



Summer School students with Profs Leopold and Gleeson at Matilda Bay foreshore, UWA.

WUN students participate in UWA's Critical Zone Observatory

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Twenty students representing seven countries and nine universities attended Summer School at UWA in February 2015, including a week at UWA's Critical Zone Observatory. The Summer School was jointly funded by the Worldwide Universities Network (WUN), UWA, and the US-National Science Foundation. Students who participated were competitively selected from across the WUN.

Students shared their global perspectives on responses to climate change and in particular looked at landscape and soil-related climate change issues that are fundamental to the future of the planet.

WUN Executive Director, Professor John Hearn said "the location for the Network's first summer school could not be more appropriate: the south-west of WA is a recognised global biodiversity hotspot – the only one in Australia – and home to the WUN Critical Zones Observatory".

In 2013 UWA joined the Critical Zone Exploration Network (CZEN), a global community of scientists using a network of field sites to investigate this zone that sustains human and other terrestrial life. The new Critical Zone Observatory (CZO) at UWA Farm Ridgefield at Pingelly is the first such observatory in Australia and in the Southern Hemisphere.

To launch this observatory, Dr Matthias Leopold and Dr Deirdre Gleeson from the School of Earth and Environment and IOA ran a three-day international workshop in April 2014, and more recently the Summer School in February 2015.

Students attended lectures from some of UWA's brightest minds including IOA Director Hackett Prof Kadambot Siddique, Director Western Australia Biogeochemical Centre Dr Pauline Grierson, IOA Associate Director and ARC Future Fellow Prof Daniel Murphy, Head Soil Biology and Molecular Ecology Group Assoc/Prof Louise Barton, and E/Prof Lyn Abbott. Staff from the School of Earth and Environment were also in attendance at the Farm and assisted the students in their field work – this included Dr Falko Mathes, Dr Suman George, Dr Gavan McGrath, Dr Nik Callow and Prof Jason Beringer.

Dr Deirdre Gleeson said international students who had never been to Australia were impressed by the relationship between WA farmers and scientists. "Some of them had not experienced that level of connection to the farming community," Dr Gleeson said.

University of Sheffield, UK student Harry Langford said "it was an exceptional opportunity to learn about the ancient soils of Australia and the agricultural challenges it poses" while University of Colorado, US student Melissa Foster said "it had provided students from the northern hemisphere

with an opportunity to learn about soil, water and agricultural management under drastically different climate conditions."

The week at the UWA Farm was followed by a week-long writing retreat at the UWA Albany Centre where E/Prof Bob Gilkes gave the students some valuable insight into how to prepare their science for publication.

Prof Steve Banwart, who heads up the EU SoilTRC Critical Zone Program attended the UWA Summer School and said "the students have been inspired and intellectually stretched by the Summer School at UWA – they are incredibly enthusiastic about the experience."

"Given the wide variety in student backgrounds it is likely that this experience will further enhance not only their academic abilities but equip them with valuable networking and leadership skills," Dr Leopold said.

UWA is working with other organisations in Australia and across the southern hemisphere to extend the CZEN to include the re-vegetation of mine sites and other disturbed sites; to understand the processes within the Critical Zone of weathering, transport of nutrients and pollutants; and adaptation of agricultural practices on ancient soils to climate change and climate variability.



Director's column

Hackett Professor Kadambot Siddique
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2015 is the International Year of Soils and it is fitting that the first newsletter this year has a focus on IOA's research on soils. Soil loss is expected to be a critical issue for global agricultural production under conventional farming practices. Soil and vegetation store a vast amount of carbon and land clearing and degradation is turning this valuable carbon sink into a major source of greenhouse gas emissions. The role of conservation agriculture in improving soil health and fertility is highlighted in a recently published book (see page 3).

In February, we hosted a Summer School with the WUN at UWA's Critical Zone Observatory (see cover) and in March, we welcomed internationally renowned soil scientist Professor David Hopkins, Dean of Agriculture, Food and Environment at the Royal Agricultural University, UK to Perth to give the 2015 Hector and Andrew Stewart Memorial Lecture (see page 11). Keeping in soils, Professor Jim Barrow was also honoured by the *European Journal of Soil Science* for his sustained contribution to soil science over the last 30 years (see page 12).

IOA has appointed two Associate Directors, Professor Daniel Murphy from the School of Earth and Environment and Professor Philip Vercoe from the School of Animal Biology (see facing article). They will work with me to finalise IOA's Strategic Plan (2015-2019) and develop new and emerging

cross-disciplinary themes in areas where UWA's researchers in agricultural and related areas have strong capacity in which to build on.

The IOA's Industry Advisory Board held its first meeting for 2015 in March. We welcomed Dr Richard Williams from CBH Group to the Board, and bid farewell to Mr Terry Hill and Dr Jim Fortune who have stepped down. They have both served on the Board for a number of years and have been excellent contributors.

UWA is based in a region that is a major food producer and exporter. Regular international visitors, food and agriculture lectures and industry forums ensure exposure of our researchers to ideas and developments outside UWA. Much of this activity is coordinated through IOA.

A number of events have been scheduled in our calendar including the annual IOA Postgraduate Showcase which will be held on Thursday, 11 June. All are welcome to listen to presentations from our best postgraduate students conducting agriculture and related research.

The IOA Industry Forum 2015 will be held on Thursday, 9 July at UWA. The topic for the forum is 'Where are we heading with the red meat industry?' and was chosen in consultation with the Industry Advisory Board. It will no doubt be another thought-provoking discussion with some of the nation's key industry leaders.

I invite you all to join us at UWA Farm Ridgefield on Friday, 11 September for our Field Day 2015. The team is working hard to put together an exciting program with engaging presentations and field demonstrations.

I must comment on the number of awards and accolades that our staff and students are receiving. These awards are not small achievements and reflect their dedication towards science excellence and translating scientific outcomes to advancing agriculture and food production.

Agricultural research and teaching at IOA is strongly interdisciplinary while being based on disciplinary strengths in plant, animal and soil science, and agricultural resource economics. We have already made numerous scientific publications in 2015 which demonstrate interdisciplinary strengths in agriculture at UWA.



L: Professor Daniel Murphy R: Professor Philip Vercoe

IOA appoints two Associate Directors

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IOA has welcomed two new Associate Directors to the team this year. Professor Phillip Vercoe from the School of Animal Biology, and Professor Daniel Murphy from the School of Earth and Environment will be working on Institute strategic and operational matters. They will dedicate one day per week on IOA matters from an office located within the Faculty of Science.

Professors Vercoe and Murphy are not new to IOA. They have played a significant role leading IOA's Animal Production Systems and the Integrated Land and Water Management programs respectively.

The Associate Directors will provide support to the Director on strategic matters and share responsibilities for initiatives with state and national funding bodies, international collaboration opportunities, and interaction and communication with relevant farmer groups.

Professors Murphy and Vercoe have already commenced on building IOA's strengths by identifying new and emerging cross-disciplinary themes. The Theme Leaders group will meet bi-monthly.

Book on Conservation Agriculture

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Soil loss is expected to be a critical issue for global agricultural production. There has been a move away from traditional farming practices with conventional tillage and burning crop residues, towards conservation agriculture.

But what exactly is conservation agriculture? A new book on the topic edited by IOA agricultural scientists Adjunct Associate Professor Muhammad Farooq and Hackett Professor Kadambot Siddique sums up the viable approach to creating sustainable agriculture.

