

The UWA Institute of Agriculture

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**WESTERN
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The Stewart family with Dr Shashi Paroda and Dr Raj Paroda.

Innovation led agricultural growth and SDGs

Diana Boykett
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Dr Raj Paroda, former director of the Indian Council of Agricultural Research (ICAR), was invited to deliver the 25th Hector and Andrew Stewart Memorial Lecture at UWA in November 2018.

Dr Paroda has made significant contributions in the field of agriculture both as a researcher and able administrator. He is well known globally for initiating and strengthening many visionary programs including with the UN FAO, World Bank and CGIAR to meet new challenges faced by the agricultural research system.

In his talk titled *Innovation led agricultural growth and SDGs*, Dr Paroda discussed the challenges

of increasing productivity whilst reducing cost on inputs, the need to make agricultural innovations mainstream and the importance of public-private partnerships.

He said agriculture is not the cause but the solution for achieving sustainable development goals, and bridging the widening gap between rich and poor.

“The task ahead is indeed difficult, but not insurmountable, provided the pace of overall progress is accelerated,” Dr Paroda said.

“Scaling of agricultural innovations can be achieved with the right incentives, policies, institutions and human resources.”

Dr Paroda gave an overview of some high impact innovations and

finished the talk by saying sustainable development goals can be achieved through an improved social progress index (SPI), a much more valuable measure than GDP.

The Hector and Andrew Stewart Memorial Lecture is in honour of the late Hon Hector J Stewart, MLC, and his son, the late Mr Andrew M. Stewart, both Wagin wool growers. Mr Stewart Jr was President of UWA's Guild of Undergraduates in 1929 and was invited to join the teaching staff at the University in 1937. He was twice Dean of UWA's Faculty of Agriculture.

The inaugural Hector and Andrew Stewart memorial lecture was 52 years ago in 1966 by Professor TJ Robinson on 'Sheep Fertility Research - Its Potential for Western Australia.



Director's column

**Hackett Professor Kadambot Siddique AM, CitWA, FTSE, FAIA, FNAAS, FISPP
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The 2018 season is looking very promising both in terms of higher than expected yields and strong prices – a winning combination that will give a much needed boost to the agriculture industry as a whole.

The UWA Institute of Agriculture has had a busy and productive 2018. Several new students commenced their PhD studies at UWA in agriculture and related areas. A number of agreements and memoranda of understanding were signed between UWA and international institutions. I recently travelled to Indonesia (see page 12) and China (see page 12) to sign agreements with Udayana University and Lanzhou University.

We hosted the 25th Hector and Andrew Stewart Memorial Lecture in November and were fortunate to welcome global agriculture leader Dr Raj Paroda to the University (see cover story). Dr Paroda is an extremely accomplished

agricultural scientist and administrator who has dedicated his career to shaping agricultural policy and reform in both India and internationally. Dr Paroda's lecture was titled *Innovation led agricultural growth and SDGs* and was well received by the Stewart family and those who attended. During his visit to UWA, he spent time interacting with PhD students and early career researchers giving them tips on how to collaborate and create impact through their research and development on the international stage.

I would like to congratulate IOA researcher Dr Michael Considine on being awarded a Future Fellowship from the Australian Research Council. It is one of Australia's premiere scientific fellowships and is well deserved. During the Fellowship, Dr Considine's research will focus on crop species, particularly fruit trees, building on his recent work on grapevine and the apple breeding program in Manjimup in Western Australia (see page 11).

IOA's associate director Professor Wallace Cowling was elected Fellow of the Australian Academy of Technology and Engineering (ATSE). Professor Cowling is an outstanding contributor to Australian agricultural science, technology and productivity through advances in crop breeding and genetics. He is a good example of a 'Professor of Practice' and the fellowship is well deserved.

I would like to sincerely thank IOA's Industry Advisory Board for their dedication and support throughout the year. We recently bid farewell to Mr Shane Sander and Mr Tym Duncanson who served on the Board for five and three years respectively. During that time they served the university and rural industry readily and unreservedly. Mr Simon Stead,

director, CBH Group joined the board in August and is committed to providing advice and industry feedback on agricultural issues and priorities within the industry and wider community.

Finally, I must acknowledge the UWA Executive, Theme Leaders, UWA Farm Ridgefield committees, IOA members and staff for their hard work throughout 2018. We bid farewell to Future Farm 2050 Project Officer Debra Mullan. Debra joined the team in 2015 and has done an excellent job liaising with UWA Farm Ridgefield staff, developing the Massive Online Open Course and coordinating outreach activities on the Farm. We wish her all the best in her future endeavours.

Season's greetings and best wishes for a happy new year to you and your family.





Five engineering design students visit UWA Farm Ridgefield

Engineering design students tackle agriculture issues on UWA Farm

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

Students studying Electrical and Electronic Engineering Design Project have been working on improving current, and designing new, security measures for UWA Farm Ridgefield in Pingelly.

This unit requires students to integrate and apply knowledge and skills to a substantial real-world design challenge.

UWA Farm Ridgefield operates under the constraints of poor connectivity, a common problem in regional areas in Western Australia, and therefore provides a perfect real-world environment for engineering students to design systems which solve a problem and are fit for purpose.

In August, five students from the unit and staff members from the Faculty of Engineering and Mathematical Sciences undertook a field trip to UWA Farm Ridgefield to review the connectivity issues and initiate strategies and designs which could operate under these constraints. The students have since set about developing recommendations for cost-effective engineering solutions for maintaining security at UWA Farm Ridgefield.

In addition to gaining knowledge and insight into their project constraints and design considerations, the students were also given a tour of the farm and details on the multi-disciplinary nature of the Future Farm 2050 (FF2050) Project.

Engineering Innovations for Food Production is one of IOA's six research themes, and the FF2050 Project provides exciting opportunities for engineers to help solve agricultural issues.

Pingelly Astrofest 2018

Debra Mullan, debra.mullan@uwa.edu.au

In October, over 130 people from both the local community and metropolitan area came together at UWA Farm Ridgefield to celebrate astronomy and Australian science at Pingelly Astrofest.

As part of the UWA Future Farm 2050 Project's commitment to connecting with rural communities and bridging the city-country divide, IOA once again partnered with the International Centre for Radio Astronomy Research (ICRAR) to host the second Pingelly Astrofest.

Telescopes were set up all evening with passionate astronomy volunteers, UWA PhD students and ICRAR staff available to guide attendees through the night sky.

Experts explained the use and principles of telescopes and clearing of the clouds later in the evening gave attendees great views of the moon, Saturn and Mars. Attendees were able to delight in the Scitech Spacedome show which ran throughout the evening, participate in the science shows and view an astrophotography exhibition.

Dr Luke Davies, a project scientist for ICRAR, captivated the audience with the evolution of galaxies and the structure of the universe and then fielded some well thought out questions from enthusiastic primary and high school students.

In addition to fantastic activities, attendees who had registered online to attend the event went into a prize draw including ICRAR prize packs with an

astrophotography book *The Universe – Yours to discover* and a grand prize of a Saxon DeepSky 8" Dobsonian Telescope.

Mr Peter Wilson who won the telescope said his eight year old son Andrew is a budding scientist and they are most grateful to receive such a generous prize.



Peter Wilson wins Saxon DeepSky Dobsonian Telescope

Dale research site Field Day – Focus on Frost

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More than 80 researchers, breeders, growers and industry representatives all with a key interest in wheat frost and canola research came together on 11 October 2018 at DPIRD's Dale research site Field Day.

Located the 30 km northwest of Brookton in a frost prone depression, the day involved two, four-spot rotating 20 minute sessions, involving presentations covering Trial site management (B Cleland, M Baker and R Develin; Living Farm) and wheat and

canola TOS variety choice trials (B Biddulph, J Bucat and I Farre; DPIRD).

Additionally, there was a wheat and frost focus with presentations by

- R Smith (Living Farm) and B Biddulph (DPIRD) on Cereal Crop Type x Sowing Windows.
- K Ryan, G Troup and G Thomas (DPIRD) on Debugging; The Role of Bacteria in Frost.
- B Leske (UWA/DPIRD) on Frost Susceptibility in Wheat.
- D Nicol (DPIRD) on Frost: Nitrogen x Seeding Rate & Variety.
- N Callow and B Stutsel (UWA) Frost, Drones and Data Capture Options and Considerations.
- N Taylor (UWA) Big Data Analytics in Agriculture.

The event was hosted by DPIRD and UWA staff were invited to attend and learn more about collaborative research opportunities with field based frost and agronomy researchers. The day concluded with the launch event for the Frost ID Guide (available to download at www.agric.wa.gov.au/frost/frost-identification-guide-cereals).



DPIRD Dale research site 2018 (Photo courtesy of Steve Curtin of ConsultAg)

WA research to help farmers make more informed decisions

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A new partnership between UWA and DPIRD will see vast amounts of WA agricultural data collected and analysed, at an unprecedented scale, to help farmers make more informed decisions.

