



IOA director Kadambot Siddique (centre) with (from left) Liam Ryan, Kimberley Adams, Nikki Dumbrell and Georgia Pugh.

Photo by Peter Maloney, courtesy DAFWA

## UWA graduates judged best Young Professionals in Agriculture

**Ms Uly Fritsch**

Email: [ully.fritsch@uwa.edu.au](mailto:ully.fritsch@uwa.edu.au)

**UWA graduates excelled – again – at this year's Young Professional in Agriculture Awards, claiming the top three awards as well as the prize for best presentation at this prestigious event, hosted annually by the Ag Institute of Australia (WA Division) and sponsored by the Department of Agriculture and food, WA (DAFWA).**

In front of a packed auditorium at CSIRO Floreat, winner Kimberley Adams impressed judges and audience alike with her presentation on stubble retention and the impact of soil water repellence in sandy soils. Kimberley grew up on a broadacre farm in Mount Barker, a region in which non-wetting soils are a key factor limiting agricultural productivity. "I witnessed first-hand that this is a big issue, and decided to do a trial on my family's farm, aiming to identify practices that reduce water repellence."

Kimberley graduated with first class honours in UWA's Bachelor of Science (Agricultural Science). Her supervisors were Dr Ken Flower (UWA), Dr Margaret Roper and Dr Phil Ward (both from CSIRO).

Kimberley now works as an agronomist in Northam and is keen to continue contributing to the productivity and viability of the farming

sector. She will represent Western Australia in the national forum later in the year organised by Ag Institute Australia.

Runner-up Nikki Dumbrell also graduated with first-class honours, focusing on Environmental and Natural Resource Economics. Her presentation examined a range of carbon farming practices from the farmers' perspective, to identify which practices farmers are most likely – and least likely – to adopt and determine the underlying reasons for these preferences. She was supervised by Assistant Professor Marit Kragt and Dr Fiona Gibson (both from UWA). "I had excellent support – my supervisors were always prompt and constructive with their feedback." Nikki now works with the West Australian No-till Farmers' Association to overcome the barriers to carbon farming practices.

Third place was claimed by Georgia Pugh, whose passion for beef production was sparked by her family's cattle business. Her presentation explored the causes of 'dark cutting' beef, i.e. meat with a dark appearance and classified as unfit for human consumption. Her supervisors were Dr Peter McGilchrist (Murdoch University) and Professor Ross Kingwell (UWA).

Georgia is committed to improving the industry's image and making it more efficient and sustainable in the future. She plans to become an agricultural

consultant when she finishes the commerce component of her double degree with agricultural science at UWA.

Liam Ryan took out the 'best presentation' award for his engaging talk – and slides – on how he had used novel magnetic probes (ZIM Probe) clamped to the leaves of individual wheat plants to monitor their water hydration status and explore the factors affecting a plant's capacity to maintain turgor.

Liam was supervised by Dr Helen Bramley and Professor Erik Veneklaas (both from UWA). Liam is currently working as an Environmental Officer at DAFWA Northam.

DAFWA Grains Industry Executive Director Mark Sweetingham presented the awards to the winners and commended the finalists on the high quality of their presentations. "The success of the WA agricultural sector is dependent on attracting young people such as those who made presentations here today, who are innovative, progressive and passionate, and possess impressive communication skills."

"The future of the agriculture and food sector is with our young people and this forum provides a wonderful opportunity to promote the diverse careers the industry has to offer and to showcase WA's promising young professionals."



## Director's column

**Hackett Professor Kadambot Siddique AM**  
**FTSE email: [kadambot.siddique@uwa.edu.au](mailto:kadambot.siddique@uwa.edu.au)**

Three months into 2014, there can be no doubt that this year heralds both significant changes and new opportunities at the UWA Institute of Agriculture (IOA).

Following IOA's external review in late 2012, the Institute established an Executive Management Board (to replace the Executive Committee), led by Professor Robyn Owens, Deputy Vice-Chancellor (Research), and an Industry Advisory Board (to replace the External Advisory Board), led by Dr Terry Enright, Independent Director of the Australian Livestock Export Corporation (Livecorp), Director of Grain Producers Australia, in order to broaden its governance and ensure ongoing dialogue and input at executive level across disciplines at UWA and from core industry partners and funding agencies.