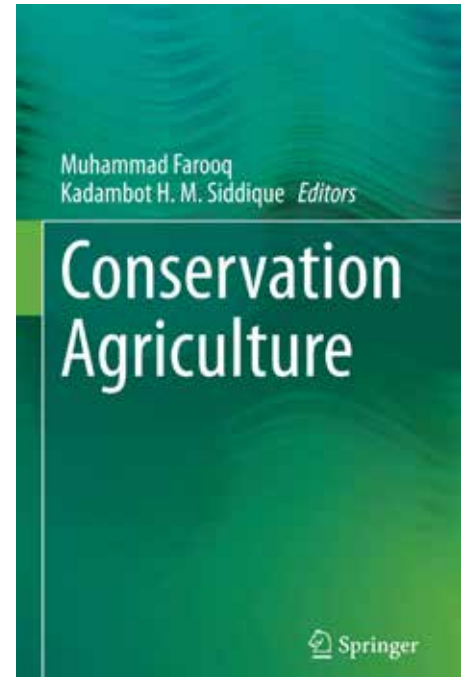
"In brief, conservation agriculture is a resource-saving agricultural production system that aims to achieve production intensification and high yields while enhancing the natural resource base, through compliance with four principals," Prof Siddique said.

The four interrelated principals described in the book are minimal soil disturbance, permanent residue cover, planned crop rotations and integrated weed management, along with other good production practices of plant nutrition and pest management.

Prof Siddique said the book's release is timely as although several papers and conference proceedings are available on the subject, a comprehensive textbook on conservation agriculture was lacking.

The book provides a comprehensive coverage in 23 chapters on conservation agriculture and provides case studies of the experiences and challenges in different regions. Importantly, the authors discuss some practical alternatives that can be implemented and proposes new areas of research.

An electronic copy of the book can be purchased from www.springer.com/life+sciences/agriculture/book/978-3-319-11619-8



IPPC certificate of recognition for PhD Student

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UWA PhD student from the School of Earth and Environment and IOA has received international recognition for her key role in the development of an international diagnostic protocol to aid in the identification of a fungal wheat disease, Karnal bunt.

The need for the protocol was highlighted in 2004 when exported wheat from Australia was misidentified as being infested with Karnal bunt, disrupting wheat exports.

Ms Dominie Wright, a plant pathologist at DAFWA said the exotic fungal wheat disease is not present in Australia.

"Correct identification of the disease is important because it's a quarantinable pathogen with significant trade implications," Dominie said.



Ms Dominie Wright displays a certificate of recognition from the IPPC for her work as lead author on the global Karnal bunt protocol. Photo: DAFWA

In 2007, the International Plant Protection Convention (IPPC) started developing international protocols and called for experts to be involved. Dominie, who had previously been involved with the development of an Australian diagnostic tool for the disease said Australia was well placed to lead the development of this international protocol.

"The IPPC Karnal bunt protocol was developed in the absence of established guidelines or templates to build from. I liaised closely with a counterpart based in the Netherlands, and the protocol was subsequently endorsed by all 134 members of the Food and Agriculture Organisation (FAO)," Dominie said.

The FAO publication 'Annex to ISPM 27 Diagnostic protocols for regulated pests' outlines what countries should do if they suspect Karnal bunt and how to identify it.

The IPPC Chairperson acknowledged Dominie for her outstanding contribution and commitment as lead author and presented her with a certificate of recognition.

In keeping with preparedness for biosecurity threats, Dominie's PhD research at UWA includes the development of an adult education framework best suited to how growers and agronomists in rural areas learn.



International Water Centre's Masters' students on the field trip.

IOA supports Water and Agriculture Landscape Master's students

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In late November 2014, 20 students from 12 countries visited UWA for the Water and Agricultural Landscapes module of the International Water Centre's (IWC) Master in Integrated Water Management.

The Water and Agricultural Landscapes module was first developed through the Centre for Ecohydrology by Professors Neil Coles, Susana Neto and Jeff Camkin in 2012. It is delivered annually and is based on a seven-day intensive and reflective learning experience at UWA with field trips to Gngangara and the Peel-Harvey region.

A strong multi-disciplinary team including UWA and IOA Professors Neil Coles, Mark Rivers, Ed Barrett-Lennard and Ed Hauck, and officers from the Department of Water and the Department of Agriculture and Food, Harvey Water, Peel-Harvey Catchment Council, Alcoa and farmers in Perth and Southwest WA are involved.

The diverse group of IWC master's students brings a wide range of experiences from all over the world. Countries represented in 2014 were Australia, Bangladesh, Bhutan, Botswana, Chile, Ecuador, Honduras, Indonesia, Macau, New Zealand, Tahiti and USA. Students get the opportunity to share their experiences and identify opportunities for improving integration and harmonisation in agricultural landscapes.

Participants brought with them a water management case study which they followed through the module to aid reflection and synthesis of the lectures, workshops and field trips in order to identify the most important contributions to their personal learning objectives.

Prof Neil Coles introduced the participants to the fundamentals of agriculture, water in agricultural landscapes and the water-energy-food nexus and Prof Ed Barrett-Lennard discussed the impact of salinity on plant growth and the potential for saline agriculture to contribute to future needs.

In the visit to Gngangara mound, participants explored the complex water and land management

challenges including dealing with a rapidly changing climate, population growth, increasing competition between agriculture, public and private water supply, and the need and approaches used to maintain groundwater dependent ecosystems.

In the second field trip, students visited the Peel Harvey Catchment Council, Alcoa Farms, Wokalup Agricultural College, Harvey Water and Harvey Dam, finishing with an explanation on water use in brewing. They met with local stakeholders and businesses, taking the opportunity to discuss local water and agriculture issues and their connection to the broader issues of regional and urban water planning for Perth. Prof Ed Hauck followed with an interactive lecture on the process of developing water policy.

The intensive but highly enjoyable week culminated in student presentations of the main learnings, sources of inspiration and how they intend to use their learnings in their future careers.

For more information on the International Water Centre's Master of Integrated Water Management visit www.watercentre.org.

Robson Medal awarded to UWA plant biochemist

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ARC Future Fellow Dr Nicolas Taylor has won the Faculty of Science 2014 Robson Medal for Research Excellence in Agriculture and Related Areas.

The medal was presented by Emeritus Professor Alan Robson himself at the Early Career Researchers Award Ceremony held on UWA's Thurling Green in March 2015.

The Robson Medal rewards outstanding achievement by early-career researchers in the form of written publications for highly-ranked, international journals. The award takes into account the current Impact Factor (Thompson ISI) of the journal in which the paper was published, as well as the ERA Field of Research assignable to the paper. The runners up for this year's medal were Dr Amin Mugeru, Dr David Secco and Dr Xiangling Fang.

Dr Taylor received the award for his paper, "Investigating the Role of Respiration in Plant Salinity Tolerance by Analyzing Mitochondrial Proteomes from Wheat and a Salinity-Tolerant Amphiploid" which was published in the *Journal of Proteome Research* in 2013.



Dr Nicolas Taylor receiving the Alan Robson Medal from E/Prof Alan Robson.



UWA graduates Joshua Barton (centre) and Benita Moir (right) with Sheree Walters from Curtin (left) judged best young professionals in agriculture. Photo: Peter Maloney

Young Professionals in Agriculture

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UWA graduates have yet again come out top in this year's Young Professionals in Agriculture Forum.

The annual forum, hosted by the Ag Institute Australia (WA Division) and supported by the Department of Agriculture and Food, WA (DAFWA) recognises the work of students who have completed an undergraduate degree at a Western Australian University. Finalists are required to submit a research paper and deliver an oral presentation in front of large audience.

Benita Moir received the top honours for her research on the use of supplementary feed in grazed wheat crop to increase the dispersion of sheep and utilisation of the crop.

