

# The UWA Institute of Agriculture

Number 30, December 2016



THE UNIVERSITY OF  
**WESTERN  
AUSTRALIA**



## Agricultural Engineer wins at WA Innovator of the Year Awards

**A new tool that makes native seeds easier to handle has won researchers from UWA and the Botanic Gardens and Parks Authority a top prize at the 2016 WA Innovator of the Year awards.**

The 'seed flamer', which won the Mitsubishi Corporation Emerging Innovation Category at the State awards ceremony held in November, will transform how vast areas such as degraded agricultural lands are revegetated.

By repeatedly exposing seeds to a flame inside a rotating drum, in a precisely controlled fashion, the fluffy appendages

and hairs on the seeds are carefully removed making them much easier to handle.

Agricultural engineer Assistant Prof Andrew Guzzomi, from the School of Mechanical and Chemical Engineering and IOA, said the fluffy appendages and hairs on wild collected seeds make them bulky to store and transport and they stick together, making them hard to sort and use in direct seeding machinery.

"Removing the appendages enables the application of artificial coatings to seeds to improve germination and allow precision machine sowing.

"Importantly, the exposure of the seeds to the flame is controlled to have the desired result without harming the seeds' ability to germinate," he said.

The 'flash flaming' device has been patented and a partnership to support the commercialisation of the invention is being offered through UWA's Research Development and Innovation office.

Professor Guzzomi and his team has previously developed sandalwood seed planters for the WA grainbelt.



## Director's Column

Hackett Professor Kadambot Siddique AM CitWA FITSE FAIA FNAAS FISPP  
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The promise of a record breaking grain production season in Western Australia has been marred by the devastating frosts in September, and as harvest progresses, the full impact of the multiple frost events are being uncovered. In our pledge to provide research-based solutions to advance agriculture, UWA researchers led by Dr Nik Callow are harnessing new technologies to improve frost monitoring methods and mapping of damage to grain crops following frost events (see page 7). I wish growers a smooth and safe harvest in the lead up to the end of the year.

IOA researchers are continuously striving for research excellence and the latest international rankings are a reflection of their hard work and dedication. In Shanghai Jiao Tong University's Academic Ranking of World Universities ([www.shanghairanking.com](http://www.shanghairanking.com)), UWA improved its rank to 24th in the world for *Life and Agricultural Sciences*. UWA also improved its rank in the National Taiwan University Ranking 2016 (<http://nturanking.lis.ntu.edu.tw>) for the field of *Agriculture*, to 29th in the world. Congratulations to all involved in conducting high impact research.

One such piece of research resulted in a new tool that makes native seeds easier to handle. Agricultural engineer Dr Andrew Guzzomi and team from UWA and the Botanic Gardens and Parks Authority developed the 'seed flamer' which will transform how vast areas of degraded agricultural lands are revegetated. The innovation has won researchers a top prize at the 2016 WA Innovator of the Year awards (see cover story).

The UNFAO International Year of Pulses 2016 has been a rewarding year advocating the benefits of pulses

to sustainable cropping systems and human health. In my role as special ambassador for the Asia and the Pacific region, I have had the opportunity to contribute to fruitful discussions about the existing policy environment, and priorities for the advocacy and promotion of pulses in the region. IOA members have helped spread the message about pulses at numerous events throughout the year, including at UWA Open Day, Dowerin Field Days, National Science Week, the IGA Perth Royal Show and at various international events (see pages 4, 5, 10 and 14).

Global Pulse Day is on 18 January 2017 and I want to use that opportunity to wrap up my ambassadorship with a food drive. IOA will be collecting pulses until mid-January, to be donated to Foodbank WA. You can either bring in bags or tins of pulses, or, to make donating easier, you can buy a tin of chickpeas for a gold coin to put in the box. You can find the box and the chickpeas at the IOA office.

Finally, I would like to sincerely thank IOA's Industry Advisory Board, the Institute Management Board, Theme Leaders, UWA Farm Ridgefield Committees, IOA members, staff, collaborators and funding bodies for their dedication and support to IOA throughout 2016.

I would also like to sincerely thank Mrs Rachel Benton for her hard work and positive attitude over the past year and a half. Rachel has accepted a position with the Research Development Office in the Faculty of Medicine and Health Sciences and I wish her all the best in her new role.

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



## Pingelly Astrofest an astronomical success

Britt Liebeck  
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**The scenic backdrop in Pingelly proved to be a popular place for budding astronomers and star enthusiasts of all ages on Saturday 17 September.**

Over 300 people from Pingelly, surrounding communities and Perth ventured out to UWA Farm Ridgefield's inaugural Pingelly Astrofest to see what the sky had on offer.

UWA Farm Ridgefield and the International Centre for Radio Astronomy Research (ICRAR) hosted the free community based festival to celebrate local astronomy and Australian science.

UWA Farm Ridgefield is home to the Future Farm 2050 Project, which undertakes research into best practice farming for the future. Project Leader Prof Graeme Martin said that the event was a huge success, with the attendance far exceeding expectations.

"This event was a great way to invite the community to the farm to get involved in science and learn about astronomy, and we are thrilled that so many locals came to enjoy the evening."

Local astronomy enthusiast Mr Trevor Keates gave a talk on the history of astronomy in Pingelly, and many visitors young and old enjoyed the Spacedome and 'Element of Surprise' shows that Scitech put on throughout the evening.

As the sun went down, dedicated volunteers from The Astronomical Group of WA (AGWA) and The Astronomical Society of WA (ASWA) pointed their telescopes to Saturn, Jupiter, the Moon and plenty of stars.

One participant from Beverley said it was a fantastic to have an event like this out in the country.

"It was great to chat to the astronomers and there were so many activities to get involved with," she said. "The telescopes and Scitech shows were definitely a highlight."

"We love inviting our neighbours in Pingelly and nearby shires to the farm and we hope to host more events like this for the local community."

"We would like to say a huge thank you the Pingelly CRC, Men's Shed and all the volunteers that contributed to making this event a huge success."



NATIVE SHRUBS GROWING ON UWA FARM RIDGEFIELD

## Demonstrating Ecosystem and Biodiversity Management

Restoration, including planting trees, is a significant component of UWA Farm Ridgefield's strategic plan. It incorporates scientific research investigating restoration of the agricultural landscape in parallel with pasture production and utilisation.

Guided by a biodiversity action plan developed by Greening Australia, a project is under way to re-establish the native ecosystem on non-arable areas of the Farm. The project, "Demonstrating Ecosystem and Biodiversity Management on UWA Farm Ridgefield", is supported by the Australian Government's 20 Million Trees Programme (part of the National Landcare Programme) and Greening Australia, WA.

This year, over 28,000 seedlings were planted, over 20kg of native seeds directly seeded, using almost 70 species. The total area that was incorporated into the project this year was 50 Ha.

Since 2012, students from John Curtin College of the Arts, Applecross Senior High School and Ardross Primary School, as well as UWA student volunteers have also planted trees on the farm to contribute to the restoration program.

The Ridgefield Multiple Ecosystem Services Experiment led by Prof Richard Hobbs compares monocultures and mixtures of native plant species that provide ecosystem services in a long-term experiment.