I am pleased to advise that the independent Review Panel commended IOA on a range of achievements, including lifting the profile of agriculture research and training internationally and developing a unified identity for agriculture research and teaching at UWA.

Early this year, IOA has held a strategic planning day in which representatives from across UWA exchanged their ideas regarding IOA's strategic direction over the next five years, to capitalise on existing strengths and provide a focus for new initiatives and we will keep you informed of the developments as they arise.

One of the latest new initiatives has been the establishment of the first Critical Zone Observatory in the southern hemisphere based at UWA Farm Ridgefield (see also page 3), and our international collaborations have received a boost with the

establishment of a joint soils laboratory between UWA and the Chinese Academy of Sciences (CAS) (see also page 2) and a Memorandum of Understanding between UWA and the Chinese Academy of Agricultural Sciences (CAAS) (see also page 9).

UWA's strength in agricultural research and education has again been confirmed in a substantial number of prestigious awards claimed by our scientists (see also page 15) and students (see cover story). Congratulations to them all!

At local level, UWA's Turf Research Group has continued its impressive run of highly successful outreach events (see also page 4) and the team at IOA is looking to continue to interact with the industry and community when presenting its annual Postgraduate Showcase (5 June) and Industry Forum (3 July) to share some of the latest agricultural research discoveries and provide a forum to debate a contemporary 'hot topic' in Australian agriculture (see also page 20).

Finally I would like to sincerely thank Ms Uly Fritsch for her excellent work and commitment as the Communication Manager of IOA during the past 3 years. I wish Uly all the best in her new position within UWA.

## Centre of Excellence in Plant Energy Biology awarded \$26 million

**A \$26 million Australian Research Council grant has enabled the establishment of a new national Centre of Excellence in Plant Energy Biology (CoE PEB) at UWA from 2014 to 2020.**

National collaborators are The Australian National University, The University of Adelaide and La Trobe University. The CoE PEB is the only centre awarded to Western Australia in the ARC's 2014 Centre of Excellence funding round and will develop new approaches needed in agriculture due to narrowing resources and a rising world population.

The Director of the CoE PEB is Winthrop Professor Harvey Millar and the centre will lead research to increase the efficiency of energy conversion and use by plants to make them more tolerant to environmental challenges and better at allocating resources.



Harvey Millar



(From left) Bolun Ning (CAS Bureau of International Cooperation), Tony O'Donnell (UWA), Jill Collins (Australian Consul General) and Jinshui Wu (Director of ISA-CAS).

## Establishment of joint soils laboratory in China

**A history of close collaboration between UWA and the prestigious Chinese Academy of Sciences (CAS) culminated in the launch of the two institutions' first joint laboratory in December 2012.**

The joint laboratory for Soil Systems Biology – an initiative of UWA's Faculty of Science and CAS's Institute of Subtropical Agriculture – aims to harness the power of micro-organisms to increase soil productivity and protect the environment, using the latest molecular sequencing, imaging and isotope tracer techniques.

CAS' and UWA's wealth of expertise and experience in soil science and the (likely) benefits of sharing these assets have long been recognised by both institutions. Three UWA soil scientists have formal ties with CAS: Winthrop Professor Tony O'Donnell, Dean of UWA's Faculty of Science, has been holding a Visiting Professorship for Distinguished International Researchers by CAS since 2012, Professor Daniel Murphy's Visiting Professorship commenced in 2012, and Winthrop Professor Andy Whiteley, was awarded a Visiting Professorship with CAS at the launch of the joint centre.

"To meet the global scientific challenges and the key environmental issues successfully, we need an integrated, international approach, and the establishment of this centre represents an important step on this path", says Whiteley. Besides conducting innovative, cutting-edge research, the laboratory will also play a key role in training the next generation of soil scientists.