Coming from Narrikup, Benita has always had an interest in agriculture. Since most farming enterprises in south-western Australia are mixed crop and livestock, she looked at integrating sheep with cropping in a way that benefits both individual enterprises, in order to potentially increase on-farm efficiency.

Benita's research was supervised by Dr Ken Flower from the School of Plant Biology and IOA, and Dr Dean Thomas from CSIRO.

Joshua Barton placed second for his work on the effect of genetic selection for lean meat yield breeding values. His interest in the lamb industry was sparked by his father and their own sheep milking business. Joshua decided to pursue an Honours degree to produce a higher yielding lamb without compromising quality for consumers, thus benefiting the entire lamb supply chain.

Joshua's research was supervised by Associate Professor Dominique Blache from the School of Animal Biology and IOA, and Dr Peter McGilchrist and Dr Kelly Pearce of Murdoch University.

Other finalists from UWA who presented their research on the day were Jacinta Patterson, Mary-Anne Lowe and Kyle Mart. Sheree Walters of Curtin University was awarded third prize and Claire Payne of Murdoch University took home the best presentation award.



Profs Jacqueline Batley and Dave Edwards receiving their award. Photo courtesy of CEG CoE in Genomics.

IOA researchers talk crop improvement in India

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UWA demonstrated its expertise in crop genomics and plant breeding at the fifth international conference on Next Generation Genomics and Integrated Breeding for Crop Improvement, held in February 2015 at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India.

A number of researchers from the School of Plant Biology and IOA were invited to present talks and chair sessions. Prof Dave Edwards gave a keynote presentation "Improving genome assemblies

and capturing genomic variation data for applied crop improvement", Head of the School of Plant Biology, Prof Tim Colmer chaired the session Novel Breeding Approaches, IOA Director Hackett Professor Kadambot Siddique chaired the session on Climate Resilience Genomics and Breeding, and Prof Jacqui Batley judged over 100 posters in the poster sessions.

The conference built on the success of the four previous meetings on next generation sequencing data analysis in modern breeding approaches for increasing food security and was organised in collaboration with the Bill and Melinda Gates Foundation and the Generation Challenge

Program. The earlier conferences had been restricted to selected participants, however, based on overwhelming requests from researchers, this year the conference was opened to all interested researchers.

Over 300 participants from more than 30 countries attended. Two UWA researchers; Prof Dave Edwards and Prof Jacqueline Batley were presented with gifts from the Director General of ICRISAT, Dr David Bergvinson, and the conference organiser, Dr Rajeev Varshney, for their attendance and contribution to all five of the conferences, and in recognition of their ongoing, fruitful collaborations with ICRISAT.

WA Royal Agriculture Society scholarship for UWA student

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UWA Agricultural Science undergraduate student Roxanne Mostert has been awarded a tertiary scholarship from the Royal Agriculture Society of WA (RAS).

The Agricultural Youth Bendat Family Foundation scholarship is part of the RAS Rural Leaders program and will provide financial assistance for three years of Roxanne's degree.

RAS president Dr Rob Wilson said the calibre of this year's applicants for the scholarship was impressive.

"The WA agricultural industry will ultimately benefit from the education, skills and passion that this next generation bring to a new and exciting period of industry growth and innovation," he said.

Roxanne, from Redmond is especially interested in animal feeding and digestion, microbiological soil health as well as sustainable agricultural practices. She plans to work as an animal nutritionist or farm consultant.

"I enjoy working alongside people and I want to raise awareness of the importance of agriculture," Roxanne said.



Roxanne Mostert with RAS president Dr Rob Wilson. Photo credit: RASWA

The high achiever who graduated from the WA College of Agriculture in Denmark in 2014 has been the recipient of several other prestigious awards. She was named Agricultural Student of the Year at the National 2014 Farmer of the Year Awards in Melbourne.



Prof Siddique with Prof Bruce Kimball at the Agriculture and Climate Change Conference.

Adapting crops to increased uncertainty

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The sustainability of agriculture is being challenged by climate change and rising food demands from a larger and wealthier human population. Humanity faces a global food deficit unless the efficiency and resilience of crop production is improved. There is an urgent need to increase crop yield, quality and stability of production, enhancing the resilience of crops to climate variability and increasing the productivity of minor crops to diversify food production.

The Agriculture and Climate Change conference, held in Amsterdam in February 2015 was attended by IOA Director Hackett Professor Kadambot Siddique and Prof Dave Edwards from the School of Plant Biology and IOA. The focus was on the impact of climate change on crop production, and explored approaches to maintain and increase crop productivity in a changing climate. Professor Edwards was the Co-Chair of the conference organising committee and Professor Siddique was on the international scientific advisory committee.

By sharing knowledge and gaining a greater understanding of the impact of climate change on food production, we can work together to mitigate the impact of climate change on agriculture and secure sustainable food production for future generations.

The meeting consisted of eight sessions, initially examining the potential impacts of climate change on Agriculture and sustainability, and then addressed specific impacts including biotic and abiotic stress, nutrient use efficiency and the impact of increased carbon dioxide. The final sessions explored approaches and technologies for the acceleration of crops improvement and adaptation for expected climate change scenarios. Selected papers from the conference will be published in a special issue of 'Current Opinion in Plant Biology' by Elsevier.

Given the high attendance at this meeting and increasing impact of climate change on agriculture, we expect to hold a second meeting in 2017.

UWA hosts leading African scientists in the quest to increase food security

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During November and December last year, UWA hosted two distinguished researchers, Dr Joseph Ndunguru and Dr Peter Sseurwagi, who lead multi-national, Africa-focussed research projects funded by the Bill and Melinda Gates Foundation. Both researchers are from the Mikocheni Agricultural Research Institute in Dar es Salam, Tanzania which Dr Ndunguru heads.

Dr Ndunguru, a molecular plant virologist, is also the Tanzanian National Biotechnology Research Coordinator. He is Chief Investigator of a large international project entitled 'Disease Diagnostics for sustainable Cassava Productivity in Africa' co-funded by the Bill and Melinda Gates Foundation and the UK Department of International Development.

Dr Sseurwagi is an insect vector virologist. He is African Chief Investigator of a large international project entitled 'African cassava whitefly: outbreak, causes and sustainable solutions' also funded by the Bill and Melinda Gates Foundation. UWA's Dr Laura Boykin from the School of Chemistry and Biochemistry and ARC CoE in Plant Energy Biology is a Principal Investigator of the project.

Cassava is the most important staple food crop in sub-Saharan Africa for 700 million people. Dr Ndunguru's and Dr Sseurwagi's research is currently focussed on understanding and

managing Cassava mosaic begomoviruses and Cassava brown streak viruses and their whitefly vectors. Major epidemics caused by both types of virus devastate cassava production in sub-Saharan Africa causing famine and food insecurity.

While in Perth, Dr Ndunguru and Dr Sseurwagi brought with them cassava virus and whitefly samples from East Africa. As required by AQIS, their samples were treated before arrival so they were no longer infectious (viruses) or dead (whiteflies). They used their time by subjecting these samples to intensive genomic analysis in collaboration with UWA's whitefly specialist Dr Laura Boykin, Dr Sandra Tanz and one of DAFWA's plant virologists Dr Monica Kehoe.

This included use of Magnus, the southern hemisphere's fastest supercomputer located at the Pawsey Supercomputing Centre (formerly iVEC), and the Next Generation Sequencing facilities of Plant Energy Biology. They also helped develop a new collaborative research proposal on cassava virus disease epidemiology with UWA's Prof Roger Jones and DAFWA's Brenda Coutts and made plans for other future collaborations.