ADJUNCT PROF DR RAJEEV VARSHNEY RECEIVING THE SHANTI SWARUP BHATNAGAR

## Rajeev Varshney wins award dubbed the Nobel Prize of India

India's Prime Minister Narendra Modi has recognised the importance of genomics breeding for advancements in agriculture, through an award to Dr Rajeev K Varshney, Research Program Director- Genetic Gains at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and Research Professor at UWA.

The Shanti Swarup Bhatnagar (SSB) was awarded to Dr Varshney for his contribution to decoding the genome sequences of three important crops – pigeonpea, chickpea and groundnut and identifying genes with traits to develop more resilient varieties.

The SSB Award is most coveted and often dubbed as the Noble Prize of India in multidisciplinary science. The prize is

awarded on the basis of contributions made through work done in India during the five years, preceding the year of the prize. Dr Varshney is one of a few agricultural scientists who has been conferred this prestigious award.

Indian Prime Minister Modi emphasised the need to double the income of farmers by 2022 and also highlighted the importance of science to produce more pulses in rainfed conditions, at the 75th Foundation Day of the Council for Scientific & Industrial Research (CSIR) in New Delhi on 26 September 2016.

He said per drop, more crop, our objective should be to move to an inch of land, and a bunch of crops. The prime minister also talked about time bound delivery of scientific results, of which, a successful technology is one which provides benefit to the common man.

ICRISAT Director General Dr David Bergvinson said, "the power of genomics science (upstream research) and collaboration with advanced research institutes and national partners, especially ICAR and State Agricultural Universities, has made it possible for us to make a quantum leap in genomics research and molecular breeding in dryland tropics."



RESEARCHERS IMPART THEIR PASSION FOR PULSES ON NATIONAL SCIENCE WEEK ATTENDEES

## NATIONAL SCIENCE WEEK GETS PULSES RACING

Professor Willie Erskine  
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**UWA researchers got pulses racing at this year's National Science Week held at the Perth Cultural Centre in August.**

Being the International Year of Pulses, Prof Willie Erskine and his team from the Centre for Plant Genetics and Breeding set up a booth around pulses,

their nutritional benefits and how they contribute to sustainable agriculture. Prof Erskine also gave a public talk on 'You, and the International Year of the Pulse' in the open amphitheatre.

The event was family-oriented and the crowd was interested and interactive.

# UWA graduate is best agronomist in Australia under 30

Courtney Piesse  
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**UWA agricultural science graduate Mr Courtney Piesse from Elders Kojonup was recently named as the inaugural winner of the Adama Young Agronomist of the Year award.**

Courtney topped a field of 100 young agronomists around Australia to take out the inaugural award, making him the best agronomist in the country under the age of 30.

Adama Chief Executive Officer, Darrin Hines, congratulated Courtney on his win, adding that he demonstrated tremendous agronomic skills throughout the competition.

“Courtney has proven to be an agronomist who farmers can trust and rely on across the full scope of their operations,” Mr Hines said. Courtney and the two runners-up, Andrew McMahan from Manangatang, Victoria, and Matt Foulis from Wilmington, South Australia

travelled to the USA to examine cropping systems in California and Washington.

Now in his ninth year at Elders, Courtney grew up on his family’s sheep and cropping farm at Kojonup before heading to UWA to obtain degrees in agricultural science and commerce. He then took up his first professional role at Elders Merredin as an agronomist in 2007.

“After growing up in the Great Southern, it was great to work with eastern wheat belt farmers to learn a different approach to grain and livestock production,” Courtney said.

“These clients allowed me to expand my skills with them so I thoroughly enjoyed my four years there and the opportunity to learn more about farming in a low rainfall environment.”

In 2011, he returned to Kojonup with Elders as agronomist and then senior agronomist for the Great Southern before he moved into horticultural agronomy in 2015.



COURTNEY PIESSE

As a result, Courtney is applying his agronomy skills to crops such as potatoes, onions, carrots, leafy vegetables, table grapes and tree crops in Midland and Bunbury as well as intensive beef and dairy, broadacre crops/pasture in Williams and irrigated cropping in the Pilbara.

“No matter which farm enterprises our clients are involved in, I believe the key issues for agronomists like me are how we address diminishing gross margins for farmers and how we filter the wealth of information they receive to make their operations viable and sustainable.”



## Pulses in meeting the zero hunger and nutritional challenges

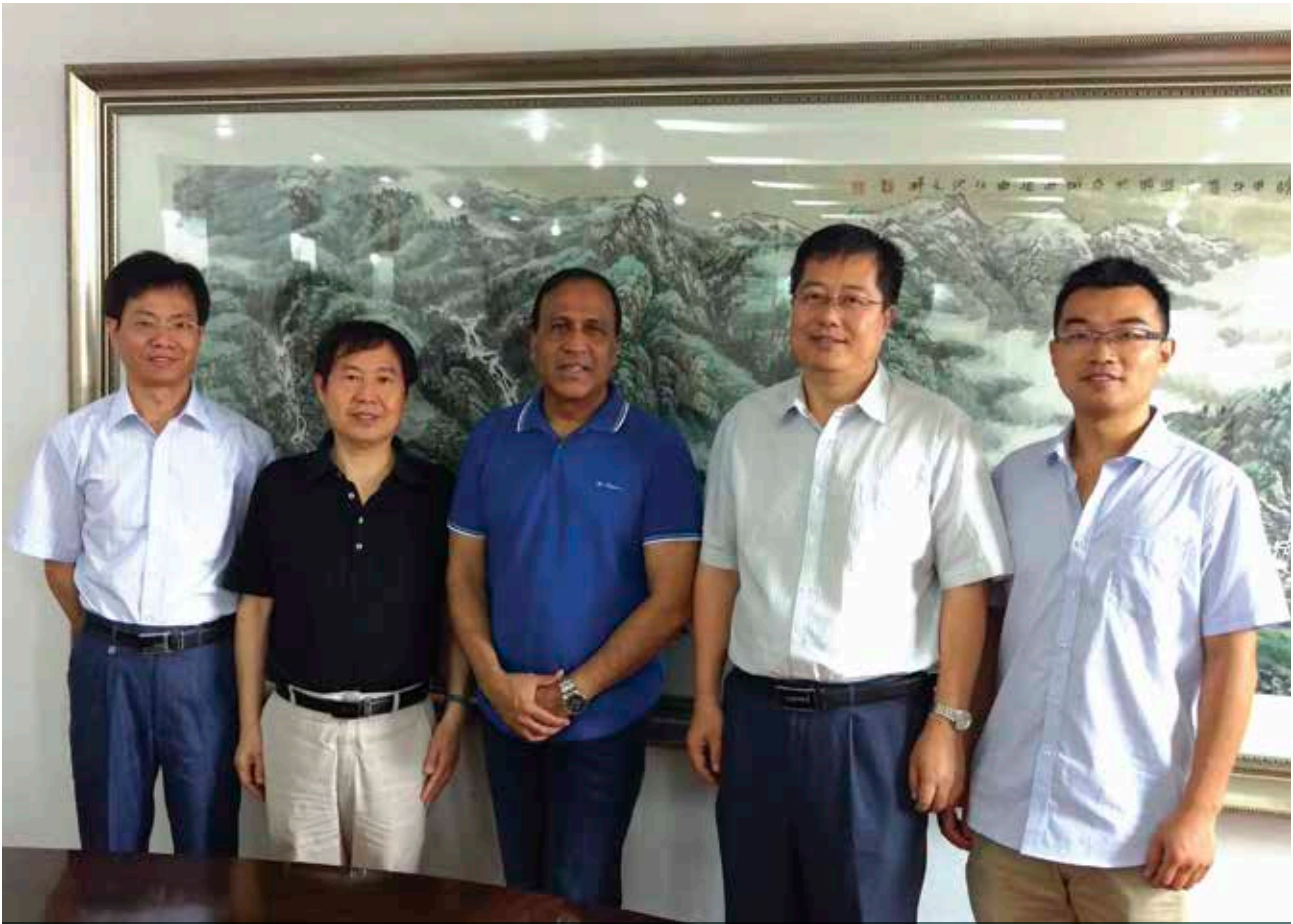
Hackett Prof Kadambot Siddique  
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**A Consultation Forum on enhancing the productivity and profitability of pulses for addressing food and nutritional security was convened in August by the MS Swaminathan Research Foundation (MSSRF), Chennai, India.**