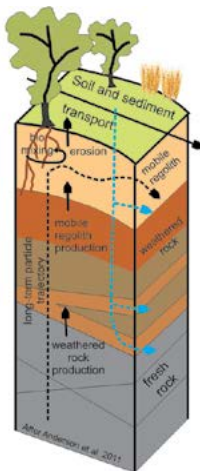
For further information visit [www.news.uwa.edu.au/201312176372/research/tiny-organisms-may-hold-key-global-food-supply](http://www.news.uwa.edu.au/201312176372/research/tiny-organisms-may-hold-key-global-food-supply)



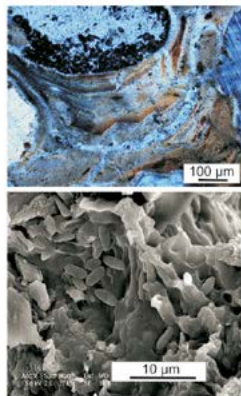
# UWA Farm Ridgefield site for first 'Critical Zone Observatory' in southern hemisphere



Landscape scale



Process scale



Micro scale

An international network of scientists study Earth's 'outer skin' – known as Critical Zone – at sites around the world that are known as 'Critical Zone Observatories' (CZO).

The Critical Zone is where soil interacts with rock, water, the atmosphere and living organisms. This zone is essential for terrestrial life on Earth because it produces food, influences water quality and regulates local micro climate.

UWA's Farm Ridgefield at Pingelly has become the site for the first CZO in the Southern hemisphere, making UWA the first Australian university to be a part of the international network of research sites.

The Avon River Catchment Observatory ([www.czen.org/content/uwa-czo-avon-river-catchment](http://www.czen.org/content/uwa-czo-avon-river-catchment)) is coordinated by Assistant Professor Matthias Leopold (UWA School of Earth and Environment and IOA) who explains its significance: "There

are approximately 50 Critical Zone Observatories globally, but most are in Europe and the United States. To make the study of Earth's critical zone truly global, CZOs are needed in locations where climate, soils and land management differ from that of Europe and the United States. The site will provide a focus for local, national and international researchers who study this critical part of the environment."

To begin the research at the new CZO, UWA is bringing together more than 30 local researchers and international CZO experts at a two-day workshop in April 2014 coordinated by Leopold and Associate Professor Deirdre Gleeson ([www.see.uwa.edu.au/research/czo-critical-zone-observatory](http://www.see.uwa.edu.au/research/czo-critical-zone-observatory)). Participants will visit the UWA Farm Ridgefield to hear about the unique landscape, geology and soils at the site and to engage in hands-on workshops and in planning future research.

For further information see [www.news.uwa.edu.au/201402276473/international/whats-critical-about-earths-outer-skin](http://www.news.uwa.edu.au/201402276473/international/whats-critical-about-earths-outer-skin)

## Soil Science teaching attracts students to UWA Farm Ridgefield

Assistant Professor Matthias Leopold  
Email: [matthias.leopold@uwa.edu.au](mailto:matthias.leopold@uwa.edu.au)

Soils are undoubtedly at the core of agricultural production and UWA has been long known for its high reputation in Soil Science and Plant Nutrition. Add to this a growing public awareness of the importance of food and water security and it comes as no surprise that at UWA the number of under- and postgraduate students who want to learn more about the life-sustaining functions of soils is on the rise.

Besides specialised units dealing with soil-plant, soil-water or soil-atmosphere interactions, UWA also offers units in pedogenesis – the science and study of the processes that lead to the formation of soil.

In March 2014, UWA's Assistant Professor Matthias Leopold (School of Earth and Environment and IOA) took over 80 students and staff from the Crawley and Albany campus to the UWA Farm Ridgefield at Pingelly over a weekend, to study the fundamental medium of agriculture – the soils. "It all starts with a general understanding of the landscape and ends with a profound knowledge about soil properties and functions," says Leopold. "The UWA Farm offers ideal study opportunities, as the soils at the farm are highly diverse which allows students to gather extensive pedologic information in a short time.

At undergraduate level – in a unit named 'Land Use Management' (EART3338) – involves digging a hole in the ground and describing and sampling the physical and chemical properties of the solum in a professional way.

Leopold is excited about other unique opportunities which the UWA Farm holds for soil science students: "2014 is the first time where parts of the information by the students will be integrated in the new web-based



UWA 'Land Management' students during their visit to the UWA Farm.

GIS system of the UWA Farm. This will help to manage crop production, restoration and water management and ensure that the soil data will be available to future students and the wider community."

The web-GIS is part of an Improving Student Learning (ISL) grant at UWA, co-sponsored by IOA and led by Assistant Professors Bryan Boruff, Matthias Leopold, Emeritus Professor Lyn Abbott and Associate Professor Dominique Blache. It will ensure availability of elaborate soil data (and other information) to students and the community in the future.