Dr Ndunguru gave an inspiring and well received public lecture sponsored by UWA's Institute of Advanced Studies entitled 'Emerging biosciences capacity in Africa: Case study of the Regional Cassava Viruses Disease Diagnostic Project'. Both visitors also gave a research-focussed IOA Special Seminar.



Eviness Nyalugwe (UWA), Sarina Macfayden (CSIRO), Roger Jones (UWA and DAFWA), Peter Sseurwagi (Mikocheni Agricultural Research Institute), Joseph Ndunguru (Mikocheni Agricultural Research Institute), Laura Boykin (UWA), Monica Kehoe (DAFWA) and Brenda Coutts (DAFWA).

Smart legacy in agriculture continues

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Two agricultural science honours students at UWA – one from Toodyay and the other from Bunbury – have achieved their goals of contributing to Australian agriculture having been awarded the Sir Eric Smart Scholarship for thier research through IOA.

Fraser Stewart who grew up on the family farm in Toodyay wanted to focus his research on a current topic affecting agriculture in the grainbelt. His project investigated the economic, social and environmental opportunities and challenges associated with foreign investment through a series of face-to-face interviews with farmers in the WA grainbelt.

Contrary to popular belief, the study revealed that foreign investment is not having a detrimental effect on farmers and rural communities where the interviews were conducted.

“Overall, foreign investment was found to offer opportunities for capital injection, natural resource management, employment and community support in the grainbelt,” Fraser said. Fraser has now taken up a National Australia Bank Agribusiness traineeship.

Mary-Anne Lowe from Bunbury chose to undertake research into water repellency in soils, which is one of the constraints on agricultural productivity in southwestern Australia. She conducted laboratory-based research into non-wetting agricultural soils in WA, a project supported by the Cooperative Research Centre for Polymers.

Mary-Anne compared the effectiveness of two surfactants on soil water distribution and runoff on three types of soil and developed a laboratory-based method for effective testing of amelioration techniques to improve conditions on water repellent soil.

“The system represents an inexpensive tool to screen different surfactants and soils in the lab before the more capable products are tested in extensive and costly field trials,” Mary-Anne said.

Mary-Anne is continuing the research as a postgraduate student at UWA.

Sir Eric Smart was a farmer and a pioneer who wanted science to improve agricultural production. He endowed substantial funds to UWA upon his death in 1973. This was later supplemented by a gift from his son Peter Smart.



Mary-Anne Lowe and Fraser Stewart are 2014 Sir Eric Smart scholarship winners.

Home-grown research leads to practical application within the Industry

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Researchers from the Australian Herbicide Resistance Initiative (AHRI) based at UWA's School of Plant Biology and IOA have received international recognition for their research into techniques to control weed seeds in grain paddocks at harvest time.

Dr Michael Walsh and Professor Stephen Powles were awarded the 2014 Outstanding Paper in Weed Technology by the Weed Science Society of America (WSSA) for their paper 'High seed retention at maturity of annual weeds infesting crop fields highlights the potential for harvest weed seed control'.

Dr Walsh has been pioneering new techniques and tools of harvest weed seed control (HWSC), to prevent annual weeds from persisting through cropping phases and interfering with crop production.

The research, funded by GRDC, showed that the seed retention of four dominant annual weeds of Australian cropping systems – annual ryegrass, wild radish, brome grass and wild oat – was between 77% and 99%.

According to the authors, this high level of seed retention at crop maturity indicates there is large potential of HWSC systems to diminish crop interference by the four most problematic species of Australian crops.

“Harvest weed seed control commenced in WA and is now being adopted across Australia. AHRI collaborative efforts led by Michael Walsh have research underway in this new area in the US and Canada that will lead to adoption of these techniques there, and in other major grain producing nations,” Prof Powles said.

“The award is a very significant recognition of home-grown Australian research leading to direct, commercial, practical adoption and outcomes in Australia and then internationally.”



Dr Michael Walsh.



Over 120 people came along to a Soils Masterclass that was held at Scaddan recently.

Soils MASTERCLASS at Scaddan

Julianne Hill

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Farmers and others in the agriculture industry had the chance to talk to some of Australia's finest soils specialists at a once-off soils MASTERCLASS session that was held at the Campbell family property at Scaddan (near Esperance) in late February this year.

These small group MASTERCLASSES showcasing the who's who of those with soils expertise, were on hand to talk to the more than 100 farmers and industry representatives.

Esperance port zone GRDC's Regional Cropping Solutions Network in collaboration with SEPWA and DAFWA's Soil Compaction project brought this event to the Esperance port zone to help us dig down to find out more about the soils we make our living from.

Presenters on the day included:

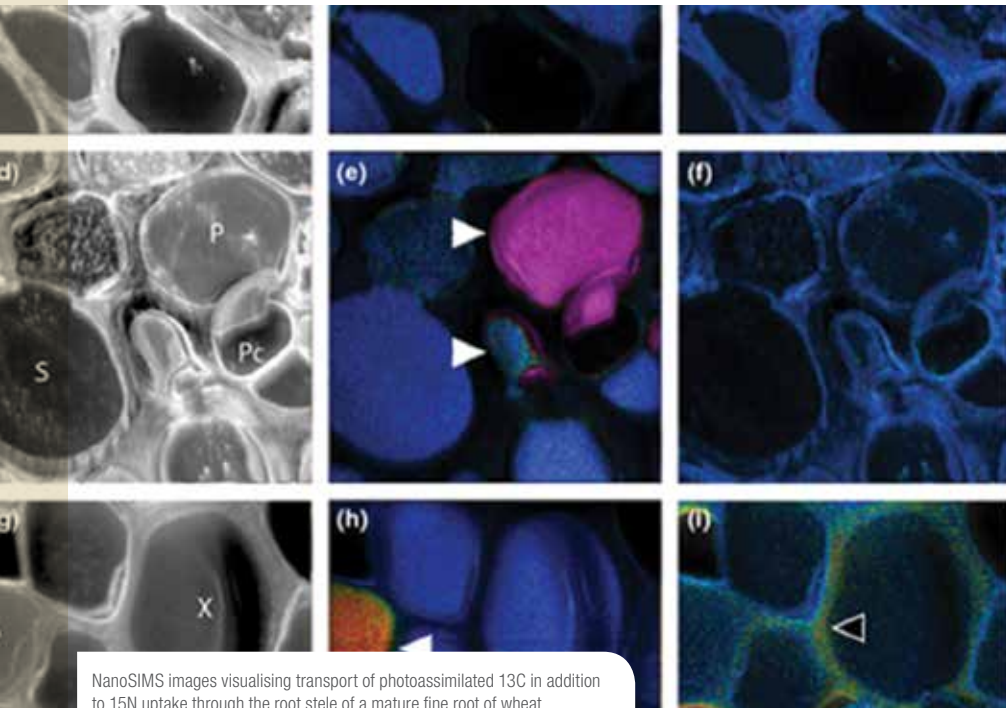
- David Hall (DAFWA): Improving lighter soil types, including the use of delving and claying
- James Hagan (DAFWA) and Andrew Newall (NewAg Consulting): Matching equipment for Controlled Traffic systems. Economics of CTF – constraints and rooting depth, machinery planning, transition planning of machinery.
- Nigel Metz (SEPWA) and Quenten Knight (PAA): Raw data from CTF vs non-CTF paddock scale work; matching machinery to fit
- Yvette Oliver (CSIRO): Targeted acidity management with reference to rooting depth... how to target where to apply lime, considering yield potential
- Bill Bowden (Consultant): The value of chemical soil tests and nutrient budgeting
- Chris Gazey and Liam Ryan (DAFWA): Soil acidity for south coast farming systems
- Jeremy Lemon (DAFWA): Economic considerations of various nitrogen sources
- Dan Murphy (IOA) and Fran Hoyle (DAFWA): Methods for building soil carbon in a continuous cropping system, and is it worth it?