Field workers and researchers will compile data on crop varieties, their growth, and how they are impacted by weather conditions, soil, varieties and fertilisers. The WA data along with national data will be made broadly

available to farmers through the Agriculture Research Data Cloud project, helping to unlock the \$19.1 billion potential value of agriculture in Australia.

Recent advances in on-farm data collection has resulted in a world where everything relating to agriculture can be monitored, however significant challenges lie ahead in integrating such data to best inform real time farming decisions.

WA Project team leader Dr Nic Taylor from UWA's School of Molecular Sciences, the ARC Centre of Excellence in Plant Energy

Biology and IOA said using technology to capture and analyse data was an important stepping stone towards a new way of approaching agriculture.

“With *Decision Agriculture*, we can make use of an amazing array of data and technology that can be accessed remotely by farmers anywhere in Australia to help inform key managerial decisions including seasonal programs, fertiliser inputs and disease and pest control. This is in addition to responding to seasonal conditions in a timely manner,” Dr Taylor said.

“This project is perfectly timed to take advantage of the latest developments in on-farm data capture and to kick-start the process of providing end users with knowledge and tools to make data-driven farming decisions.”

Dr Ben Biddulph from DPIRD said the scale of data being collected, both for crop research and on farms had consistently increased in the past decade.

“Every year, cheaper solutions become available which make in-depth data collection more feasible,” he said.





AusCanola 2018 – the 20th Australian Research Assembly on Brassicas

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The vibrant research-focussed canola conference, AusCanola2018 was held in Perth from 4 - 6 September 2018, and attracted over 120 delegates from across Australia and internationally.

The Grains Industry Association of Western Australia (GIWA) and Australian Oilseeds Federation (AOF) co-hosted the conference, with IOA associate director Professor Wallace Cowling as Chair of the steering committee and Professor Jacqueline Batley from the School of Biological Sciences and IOA as Chair of the program committee.

The inaugural canola conference was held in Perth in 1977, when 11 Brassica researchers met at UWA to create the 1st Australian Rapeseed Agronomists and

Breeders Research Workshop, ARAB, led by UWA's the late Professor Noel Thurling.

Current canola pathologist and researcher Professor Martin Barbetti from UWA's School of Agriculture and Environment and IOA attended the first conference and again at the 20th conference in 2018.

From its humble beginnings, the canola industry in WA now covers more than one million hectares annually. The involvement and interest of the canola industry was evident in a captivating field tour to Cunderdin which included canola variety trials, canola breeding company displays, and a visit to WA No-Till Farmers Association long-term cropping site. A grower-researcher discussion on the second day of the conference provided valuable two-

way dialogue between industry and academia.

Dr Francis Ogbonnaya, GRDC pulses and oilseeds manager, briefly presented GRDC's investment in canola pre-breeding. He introduced UWA's research progress in establishing heat tolerance screening tools for canola breeding program as a successful example.

IOA sponsored the visit of international keynote speaker Professor Surinder Banga, from Punjab Agricultural University in India. Professor Banga is a long-term collaborator with UWA researchers and has shared valuable genetic cross progenies of canola. Whilst in Perth, Professor Banga delivered a special lecture at UWA and interacted with researchers, students and the industry.

Pulse improvement science for delivery

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As part of a review of GRDC's investment in pulses, managing director Dr Steve Jefferies and Dr Francis Ogbonnaya, program manager visited UWA in November.

Dr Janine Croser from the Centre for Plant Genetics and Breeding and IOA and her team provided an overview of their research on high throughput rapid generation and phenotyping platforms for pulses.

Particular attention was paid to the promising hybrid material coming from crosses between domesticated and wild chickpea

and new techniques for controlled environment based chilling tolerance at flowering which together could be transformative for the crop.

The visit highlighted the group's successful delivery of over 8,400 lines to the Pulse Breeding Australia genetic improvement programs.



Drs Janine Croser, Steve Jefferies, Maria Pazos Navarro and Francis Ogbonnaya (L to R) examining wild chickpeas in the UWA glasshouse

The research links closely with all major pulse breeding programs in the country under the theme *Science for Delivery*.

The research is funded by GRDC and led by Dr Croser and Professor William Erskine in the Centre for Plant Genetics and Breeding and IOA.

Mining wild chickpea ancestors for improved crop resilience

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Chickpea yield is reduced by climatic, disease, pest and subsoil constraints, costing the industry millions of dollars in lost yield per year. Developing cultivars with resistance/ tolerance to these constraints is the highest priority for the Pulse Breeding Australia chickpea breeding program.

Domestication of chickpea resulted in a narrow genetic base, however valuable genes for combating production constraints are present in the wild relatives. UWA researchers Drs Maria Pazos Navarro, Judith Lichtenzveig, Simone Wells and Janine Croser have been identifying novel ways to identify and rapidly incorporate genes of interest into the domestic species.

Using the UWA-developed Rapid Gene Introgression (RGI) platform, the first recombinant inbred line population from a cross between domestic and wild chickpea has been delivered to the Australian Grains Genebank.

The RGI platform combines crossing, cloning and the use of optimal light spectra, photoperiod and temperature to achieve generation turnover in 60 days. The RGI-derived domestic x wild population has taken 18 months to develop from crossing, compared to four or more years using conventional methods.

The interspecific population is the first output of this type from a consortium of international researchers, led by UC-Davis (chickpea innovation lab).



Domestic x wild Cicer recombinant inbred lines growing at UWA.

Rapid gene introgression will result in accelerated exploitation of valuable traits into breeding programs and faster delivery of new genes to the paddock.

This research was supported by GRDC and UWA. The strategy is to develop an economic index of valuable traits, such as crispness, colour and shelf life, as well as fibre and pectin content, which have other health benefits.

“This will enable a sustainable pipeline of high-value apple varieties within the medium term.”

Research supporting the presentation has been funded by Horticulture Innovation Australia, DPRID, UWA, ECU, Pomewest and Fruit West.



Breeding wheat to avoid grain losses during global warming

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Grain crops such as wheat, maize and rice produce more than 60% of the calories for global human consumption, and they are sensitive to heat stress during the reproductive stage.

Most studies predict a decrease in grain yield of 10%–25% in the late 21st century as a result of predicted higher

global temperatures. Harvested grain yield is expected to decrease by 10% for every 1 °C increase in afternoon temperature above a threshold of 25 °C during flowering, reaching zero yield at the limiting temperature of 35 °C.

Such heat waves are expected to occur more often and earlier in spring as global warming continues. Therefore,

genetic improvements in grain yield and heat stress tolerance are necessary to avoid a fall in crop yields caused by global warming during the 21st century.

IOA associate director Professor Wallace Cowling says breeding is a complex process, involving selection for several traits in each cycle.

“Traditionally, this is done one trait at a time, which is called independent culling for traits,” Professor Cowling said.

“This is inefficient compared with index selection, which combines all traits into a single economic index before selection. With global warming, a new trait must be added to protect grain yield - heat stress tolerance during flowering.”

Professor Cowling’s research team modelled wheat breeding from 2017 to 2077 to improve heat stress tolerance to match an increase in global warming of +2 or +4 °C, and included grain yield and three other traits in an economic index.

Global Food Waste: Causes and solutions

Professor Michael Blakeney
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According to a 2011 report prepared for the Food and Agriculture Organization of the United Nations (FAO), 1.3 billion tons of foodstuffs, equivalent to a third of the global food production is lost or wasted every year. The United Nations Secretary-General's High-Level Panel on Global Sustainability estimated that food wasted by consumers in high-income countries is roughly equal to the entire food production of sub-Saharan Africa.

Food loss and waste (FLW) has significant environmental impacts and occurs at all stages along the supply chain. In developing countries it is estimated that two thirds of these losses occur at the postharvest, transportation and processing stages,

The simulation showed that traditional selection methods such as independent culling failed to reach targets for heat stress tolerance, and therefore grain yield began falling by 2050, despite continued investment in wheat breeding.

“The most successful breeding method involved rapid cycles of recurrent selection with optimal contributions selection (OCS) and moderate selection intensity to improve all traits in the economic index, including heat stress tolerance,” Professor Cowling said.

“With this method, grain yield and economic index in wheat continued to increase beyond 2077.

“As such, potentially serious disruption to global food security caused by heat stress can be averted by adopting these new breeding methods, and including priority selection for heat stress tolerance during flowering.”

because of poor agricultural practices and poor infrastructure for storage, processing and transport. In developed countries most FLW occurs at the level of consumption, being driven by behavioural factors such as impulse and bulk buying and poor planning.

The economic implications of food waste generally involve: household expenditures; raw materials and agricultural expenditures; savings from avoidable food waste; costs for waste treatment; health costs due to over-eating and environmental costs attributable to food waste disposal.