# Turf Research Open Day attracts record numbers

Ms Ully Fritsch

Email: [ully.fritsch@uwa.edu.au](mailto:ully.fritsch@uwa.edu.au)

**A record crowd of 160 people braved sweltering heat to participate in this year's UWA Turf Research Program Open Day, held at UWA's Shenton Park Research Station in February.**

The UWA Turf Research Program has been working in partnership with the Australian Turf Industry since 1995, and the Open Day has become a 'must-go'-event for industry groups, local government representatives and sporting associations, entrusted with caring for our parks, sporting ovals and similar public places under increasingly challenging conditions arising from our changing climate.

"Public open spaces such as parks, sports ovals and recreation grounds provide an enormous benefit to the health, lifestyle and social well-being of West Australians," says Associate Professor Louise Barton, "However, with the drying climate in WA's south-west and reduced water availability in many areas, turf managers and home owners are under increasing pressure to decrease their water use. It is crucial we look at ways to do this while still maintaining green public open spaces and this is the focus of the UWA Turf Research Program."

The team has adopted a two-pronged approach, investigating (i) how Local Government best utilise water allocation to maintain their turfgrass areas and (ii) the efficacy of a range of soil amendments to decrease watering requirements of turfgrass.

Barton leads the project investigating approaches to best manage current and future water allocation to turfgrass in public open spaces, with the view to optimise irrigation schedules and to reduce the incidence of soil water repellence. Using a series of 10m<sup>2</sup> plots, combinations of water allocation amounts, watering schedules and soil wetting agent are being used to determine (i) if turfgrass can be maintained with a water allocation, and the implications of further lowering the allocation; (ii) how an annual water allocation is best distributed during the year and (iii) if applying a wetting agent improves the effectiveness of water allocation.

Findings-to-date indicate that turfgrass quality can be maintained on the current water allocation to Local Government (7500 kL/ha per year), but only if the irrigation system is efficient and wear-and-tear is not excessive. Applying a good wetting agent can further improve the effectiveness of a water allocation, and may potentially lower the amount of water required to maintain turfgrass.



Louise Barton at the Turf Research Open Day, outlining the different water allocation treatments tested at the Shenton Park trial site.

While the water allocation project is in its third year, the group's soil amendment project only started in late 2013: "This is the first time, that different soil amendments are being scientifically examined and evaluated for the Perth Metropolitan area, by an independent body of researchers" says Associate Professor Pieter Poot, who leads the project. "We anticipate that by the end of this (three-year) field experiment we will have independent evidence of the efficacy of a range of recommended soil amendments in decreasing the irrigation requirements for turfgrass, and we will know what mechanisms are responsible for the variation in efficacy of different treatments. In addition, we will know the amount of water that can potentially be saved by using soil amendments, and the resulting turfgrass quality."

Based on industry recommendation and cost factors, six soil amendments – bentonite, compost, kaolinite, ready grit™, spongelite, zeolite- have been selected for (characterisation in) this field experiment. Using a series of 2.5 x 3.5 m<sup>2</sup> plots, twelve amendment treatments (i.e. all products by themselves, combined with compost and a control) are tested at two irrigation rates, with

four replicates. Below-ground access tubes allow obtaining pictures of the developing root system and measure moisture levels. In addition the team will record turfgrass growth, colour, nutrient content and leaf surface temperatures. "This state-of-the-art technology has already provided new insights," says Poot. "The below-ground pictures taken one week after laying the turf showed that the root system had already developed to a depth of 60 cm. The leaf surface temperature will be measured with an infra-red camera and provide the data to evaluate how water stress is developing."

Barton and Poot are quick to point out that the value of this project and the success of the Open Day is founded on far more than cutting edge technology: "We are lucky to have fantastic support from Horticulture Australia, who in partnership with the Turf Industry and various State and Local Government groups and WA State Government, provide financial and in-kind support to the projects."





Helen Carroll with Yongjuan Guan at the Mike Carroll Travelling Fellowship Award Ceremony, held at UWA in February.

## Mike Carroll Travelling Fellowship winner aims to boost sheep fertility

**Ms Ullly Fritsch**  
email: [ully.fritsch@uwa.edu.au](mailto:ully.fritsch@uwa.edu.au)

**The opportunity to expand one's skills at a world-class laboratory under the guidance of leading researchers is a dream shared by most young researchers.**

This dream recently became reality for a PhD candidate Ms Yongjuan Guan as the winner of the 2013 Mike Carroll Travelling Fellowship award.