After the MASTERCLASS sessions, participants were invited to visit some soil pits, check out the Campbell families composting, and have a look at other soil amelioration options that farmers can use to lift their soil fertility.

The Campbells have initiated a composting system on their property. Their compost is made up by combining barley straw, sheep, cattle and pig manure, and clay, and uses approximately one kilolitre of water per tonne of compost.

The pièce de résistance in a fantastic day was an option for those who wanted to ask more about matching machinery for establishing or fine-tuning a CTF system on their property. Consultants including Nigel Metz, Andrew Newall, James Hagan, and Quenten Knight (PAA) were on hand at the Gibson Soak giving one-on-one consultations about controlled traffic at no extra cost.

For more information or to get the notes from the day, contact GRDC's Regional Cropping Solutions Julianne Hill on 0447261607 or email regionalcroppingsolutions@gmail.com



NanoSIMS images visualising transport of photoassimilated ¹³C in addition to ¹⁵N uptake through the root stele of a mature fine root of wheat.

Fungi acts as hub for translocating plant carbon to soil microbes

Jennifer Carson
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***Arbuscular mycorrhizal* fungi may stimulate microorganisms outside the root zone to release nutrients from organic matter, which the fungi then transport back to their host plant.**

Arbuscular mycorrhizal fungi form a symbiosis with their host plant in which they take up phosphorus and nitrogen from soil outside the plant's root zone and transfer them to the plant. In return, the plant provides the fungi with organic carbon that it needs to grow.

Researchers from the School of Earth and Environment, IOA and the Centre for Microscopy Characterisation and Analysis, together with collaborators from the University of Vienna recently investigated what happens to the plant carbon after it is transferred to the *arbuscular mycorrhizal* fungi.

They found that the fungi transported a large proportion of the carbon they received from the plant through their hyphae into the surrounding soil. Once outside the root zone, the fungi released the plant carbon into soil where it was used by soil microorganisms.

IOA Associate Director Professor Murphy, who led the research team, explains that this process could be highly beneficial to plant nutrient supply.

"Transporting plant carbon outside the root zone could stimulate microorganisms to release nutrients from organic matter. The nutrients are then taken up by *arbuscular mycorrhizal* fungi and transported back to the plant. Therefore, through *arbuscular mycorrhizal* fungi, plants are able to take up nutrients from soil where they don't have roots."

The researchers also found evidence that plants use *arbuscular mycorrhizal* fungi to obtain nutrients from nutrient-rich patches of organic matter. When they added a small amount of nitrogen to soil, plants released more carbon to *arbuscular mycorrhizal* fungi.

"A small increase in nitrogen availability in soil could signal to plants that there was a nitrogen-rich patch of organic matter in soil. We think this may have triggered the plants to channel more carbon towards that spot through mycorrhizal fungi in order to stimulate microbial release of nitrogen," Professor Murphy said.

This research was funded by GRDC through the second Soil Biology Initiative and an Australian Research Council Future Fellowship awarded to Professor Murphy.

Vale Norman Goodchild

Dr Norman Goodchild passed away on 6 November 2014. He was 91 years old.

Norman had a long association with the University as a respected staff member within the former Faculty of Agriculture.

His area of expertise was agriculture statistics and he was the senior lecturer in Biometrics for many years. Norman was Dean of the Faculty of Agriculture in the 1980's and more recently held the title Honorary Research Fellow.

He taught two of our current Heads of Schools, Professors Tim Colmer and David Pannell.

Norman was always willing to offer advice on experimental design and statistical analysis to staff and students. He enjoyed many fruitful collaborations with colleagues throughout the Faculty and outside.

Norman will be sadly missed by his colleagues in the Faculty and around the University.



2nd International Plant Breeding Congress & EUCARPIA-Oil and Protein Crops Section Conference

1-5 November 2015
WOW Kremlin Palace
Antalya, Turkey

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Prof William Erskine and Prof Wallace Cowling with Dr Marie Lummerzheim at the UWA University Club.

Teaching Plant Genetics and Breeding at UWA and LaSalle-Beauvais

Diana Boykett
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The Director of UWA's Centre for Plant Genetics and Breeding within School of Plant Biology, Professor William Erskine, and IOA Professor Wallace Cowling, recently had discussions for a potential collaboration with Institut Polytechnique LaSalle Beauvais, France, in plant breeding education at the MSc level.

International Relations Director of LaSalle Institute, Dr Marie Lummerzheim, visited UWA in February 2015. The visit focussed on potential collaborations

in teaching the Master's of Science in Plant Genetics and Breeding at UWA and LaSalle-Beauvais.

"The two groups have similar philosophy to teach applied plant breeding within a research framework. We both aim to graduate MSc candidates who will make excellent practical plant breeders," Prof Erskine said.

A collaboration between the two universities would allow students in Australia and France to benefit from plant breeding seminars in each institution linked by satellite video, and other initiatives such as student exchange and work experience.

Collaboration benefits UWA and Lanzhou University

Dr Yanlei Du
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From June to December 2014, I was a Visiting Research Fellow at IOA with Professors Neil Turner, Kadambot Siddique and Tim Colmer, and Dr Jiayin Pang. We investigated the physiological role of phytohormones and assimilate supply on drought tolerance/sensitivity during reproductive development of chickpea. The short visit to UWA has been an invaluable opportunity for me to broaden my research ideas and strengthen the collaboration between UWA and my home institution, Lanzhou University (LZU) in Gansu Province, China.

My first connection to UWA was through Professor Neil Turner who co-supervised my PhD at LZU with Professor Feng-Min Li. My PhD project on the adaptation of wheat to drought was enabled by a Memorandum of Understanding to cooperate on research and training in areas of dryland agriculture that was signed by LZU and the UWA in September 2007 and renewed in September 2012.

In May 2013, the Centre for Dryland Agricultural Ecosystems (CDAE) opened at LZU to increase the cooperation between LZU, UWA and International Centre for Agricultural Research in Dry Areas (ICARDA) in dryland agricultural research and training. My visit and joint research at UWA was made possible because of this collaboration. I am very appreciative of IOA's excellent research environment and will introduce some of the skills and techniques I have learnt to LZU.



Dr Yanlei Du at Bindi Bindi, Western Australia.

Firstly, it was my first time using large-bins (80 litre Sulo bins) to investigate the drought responses of crops. This system closely simulates field conditions and allows the soil to dry more slowly after water is withheld. I plan to introduce this large-bin system to China to improve crop production studies for the semiarid and arid areas of the Loess Plateau of north-west China.

Professor Kadambot Siddique invited me to attend an undergraduate course on Rainfed Cropping Systems. I was impressed with the "open relationship between teachers and students", "open class teaching mode" and "open class organisation" which is very different to Chinese system in which I completed my undergraduate studies.

UWA also has a very successful multi-supervisor model for supervising PhD students which I consider beneficial to students as it encourages more interaction with supervisors with a broad range of expertise.

I have recently returned to LZU where I am a lecturer in the State Key Laboratory of Grassland Agro-ecosystems, Institute of Arid Agroecology in the School of Life Sciences. I have been asked to discuss this style of teaching with the Vice-Dean for teaching at the School and look forward to further collaboration with UWA.



Professor Jim Barrow in 1982.

Soil scientist honoured in International Year of Soils

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Leading international soil science journal, the *European Journal of Soil Science* has honoured UWA soil scientist Professor Jim Barrow by re-publishing a paper first published over 30 years ago.