Professor Blakeney from UWA's Faculty of Law and IOA recently published a book *Food waste. Causes and solutions* which explores the metrics of FLW, as well as the methodologies adopted for its quantification. The environmental impacts of FLW are examined with a focus on greenhouse gas, water loss and landfill.

The book seeks to investigate all of the dimensions of FLW and then proposes a range of options to minimise FLW. It locates FLW in the international debate on food security and addresses the economic impacts of FLW, as well as the potential negative externalities arising from the minimisation of food waste.

Professor Blakeney said the central portion of the book identifies the drivers of food waste along the food supply chain.

“Specifically, it looks at drivers of FLW at the pre-harvest factors and post-harvest stages, as well as the losses which occur during storage, transportation, processing and packaging and the wholesale and retail and household consumption stages,” Professor Blakeney said.

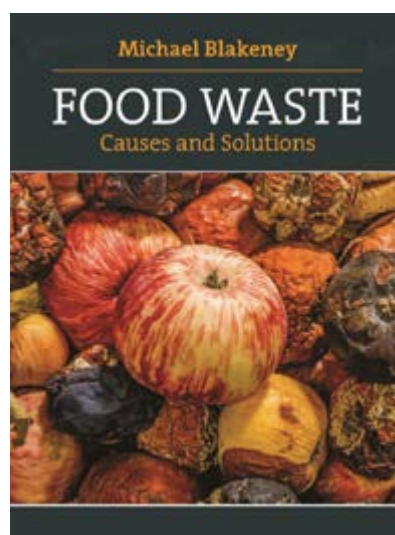
“This chapter also looks at variations between the systemic causes of FLW in developing and developed

countries. The various drivers of FLW are identified with a view to suggesting remedial action.”

Professor Blakeney looks at the ethical dimension of FLW in the context of corporate social responsibility, consumer welfare, sustainable consumption and the concept of ethical consumption. He considers the possibility of regulatory options to minimise the generation of FLW and contrasts voluntary regulation with mandatory regulation and looks at the legislative regimes in EU member states, the USA and Japan.

“Reviewing the multidisciplinary literature on FLW, as well as the various international and national policy documents, this book provides a comprehensive overview of FLW which will be a resource for established scholars in the field and policymakers dealing with issues of food waste management, prevention and reduction,” Professor Blakeney said.

The book will be a textbook and library reference for courses on agricultural policy and on food law and regulation and in courses concerned with Sociology of Agriculture and Food; Agricultural Economics; Rural Economics and Food Studies.





International workshop and regional expert consultation on Mountain Agriculture Development and Food Security and Nutrition Governance participants in Beijing

Mountain Agriculture Development and Food and Nutritional Security

Hackett Professor Kadambot Siddique
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Mountain agriculture deserves special attention when addressing Zero Hunger because of its ecological, agricultural, cultural, and socioeconomic significance for hunger and poverty reduction in the context of climate change.

Mountains are home to one tenth of the world population (over 900 million people) and cover 25 percent of the earth's land surface. They host approximately one quarter of all terrestrial biodiversity and nearly half of the world's biodiversity hotspots. In addition, mountains provide precious global goods and services in the form of water, hydroelectricity, timber, niche products, mineral resources and flood management.

Mountainous areas are the hard nut for achieving Zero Hunger and poverty reduction. Around 40 percent of mountain populations reside in developing and transition countries, with about 300 million people food insecure, and half of them suffering from chronic hunger. One in nine people globally are food insecure, compared to

one in three people in mountain areas. Despite the alarming situation, the issues of mountain food and nutritional security are often neglected in national and international policy agendas.

Food and nutritional security are very challenging in mountainous areas in Asia and the Pacific with some 490 million people currently hungry. Malnutrition such as stunting among children below the age of five remains high.

The International Workshop and Regional Expert Consultation on Mountain Agriculture Development and Food Security and Nutrition Governance was held in Beijing, China during 30 October – 1 November. The focus of the workshop was on Asian countries including: China, India, Pakistan, Bangladesh, Thailand, Bhutan, Cambodia, Laos, Nepal, Vietnam and Myanmar. It was jointly organised by UNFAO, University of International Relations (Beijing, China), International Centre for Integrated Mountain Agricultural Research (ICIMOD), Centre for International Agriculture Research of Chinese Academy of Agricultural Science and The University of Western Australia.

Hackett Professor Kadambot Siddique gave a keynote talk at the workshop and

chaired several sessions. He said that while mountain agriculture has enormous potential to provide adequate and nutritious food supply to address Zero Hunger, the living conditions of mountain people have deteriorated and their vulnerability to hunger has increased.

Other issues such as harsh climates, inaccessibility, fragility and seasonality in the mountain areas, poor market access and weak institutional services, combined with political and social marginality, constitute major constraints for mountain vulnerability and food insecurity.

“Sustainable development of mountain agriculture requires long-term investment in a holistic and integrated approach. It should involve policy, socio-economic and institutional aspects; natural resource management and crop and livestock improvement,” Hackett Professor Siddique said.

“Special attention and concentrated solutions targeting mountain agriculture are required to work towards the UNFAO's Zero Hunger goals.”

The workshop concluded with several key recommendations and follow up action.

UWA inspires the Philippines' Future Rice Farm

Mr Roger Barroga, rbarroga@gmail.com

The Future Farm 2050 Project on UWA Farm Ridgfield inspired the Philippines Rice Research Institute (PhilRice) to establish its own Future Rice farm in 2013.

Mr Roger Barroga, who was a PhD student at UWA's School of Geography attended the opening of the UWA Farm Ridgfield in 2009. His supervisors were Professor Matthew Tonts from the Faculty of Arts, Business, Law and Education and Hackett Professor Kadambot Siddique from IOA.

Upon his returned to the Philippines, Roger started converting a 5-hectare farm into a model rice farm that combines smart rice farming innovations and farm tourism. The farm showcases the latest inbred and hybrid rice varieties grown

with machines and farm apps, and drones for nutrient and pest management.

Automated drip irrigation system for vegetables, and ammonia gas sensors for piggery, and sensors to monitor water ph, dissolved oxygen and chemical content livestock and fish production are also employed.

Roger said the goal is to have continuous data to increase rice yields, reduce costs, and create new income streams.

"To attract people to visit the farm, a huge rice paddy art is made every planting cycle. The huge 3D images of famous personalities have made the farm a tourist destination," Roger said.

In 2017, the farm received a certificate of Good Agricultural Practices (GAP). Farm automation is also drawing university

students to the farm. Unmanned small tractor and rice seeder are now being tested. Three farm apps were developed and made available in Google Play.

Roger received a presidential commendation for this innovative project in September 2018.



Mr Roger Barroga develops the FutureRice Farm based on UWA's Future Farm 2050 Project

Kim Chance Fellowship for postgraduate student

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Local labelling and marketing initiative Buy West Eat Best has celebrated ten years since its inception by announcing a bursary to be awarded to a UWA PhD candidate.

The program, which was developed to assist local food producers to promote their products to WA consumers, has grown from 38 members in 2008, to more than 170 members including major retailers, small growers, artisan producers, large-scale processors, restaurants, chefs and food service providers.

Department of Primary Industries and Regional Development food director Deborah Pett said the program had brought more awareness of WA's abundance of beautiful fresh food and the stories behind their producers.

"The impetus behind the program was a push from the community wanting to know where their food came from," Ms Pett said.

"The resulting food labelling program allowed consumers to connect with local produce and allowed producers to stand behind one brand which represented quality, freshness and buy local."

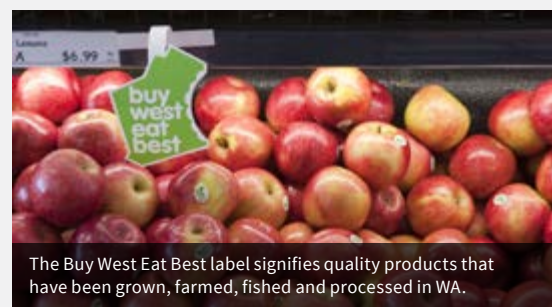
The industry gathered at UWA to celebrate the 10th anniversary milestone where the Minister for Agriculture and Food Alannah MacTiernan announced the fellowship award. The \$10,000 award will support a UWA PhD candidate with the specific purpose of advancing agriculture in WA.

The bursary is a memorial to former Minister for Agriculture, Forestry and Fisheries, the late Hon Kim Chance, a West Australian farmer and politician, in recognition of his devotion to agriculture.

Minister MacTiernan said the late Kim Chance played an instrumental role in not only establishing the Buy West Eat Best program, but in championing the core value messages that remain in place today.

"It also recognises his tremendous efforts to support and promote farming and regional communities," Minister MacTiernan said.

"He was a fabulous ambassador for industry and commanded respect across town and country."



The Buy West Eat Best label signifies quality products that have been grown, farmed, fished and processed in WA.