UNFAO Special Ambassador for International Year of the Pulses, Hackett Prof Kadambot Siddique joined prominent national and international scientists at the three-day forum to discuss the role of pulses in hunger, nutrition and poverty alleviation. In attendance were FAO, ICRISAT, ICARDA, the Indian Council of Agricultural Research (ICAR), and several leading farmers from India who made significant contributions.

Prof Siddique presented a talk on recent developments in the abiotic stress tolerant pulse for the future, and following the event, MSSRF released a publication titled ‘Pulses in meeting the zero hunger challenges.’

Forum attendees also contributed to the “Chennai Declaration” document with key recommendations for enhancing productivity and profitability of pulses for addressing food and nutritional security.



DEPUTY DIRECTOR PROFESSOR XINGCHANG ZHANG OF ISWC PRESENTED A CERTIFICATE OF VISITING PROFESSORSHIP TO PROF SIDDIQUE

## UWA and CAS collaborate to combat drought

**Dr Yinglong Chen**  
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Prof Kadambot Siddique and Dr Yinglong Chen from IOA visited the Institute of Soil and Water Conservation (ISWC), Chinese Academy of Sciences (CAS) and Ministry of Water Resources, Yangling, China, during 19 to 24 August 2016.

Established in 1956, ISWC is the first research institution of its kind in northwest China and has international reputation in soil erosion processes and simulation, water and soil conservation, restoration and utilisation, and dryland farming.

It has merged with six other institutions in Yangling to form the new Northwest Agricultural and Forestry University (NWFU) since 1999, and is under the umbrellas of both CAS and NWFU.

During the visit, Prof Siddique was appointed Visiting Professor by the Deputy Director Prof Xingchang Zhang of ISWC, who also made an academic visit to UWA in November 2015.

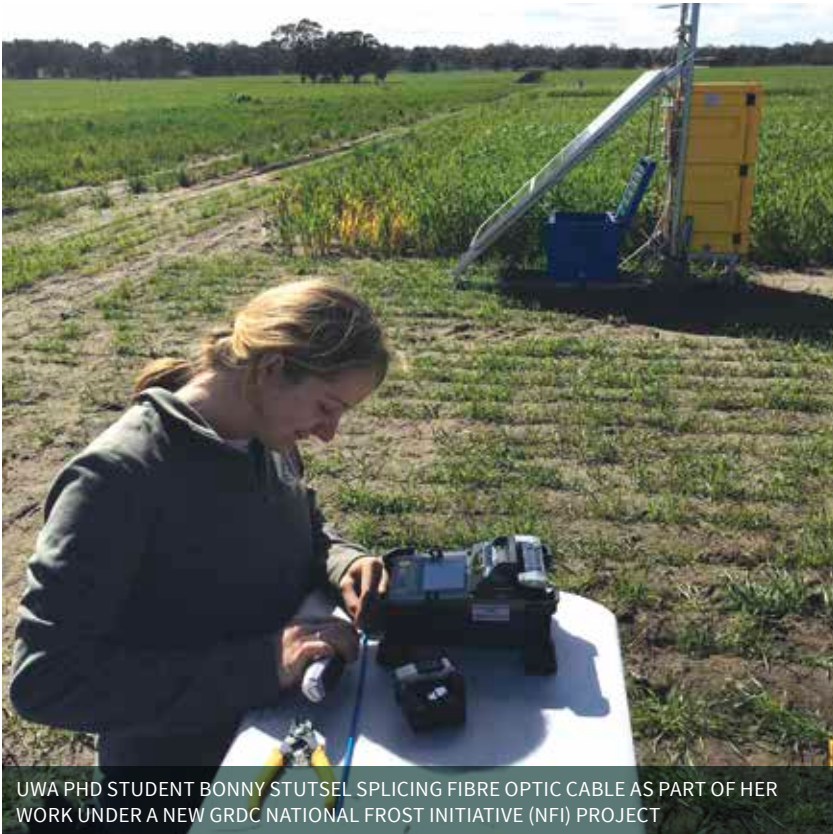
Prof Siddique and Dr Chen attended several meetings with researchers from ISWC, College of Agronomy, State Key Laboratory of Soil Erosion and Dryland Farming on the Loess Plateau, and Institute of Water-saving Agricultural in Arid Areas of China during the visit. Prof Siddique presented four talks to the staff and postgraduate students.

Prof Siddique and Dr Chen visited research facilities including the Rainfall Simulation Laboratory for Soil Erosion Processes (the second largest in the world), and belowground weighing lysimeter facilities.

Dr Chen has established a long-term collaboration with ISWC including the support of the CAS “100 Talent” program. He is a theme leader and chief scientist of State Key Laboratory of Soil Erosion and Dryland Farming on the Loess Plateau to help establish research capacity in studying crop root systems for dryland agriculture.

The semi-hydroponic phenotyping system developed by Dr Chen at UWA is re-constructed at ISWC to identify root trait variability in large collections of maize and wheat germplasms in China.

Prof Siddique and Dr Chen discussed with CAS and NWFU colleagues regarding a joint workshop on crop roots and rhizosphere interactions in Yangling in September 2017 to promote further collaborations between UWA, CAS and NWFU through ISWC.



UWA PHD STUDENT BONNY STUTSEL SPLICING FIBRE OPTIC CABLE AS PART OF HER WORK UNDER A NEW GRDC NATIONAL FROST INITIATIVE (NFI) PROJECT

## New technologies deployed in frost fight

New technologies and alternative scientific disciplines are being harnessed in a bid to improve frost monitoring methods and mapping of damage to grain crops following frost events.

“If successful, this could enable growers to customise their own frost management tool kit,” said Dr Nik Callow, from the School of Earth and Environment and IOA.