The journal's Landmark Papers is a series of key papers selected to be re-published in recognition of research that has been hugely instrumental to the field of soil science. Professor Barrow's paper, 'A mechanistic model for describing the sorption and desorption of phosphate soil' was first published in the *Journal of Soil Science* in 1983, and is the fourth in the series.

Three of the journal's Associate Editors commented that 'a striking feature of the impact of Barrow (1983) is that, although the model in its full complexity has rarely been used, it has continuously been cited over the 30 years since publication, indicating the impact of the underlying ideas'.

Professor Barrow's research described the way phosphate behaves when it is added as a fertilizer to low-phosphate soils. The phosphate first reacted with the outside of the soil particle before soaking into it. Once it had soaked-in, it was less accessible to plants meaning farmers were required to reapply more phosphate than was seemingly required by crops.

Professor Barrow is 82 and is still actively engaged in scientific research. He has recently shown a twist to the tale of phosphate immobilization in soils. The "soaking-in" behaviour stops after years of fertilization, when the soils are no longer low-phosphate. Fertilising plans have not been altered accordingly so too much phosphate is being applied to these soils. The oversupply of phosphate results in its transfer to surface waters causing eutrophication and environmental concern.

A selection of other papers which have developed and built on Barrow's original research have been published alongside the Landmark Paper No. 4.

Benjamin Congdon best PhD student

Prof Roger Jones
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Benjamin Congdon received an award for best PhD Student Presentation at the Australasian Plant Pathology Society event at Curtin University in November 2014. His presentation was entitled "Contact and wind-mediated transmission of *Pea seed-borne mosaic virus* in field pea".

Benjamin gave a very polished presentation including a dynamic video showing use of fans in the glasshouse to simulate wind and investigate its importance in spreading the virus.

He started by explaining that he was the son of a WA grainbelt farmer and felt very passionate about having the opportunity to undertake research on an important issue for the national Australian grains industry.

He explained that the virus is seed-borne and aphid-transmitted. Most commercial field pea seed stocks carry the virus resulting in widespread infection. Although its foliage symptoms are subtle, it often causes losses of 25% or more, in addition to disfiguring field pea seeds reducing their marketability.

Spread of the virus often occurs in the field when aphids are absent suggesting that transmission by seeds and aphids is not the whole story. Benjamin found this suggestion to be correct as his research demonstrated an alternative method of spread, "contact transmission".

Infectivity of the virus survived in sap from crushed infected pea leaves. When leaves of infected and healthy plants brushed against each other due to wind, they created small wounds which allowed the virus in infective sap droplets from a wounded infected plants to infect wounded tissue on the healthy plant. This resulted in infection of the healthy plant.

The finding that the virus is spread by contact transmission due to wind has critically important implications for understanding how its epidemics spread in field pea crops and controlling the virus more effectively.

Benjamin is based at DAFWA and his UWA supervisors are Professor Roger Jones and Associate Professor Michael Renton. His DAFWA and NSW-DPI collaborators are Dr Brenda Coutts and Dr Joop van Leur, respectively.

Benjamin's project is part of an ARC Linkage project in collaboration with DAFWA and NSW-DPI entitled "*Determination of factors responsible for aphid-borne pea seed-borne mosaic virus epidemics in peas and development of effective virus management tools*".



Benjamin Congdon awarded best PhD Student presentation.



UWA representatives with project delegates.

Australian and Indian researchers tackle abiotic stress in chickpea

Hackett Professor Kadambot Siddique
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The Third Australia-India bi-lateral project meeting was held at the International Crops Research Institute of the Semi-Arid Tropics (ICRISAT), India in February.

On the agenda for discussion was the progress and future direction in AISRF Grand Challenge project on “Genomics approaches for stress tolerant chickpea”. It is a collaborative project between Australian institutions (ACPF, UWA, SARDI, RMIT/UM and UQ) and Indian institutions (ICRISAT, IARI, NIPG, Krishidhan Pty Ltd).

UWA was represented at the meeting Professors Kadambot Siddique, Tim Colmer, David Edwards, Jacqueline Batley, and Dr Jiayin Pang.

Director General ICRISAT, Dr David Bergvinson welcomed the participants and reiterated the importance of international collaboration. He commended the excellent efforts between Australia and India in this project. He highlighted the significance of chickpea for Australia and India, and the need to alleviate the gain in yield for dryland environments.

Professor Kadambot Siddique commented on the significant contribution Indian chickpea germplasm has made to Australian chickpea breeding programs and highlighted the need for such collaboration.

Overall the project has made substantial progress in the area of drought, heat and salinity tolerance physiology, phenotyping, field evaluation and genomics. The group discussed work plan for the coming year and future direction beyond the current project. The next bilateral meeting will be held in Australia in August/September 2015.

Separately, Professors Siddique and Colmer met with Dr David Bergvinson and Dr Peter Carburry, Deputy Director General Research, regarding ongoing collaboration between UWA and ICRISAT. They discussed strategies to enhance collaboration in the future and invited them to visit UWA in the near future.

Horizon student visits cotton research station

Ms Alana Martin
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Early this year, I flew from my city life in Perth to a cotton research station in a small town called Narrabri in New South Wales. I spent two weeks working with the Australian Cotton Research Institute on a placement as part of my Horizon Scholarship. It was sponsored by Cotton Research and Development Corporation (CRDC).

I was given hands on experience both in the laboratory and in the field focusing on my passion in soil biology.

It was an eye opening experience to be shown firsthand what goes on in cotton research and to have the opportunity to meet the amazing people working on all aspects of the cotton production and farming systems.

I saw how soil biology is applied in the commercial cotton industry. I travelled with a team further out to a farm in Warren and met growers applying gypsum and deep-ripping during fallow periods to improve soil moisture retention. I also worked on soil samples in the laboratory which I had collected from the field, testing for nutrients and soil quality.

One of the most interesting aspects of my placement was to experience the self-mulching clay soils in New South Wales. I am eager to learn more through my studies in agriculture at UWA and my next industry placement in 2016.



Horizon Scholarship recipient Alana Martin on her industry placement in NSW.

Memorial lecture on soils and the ends of the Earth

Diana Boykett
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There was standing room only at the 23rd Hector and Andrew Stewart Memorial Lecture held on Thursday, 19 March 2015.

In keeping with the International Year of Soils, internationally acclaimed soil scientist Professor David Hopkins, Dean of Agriculture, Food and Environment at the Royal Agriculture University at Cirencester, UK, delivered this year's lecture.

The fascinating lecture entitled, 'Soils and the ends of the Earth, and a few places in between' took the audience to the polar deserts of Antarctica and



L-R: Dr Andrew Stewart, Prof David Hopkins, Don Stewart and Rosemary Stewart.

Arctic where Prof Hopkins has conducted fieldwork in multiple seasons.

The focus was on soils, and soils in some of the most extreme environments on the premise that it might shed some light on some of the less extreme environments. Prof Hopkins illustrated the diversity of soils and their roles in ecosystem processes, and showed how they are being affected by environmental change or management, or use by humans.

The inaugural Hector and Andrew Stewart Memorial Lecture was 49 years ago in 1966 by Professor T.J. Robinson on "Sheep Fertility Research – Its Potential for Western Australia". The lectureship is in memory of the late Mr Hector J. Stewart, MLC and of the late Mr Andrew Stewart, a member of the academic staff in the Faculty of Agriculture at UWA from 1937 to 1959.

A recording of the lecture can be downloaded from www.ioa.uwa.edu.au/publications/lectures/2015



Professor Kadambot Siddique with KVASU senior management during the visit.

Animal Production and Climate Change Collaboration

Hackett Professor Kadambot Siddique
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During a recent visit to Kerala Veterinary and Animal Sciences University (KVASU), India, Hackett Professor Kadambot Siddique met with Dr B. Ashok, Vice Chancellor KVASU and the senior management.