Phosphorus-efficient crops on our doorstep

Adjunct Research Fellow Asad Prodhan, asad.prodhan@uwa.edu.au

Agricultural production heavily depends on the input of phosphorus fertilisers to meet the needs of crops. However, its excessive application depletes the non-renewable 'phosphate rock', increases agricultural production costs, and pollutes our environment.

Many farmers across economically-poor regions cannot afford the expense of phosphorus fertiliser thus causing a bottleneck in securing global food production. Therefore, developing crop varieties that require less phosphorus is necessary to relieve the problem.

Adjunct Research Fellow Dr Asad Prodhan from the School of Biological Sciences and IOA has found a new way that allows plants to grow and reproduce with extremely low levels of phosphorus. He said south-western Australian plants have evolved in some of the world's most phosphorus-impooverished environments and could hold the key to developing crops that demand less phosphorus.

"We have taken advantage of phosphorus deficiency in south-western Australian soils and studied how plants cope with the low phosphorus availability in these landscapes," Dr Prodhan said.

"To adapt to the low phosphorus environments, the plants have evolved to function with a low concentration of ribosomal RNA.

"Ribosomal RNA accounts for 40% of organic phosphorus in leaf cells, so the phosphorus requirements in these plants are reduced by at least 50% without compromising their photosynthetic performance."

Ribosomes are the protein-synthesising machinery in cells. Whilst the low concentration of ribosomal RNA reduces phosphorus demand, it also reduces the protein synthesis capacity and therefore also reduces the consumption of the protein-synthesising nutrients like nitrogen, sulphur, and micronutrients.



Banksia menziesii evolved in phosphorus-impooverished environments in south-western Australia.

"The bigger picture of these findings is that the south-western Australian plants are not only phosphorus-efficient but also nitrogen-, sulfur-, and micronutrient-efficient," Dr Prodhan said.

"This could revolutionise the nutrient demand in food crops, thus contribute towards securing the global food production." respond to a lack of oxygen. Based on this new research we may be able to come up with a breeding solution, because after 2000 years we finally understand the mechanism behind the damage to wheat."



UWA agriculture graduate James Bidstrup is competing for the opportunity to represent WA at the 2019 evokeAG conference.

Young Agricultural leader competes for evokeAG conference

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UWA agricultural Science graduate and soon-to-be Esperance resident James Bidstrup is competing for the opportunity to represent WA at the nation's agrifood international technology conference in 2019.

The evokeAG event, held in Melbourne, offers the opportunity for leaders in the farming, technology, research, innovation, business, government and finance industry to connect and solve the most pressing issues facing agriculture.

With just two places available, Mr Bidstrup said he was determined to fill

Future Fellowship to understand seasonality in plants and crops

Dr Michael Considine, michael.considine@uwa.edu.au

IOA researcher Dr Michael Considine from the School of Molecular Sciences has been awarded and ARC Future Fellowship, one of Australia's premiere scientific fellowships.

Dr Considine has been seconded from DPIRD to UWA for over ten years to carry out research relevant to the strategic development of horticulture crops. The insights he developed



Dr Michael Considine awarded ARC Future Fellowship

through this industry-directed research have led him to receive the Fellowship which provides four years' salary and a small research budget.

During the Fellowship, Dr Considine's research will focus on crop species, particularly fruit trees, building on his recent work on grapevine and the apple breeding program in Manjimup in Western Australia. The basis of the studies is plant development, and particularly how plant life and form is shaped by the environment and changing seasons.

Dr Considine said unlike animals, plants have no fixed body plan, but the number of branches and the cycles of dormancy, germination and flowering are driven by climate and seasonality. He said this principle is hugely important when considering canopy management, as well as crop forecasting and harvest index. It's also extremely important in the context of stress resilience and climate variability and change.

"My research focusses on the perception of environmental cues

through changes in the availability of oxygen and signals that arise from oxygen, such as reactive oxygen species or ROS," Dr Considine said.

"Evolution tells us that oxygen availability has played a critical role in shaping animal and plant life. In fact there was 3 billion years of life before oxygen levels stabilised sufficiently to allow multicellular life forms to evolve."

Dr Considine said plants have stem cells which are essential for growth. It is thought that like stem cells in animals, plant stem cells require a low oxygen environment, but there are fundamental differences which are not well understood.

"To date, there are a few examples of where oxygen signalling is known to control vital transitions in plants and these include germination, seedling development and meiosis," Dr Considine said. "My studies look at other vital developmental transitions, particularly branching and bud dormancy.

"Branching and dormancy are both properties of meristems - the growing tips of plants where their stem cells reside - but indicate that plant growth is not continuous. Understanding what guides decisions to grow or not is fundamental to increasing and managing crop yield."

one and talk to the attendees about his vision for the industry.

"Agriculture has been a lifelong passion and now I'm in a position to give back to the industry and ensure that the next generation in agriculture continues to get great opportunities like evokeAG," he said.

"Being a part of the evokeAG Conference gives me the chance to bring home some of the new technology and research done by

the brightest minds in the agriculture industry and educate people on how to help address some of the challenges our industry faces."

Having always had a passion for agriculture, Mr Bidstrup took to studying Agricultural Science at UWA after graduating year 12 at Denmark Agricultural College.

Mr Bidstrup has since worked for CBH and volunteered as a stock handler for sheep and cattle breeders, leading

the team that won the inaugural Young Farmers Challenge at the 2018 Dowerin Field Day.

This December, Mr Bidstrup will make the move to the Esperance region to take up his dream job as an agronomist for Elders. The move is set to feel very much like coming home for the graduate, whose great grandparents pioneered the Sunrise Hill farm at Salmon Gums and the Peninsula mine at Norseman before retiring in Esperance.

UWA signs agreement with Udayana University, Indonesia

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

Udayana is a comprehensive university in Bali, Indonesia which has just completed 56 years of operation. The main focus of the university is to develop science, health, technology as well as improve people's welfare (humanity) and competitiveness of the nation.

Recently a delegation from Udayana University led by Professor I Nyoman Rai, Dean of Faculty of Agriculture and Professor Ida Ayu Astarini, Vice Director for Academic and Students Affairs visited UWA. Professor Astarini is an alumna of UWA and completed a Master of Science and PhD under the supervision of Professors Junie Plummer and Guijun Yan.

Discussions were held with relevant academics in the Faculty of Science, Faculty of Arts, Business, Law and Education, and the Dean of Graduate Research School. The delegation also visited various laboratories, glasshouses and growth room facilities.

In October, Hackett Professor Kadambot Siddique visited Udayana University and signed a Memoranda of Understanding on behalf of UWA's Vice Chancellor. Both universities have agreed to collaborate on projects of mutual interest, student exchange and staff training.

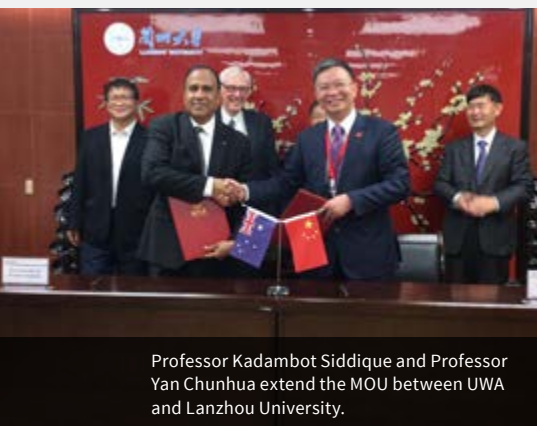
During the visit, Professor Siddique attended and delivered a keynote talk at an international conference 'Global



An MOU between UWA and Udayana University, Indonesia is signed

partnership for advancing innovation on science, technology and humanity solutions resilient to climate change'. Topics of the conference included: Health and Medicine; Social Sciences and Humanities; Food Security and Agriculture; Electrical Engineering; Electronics and Informatics; Materials Engineering and Processing Technology; Transpiration, Civil Engineering; Architecture and Built Environmental Science; Defence security; Sustainable Development and Renewable Energy.

Over 950 participants attended the conference including several keynote and invited speakers from USA, Japan, Malaysia, Thailand and Korea.



Professor Kadambot Siddique and Professor Yan Chunhua extend the MOU between UWA and Lanzhou University.

Strengthened collaboration between UWA and Lanzhou University

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

institutions have jointly published over 110 papers in international high quality journals.

A large number of faculty members and students from both institutions have completed joint training and mutual visits contributing substantially to agricultural production and ecosystem sustainability in both countries.

Recently on behalf of the UWA Vice Chancellor, Hackett Professor Kadambot Siddique signed the agreement to extend the MoU for another term. LZU president Professor Yan Chunhua said he greatly appreciated the productive collaboration between the two universities over the years and plans to visit UWA next year.