Dr Callow and PhD students Bonny Stutsel and Mary Murphy, have been gathering data in the WA grainbelt under a national project managed by CSIRO and funded and coordinated by the Grains Research and Development Corporation (GRDC) National Frost Initiative (NFI).

Several frost events have occurred in the WA grainbelt during this August/September which have resulted in extensive damage to crops.

Dr Callow said that traditionally, growers had relied on weather stations to gauge frost severity but there was growing recognition of the benefits of using temperature monitoring equipment within a paddock in frost-prone areas.

“Temperatures can vary by as much as 2°C or more between the soil and the plant canopy, and monitoring temperatures well below the canopy may underestimate the likely damage to a crop, particularly during marginal frost events,” Dr Callow said.

“Bonny Stutsel’s PhD is focused on understanding where to monitor temperatures that will give growers data that reflects the temperature that critical parts of plants have been exposed to and the likely damage.”

The team is using fibre optic cable in the field to conduct ‘distributed

temperature sensing’ (DTS), a new research technology which allows temperature to be measured every 25cm along many kilometres of the cable, that can be placed in crops.

“While this technology is too cumbersome and costly to use in normal farming systems, the research will allow us to make better recommendations on where to place temperature loggers and whether you need to move them as the plants and canopy grow,” Dr Callow said.

“This will help ensure that low-cost loggers provide realistic data to determine temperature and likely frost damage.”

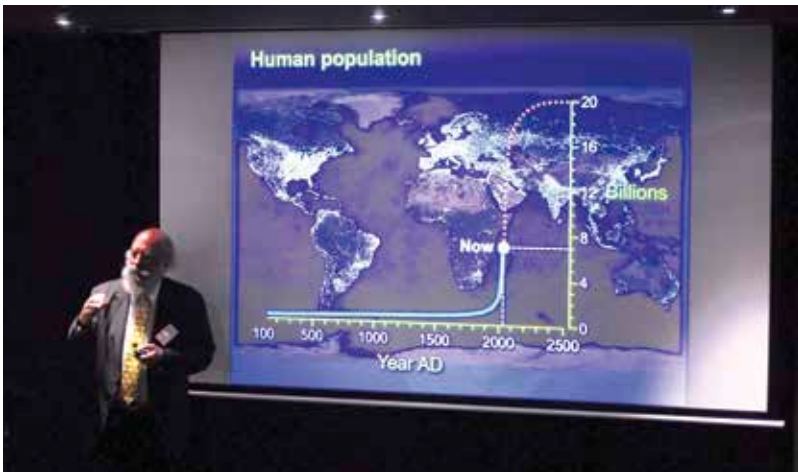
The other focus of the project is post-frost event detection methods, including the use of Remotely Piloted Aircraft Systems (RPAS), also known as drones or Unmanned Aerial Vehicles (UAVs).

This is investigating whether spectral cameras, which can measure the wavelength of light reflected from plants, or thermal cameras, which can measure plant stress and potentially frost damage, are the best sensors to use in RPAS to map frost damage after an event.

“Mary Murphy’s PhD is looking at how data from the visible and non-visible (infrared) light spectrum generated by spectral cameras may allow frost damage to be assessed well before the visual signs of damage appear,” Dr Callow said.

“Spectral data can be collected from handheld sensors or remote aircraft and the team will evaluate these options and make recommendations on how to most accurately map frost with RPAS.”

Thermal images of crops, also collected from handheld and airborne thermal sensors, could provide an alternative approach to spectral sensing and measure crop stress.



## Livestock Industries: can they help feed the world with limited impact on the planet?

Prof Graeme Martin  
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Professor Graeme Martin from the School of Animal Biology and IOA was invited by United Nations Association of Australia (UNAA) to present the topic: “Livestock Industries: can they help feed the world without destroying the planet?”

He shared the podium with Curtin University’s Professor Janet Bornman who spoke to the topic of “Opportunities and risks on the way to improving food security”. The event was held in the Rio Tinto Central Theatre, Central Park, Perth, on World Food Day on 16 October.

World Food Day is a commitment to eradicate hunger in our lifetime and celebrates the creation of the Food and Agriculture Organisation of the United Nations.

Our climate is our biggest threat to a secure food supply. With an adverse changing climate and population increases to meet an increased demand, agriculture and food systems will need to adapt to become more resilient, productive and sustainable.

Prof Martin addressed the issues raised by FAO’s 2006 Report, “Livestock’s Long Shadow” and presented the perspective that livestock were, in fact, an essential component of strategies for food security. However, there are six major challenges that need to be met:

- 1) Improved animal health, welfare, nutrition so that the animals are as efficient as possible;
- 2) Selection of breeds that are suited to environment, rather than importation of exotic breeds in the hope that they will increase productivity;
- 3) Human nutrition – getting the balance right between quality and quantity;
- 4) Remembering that livestock often have a deep relevance to human culture so cannot simply be abandoned;
- 5) Reduce the consumption of human food by livestock; ensure ruminants graze in non-cropping areas or are fed food waste;
- 6) Reduce the environmental footprint, particularly methane emissions.



MAREE GOOCH AND ELIZABETH BRENNAN IMPART SOME KNOWLEDGE ON THE NEXT GENERATION OF AGRICULTURE PROFESSIONALS

## INFLUENTIAL WOMEN IN AGRICULTURE INSPIRE NEXT GENERATION OVER BREAKFAST

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The UWA Students of Natural and Agricultural Science (SNAGS) held another successful breakfast to celebrate women in agriculture on 16 August 2016.

The annual event, now in its third year was sold-out to a crowd of over 150 students and industry members joining us for breakfast at the University Club of WA. Students from UWA, Curtin, Murdoch and Muresk Institute attended and enjoyed interacting with their peers and industry groups.

The purpose of the breakfast is to promote the role of women within the agriculture industry, and provide an opportunity for the next generation of agriculture professionals to engage with influential women in the industry.

This year we had two inspiring women, Mrs Maree Gooch, finalist RIDIC Rural Women of the Year 2016, and Ms Elizabeth Brennan, President of Australian Women in Agriculture, to share their experience and leadership within the industry. Both Maree and Elizabeth gave an overview of their work and described the many challenges they have faced on their journey.

Their presentations sparked interesting discussions on what can be done to increase the numbers of women in senior management positions within a traditionally male dominated industry.

The event was sponsored by many industry groups and we thank them for their ongoing support for the event.





## CABERNET AIN'T JUST CABERNET

Patricia Agudelo-Romero and  
Dr Michael Considine  
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**The massive advances in cost-effective state-of-the-art whole genome sequencing technologies have provided a unique opportunity to crack the genetic code of agricultural crops such as grapevine, and there are considerable differences within a single variety.**

The fingerprints of Australia's top ten Cabernet Sauvignon clones are being resolved by a team of UWA researchers to identify genetic markers of their identity. With this information, researchers in Australia will be able to further explore spontaneous mutations, and how they relate to variation in berry and wine quality. They will also be able to study the regional effect on expression of clonal quality traits, potentially linking to other research such DAFWA's 'Clones for Climate' study.