UWA and KVASU have an existing MoU and ongoing collaboration. The discussions focussed on collaboration on PhD program in animal

production and climate change, joint scientific publications, science communication training and technology transfer.

IOA agreed to collaborate on an international workshop on future farming to be hosted by KVASU and the technology-enabled distance learning program. KVASU Vice Chancellor has agreed to visit UWA during latter half of this year.

Research breakthroughs by PhD Students benefit potato industries worldwide

Professor Roger Jones
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PhD students Brenda Coutts and Alison Mackie recently published their research papers involving different potato pathogens in the prestigious American journal *Plant Disease*. Their research has major implications for potato production as both pathogens studied threaten seed and consumption potato industries worldwide.

Each research paper described important new information about spread and control of potato pathogens. Brenda's paper was entitled "*Potato virus Y: contact transmission, stability on surfaces, and inactivation with disinfectants*", and Alison's paper "*Potato spindle tuber viroid: stability on surfaces, and inactivation with disinfectants*".

Brenda's research, supervised by Prof Roger Jones, was on Potato virus Y (PVY) which causes the most damaging viral disease of potato worldwide. It reduces potato tuber yield and

disfigures infected tubers, and has increased greatly in importance over the last 30 years due to the spread of new recombinant virus strains.

PVY has long been known to spread by aphids and planting infected tubers. However, this is not the whole story as Brenda's research found for the first time that as it spreads by contact when infected plants brush against healthy ones. Also, when infective sap was applied to different surfaces, PVY remained infective for 24 hours on tire and metal, six hours on cotton and hessian, and three hours on wood.

These findings suggest agricultural machinery moving through crops can both cause spread of PVY, explaining its spread when aphids are absent.

PSTVd was known to spread by contact and planting infected tubers, but has no known insect vector. Alison's research demonstrated that PSTVd infectivity survived for 24 hours on seven of eight common surfaces (cotton, wood, rubber, leather, plastic, metal, and string), but for only 30 minutes



L: Brenda Coutts R: Alison Mackie

on human skin. This suggests that agricultural machinery moving through crops spread PSTVd readily. Alison's PhD was co-supervised by Professors Roger Jones and Martin Barbetti.

Both PhD students studied the effectiveness of a range of commercial disinfectants on survival of pathogen infectivity. Use of household bleach and non-fat milk powder were suitable decontamination treatments for both pathogens.

Both Brenda and Alison are DAFWA employees and Brenda undertook all her research using DAFWA facilities. Brenda's research was funded by DAFWA and the Agricultural Produce Commission – Potato Producers Committee. Alison's research was funded by the CRC for plant Biosecurity and Horticulture Australia Ltd.

New Staff



Ms Annie Macnab
Accounting Officer
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IOA part time Accounting Officer Annie Macnab has a long association with the University: she and her husband are both UWA graduates who met while Annie was a residential tutor at St Columba College (now Trinity), they were married in the Sunken Garden, and their two children are both UWA graduates.

After many years working in the public sector in WA and Queensland, and ten years working for herself as a management consultant, Annie returned to UWA in 2003 as the Library Administration Manager.

Annie is your go-to person for all accounting enquires. If she doesn't know the answer she is bound to know someone who does.



Professor David Edwards
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Professor Dave Edwards accepted an ongoing position as Professor in cereal genomics at UWA in the School of Plant Biology and IOA in January 2015.

He gained an Honours degree in agriculture from the University of Nottingham and a PhD from the Department of Plant Science, University of Cambridge, UK.

His current research activities include the characterisation of complex plant genomes, translational genomics and genome informatics, with a focus on wheat, Brassica and chickpea crops.



Dr Jin Wang
Visiting Research Fellow
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Visiting Research Fellow, Dr Jin Wang is spending 12 months working with Prof Daniel Murphy and Dr Yichao Rui and the Soil Biology and Molecular Ecology Group in the School of Earth and Environment, UWA.

Since his arrival in February 2015, he is combining Nanoscale Secondary Ion Mass Spectrometry (NanoSIMS) and DNA-Stable Isotope Probing (DNA-SIP) techniques to look at nitrifiers in soils.

Dr Jin Wang is an Associate Professor in Changzhou University, Jiangsu, China. Jin completed his PhD in Jiangnan University and has been researching on anaerobic acidogenic fermentation of sewage sludge, and interaction between oil contamination and microbial community structure for over five years.

Staff Awards and Industry Recognition

NAME	AWARD
E/Prof Lyn Abbott	Joan Eveline Award for Mentoring, presented at the 20th Anniversary of the UWA Leadership Development for Women Program.
Mr Benjamin Congdon	Best Student Presentation at the Australasian Plant Pathology student symposium
Adj/Assoc/Prof Muhammad Farooq	Top cited paper award from the University of Agriculture, Faisalabad, Pakistan
Adj/Prof Hari D Upadhyaya	Dr Harbhajan Singh Memorial Award for contributions to Plant genetic Resources by the Indian Society of Plant Genetic Resources

Visitors to Institute of Agriculture

VISITOR	VISITORS' ORGANISATION, COUNTRY	HOST DETAILS/PURPOSE	DATES
Prof James Vercammen	University of British Columbia, Canada	Prof David Pannell, School of Agricultural and Resource Economics	February – June 2015
Dr Joseph Ndunguru	Mikocheni Agricultural Research Institute, Dar es Salam, Tanzania (Gates Foundation Project)	Dr Laura Boykin, Plant Energy Biology; Prof Roger Jones, School of Plant Biology; Dr Monica Kehoe	16 November – 15 December 2014
Dr Peter Sseruwagi	Mikocheni Agricultural Research Institute, Dar es Salam, Tanzania (Gates Foundation Project)	Dr Laura Boykin, Plant Energy Biology; Prof Roger Jones, School of Plant Biology; Dr Monica Kehoe	16 November – 15 December 2014
Assoc/Prof Xiangbi Chen	Institute of Subtropical Agriculture, the Chinese Academy of Sciences	Prof Daniel Murphy, School of Earth and Environment	March 2015 – March 2016

New Research Funded Project (Since November 2014)

VISITOR	FUNDING PERIOD	FUNDING BODY	SUPERVISORS
Establishing the extent and significance of viruses with wind-borne insect vectors arriving from nearby countries and establishing in northern Australia	2015–2017	CRC for Plant Biosecurity	Dr Laura Boykin Prof Roger Jones Prof Ian Small
Evaluation of <i>Musa acuminata</i> subsp. <i>malaccensis</i> for resistance to <i>Fusarium</i> wilt of banana'	2015	UWA UQ Bilateral Research Collaboration Award	Prof Jacqueline Batley, Assoc/Prof Elizabeth Aitken
Characterising Genes for Wheat Quality	2015	UWA UQ Bilateral Research Collaboration Award	Prof David Edwards
Oxygen Signalling in Grapevine Bud Dormancy	2015–2017	ARC Discovery Projects	A/Prof Michael Considine, Prof Christine Foyer, Prof Timothy Colmer, Dr Daniel Gibbs, Dr Pieter Verboven, Prof John Considine
Evolutionary Dynamics and the Transformation of Rural Australia	2015–2018	ARC Discovery Projects	Prof Matthew Tonts, Prof Paul Plummer, Dr Neil Argent
Grain Legumes – 2014 Competitive Grants – Phenotyping Root Traits in Chickpea – <i>Cicer Arietinum</i> L – Core Collection	2015	CGIAR	Hackett Professor Kadambot Siddique