Whilst at LZU Professor Siddique delivered a talk at the 2018 Forum on Ecological Civilization of the University Alliance along the Belt and Road at Lanzhou University. IOA Adjunct Professor Neil Turner also delivered an invited talk at the forum.

The 4th International Grassland Conference was also held at LZU and Professors Hans Lambers and Kadambot Siddique delivered invited talks. Participants at both conferences included representatives from China, US, Europe, New Zealand, Africa, Pakistan, Japan, Iran and high level officials from Beijing.

Over the last ten years, UWA and Lanzhou University (LZU) have conducted joint research and postgraduate training, achieving outstanding progress, particularly in agricultural science, ecology and related areas.

The initial Memorandum of Understanding between the two universities was signed in 2007, and it was renewed in 2013. To date both

Seasonal calendars developed for flood-affected communities in Cambodia

Dr Natasha Pauli
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Master of Environmental Science student Savuti Henningsen recently returned from two weeks of field research in Kratie Province, Cambodia. Savuti's research is examining the gendered impacts of environmental change in flood-affected communities that lie along the banks of the lower Mekong River.

The field team included Savuti Henningsen, supervisor Dr Natasha Pauli from the School of Agriculture and Environment and IOA, field co-ordinator Chanchhaya Chhom from Green Move Consulting, and research assistants

Thidameas Hak and Nakhem Eom who both recently graduated with a BA in Economic Development at the Royal University of Phnom Penh, Cambodia.

During the visit, Savuti and the field team visited four villages, where the diverse agro-ecosystems are adapted to regular seasonal flooding of the Mekong. In some years flooding can be severe, and in other years the villages are affected by drought.

The team facilitated focus groups with villages to develop seasonal calendars, identifying when different crops are sown, cared for and harvested, and how floods and droughts can affect livelihoods and resources such as



The field team including Dr Natasha Pauli, Thidameas Hak, Savuti Henningsen, Nakhem Eom and Chanchhaya Chhom.

fisheries. The seasonal patterns of women's lives were also documented by discussing how their daily activities and routines change throughout the year.

The project fits within a broader program of research on climate-change adaptation in post-disaster recovery processes in flood-affected communities in Cambodia and Fiji, funded by the Asia-Pacific Network for Global Climate Change Research (climatechangeplus.net). The lead institution is the University of Auckland, with several partner universities including UWA, Royal University of Phnom Penh, the University of Sydney and the University of the South Pacific.



Svetlana Micic, DPIRD in the glasshouse.

Most of the advice given to farmers through various advisers has been based on field experiments. However, the evidence is not always published and reviewed so the findings need to be re-examined periodically to confirm their continued applicability and to identify gaps in current knowledge.

Review of tactical crop management

Adjunct Professor Wal Anderson, wmanderson@omninet.net.au

UWA Adjunct Professor Wal Anderson, Dr Ross Brennan, Svetlana Micic, Dr Kith Jayasena and Dr Tom Nordblom from DPIRD conducted an extensive review of tactical crop management in WA.

The advice deals with management during the season for crops such as wheat, barley, lupins, and canola in dryland regions with winter-dominant rainfall. Crop nutrition, plant density, sowing times, disease, weed and pest management are all addressed in the review.

Adjunct Professor Wal Anderson said in WA there has been good interaction between the specialist researchers and agronomists that have generated and extended this sort of advice, often

due to co-location and collaboration across State, Commonwealth and University institutions.

"We have observed whilst reviewing this subject that much of the evidence has been generated in WA," Professor Anderson said. "The evidence seems to indicate that average farm grain yields in many regions of the world has only reached about half to two thirds of the rainfall-limited potential."

Given the recent wide fluctuations in seasonal conditions it seems relevant to point out how adjusting crop management practices during the season can assist in consistently reducing the gap between average and potential grain yields.

18th International Student Summit Tokyo

Dr Louise Barton
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Undergraduate Agriculture Science student Ms Rachel Darwin recently represented UWA at the 18th International Student Summit in Tokyo, Japan. The conference theme explored Students Taking Actions to Increase Youth Involvement in Sustainable Agriculture and to Close the Gap Between Actors in the Food System.

Rachel is a second year student from Denmark, Western Australia, who is completing her Bachelor of Science majoring in Agricultural Science and Conservation Biology. Her presentation Improving the Sustainability of Western Australian Agriculture by Grazing Native Shrubs: How Students Can Make a Difference, examined how students can work alongside researchers to improve the sustainability of livestock production using native shrubs.

The 2018 International Student Summit was hosted by Japan's Tokyo University of Agriculture and gave undergraduate students from 28 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, agriculture, environment and food security.

Students also had the opportunity to learn more about the agriculture and culture in the host country by participating in field trips to local farms and the region.

The summit was initiated 18 years ago by Tokyo University of Agriculture to promote and foster student leadership in agriculture and environmental sciences. The Japanese University sponsored Rachel's travel. Last year, students Mr Joshua Clune represented UWA at the summit in Taiwan.

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 2019 conference theme is Youth Transforming Thoughts on Sustainable Agriculture and Resource Management to Connect Local and Global Community.

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



Rachel Darwin receives her certification of participation the Tokyo University of Agriculture's Vice President, Professor Keiko Natsuaki. Photo: Tokyo University of Agriculture.

Honorary Professorship from Shenyang Agricultural University

Professor Hans Lambers
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Plant ecophysiologist Professor Hans Lambers from the School of Biological Sciences and IOA, has been awarded a Top Honorary Professorship from Shenyang Agricultural University, China in October. The Professorship recognises the significant contributions he has made to phosphorus nutrition of crops and pasture legumes, and mineral nutrition of Australian native plants.

Whilst in China, Professor Lambers visited his student Associate Professor

Yifei Liu's research team at the National Key Engineering Laboratory for Efficient Utilization of Soil and Fertilizer Resources in the China-US Center of Soil Productivity and Environmental Conservation, and intelligent greenhouses with SYAU intellectual property and research fields.

Professor Lambers also gave two lectures entitled 'Plant phosphorus-acquisition strategies on the world's most phosphorus-impooverished soils: lessons for agriculture' and 'Preparing your results for publication: maximising your chances to get your manuscript rapidly accepted' for students and faculty of the related academic areas in SYAU.

During the above appointments, Professor Lambers will give regular lectures at SYAU, jointly supervise PhD students, and establish further collaboration between UWA and SYAU in agriculture and related areas.



Professor Hans Lambers (centre) receives honorary professorship from Shenyang Agricultural University, China



Louise Willememen, Grace Nangendo, Judy Fisher, Nicole Berger Co-ordinating Lead Authors of the IPBES Assessment

Landmark 3-year assessment report on land degradation and restoration released

Adjunct Professor Judy Fisher, ecologist@westnet.com.au

Worsening land degradation caused by human activities is undermining the well-being of two fifths of humanity, driving species extinctions and intensifying climate change. It is also a major contributor to mass human migration and increased conflict, according to the world's first comprehensive evidence-based assessment of land degradation and restoration.

To address these challenges, The Plenary of Governments in Colombia approved the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) to conduct a three-year assessment on land degradation and restoration.

Adjunct Professor Judy Fisher was elected as Coordinating Lead Author of the Assessment by all governments to the multidisciplinary expert panel, which oversees the technical side of all IPBES work, and comprises five representatives from each United Nations Region. Dr Fisher represents Western Europe and other Grouping of Countries (WEOG).

The assessment was prepared by more than 100 leading experts from 45 countries and draws on 3,000 scientific, government, indigenous and local knowledge sources. It was extensively peer-reviewed and improved by more than 7,300 comments received from over 200 external reviewers.

Executive Secretary of the United Nations Convention to Combat Desertification (UNCCD), Monique Barbut, said the report shows the alarming scale of transformation that humankind has imposed on the land and the changing nature of the forces driving land degradation.

"We live in an increasingly connected world, yet as consumers we are living ever further away from the lands that sustain us," Ms Barbut said.

"Addressing land degradation location by location is insufficient when consumption in one part of the world influences the land and people in another."

Global opportunities abound for UWA graduate

Dr Nicola Bondonno
nicola.bondonno@uwa.edu.au

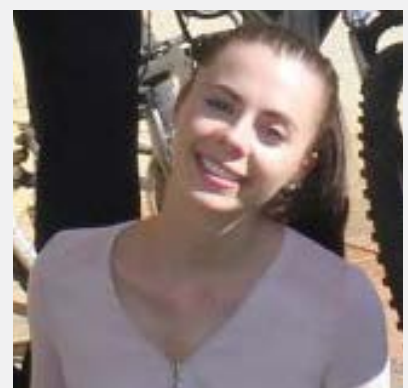
Dr Nicola Bondonno recently completed her PhD at UWA investigating cardiovascular health benefits of specific vegetables. Her long-term research goal is to reduce the prevalence of heart disease in Australia by providing scientifically-proven recommendations for people to increase their consumption of flavonoid-rich foods and beverages.