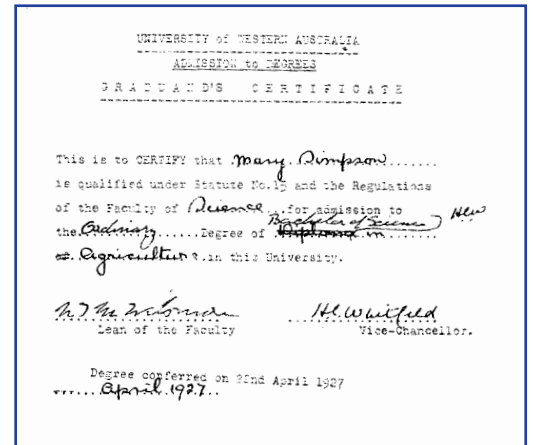
To develop the fingerprints, the team applied genome resequencing of the ten clones, with some replicate vines included. The sequence data were then mapped to the Cabernet Sauvignon reference genome, which was only just published this year. The data represented approximately 30X depth of sequencing and 90% coverage of the genome.

Identifying and validating the fingerprints has proven to be a significant challenge. A number of analytical approaches were applied in order to yield robust fingerprints. A total set of 33362 single-nucleotide polymorphisms (SNPs) were found to discriminate the total set of clones. When researchers compared clones one-to-one, they found they could discriminate each clone using between 1780 to 5100 SNPs. These are considerable differences considering they are all Cabernet Sauvignon!

The data analysis is not finished yet. There are other elements to explore, such as the effect of viral infection on the variation in DNA, as well as mobile genetic elements, which may explain some of the larger sequence differences.

Importantly, the researchers hope this set of data can be made available to industry and other researchers, so that it can be mined for more information as new technologies and understanding emerge.

This research was funded through an Australian Research Council Linkage Project based at UWA, with financial support from DAFWA and the WA wine industry through WAVIA, and in-kind contributions from the Yalumba Nursery and AWRI.



GRADUAND'S CERTIFICATE OF THE FIRST KNOWN FEMALE TO GRADUATE FROM UWA WITH A BSC AGRICULTURE.

## UWA's first female agriculture student graduated in 1927

Diana Boykett  
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**Records uncovered by several members of the Faculty of Science and University Archivist, Ms Maria Carvalho have revealed some interesting insights about the first students enrolled in Agricultural Science at UWA.**

The first student record of a female studying agriculture they found was for Mrs Mary Maclean (nee Simpson).

Women were enrolled at UWA from 1911, and the Chair of Agriculture was established in 1913 under the Faculty of Science. It was later in 1936 that The UWA Institute of Agriculture was established.

Mrs Maclean enrolled at UWA on 8th March 1923, and graduated with a Bachelor of Science in Agriculture on 22nd April 1927. The granduan's certificate is signed by NTM Wilsmore, then Dean of the Faculty, and UWA's first Vice-Chancellor, HE Whitfeld.

If you have any records or stories about UWA's agriculture alumni to share, please contact the IOA by emailing [ioa@uwa.edu.au](mailto:ioa@uwa.edu.au).

## WHEAT BREEDING IN CHINA: A BREEDER'S PERSPECTIVE

Dr Helen Liu  
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Wheat breeder Dr Yong Zhang from the Institute of Crop Sciences, Chinese Academy of Agricultural Science (CAAS), visited School of Plant Biology and IOA in August 2016.

Dr Zhang gave an informative seminar on breeding for high yield with good quality wheat in China. He discussed the history and current status of wheat breeding, the progress of yield and quality improvement, and the opportunities and challenges of wheat breeding in China.

Wheat is a major crop in China with a yearly production of 112 million tonnes and a consumption of 114 million tonnes.



DR YONG ZHANG EXAMINE GRAIN QUALITY IN A WHEAT PLOT

In Australia, production and consumption are 26 million tonnes and 5 million tonnes respectively.

Apart from yield potential and resistance to abiotic and biotic stresses, nutrition and quality has become an increasingly important breeding objectives with the increased government support to farmers, and research and development.

Dr Zhang summarised the genes and functional DNA markers related to yield and quality improvement, and the availability and utilisation of these markers in their labs.

UWA Researchers and PhD candidates discussed with Dr Zhang the prospective use of genome wide selection in wheat breeding, and markers were available for important traits such as yield, heat and drought tolerance, water use efficiency and pre-harvest sprouting.



PROF SIDDIQUE WITH MR ALAN MELDRUM AND MS GEORGIA REID AT THE PULSE DISPLAY

## Passion for pulses at Perth Royal Show

Nutritious seeds for a sustainable future was the key message at a pulse display at this year's IGA Perth Royal Show held in September 2016.

The IGA Perth Royal Show is Western Australia's most important community event, and attracts over 400,000 visitors from the city and rural areas every year.

IOA grew several varieties of chickpea, lentil, faba bean, field pea and lupin plants for the display in the Farm 2 Food Pavillion, to show visitors where the seeds come from. Dried seeds and packaged products were also on display.

IOA Director Hackett Prof Kadambot Siddique was invited to speak at an International Year of Pulses 2016 breakfast event hosted by the Royal Agricultural Society of Western

Australia during the Show. Speaking to approximately 50 key opinion leaders in the agricultural industry, Prof Siddique discussed how pulses can provide solutions to human health and sustainability of cropping systems.

"The International Year of Pulses 2016 is timely because pulses are important for food and nutritional security, environmental benefits and mitigation of climate change," Prof Siddique said.



DR JAMES RIDSDILL-SMITH SPEAKS AT THE XXV INTERNATIONAL CONGRESS OF ENTOMOLOGY. PHOTO: ENTOMOLOGY SOCIETY OF AUSTRALIA

## Honorary membership for entomologist

**Adjunct/Prof James Ridsdill-Smith has been appointed by the Council of the International Congresses of Entomology to Honorary membership.**

His election at the 25th International Congress of Entomology in Orlando, Florida, recognises national and international contributions to entomology and to the International Congresses of Entomology.

Dr Ridsdill-Smith has served on Council for 12 years and was Secretary General from 2008-2016. Every four years the Council has elected 2-3 honorary members, and out of the 70 elected since 1910 Dr Ridsdill-Smith is the third from Australia.

The 26th Congress of Entomology will be held in Helsinki, Finland in July 2020 with the theme Entomology for the Planet Earth.



## Bushfire prediction technology to benefit WA's grain growers

Prof George Milne  
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**UWA researchers who developed the award winning bushfire prediction technology, *Aurora/Australis* are now developing a device that will bring the simulation program to the front-line.**

It will directly benefit residents in regional areas in many ways including identification of safe evacuation routes, and protection of crops and critical infrastructure.

Currently, the *Australis* fire prediction system assists the emergency services to make decisions by providing them with bushfire simulation maps and prediction tools. However, it is run from Perth and relies on a direct internet connection which may not be available in the field in regional WA.

Prof George Milne from the School of Computer Science and Engineering and IOA is developing an "in-the-paddock" device to give volunteer bushfire brigades and grain growers access to the prediction tools from their vehicles, and in areas with poor communications infrastructure.

Prof Milne said the in-cab device will be free-standing, and will have the capability to run the enhanced *Australis* simulator without the need for connection to the internet.

