Agriculture Research (ACIAR), Canberra	Prof Martin Barbetti, William Erskine	9 October 2017
Prof Kamini Singha	Colorado School of Mines, USA	Dr Matthias Leopold, Prof Petra Tschakert	August 2017
Dr Zhang Gengyun, Mr Yuan Guobao, Dr Zou Hongfeng, Ms Zhang Wenna	BGI Millet	Dr Ping Si, Prof Daniel Murphy Prof Petra Tschakert	16 October 2017

PhD STUDENTS

STUDENT NAME	TOPIC	SCHOOL	SUPERVISOR(S)	FUNDING BODY
Wilckyster Nyateko	Sustainability of Agricultural intensification practices among Maize-legume smallholders in Kenya	UWA School of Agriculture andEnvironment and IOA	Dr Amin Mugera, Dr Atekalty Hailu	Australia Awards
Duong Nguyen	Genetic analysis of salt tolerance in chickpea	UWA School of Agriculture and Environment and IOA	Prof Tim Colmer, Dr Lukasz Kotula, Dr Tim Sutton (SARDI)	UWA RTP (International)
Lu Lu	Genomics of wheat yield	UWA School of Agriculture and Environment and IOA	Prof Guijun Yan, Dr Helen Liu	RTP
Guannan Liu	Genomic markers for lupin production	UWA School of Agriculture and Environment and IOA	Prof Guijun Yan, Dr Helen Liu	Full fee paying
Hue Vuong	Food Safety in Vietnam	UWA School of Agriculture and Environment and IOA		
Edi Wiraguna Dalimin	Combined salinity and waterlogging tolerance in grasspea	UWA School of Agriculture and Environment and IOA	Prof William Erskine, Prof Tim Colmer, Dr Imran Malik	Indonesian Educational Fund

POSTGRADUATE RESEARCH STUDENTS

STUDENT NAME	TOPIC	SCHOOL	SUPERVISOR(S)	FUNDING BODY
Buddhi Chaudhary	Role of Indigenous Knowledge in Innovation Systems: The Case of Tharu Indigenous Nationality in Nepal	School of Social Sciences, UWA School of Agriculture and Environment and IOA	Dr Gregory Acciaioli, Prof William Erskine	UWA RTP (International
Maria Purnamasari	Camelina sativa – a source of phytoalexin-based resistance to important canola fungal diseases	UWA School of Agriculture and Environment and IOA	Prof William Erskine, Dr Janine Croser, Dr Parwinder Kaur, Prof Martin Barbetti	Indonesian Educational Fund
Anqiang Tang	Identifying the molecular mechanisms of yield improvement in Western Australian wheat varieties	School of Molecular Sciences and IOA	Dr Nicolas Taylor, Dr Shaobai Huang, Prof Harvey Millar	UWA RTP
Aygul Abzalov	Identifying the molecular responses of membrane lipids to heat and frost of temperature tolerant and sensitive Australian wheat varieties	School of Molecular Sciences and IOA	Dr Nicolas Taylor, Dr Monika Murcha	UWA RTP
Yimin Wang	Identifying the molecular responses to predicted 2050 climate of Western Australian wheat varieties	School of Molecular Sciences and IOA	Dr Nicolas Taylor, Dr Monika Murcha	Full fee paying
Atbin Mohabbati	Addressing to the missing data of OzFlux network using 'panel-data' method	UWA School of Agriculture and Environment and IOA	Prof Jason Beringer, Dr Matthias Leopold	RTP international scholarship
Luoyang Ding	Effect of temperament genotype on sheep production	UWA School of Agriculture and Environment and IOA	Dr Dominique Blache, Prof Shane Maloney, Dr Jennifer Rodger	China Scholarship Council and SIRF

NEW RESEARCH GRANTS JULY 2017–NOVEMBER 2017

TITLE	FUNDING PERIOD	FUNDING BODY	SUPERVISORS
Stress-resilient Phaseolus bean crops: addressing interactions of root rots with variable water availability under current and future climate scenarios	2017	ACIAR	Prof Martin Barbetti, Dr Joop van Leur
Policy Analysis of food safety and trade in Vietnam	2017-20	ACIAR	Dr Elizabeth Petersen, Dr David Vanzetti, Associate Professor Steven Schilizzi, Associate Professor Michael Burton, Professor David Pannell
Food security and the governance of local knowledge in India and Indonesia	2017-18	University of Newcastle ex ARC Discovery Project	Professor Christoph Antons, Winthrop Professor Michael Blakeney, Professor Kadambot Siddique, Professor Dr Philippe Cullet, Associate Professor Yunita Winarto, Dr Gregory Acciaioli, Dr Jagjit Plahe
Plant-soil interactions through space and time: forecasts and ecological relevance	2018	UWA Research Collaboration Awards	Mr Michael Renton, Emeritus Professor Johannes Lambers, Associate Professor Etienne Laliberte, Dr Benjamin Turner, Dr Francois Teste
Development of novel transcriptional regulators and synthetic logic gates for sophisticated control of plant activity and production	2017	UWA Fellowship Support Scheme	Dr Brendan Kidd
Microbe mediated alternative Nitrogen nutrition in Australian seagrasses	2018	UWA Research Collaboration awards	Philipp Bayer, Matthew Fraser, Agnieszka Golicz, Jeremy Bougoure, Ursula Steinfort J. Chris Pires