Dr Bondonno recently received a prestigious National Health and Medical Research Council Fellowship. She will spend the next two years working at the University of East Anglia in Norwich, UK, helping to conduct the world's largest blueberry intervention study.

Earlier this year, Dr Bondonno spent a month in Copenhagen, Denmark examining the relationship between diet and heart disease in a cohort of more than 50,000 Danish citizens. In particular she was looking at the intake of flavonoids, antioxidant compounds found in fruits and vegetables, as well as tea, chocolate and red wine.

"Results are yet to be published, but we have made some very exciting discoveries, in particular that flavonoids afford the most protection to people at the highest risk of developing heart disease," Dr Bondonno said.

She presented her findings at the American Heart Association Conference in Chicago, US in November.



Dr Bondonno is currently visiting the Plants for Human Health Institute in North Carolina, US, where she will spend three months learning methods for measuring how flavonoids are metabolized by the body. She plans to return to Perth in 2021, collating all she has learnt from her travels to strengthen the research being done in WA.

2018 Farrer Memorial Medal to Dr Reg Lance

UWA graduate Dr Reg Lance has been awarded the Farrer Memorial Medal in recognition of his work in barley breeding and genetics.

Deputy Director General, Agriculture at NSW Department of Primary Industries, Kate Lorimer-Ward, presented the prestigious medal and congratulated Dr Lance for his dedication and contribution to research in malting and feed barley breeding and genetics.

“Dr Lance’s career has covered all aspects of improvements in yield, agronomic performance, malting and feed quality, plant pathology, and adaptation to abiotic stresses in barley,” she said.

“Furthermore, his career has spanned across continents, universities and government departments, including USA and Denmark, UWA, Murdoch University, University of Adelaide and University of Queensland.

“This has included supervising or co-supervising nine PhD students, further contributing to the research within this area of agriculture.”

The Farrer Memorial Medal is awarded annually to commemorate William James Farrer, Australia’s leading wheat breeder, in recognition of distinguished service in agricultural science and contribution to Australia’s cropping industries.



Farrer Trustee Michael Arnott, Farrer Memorial Medal winner Dr Reg Lance and DPI Deputy Director General Kate Lorimer-Ward

New Appointments

Simon Stead | simon.stead@cbh.com.au



Mr Simon Stead, Director, CBH Group has joined IOA’s Industry Advisory Board.

Mr Stead runs a mixed sheep, cattle and cropping operation in Cascade and Dalyup in the Esperance port zone. He worked for Wesfarmers and has a long involvement with the South East Premium Wheat Growers Association (SEPWA).

Mr Stead is a founding member and past chair of the Association for Sheep Husbandry, Excellence, Evaluation and Production (ASHEEP).

He holds an Executive Certificate in Agribusiness Marketing from Monash University and is a Graduate of the Australian Institute of Company Directors.

Joint PhD program between UWA and Nagoya University

A new joint PhD degree program in Agriculture and related disciplines was officially launched between UWA and Nagoya University, Japan in December.

This joint PhD program is a result of a long history of collaboration between UWA and Nagoya Graduate School of Bioagricultural Science. Strong researcher-to-research links have been developed through a commitment to ongoing academic and student exchange, resulting in over fifty joint scientific journal publications in the past five years.

The program will further strengthen UWA’s relationship with Nagoya University and with Japan to provide new and exciting opportunities for agricultural research and innovation for both countries and in particular for students.



AWARDS AND INDUSTRY RECOGNITION

NAME	AWARD
Hackett Professor Kadambot Siddique	Kerala Cultural Association of WA, Award of Honour in recognition of outstanding achievement in agricultural science
Dr Zakaria Solaiman	Soil Science Society of China award for best paper published in the journal 'Pedosphere'.
Professor Wallace Cowling	Fellow of the Australian Academy of Engineering and Technological Sciences
Mr Md Sultan Mia	Convocation Postgraduate Research Travel Award

VISITORS TO IOA

NAME OF VISITOR	VISITOR'S ORGANISATION AND COUNTRY	HOST DETAILS	DATES OF VISIT
Professor Eric Danquah	University of Ghana	Hackett Professor Kadambot Siddique	5-8 November 2018
Dr Babu Pandey	Molecular Plant Breeding, Agriculture Victoria Research, Department of Economic Development, Jobs, Transport and Resources, Victoria	Hackett Professor Kadambot Siddique	4 October 2018
Delegation from Udayana University	Indonesia	Hackett Professor Kadambot Siddique	8 October 2018
Professor Surinder Banga	Punjab Agricultural University	Hackett Professor Kadambot Siddique	7 September 2018
Dr Yongzhong Luo	Gansu Agriculture University	Adjunct Professor Neil Turner, Professor Guijun Yan and Dr Hui Liu	March 2018-March 2019
Dr Ling Xu	Zhangjiang Scien-Tech University	Professor Guijun Yan, Dr Hui Liu and Dr Ping Si	August 2018-August 2019
Dr William Wintermandel	US Department of Agriculture	Adjunct Prof Roger Jones	12 September 2018
Mr Aitian Ren (Visiting PhD student)	Lanzhou University, China	Emerita Professor Lyn Abbott	October 2018 – October 2019
Dr Yong Liu (Visiting Research Fellow)	Guangdong Institute of Eco-environment and Soil Sciences, Guangzhou, China	Professor Zed Rengel, Dr Yinglong Chen	October 2018 – October 2019
Mr Hualiang Zhang (Visiting PhD student)	Northeast Normal University, China	Professor Zed Rengel, Dr Yinglong Chen	November 2018 – November 2020
Dr Lijun Liu (Visiting Research Fellow)	Huazhong Agricultural University, China	Hackett Professor Kadambot Siddique, Dr Yinglong Chen	November 2018 – November 2019

NEW POSTGRADUATE RESEARCH STUDENTS

STUDENT NAME	TOPIC	SCHOOL	SUPERVISOR(S)	FUNDING BODY
Manjula Premaratne	Nitrogen cycling in agricultural systems	UWA School of Agriculture and Environment and IOA	Professor Daniel Murphy; Dr Frances Hoyle	GRDC
Rudra Bhattarai	Wheat heat and drought tolerance	UWA School of Agriculture and Environment and IOA	Hackett Professor Kadambot Siddique; Professor Guijun Yan; Dr Hui Liu	RTP
Tanushree Halder	QTL mapping of wheat Root traits	UWA School of Agriculture and Environment and IOA	Professor Guijun Yan; Hackett Professor Kadambot Siddique; Dr Hui Liu	RTP
Mohammad Moinul Islam	Optimising industrial hemp as a new crop in Western Australian agriculture	UWA School of Agriculture and Environment and IOA	Dr Zakaria Solaiman; Hackett Professor Kadambot Siddique; Emerita Professor Lynette Abbott; Professor Zed Rengel	RTP UWA Top Up

MEMORANDA OF UNDERSTANDING

TITLE	DATE SIGNED
MOU between UWA and Udayana University, Indonesia	October 2018
Letter of extension of the MOU between UWA and Lanzhou University, China	24 September 2018
MOU between UWA and Acharya N.G. Ranga Agricultural University, India	17 September 2018
MOU between UWA and Oterra	4 June 2018
MOU between UWA and the Higher Education Commission, Pakistan for a joint scholarship program	17 May 2018
MOU between UWA and Tuscia University, Italy	9 February 2018