"The devices will have an easy-to-use, touch screen interface and will be able to rapidly generate the predicted location of the fire front and overlay future fire perimeters onto computer-based maps."

"They will permit rapid generation of future fire perimeters under changes to the forecast weather. These "what if" scenarios could include changes to wind speed, direction and the timing of arrival of a front," Prof Milne said.

In addition, the *Australis* fire prediction technology will be enhanced to include development of rate-of-spread models for cereal crops, which take into account high fuel loads.



THE UWA INSTITUTE OF AGRICULTURE DELEGATES AT THE 7<sup>TH</sup> INTERNATIONAL CROP SCIENCE CONGRESS (L-R: DR XIANGLING FANG, ADJ/PROF NEIL TURNER, PROF KADAMBOT SIDDIQUE, AND DR YINGLONG CHEN)

## IOA Researchers at the 7th international Crop Science Congress in Beijing

Dr Yinglong Chen  
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**Four crop scientists from IOA were invited to present their research findings at the 7<sup>th</sup> International Crop Science Congress (7<sup>th</sup> ICSC) hosted by the Chinese Academy of Agricultural Sciences and Crop Science Society of China during 14-19, August 2016 in Beijing.**

Hackett Prof Kadambot Siddique was invited to present a talk on recent advances in studying adaptation to abiotic stress in chickpea (*Cicer arietinum* L.) which is the third most important grain legume crop worldwide with some 72% of the world production from South Asian countries.

Prof Siddique said sustainable production of chickpea is challenged by the climate changes with likely increased production limitation and uncertainty in the future.

“Abiotic stresses, such as drought and low-fertility soils, are the main factors restricting production of chickpea as well as other major crops in many counties,” Prof Siddique said.

“Root traits and pattern of water use plays an essential role in improving crop adaptation to abiotic stresses.”

Adjunct Prof Neil Turner outlined the discovery and function of abscisic acid in root-shoot communication, water use efficiency and drought resistance. Significant progress has been made showing that roots in drying soil produce ABA that is transported to the shoots where the hormone induces stomatal closure by changing the potassium concentration of the guard cells. Endogenous ABA acts as a non-hydraulic root signal in response to soil drying, maintaining the leaf hydration and turgor. Whether ABA biosynthesis and responsiveness improves yields or not in the field conditions appears to depend on the drought environment

Dr Yinglong Chen gave a talk on the development of a novel semi-hydroponic phenotyping platform for accurate and high-throughput phenotyping of root-trait variability in several important crop germplasm, including narrow-leafed lupin, barley, chickpea and wheat. His studies in root structure and function shed light on the understanding of the role of root systems in improved adaptation to abiotic stress and enhanced productivity.

Dr Xiangling Fang reported her research findings on the races of the rice blast pathogen (*Magnaporthe oryzae*) in Australia and how to manage the disease through host resistance. Her study provides the first knowledge about races of the rice blast pathogen occurring in Australia, and highlights a high level of virulence variability among Australian rice blast isolates. Several genes conferring broad-spectrum resistance to the rice blast races were discovered in this study.

IOA delegates also met and discussed ongoing and future collaborations with researchers from various institutions including Lanzhou University, North-West Agricultural and Forestry University, CAAS, Chian Agricultural University, Zhejiang University, CIMMYT, ICRISAT and ICARDA.

The crop science congress has been organised and conducted in a number of countries (including Australia in 2004) every four years since July 1992 under oversight of The International Crop Science Society. The 7<sup>th</sup> ICSC provided an excellent opportunity for participants from various regions of the world to share the latest progress in global crop science research, and develop recommendations for future thrusts in research, development, and technology transfer.



## What makes grapevine bud burst?

Ms Karlia Meitha and Dr Michael Considine  
michael.considine@uwa.edu.au

**As part of the efforts to improve Australian grape industry, IOA researchers have been studying the factors influencing bud burst.**

A PhD student in Dr Considine's group, Karlia Meitha, studied the physiological and genetic regulation of buds at the earlier stages of burst in relation to their tissue oxygen status and light perception.

The timing of bud burst is determined by a balance of external environmental cues and internal processes, and is a major determinant of other events such as flowering during the growing season. The management of bud burst is often problematic in the areas with warmer winter and abnormal seasons. The expensive and laborious application of phytotoxic chemicals such as hydrogen cyanamide is commonly performed to force the bud burst.

The objective of Karlia's research was to improve the knowledge in biological processes of the buds responding to seasonal cues. This knowledge will enable us to develop a more environmentally friendly method of bud burst management.

The conditions of light and temperature have long been proposed as the main environmental cues that trigger the onset and release of bud dormancy. However, the signaling events during these stages are still unclear, as are the direct consequences of abnormal seasonality, such as those forecast in climate change scenarios.

Karlia's research found that tissue oxygen status is important in curating stress-dependent processes in buds during the initiation of burst. The results showed that the condition of tissue oxygen in the sensitive meristem area of the buds were very low (hypoxic) and gradually increased as the buds progressed to burst.

This gradual increase of tissue oxygen status is complemented by the shift of reactive oxygen species (ROS) within the bud, implicating oxygen and ROS in key developmental functions. These data were supported by gene regulation, which highlighted a prominent role for the chloroplast, even though the buds remained tightly enclosed and apparently protected from direct light.

This research was funded by the Australian Research Council, with financial support from DAFWA. Karlia's scholarship was supported by an Australia Award Scholarship and a Wine Australia travel grant.

## VALE, DR FRANCIS KOFI OFORI

**21 March 1949 – 31 October 2016**

**Dr Francis Kofi Ofori aged 67 passed away on 31 October 2016 in his hometown, Ghana.**

Dr Ofori completed his PhD in Agronomy at UWA in 1986 under the late Professor Stern. The title of his thesis was "Maize/Cowpea intercrop: A case study of the efficiency of cereal/legume intercrop system."

Following his PhD, Dr Ofori taught selected topics in tropical cropping systems at UWA's School of Agriculture.

Dr Ofori was committed to finding solutions for hunger and malnutrition. He collaborated extensively with local and international research institutions and donor agencies such as the World Bank, FAO, and the UN Development Program in the formulation and design of crop oriented projects for Ghana.



PROF SIDDIQUE IS RECOGNISED FOR HIS CONTRIBUTION TO THE GRAINS INDUSTRY

## DIRECTOR RECOGNISED FOR CONTRIBUTION TO WA'S PULSE INDUSTRY

The Grains Industry Association of Western Australia (GIWA) hosted a Pulse Degustation Cocktail Evening in September to celebrate the International Year of Pulses 2016.

During the event, GIWA CEO Ms Larissa Taylor presented Hackett Prof Kadambot Siddique with an award in recognition of services to Western Australia's pulse industry.

CEO Ms Larissa Taylor said GIWA felt it was important to acknowledge and formally honour Prof Siddique's appointment as the International Year of Pulses Special Ambassador for the Asia and the Pacific Region, along with his ongoing commitment to improving Western Australia's agriculture especially the grains industry.

As a result of Prof Siddique's research and extensive collaborations, Australia has become one of the major grain legume exporting nations in the world. His pioneering research on chickpea has contributed enormously to the Australian chickpea industry.