The Fellowship enabled Yongjuan to learn new techniques and develop new skills at the University of Alberta, Canada, where she spent four months to progress her research on the relationship between under-nutrition and low fertility in merino rams.

Such research is highly relevant to Western Australia, considering the consistently low fertility of WA merino flocks and the fact, that under-nutrition is typical for Australian rams as the normal breeding season for sheep falls in Autumn.

In a departure from the traditional research focus (on the link between sperm quantity and fertility), Yongjuan hypothesised that, when the testis is shrinking because of under-nutrition, eggs are not fertilised because the sperm cells are damaged, or embryo development fails because the genes in the sperm are damaged.

Yongjuan's stay at the University of Alberta helped her assess the quality of the sperm cells using the latest computer-aided imaging techniques and study the functional integrity of the cells using molecular and cellular techniques.

"I am very grateful to Associate Professor Leluo Guan and her PhD student Guanxiang Liang, from the Department of Agriculture, Food and Natural Sciences at the University of Alberta. They provided resources at the miRNA laboratory and taught me bioinformatics for data analysis 'from scratch'. I am deeply honoured that I was selected for the Mike Carroll Travelling Fellowship which has taken my research to a whole new level."

The Mike Carroll Travelling Fellowship commemorates the late Dr Mike Carroll, former Director General of the Western Australian Department of Agriculture, who placed a high value on international relationships and was passionate about improving the Western Australian farming sector.

Upon her graduation, Yongjuan plans to return to China and continue her research on male animal reproduction. Her supervisors at UWA are Winthrop Professor Graeme Martin, Associate Professor Irek Malecki and Dr Penny Hawken, from UWA's School of Animal Biology and IOA.

## 'Microblitz' takes community by storm

'MicroBlitz', is a 'Citizen Science' project which is rapidly capturing the interest of the wider WA community. The brainchild of UWA soil scientist Winthrop Professor Andy Whiteley, the project enlists young and old 'volunteer scientists' to investigate the genetic biodiversity, distribution and functionality of microbial communities within Western Australian soils.

Key tools to engage the citizen scientists include a soil sampling kit developed by Whiteley and his team, and the Microblitz website ([www.microblitz.com.au](http://www.microblitz.com.au)). Registering to become a sampler is easy, simply visit the website and sign up to receive your free sampling kit and instructions.

"MicroBlitz engages volunteer citizen scientists throughout WA by connecting them with the natural environment as they collect soil samples, which are then sent to a centralized laboratory for DNA sequencing and basic chemical analysis," says Whiteley.

"In the first ten months of the program we issued over 750 kits to registered participants from a range of community sectors including school groups, farmers, conservation groups and 'the Grey Nomads'."

Whiteley attributes the rapid uptake of the project to the successful partnerships with a range of community organisations, including Life Tech, Grow Safe AMF, The Sunday Times, Bunnings Warehouse Subiaco and the Perth Caravan & Camping Show.

"These partnerships also generated significant media interest including radio interviews, newspaper articles and a spot on GWN TV news."

The team is currently working on an 'app' for data capture in the field, the release of a short film and the generation of more opportunities for volunteers to engage in the project.

The MicroBlitz project app will be formally launched in Perth later this year.

For further information visit [www.microblitz.com.au](http://www.microblitz.com.au).

This project is funded by UWA and the Office of Science, Department of Premier and Cabinet.



Expert samplers from Mount Lawley Senior High School's 'Bush Ranger Cadets' show their teacher how it is done.



The IAC members present at the meeting: (L-R): Ousmane Ndoye, Sayyed Hossain Sabaghpour, Joyce Mulila-Mitti, Raj S. Paroda, Kadambot Siddique and Francis Wachira.