NEW RESEARCH GRANTS AUG 2018 – DEC 2018

TITLE	FUNDING PERIOD	FUNDING BODY	SUPERVISORS
Faba Bean in Ethiopia – Mitigating disease constraints to improve productivity and sustainability	2018-2023	ACIAR	Professor Martin Barbetti, Dr Joop van Leur, Dr Seid Kemal, Dr Ming Pei You, Adj Professor Roger Jones
CRC for developing Northern Australia - new pastures to increase livestock productivity across the north	2018-2020	Agrimix Pty Ltd ex CRC Project	Professor Zed Rengel, Mr Nick Kempe
Changing perceptions of how oxygen directs plant development	2018-2021	ARC Future Fellowships	Dr Michael Considine
Breeding cooking time in bean (workshop)	2018	ACIAR	Professor Wallace Cowling, Hackett Professor Kadambot Siddique
Dung beetle ecosystem engineers - enduring benefits for livestock and producers via science and a new community partnership model	2017-2021	Defence Science and Technology Group (DSTG)	Associate Professor Theo Evans, Professor Leigh Simmons, Professor Raphael Didham, Dr Winn Kennington
Richgro: utilisation of a liquid b-product from a biogas facility for enriching biochar in potting mix, compost, and implications for application directly to soil	2018	Department of Industry Innovation and Science - Ausindustry: Innovation Connections	A/Professor Megan Ryan, Dr Sasha Jenkins
Developmental shifts in phosphorus-use efficiency	2018	Ecological Society of Australia Holsworth Wildlife Research Endowment	E/Professor Hans Lambers, Dr Ranathunge Ranathunge, A/Professor Erik Veneklaas, Ms Roberta Dayrell De Lima Campos
Agriculture research data cloud	2018	Federation University Australia ex Australian Research Data Commons (ARDC) (ANDS-NECTAR)	Dr Nicolas Taylor, Dr Ben Biddulph, Professor Andrew Millar, Mr John Callow, Professor Timothy Colmer, Mr Brenton Leske
Insect protein for aquaculture feed	2017-2019	Fisheries Research & Development Corporation	Dr Jan Hemmi, Associate Professor Julian Partridge, Dr Craig Lawrence, Dr Andrew Guzzomi, Ms Sasha Voss, Dr David Cook, Mr Ken Dods
Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains	2018	International Maize and Wheat Improvement Center CIMMYT ex ACIAR	Associate Professor Fay Rola-Rubzen
Profitable and environmentally sustainable sub clover and medic seed harvesting	2018-2021	Rural Industries Research & Development Corporation	Professor William Erskine, Dr Phillip Nichols, Dr Kevin Foster, Dr Andrew Guzzomi, Associate Professor Megan Ryan
Protein structure based investigations into novel herbicides with new modes of action and plant growth pathways	2018	UWA Fellowship Support Scheme	Dr Joel Haywood
Michael Considine ARC Future Fellow - Developmental functions of oxygen and redox cues in plants	2019	UWA Fellowship Support Scheme	Dr Michael Considine
WA agriculture authority WAAA - overcoming constraints to profitable cropping on forest gravel soils in the western region	2018	WA Department of Primary Industries and Regional Development	Dr Matthias Leopold
Transcriptome sequencing to discover herbicide resistance genes in wheat (<i>triticum aestivum</i> L.)	2018	Yitpi Foundation Pty Ltd	Prof Guijun Yan, Mrs Roopali Bhoite, Dr Ping Si, Hackett Prof Kadambot Siddique

UWA IOA 2018 Publications

(August - November)

Peer Reviewed Journals

- Abbas G, Chen Y, Khan FY, Feng Y, Palta JA and Siddique KHM (2018). Salinity and low phosphorus differentially affect shoot and root traits in two wheat cultivars with contrasting tolerance to salt. *Agronomy* **8**: 155
- Abdullah AS, Turo C, Moffat CS, Lopez-Ruiz FJ, Gibberd MR, Hamblin J and Zerihun A (2018). Real-Time PCR for diagnosing and quantifying co-infection by two globally distributed fungal pathogens of wheat. *Frontiers in Plant Science* **9**:1086
- Adams IP, Fox A, Boonham N, Jones RAC (2018). Complete genomic sequence of the potyvirus Mashua virus Y, obtained from a 33-year-old mashua (*Tropaeolum tuberosum*) sample. *Microbiol Resour Announc* **7**:e01064-18.
- Adams IP, Abad J, Fribourg CE, Boonham N, Jones RAC (2018). Complete genome sequence of *Potato virus T* from Bolivia obtained from a 33-year-old sample. *Microbiol Resour Announc* **7**:e01066-18.
- Adams IP, Boonham N, Jones RAC (2018). A 33-year-old plant sample contributes the first complete genomic sequence of *Potato virus U*. *Microbiol Resour Announc* **7**:e01392-18.
- Adams IP, Boonham N, Jones RAC (2018). Full-genome sequencing of a virus from a 33-year-old sample demonstrates that Arracacha mottle virus is synonymous with Arracacha virus Y. *Microbiol Resour Announc* **7**:e01393-18
- Ahmad P, Abd_Allah EF, Alyemeni MN, Wijaya L, Alam P, Bhardwaj R and Siddique KHM (2018). Exogenous application of calcium to 24-epibrassinosteroid pre-treated tomato seedlings mitigates NaCl toxicity by modifying ascorbate-glutathione cycle and secondary metabolites. *Scientific Reports* **8**: 13515.
- Al-Saedi R, Smettem K and Siddique KHM (2018). Nitrogen removal efficiencies and pathways from unsaturated and saturated zones in a laboratory-scale vertical flow constructed wetland. *Journal of Environmental Management* **228**: 466-474.
- Assainar SK, Abbott LK, Mickan BS, Whiteley AS, Siddique KHM and Solaiman ZM (2018). Response of Wheat to a Multiple Species Microbial Inoculant Compared to Fertilizer Application. *Frontiers in Plant Science*. **9**:1601.
- Ayalew H, Liu H, Liu C and Yan G (2018). Identification of early vigor QTLs and QTL by environment interactions in wheat (*Triticum aestivum* L.). *Plant Molecular Biology Reporter* **36**: 399-405.
- Bayer PE, Golicz A, Tirnaz S, Chan KCC, Edwards D, Batley J (2018). Variation in abundance of predicted resistance genes in the Brassica oleracea pangenome. *Plant Biotechnology Journal*.
- Bayer PE, Edwards D, Batley J (2018). Bias in resistance gene prediction due to repeat-masking. *Nature Plants*
- Bhoite R, Onyemaobi I, Si P, Siddique KHM and Yan G (2018). Identification and validation of QTL and their associated genes for pre-emergent metribuzin tolerance in hexaploid wheat (*Triticum aestivum* L.) *BMC Genetics* **19**: 102-113.
- Bilal HM, Aziz T, Maqsood MA, Farooq M, Yan G (2018). Categorization of wheat genotypes for phosphorus efficiency. *PLoS ONE* **13**(10): e0205471.
- Chen Y, Rengel Z, Palta J and Siddique KHM (2018). Efficient root systems for enhancing tolerance of crops to water and phosphorus limitation. *Ind J Plant Physiol*. <https://doi.org/10.1007/s40502-018-0415-3>
- Cowling WA, Li L, Siddique KHM, Banks RG, Kinghorn BP (2018). Modeling crop breeding for global food security during climate change. *Food Energy Security*. e00157.
- Ding W, Clode PL, Lambers H (2018). Is pH the key reason why some *Lupinus* species are sensitive to calcareous soil? *Plant and Soil* <https://doi.org/10.1007/s11104-018-3763-x>
- Dwivedi S, Siddique KHM, Farooq M, Thornton PK and Rodomiro O (2018). Using biotechnology-led approaches to uplift cereal and food legume yields in dryland environments. *Frontiers in Plant Science* **9**: 1249.
- Elayadeth-Meethal M, Veetil AT, Maloney SK, Hawkins N, Misselbrook TH, Sejian V, Rivero MJ and Lee MRF (2018). Size does matter: Parallel evolution of adaptive thermal tolerance and body size facilitates adaptation to climate change in domestic cattle. *Ecology and Evolution* DOI: 10.1002/ece3.4550
- Farooq M, Hussain M, Usman M, Farooq S, Alghamdi SS and Siddique KHM (2018). Impact of abiotic stresses on grain composition and quality in food legumes. *Journal of Agricultural and Food Chemistry* **66**: 8887-8897.
- Foyer CH, Siddique KHM, Tai APK, Anders S, Fodor N, Wong FL, Ludidi N, Chapman MA, Ferguson BJ, Considine MJ, Zabel F, Prasad PVV, Varshney RK, Nguyen HT and Lam HM (2018). Modelling predicts that soybean is poised to dominate crop production across Africa. *Plant, Cell & Environment* DOI: 10.1111/pce.13466.
- Goggin DE, Kaur P, Owen MJ and Powles SB (2018). 2,4-D and dicamba resistance mechanisms in wild radish: subtle, complex and population specific? *Annals of Botany* **122**: 627-640.
- Hajjhashemi S, Noedoost F, Geuns JMC, Djalovic I and Siddique KHM (2018). Effect of cold stress on photosynthetic traits, carbohydrates, morphology, and anatomy in nine cultivars of *Stevia rebaudiana*. *Frontiers in Plant Science* **9**:1430.
- Hamblin J, Barbetti MJ, Stefanova K, Blakeway F, Clements J, Cowling W, Guo, Y and Nichols P (2018). Crop breeding to break nexus between bee decline/food production? *Global Food Security* **19**: 56–63.
- Khalil Y, Flower K, Siddique KHM and Ward P (2018). Effect of crop residues on interception and activity of prosulfocarb, pyroxasulfone, and trifluralin. *PLoS ONE* **13**(12): e0208274.
- Kingwell R, Thomas Q, Feldman D, Farré I and Plunkett B (2018). Traditional farm expansion versus joint venture remote partnerships. *Australian Journal of Agricultural and Resource Economics* **62**: 21–44.
- Lamichhane JR, Debaeke P, Steinberg C, You MP, Barbetti MJ and Aubertot JN (2018). Abiotic and biotic factors affecting crop seed germination and seedling emergence. *Plant and Soil* **432**: 1–28.
- Li J, Peng Q, Han H, Nyporko A, Kulynych T, Yu Q and Powles S (2018). Glyphosate resistance in *Tridax procumbens* via a novel EPSPS Thr-102-Ser substitution. *Journal of Agricultural and Food Chemistry* <http://dx.doi.org/10.1021/acs.jafc.8b01651>
- Liu CA, Nie Y, Rao X, Tang JW and Siddique KHM (2018). The effects of introducing *Flemingia macrophylla* to rubber plantations on soil water content and exchangeable cations. *Catena* **172**: 480-487
- Liu CA, Nie Y, Zhang YM, Tang JW and Siddique KHM (2018). Introduction of a leguminous shrub to a rubber plantation changed the soil carbon and nitrogen fractions and ameliorated soil environments. *Scientific Reports* **8**: 17324.
- Liu AH, Jia D, Yuan XF, Wang YX, Chi H, Ridsdill-Smith TJ and Ma RY (2018). Response to short-term storage for ages of *Agasicles hygrophila* (Coleoptera: Chrysomelidae). A biological control agent of Alligator weed *Alternanthera philoxeroides* (Caryophyllales: Amaranthaceae). *Journal of Economic Entomology* **111**: 1169-1576
- Lu H, Yu Q, Han H, Owen MJ and Powles SB (2018). A novel *psbA* mutation (Phe274-Val) confers resistance to PSII herbicides in wild radish (*Raphanus raphanistrum*). *Pest Manag Sci* DOI 10.1002/ps.5079.
- Lynch B, Llewellyn RS, Umberger W, Kragt M (2018). Farmer interest in joint venture structures in the Australian broadacre grains sector. *Agribusiness*. **34**(2):472-491.