Prof Siddique's chickpea varieties such as Kimberly Large are grown in the Ord River Area; kabuli chickpea variety Almaz and more recent desi varieties such as Neelam and Amber are grown by Australian farmers.



## State of the art on pulses in the Asia Pacific region

The United Nations Food and Agricultural Organisation's Regional Office for Asia and the Pacific in collaboration with the Government of Mongolia organized the Asia and the Pacific Regional Dialogue on the International Year of Pulses in Ulaanbaatar, Mongolia from 24 to 26 October 2016.

The objectives were to understand and document the "state-of-the-art" on pulses in the Region in terms of opportunities and challenges, including the existing policy environment; to agree on common priorities for the advocacy and promotion of pulses in the region; and to identify knowledge gaps and research needs.

IOA Director Hackett Prof Kadambot Siddique was one of fifty participants from 14 countries including Australia, Austria, Bangladesh, China, India, Iran, Mongolia, Myanmar, Nepal, Philippines, Republic of Korea, Sri Lanka, Thailand and Vietnam attended the meeting in addition to FAO officials, including government representatives, farmers' organizations and international organizations.

Mr Bayartulga Lkhagvasuren, State Secretary of Ministry of Food, Agriculture and Light Industry of Mongolia opened the meeting and stressed the importance of pulses for the supply of a nutritious diet to the 490 million people living in the Asia Pacific region, many of whom do not have access to a sufficient supply of dietary energy to live a healthy life and their contribution to sustainable cropping systems.

In her opening address, Amgalan Ariunbold, Plant Production Consultant, FAO Regional Office for Asia and the Pacific, highlighted the Asia Pacific region as the major determinant of global crop production trends, since the region is the planet's biggest producer of cereals, vegetables, root & tubers, fruits and pulses. She pointed out that pulses are the solution to the global challenge of increasing agricultural productivity in an environmentally sound manner while improving the availability of nutritious foods for a growing population.

Unfortunately, many people think that pulses are for the poorest segments of the population and that developed countries tend to reduce pulse production, giving priorities to others crops. This ill-phenomenon is widely seen in the Asia Pacific region, especially in China, Japan, Thailand, Bangladesh and New Zealand.

Hackett Prof Siddique, delivered the keynote speech which provided an overview of the numerous benefits of pulses, the changing regional patterns in pulse production and the global consumption and health benefits. He provided strategies for enhanced production, marketing and consumption of pulse in the region and globally.



## Agribusiness productivity in Africa

Dr Amin Mugera from IOA and the School of Agricultural and Resource Economics visited the University of Stellenbosch Business School (USBS) in South Africa in August 2016 to deliver a Crawford Fund WA-supported Master Class titled **Applied Efficiency and Productivity Analysis for Agro-enterprises in Developing Countries**. Dr Nyankomo Marwa of the USBS coordinated the course.

The overall objective of the Master Class was to train a team of African scholars on the actual practice of performance benchmarking for agricultural and related enterprises; the specific aim was to start building rigorous empirical expertise of African scholars in the area of efficiency and productivity analysis. The project received financial support from the Crawford Fund WA.

Twenty one participants, representing ten African countries and Australia, benefited from the three day intensive training, followed by two days of self-directed learning via online material. Participants learned how to conduct empirical analysis, interpret results and formulate policy recommendations using performance benchmarking models.

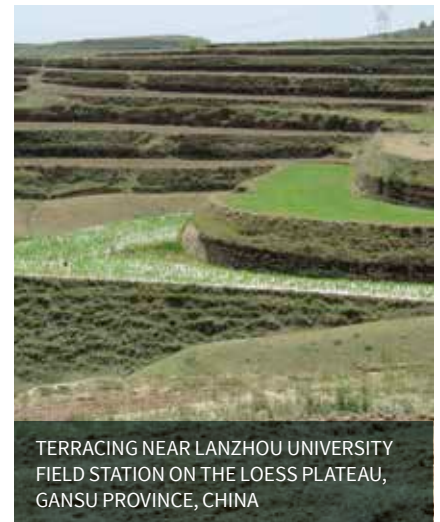
Hannes Ven der Merwe, a graduate student from South Africa said he took away three key points from the short course. Firstly, what applied efficiency and productivity analysis is; how you would apply it in industry; and importantly, how you would apply it in industry.

Dr Marwa said that this was the beginning of the USBS building a research group of efficiency and productivity analysis across Africa.

“We also envisage putting together a resource centre with relevant analytical tools and research a research support team.”

“Going forward, we are thinking about a more innovative way of offering courses on a more regular basis with a self-sustaining business model,” Dr Marwa said.

Dr Mugera said that UWA, through IOA and the Australia Africa University Network (AAUN), looks forward working with USBA in agribusiness capacity.



## PERENNIAL LEGUMES A FEATURE OF RESTORATION RESEARCH ON LOESS PLATEAU

E/Prof Lyn Abbott  
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E/Prof Lyn Abbott visited the Loess Plateau, Gansu Province in China during June 2016 to understand more about the effective management of lucerne. Her visit was part of a collaboration of more than ten years led by IOA's Adjunct Prof Neil Turner and Prof Kadambot Siddique. She was hosted by Prof Feng Ming Li and Dr Jing Wei Fan at the State Key Laboratory of Grassland Agro-ecosystems, Institute of Arid Agroecology at Lanzhou University (LZU). LZU, UWA and ICARDA has established a joint Centre for Dryland Agricultural Ecosystems at LZU.

Restoration research is an ongoing issue in the semi-arid region of the Loess Plateau. Much attention is now given to environmental plantings, and there is less extensive cropping on the terraces. The erodability of the soil is the reason for the emphasis on restoration through minimizing cultivation and by planting perennial vegetation on the terraces.

The soil at the research site is a Calcic Kastanozem with low rainfall at an altitude of about 1,500m. Lyn noted that the soil is very light and fluffy, unlike anything she had ever seen before.

This article was abridged from Soil Science Australia Newsletter *Profile* (November 2016).



UWA STUDENTS MING AND LACHLAN (LEFT) REPRESENTING UWA IN JAPAN



UWA STUDENT LACHLAN HUNTER HARVESTS RICE IN JAPAN

## Grooming students in the globalisation of intensive agriculture systems

Mr Lachlan Hunter  
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Ming and myself were lucky enough to be selected to represent UWA, and be the first Australian students to attend the Tokyo University of Agriculture (Tokyo NODAI) International Students Summit (ISS) on Food, Agriculture and Environment in the New Century.

The 16th ISS conference was held between 29-30 September at Tokyo NODAI Setagaya Campus in Tokyo, Japan. The aim of the conference is to provide students from NODAI

and their global partner universities an opportunity to gather and exchange views and ideas on global food, agricultural and environmental issues, and also to discuss their own roles in sustainable development.

This year's theme was *Students Promoting Environmental Justice in the Globalisation of Intensive Agricultural Systems*. UWA's Deputy Vice-Chancellor (Community and Engagement) Prof Kent Anderson, opened the conference and gave an overview of WA agriculture, and I presented a paper titled '*unlocking agricultural potential in the North West of Western Australia: Economic and social implications for regional communities including Aboriginal people*.'