IOA 2017 Publications

(August - November)

Referred Journals

Abagna D and Mugera A (2017). Food Poverty and Vulnerability to Food Poverty in Ghana: An Empirical Analysis. *Journal of African Development*

Awasthi R, Gaur P, Turner NC, Vadez V, Siddique KHM, Nayyar H (2017). Effects of individual and combined heat and drought stress during seed filling on the oxidative metabolism and yield of chickpea (*Cicer arietinum*) genotypes differing in heat and drought tolerance. *Crop and Pasture Science* **68:** 823-841

Ayalew H, Liu H and Yan G (2017). Identification and validation of root length QTLs for water stress resistance in hexaploid wheat (*Titicum aestivum* L.). *Euphytica* **213:** 126

Azeem MM, Mugera A, Schillizi S and Siddique KHM (2017). From Static One-Dimensional Poverty to Vulnerability to Multi-Dimensional Poverty: An Empirical Comparison of Alternative Measurement Approaches. *The Journal of Development Studies* DOI: 10.1080/00220388.2017.1344646.

Barua P, You MP, Bayliss KL, Lanoiselet V, and Barbetti MJ (2017). Long-term viability of the northern anthracnose pathogen, *Kabatiella caulivora*, facilitates its transportation and spread. *Plant Pathology* **66:** 1463-1471

Brown B, Nuberg I, Llewellyn R (2017). Negative evaluation of conservation agriculture: perspectives from African smallholder farmers. *International Journal of Agricultural Sustainability* **15**(4): 467-481

Brown B, Nuberg I, Llewellyn R (2017). Stepwise frameworks for understanding the utilisation of conservation agriculture in Africa. *Agricultural Systems* **153**: 11-22

Browne M, Gonçalo L, Ximenes A, Lopes M and Erskine W (2017). Ritual practice and staple food crop production in Timor-Leste. *Food Security* **9**: 441-451.

Chalak M, Polyakov M and Pannell D (2017). Economics of controlling invasive species: a stochastic optimization model for a spatial-dynamic process, *American Journal of Agricultural Economics* **99** (1): 123-139

Chen J, Li R, Xia Y, Bai G, Guo P, Wang Z, Zhang H and Siddique KHM (2017). Development of EST-SSR markers in flowering Chinese cabbage (*Brassica campestris* L. ssp. *chinensis* var. *utilis* Tsen et Lee) based on *de novo* transcriptomic assemblies. *PLoS ONE* **12**(9): e0184736

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Fang XW, Zhang JJ, Xu DH, Pang J, Gao TP, Zhang CH, Li FM and Turner NC (2017). Seed germination of *Caragana* species from different regions is strongly driven by environmental cues and not phylogenetic signals. *Scientific Reports* **7:** 11248

Farooq M, Gogoi N, Hussain M, Barthakur S, Paul S, Bharadwaj N, Migdadi HM, Alghamdi SS and Siddique KHM (2017). Effects, tolerance mechanisms and management of salt stress in grain legumes. *Plant Physiology and Biochemistry* **118:** 199-217

Farooq M, Nawaz A, Ahmad E, Nadeem F, Hussain M and Siddique KHM (2017). Using *Sorghum* to suppress weeds in dry seeded aerobic and puddles transplanted rice. *Field Crops Research* **214**: 211-218

Feng F, Li Y, Qin X, Liao Y and Siddique KHM (2017). Changes in rice grain quality of Indica and Japonica type varieties released in China from 2000 – 2014. *Frontiers in Plant Science* **8:**1863

Gibson FL, Rogers AA, Smith ADM, Roberts A, Possingham H, McCarthy M and Pannell DJ (2017). Factors influencing the use of decision support tools in the development and design of conservation policy. *Environmental Science and Policy* **70:** 1-8

Guan Y, Liang G, Martin GB and Guan L (2017). Functional changes in mRNA expression and alternative pre-mRNA splicing associated with the effects of nutrition on apoptosis and spermatogenesis in the adult testis. *BMC Genomics* **18**:64

Han H, Vila-Aiub MM, Jalaludin A, Yu Q and Powles S (2017). A double EPSPS gene mutation endowing glyphosate resistance shows a remarkably high resistance cost. *Plant Cell & Environment* DOI: 10.1111/pce.13067

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Hawkins J, Ma C, Schilizzi S and Zhang F (2017). China's changing diet and its impact on greenhouse gas emissions: an index decomposition analysis. *The Australian Journal of Agricultural and Resource Economics Society* **59**: 1-20

He J, Jin Yi, Du YL, Wang T, Turner NC, Yang RP, Siddique KH< and Li FM (2017). Genotypic variation in yield, yiel components, root morphology and architecture in soybean in relation to water and phosphorus supply. *Frontiers in Plant Science* **8**: 1499

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Maina S, Edwards OR, Jones RAC (2017). Two complete genome sequences of Squash mosaic virus from 20-year-old cucurbit leaf samples from Australia. *Genome Announc* **5**(30):e00778-17

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Pang J, Turner NC, Du YL, Colmer TD and Siddique KHM (2017). Pattern of water use and seed yield under terminal drought in chickpea genotypes. *Frontiers in Plant Science* **8:** 1375

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