Melonek J, Zhou R, Bayer PE, Edwards D, Stein N, Small I (2018). High intraspecific diversity of *Restorer-of-fertility*-like genes in barley. *The Plant Journal*.

Mickan BS, Abbott LK, Solaiman ZM, Mathes F, Siddique KHM and Jenkins SN (2018). Soil disturbance and water stress interact to influence arbuscular mycorrhizal fungi, rhizosphere bacteria and potential for N and C cycling in an agricultural soil. *Biology and Fertility of Soils*. <https://doi.org/10.1007/s00374-018-1328-z>

Mousavi-Derazmahalleh M, Nevado B, Bayer PE, Filatov D, Hane JK, Edwards D, Erskine W, Nelson N (2018). The western Mediterranean region provided the founder population of domesticated narrow-leaved lupin. *Theoretical and Applied Genetics*

Pauli N, Abbott LK, Rex R, Rex C and Solaiman ZM (2018). A farmer-scientist investigation of soil carbon sequestration potential in a chronosequence of perennial pastures. *Land Degradation Development* DOI: 10.1002/ldr.3184

Plunkett B, Duff A, Kingwell R and Feldman D (2018). Capital structures for large scale Australian agriculture: Issues and lessons. *Australasian Agribusiness Perspectives* **21**(9): 135-166.

Prihatna C, Larkan NJ, Barbetti MJ and Barker SJ (2018). Tomato *CYCLOPS/IPD3* is required for mycorrhizal symbiosis but not tolerance to *Fusarium* wilt in mycorrhiza-deficient tomato mutant *rmc*. *Mycorrhiza* **28**: 495-507

Qiao S, Fang Y, Wu A, Xu B, Zhang S, Deng X, Djalovic I, Siddique KHM, Chen Y (2018). Dissecting root trait variability in maize genotypes using the semi-hydroponic phenotyping platform. *Plant and Soil* <https://doi.org/10.1007/s11104-018-3803-6>

Qin X, Feng F, Wen X, Siddique KHM and Liao Y (2018). Historical genetic responses of yield and root traits in winter wheat in the yellow-Huai-Hai River valley region of China due to modern breeding (1948-2012). *Plant Soil* <https://doi.org/10.1007/s11104-018-3832-1>

Ridsdill-Smith J (2018). Inspiration from Insects. *Journal of Shanxi Agricultural University (Natural Science Edition)*, **38**(1): 1-5.

Robles-Aguilar AA, Pang J, Postma JJ, Schrey SD, Lambers H, Jablonowski ND (2018). The effect of pH on morphological and physiological root traits of *Lupinus angustifolius* treated with struvite as a recycled phosphorus source. *Plant and Soil*. <https://doi.org/10.1007/s11104-018-3787-2>

Scheben A and Edwards D (2018). Bottlenecks for genome-edited crops on the road from lab to farm. *Genome Biology*.

Sehgal A, Sita K, Siddique KHM, Kumar R, Bhogireddy S, Varsshney RK, HanumanthaRao B, Nair RM, Prasad PVV and Nayyar H (2018). Drought or/ and Heat-Stress Effects on Seed Filling in Food Crops: Impacts on Functional Biochemistry, Seed Yields, and Nutritional Quality. *Front Plant Sci* **9**:1705.

Shen J, Zhang F and Siddique KHM (2018). Sustainable resource use in enhancing agricultural development in China. *Engineering* **4**: 588-589.

The International Wheat Genome Sequencing Consortium (IWGSC) (2018). Shifting the limits in wheat research and breeding using a fully annotated reference genome. *Science*. **361** (6403):

Walsh M, Broster JC, Aves C and Powles SB (2018). Influence of crop competition and harvest weed seed control on rigid ryegrass (*Lolium rigidum*) seed retention height in wheat crop canopies. *Weed Science* **66**: 627-633.

Wang L, Cutforth H, Lal R, Chai Q, Zhao C, Gan Y and Siddique KHM (2018). 'Decoupling' land productivity and greenhouse gas footprints: a review. *Land Degradation and Development* doi: 10.1002/ldr.3172.

Wang L, Gan T, Wiesmeier M, Zhao G, Zhang R, Han G, Siddique KHM and Hou F (2018). Grazing exclusion – an effective approach for naturally restoring degraded grasslands in Northern China. *Land Degradation and Development*. **29**: 4439-4456. DOI: 10.1002/ldr.3191

Wang L, Cutforth H, Lal R, Chai Q, Zhao C, Gan Y and Siddique KHM (2018). 'Decoupling' land productivity and greenhouse gas footprints: A review. *Land Degradation and Development*. **29**: 4348-4361. DOI: 10.1002/ldr.3172.

Wang X, Liu H, Mia MS, Siddique KHM and Yan G (2018). Development of near-isogenic lines targeting a major QTL on 3AL for pre-harvest sprouting resistance in bread wheat. *Crop & Pasture Science* **69**: 864-872.

Wang Y, Kong WN, Zhao LL, Xiang HM, Zhang LJ, Li L, Ridsdill-Smith J and May RY (2018). Methods to measure performance of *Grapholita molesta* on apples of five varieties. *Entomologia Experimentalis et Applicata*, **166**: 162-170.

Watson A, Kingwell R, Griffith G and Malcolm B (2018). A review of opportunities to promote Australian wheat in export markets. *Australasian Agribusiness Perspectives* **21** (10): 165-193.

Xie J, Yu J, Chen B, Feng Z, Lyu J, Hu L, Gan Y and Siddique KHM (2018). Gobi agriculture: an innovative farming system that increases energy and water use efficiencies. A review. *Agronomy for Sustainable Development* **38**: 62-78.

Yang S, Chen S, Zhang K, Li L, Yin Y, Gill RA, Yan G, Meng J, Cowling WA, Zhou W (2018). A high-density genetic map of an allohexaploid Brassica doubled haploid population reveals quantitative trait loci for pollen viability and fertility. *Frontiers in Plant Science* (**9**): 1161.

Yu J, Golicz A, Lu K, Dossa K, Zhang Y, Chen J, Wang L, You J, Fan D, Edwards D, Zhang X (2018). Insight into the evolution and functional characteristics of the pan-genome assembly from sesame landraces and modern cultivars. *Plant Biotechnology Journal*.

Yuan Y, Milec Z, Bayer PE, Vrána J, Doležel J, Edwards D, Erskine W, Kaur P (2018). Large-Scale Structural Variation Detection in Subterranean Clover Subtypes Using Optical Mapping. *Frontiers in Plant Science*. **9** (971):

Zhong L, Fang Z, Wahlqvist ML, Hodgson JM and Johnson SK (2018). Extrusion cooking increases soluble dietary fibre of lupin seed coat. *LWT* <https://doi.org/10.1016/j.lwt.2018.10.018>

Zhu Y, Chen Y, Gong X, Peng Y, Wang Z, Jia B (2018). Plastic film mulching improved rhizosphere microbes and yield of rainfed spring wheat. *Agricultural and Forest Meteorology* **263**: 130–136.

Book chapters

Cowling WA and L Li (2018). Turning the heat up on independent culling in crop breeding. In: Hermes S and Dominik S (eds.) *Breeding Focus 2018 - Reducing Heat Stress*. (pp. 119-134). Armidale, NSW, Australia: Animal Genetics and Breeding Unit, University of New England.

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