The conference allowed us to interact with like-minded agricultural science students from all around the world and discuss current issues effecting the industry on a global level. It also gave us an insight to the role that Japanese agriculture plays within the global sector.

We thank IOA for giving us the opportunity, and in particular Dr Louise Barton for accompanying us to Japan.



## AWARDS AND INDUSTRY RECOGNITION

NAME	AWARD
Dr Andrew Guzzomi	2016 WA Innovator of the Year - Mitsubishi Corporation Emerging Innovation
Hackett Professor Kadambot Siddique	GIWA Award Recognition of services to Western Australia's pulse industry
Hackett Professor Kadambot Siddique	Visiting Professor, Institute of Soil and Water Conservation, Chinese Academy of Sciences
CRC Polymer team (Prof Daniel Murphy, Asst/Prof Matthias Leopold, Gavan McGrath, Jeremy Bougoure, Falko Mathes)	Vice-Chancellor's Impact and Innovation Award
Yongjuan Guan	Faculty of Science Publication Awards for Early Career Researchers 2016 – Feeding the World

## Visitors to IOA

NAME OF VISITOR	VISITOR'S ORGANISATION AND COUNTRY	HOST DETAILS	DATES OF VISIT
Dr Julian Klaus	Luxembourg Institute of Science and Technology	Prof Keith Smettem, Dr Matt Hipsey & Dr Nik Callow	February 2017–April 2017
Dr Raymond Cowley	Pioneer, Australia	Dr Sheng Cheng	19 September 2016
Prof Fangsen Xu	Huazhong Agricultural University, China	Dr Sheng Cheng	2 October 2016
Dr Xinmin Deng, Dr Lyle DePauw, Dr Laura Maher	Cargill, Australia	Dr Sheng Cheng	12 October 2016
Ms Rita Nowbuth	IAEA, Mauritius	Dr Sheng Cheng	12 October 2016
Dr Wayne Burton	Seed Net Australia	Dr Sheng Cheng	28 October 2016
Dr Frank Grosse, Dr Olaf Sass and Dr Yves Devisme	NPZ Germany	Dr Sheng Cheng, Prof Wallace Cowling	1 November 2016
Dr Zhao Wenqing	College of Agriculture, Nanjing Agricultural University, P.R China	Prof Kadambot Siddique & Dr Yinglong Chen	February 2017–February 2018
Dr Gurdev Chand	Sher-e-Kashmir University of Agricultural Sciences and Technology- Jammu	Prof Kadambot Siddique & Dr Yinglong Chen	
Dr Qirui Hou	Jiangsu University of Science and Technology, China	Dr Dominique Blache and Prof Jane Pillow	Early 2017–2018
Dr Nilsa Bosque-Perez	University of Idaho, USA	Adj/Prof Roger Jones	27–30 September 2017
Dr Oliver Schliebs	University of Tübingen, Germany	Prof Dave Edwards	Oct 2016–Mar 2017

## NEW POSTGRADUATE RESEARCH STUDENTS

STUDENT NAME	TOPIC	SCHOOL	SUPERVISOR(S)	FUNDING BODY
Ms Ly Le	Salinity Tolerance	Plant Biology & IOA	Prof Tim Colmer, Prof Kadambot Siddique	UWA IPRS
Mr Habib Rijzaani	Diversity in banana	Plant Biology & IOA	Prof Dave Edwards	

## NEW RESEARCH GRANTS

TITLE	FUNDING PERIOD	FUNDING BODY	SUPERVISORS
An integrated platform for rapid genetic gain in pulse crops	2016–2019	GRDC	Dr Janine Croser, Prof William Erskine, Dr Fede Ribalta
Phosphorus-efficient pastures that deliver high nitrogen- and water-use efficiency with reduced costs of production across southern Australia	2016–2019	MEAT & LIVESTOCK AUSTRALIA	Asoc/Prof Megan Ryan, Prof William Erskine, Prof Timothy Colmer
A pre-breeding and genetic diversity project in spring canola for NPZ Australia, based at The University of Western Australia 2016/17	2016–2018	NORDDEUTSCHE PFLANZENZUCHT HANS-GEORG LEMBKE KG	Prof Wallace Cowling
Improving Chickpea Adaptation to Environmental Challenges in Australia and India	2016–2017	SA RESEARCH & DEVELOPMENT INSTITUTE SARDI EX AUSTRALIA INDIA STRATEGIC RESEARCH FUND AISRF	Prof Timothy Colmer
Exploring the Scope for New Crop Suitability at Marvel Loch, Western Australia	2016	VIRTUE AUSTRALIA FOUNDATION	Hackett Prof Kadambot Siddique, Dr Chris Johansen, Prof Timothy Colmer
SoilsWest Alliance - Agriculture	2016–2018	WA DEPARTMENT OF AGRICULTURE & FOOD DAFWA EX ROYALTIES FOR REGIONS	Ms Frances Hoyle, Prof Daniel Murphy
Identifying genomic differences between Yitpi and other wheat varieties	2017	YITPI FOUNDATION PTY LTD	Prof David Edwards, Prof Jacqueline Batley
Food security and the governance of local knowledge in India and Indonesia.		ARC	Prof Christoph Antons, Prof Michael Blakeney, Hackett Prof Kadambot Siddique, Prof Philippe Cullet, Prof Yunita Triwardani Winarto, Dr Gregory Acciaioli, Dr Jagjit Plahe
Northern Australian Environmental Resource Hub – Project Plan 2	2016–2019	CHARLES DARWIN UNIVERSITY EX NATIONAL ENVIRONMENTAL SCIENCE PROGRAM NESP	Prof Michael Douglas, Dr Matthew Hipsey, Assoc/Prof Samantha Setterfield, Dr Sarah Prout Quicke, Prof David Pannell

CBH Research Program	2016	CO-OPERATIVE BULK HANDLING LIMITED	Dr Elena Mamouni Limnios, Prof Timothy Mazzarol, Hackett Prof Kadambot Siddique, Prof Geoffrey Soutar
Impact of water level manipulation in Great Lake	2016	HYDRO TASMANIA	Mr Matthew Hipsey
Soil microbial processes associated with retention of soil carbon after application of composted manure to dairy pastures	2016–2017	SOUTH WEST CATCHMENTS COUNCIL (NHT )	E/Prof Lynette Abbott, Dr Sasha Jenkins, Mr Ian Waite, Dr Zakaria Solaiman

## IOA 2016 Publications

(August – November)

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#### Book Chapter

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## UPCOMING EVENTS

**GLOBAL PULSE DAY COLLECTION**  
18 Dec-18 Jan 2017  
IOA Office, UWA

**GRDC GRAINS RESEARCH UPDATES**  
27-28 February 2017  
Crown Perth, Burswood

**HECTOR AND ANDREW STEWART  
MEMORIAL LECTURE**  
3 April 2016  
UWA

## IOA MISSION

To provide research-based solutions to food and nutritional security, environmental sustainability and agribusiness.

## HELP US REDUCE WASTE



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