New Postgraduate Research Students

STUDENT NAME	TOPIC	SCHOOL	SUPERVISOR(S)	FUNDING BODY
PhD				
Jolene Otway	Assessment of Carbon Cycling and Sequestration Potential in Agricultural Soils.	School of Earth and Environment and IOA	E/Prof Lynette Abbott; Prof Daniel Murphy; Dr Jennifer Dungait (Rothamsted Research)	Robert and Maude Gledden Postgraduate Research Scholarship
Xingyi Wang	Genetic Analysis of Seed Dormancy for Pre-harvest Sprouting Resistance in Wheat	School of Plant Biology and IOA	Assoc/Prof Guijun Yan; Prof Kadambot Siddique; Dr Hui Liu	Full fee paying M Phil. student
Roopali N Bhoite	Identification of major QTLs conferring metribuzin tolerance for the breeding of herbicide tolerance in wheat	School of Plant Biology and IOA	Assoc/Prof Guijun Yan; Prof Kadambot Siddique; Asst/ Prof Ping Si	APA scholarship
Md Sultan Mia	Pyramiding biotic and abiotic stress tolerant genes by fast generation and molecular marker assisted selection in wheat	School of Plant Biology and IOA	Assoc/Prof Guijun Yan; Dr Hui Liu	Endeavour Scholarship supported PhD student
Solomon Maina	Establishing the extent and significance of viruses with wind-borne insect vectors arriving from nearby countries and establishing in northern Australia	School of Plant Biology, School of Chemistry and Biochemistry, Plant Energy Biology, and IOA	Prof Roger Jones	CRC for Plant Biosecurity
James Wainaina	Improving food security in Kenya by controlling whiteflies on the common bean	School of Chemistry and Biochemistry, Plant Energy Biology, and IOA	Dr Laura Boykin; Prof Ian Small; Prof Laura Kubatko; Dr Paul De Barro	PhD scholarship from Australian Award
Rasha Al-Saedi	Determination of design criteria to maximise nutrient removal by vertical flow-through wetlands	School of Civil, Environmental and Mining Engineering	W/Prof Keith Smettem; Prof Kadambot Siddique	Iraqi Government Scholarship

Memoranda of Understanding (MoU) with External Organisations

ORGANISATION	TITLE
North-West Agriculture & Forestry University, Yangling, China	China-Australia Joint Research Centre for Ruminant Production
University of Agriculture, Faisalabad, Pakistan	Letter of MoU Extension, signed 3 December 2014
Syiah Kuala University, Banda Aceh, Indonesia	MOU with the Faculty of Veterinary Medicine
International Crops Research Institute for the Semi Arid Tropics (ICRISAT)	Letter of MOU Extension, signed 9 December 2014

UWA IOA 2014 Publications

Not previously reported

Ayalew H, Ma X and Yan G (2014) Screening wheat (*Triticum spp*) genotypes for root length under contrasting water regimes: potential sources of variability for drought resistance breeding. *Journal of Agronomy and Crop Science*

Barbetti MJ and You MP (2014). Opportunities and challenges for improved management of foliar pathogens in annual clover pastures across southern Australia. *Crop and Pasture Science* 65: 1249-1266

Busi R (2014) Resistance to herbicides inhibiting the biosynthesis of very-long-chain-fatty acids. *Pest Management Science*, 70: 1378-1384

Dias de Oliveira EA, Siddique KHM, Bramley H, Stefanova K and Palta JA (2014) Response of wheat restricted-tillering and vigorous growth traits to variables of climate change. *Global Change Biology* doi: 10.1111/gcb.12769

Gong X, Li C, Zhou M, Bonnardeaux Y, Yan G (2014) Seed dormancy in barley is dictated by genetics, environments and their interactions. *Euphytica* 197: 355-368

Guterres A, Soares F, Fatima A, Pereira L, Belo JB, Williams RL, Nesbitt H and Erskine W (2014). Synergy of storage management with varietal productivity improvement: The case of maize in Timor-Leste. *Journal of Agricultural Science, Camb.* DOI: 10.1017/S0021859614000859

Jugulam M, Walsh M and Hall JC (2014) Introgression of phenoxy herbicide resistance from *Raphanus raphanistrum* into *Raphanus sativus*. *Plant Breeding*, 133: 489-492

Han H, Yu Q, Vila-Aiub M, Powles SB (2014) Genetic inheritance of cytochrome p450-mediated metabolic resistance to chlorsulfuron in a multiple herbicide resistant *Lolium rigidum* biotype. *Crop Protection* 65: 57-63

Kong Y, Li X, Ma J, Li W, Yan G, Zhang C (2014) GmPAP4, a novel purple acid phosphatase gene isolated from soybean (*Glycine max*), enhanced extracellular phytate utilization in *Arabidopsis thaliana*. *Plant cell reports* 33: 655-667

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Liu MJ, Zhao J, Cai QL, Liu GC, Wang JR, Zhao ZH, Liu P, Dai L, Yan G, Wang WJ, Li XS, Chen Y, Sun YD, Liu ZG, Lin MJ, Xiao J, Chen YY, Li XF, Wu B, Ma Y, Jian JB, Yang W, Yuan Z, Sun XC, Wei YL, Yu LL, Zhang C, Liao SG, He RJ, Guang XM, Wang Z, Yue-Yang Zhang YY & Luo LH (2014). The complex jujube genome provides insights into fruit tree biology. *Nature Communication* 5: 5315 doi: 10.1038/ncomms6315

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Ma J, Stiller J, Zhao Q, Feng Q, Cavanagh C, Wang P, Gardiner D, Choulet F, Feuillet C, Zheng YL, Wei Y, Yan G, Han B, Manners JM, Liu C, (2014) Transcriptome and Allele Specificity Associated with a 3BL Locus for Fusarium Crown Rot Resistance in Bread Wheat. *PLoS ONE* 9(11): e113309. doi:10.1371/journal.pone.0113309 e96011

Mackie AE, Coutts BA, Barbetti MA, Rodoni BC, McKirdy SJ, and Jones RAC (2014) *Potato spindle tuber viroid*: stability on surfaces, and inactivation with disinfectants. *Plant Disease* (published on-line).

Malik AI, Ali MO, Zaman MS, Flower K, Rahman MM and Erskine W (2014). Relay sowing of lentil (*Lens culinaris* subsp. *culinaris*) to intensify rice-based cropping. *Journal of Agricultural Science, Camb.* DOI:10.1017/S0021859614001324

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Mohsin AU, Ahmad AUH, Farooq M and Ullah S (2014) Influence of zinc application through seed treatment and foliar spray on growth, productivity and grain quality of hybrid maize. *The Journal of Animal and Plant Sciences* 24:1494-1503

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Pan QJ, Ridsdill-Smith J, Liu TX (2014) Geographical variations in life histories of *Plutella xylostella* (Lepidoptera: Plutellidae). *Journal of Pest Science*. 87: 659-670 DOI 10.1007/s10340-014-0608-0

Ran Y, Patron N, Yu Q, Georges S, Mason J, Spangenberg G (2014) Agrobacterium-mediated transformation of *Lolium rigidum*. *Plant Cell, Tissue and Organ Culture*

Rehman A, Farooq M, Cheema ZA and Wahid A (2014) Boron nutrition improves the panicle fertility, yield and biofortification of fine grain aromatic rice. *Journal of Plant Nutrition and Soil Science* 14:723-733

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UPCOMING EVENTS

Australian Institute of Agriculture (WA Division) Careers Night
Wednesday, 22 April 2015
Royal Agricultural Society Showgrounds

IOA Postgraduate Showcase 2015
Thursday, 11 June 2015
Bayliss Building, UWA

IOA Industry Forum 2015
Thursday, 9 July 2015
UWA University Club, UWA

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