## Consultative Group for International Agricultural Research (CGIAR) grain legumes program met in India

**Hackett Professor Kadambot Siddique**  
Email: [kadambot.siddique@uwa.edu.au](mailto:kadambot.siddique@uwa.edu.au)

The Independent Advisory Committee (IAC) of CGIAR's Grain Legumes Program held its first meeting at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) during 20 – 21 February in Hyderabad, India. Hackett Professor Kadambot Siddique attended the meeting with other international members of the IAC. The committee comprised of eight members:

- Dr Raj S. Paroda, Executive Secretary, APAARI, Bangkok 10110, Thailand (Chair, IAC)
- Dr Joyce Mulila-Mitti, Crops Officer, Crop Production and Protection, FAO Regional Office, Accra, Ghana
- Dr Ousmane Ndoye, Program Manager, Non Staple Crops, CORAF/WE CARD, Dakar, Senegal
- Dr Sayyed Hossain Sabaghpour, Director General, Agricultural Research and Natural Resources Center of Hamedan Province, Hamedan, Iran
- Professor Kadambot Siddique, Hackett Professor and Director, The UWA Institute of Agriculture, The University of Western Australia, Crawley, WA, Australia
- Professor Francis Wachira, Deputy Executive Director, ASARECA, Entebbe, Uganda (representing Dr Fina Opio, Executive Director, ASARECA)
- Professor Fred Muehlbauer, USDA-ARS Grain Legume Genetics and Physiology Research Unit, Washington State University, Pullman, USA
- Dr Jill Findeis, Director, Division of Applied Social Sciences, University of Missouri, Columbia, USA

The members discussed the Terms of Reference (ToR) of the IAC as articulated by the Consortium Board for Grain Legumes and sought clarification from Dr Noel Ellis, the CRP Grain Legumes Director and Dr Philippe Ellul, Senior Science Officer, CGIAR Consortium.

The IAC members valued the opportunity to listen to presentations from Dr Noel Ellis, Director, CRP Grain Legumes, and the eight Product Line Coordinators. Clarifications were sought by IAC on the program structure, progress to date, quality of science and anticipated outputs and outcomes as well as the budget. The two days meeting clearly provided IAC members with first-hand information regarding the Grain Legumes program and its future strategic directions.

IAC made several recommendations including improved communication between product lines, stakeholders, end users and funding agencies. There is an urgent need to develop and circulate a regular e-newsletter, regularly update the Grain Legumes Program website (<http://grainlegumes.cgiar.org/>), identify and publicise success stories, and prepare timely media statements.

## WA's agricultural expertise 'goes international'

In a recent visit to Western Australia, a group of scientists from South East Asia embraced the opportunity to learn more about WA's agriculture in an effort to help advance the industry in their own countries with the new knowledge and skills gained.

The five scientists from Laos, Indonesia, Papua New Guinea, the Philippines and Pakistan were chosen under the Australian Centre for International Agricultural Research's (ACIAR) John Dillon Memorial Fellowship initiative, which aims to develop leadership skills in outstanding mid-career scientists of ACIAR partner organisation.

During their five-day visit, the scientists were hosted by the Department of Agriculture and Food, WA (DAFWA) and introduced to a range of best-practice organisations central to Australia's agricultural research, extension, teaching and policy making.

They toured a range of facilities and met with representatives from The University of Western Australia (UWA), Department of Fisheries, WA and industry representatives from a range of farming enterprises.

DAFWA's Irrigated Agriculture and Diversification Executive Director, Terry Hill emphasized the win-win nature of the initiative: "While our guests gained insights about the latest Australian agricultural developments, their visit provided our scientists with a unique opportunity to learn about advancements and issues being addressed in Asia, and a forum for developing new relationships and networks that could lead to future projects or collaborations."

Dr Craig Lawrence, an Adjunct Associate Professor at UWA and Principal Research Scientist (Biodiversity and Biosecurity Branch, Department of Fisheries, WA) added: "We have developed expertise and UWA facilities that now place us in a unique position to share this with researchers from around the world; whether it be aquaculture to alleviate food shortages; fish to control mosquito borne diseases; and/or endangered species captive breeding and restocking programs to conserve biodiversity."

After leaving WA the group met with Australia's Foreign Affairs Minister Julie Bishop in an award ceremony at Canberra to celebrate the important role and the success of agricultural skill development in Australia's aid program. For further information see [www.abc.net.au/news/2014-03-04/australia-aid/5296060?section=act](http://www.abc.net.au/news/2014-03-04/australia-aid/5296060?section=act).



(from left) Dr Craig Lawrence (Principal Research Scientist, Biodiversity and Biosecurity Branch, Department of Fisheries, WA), Dr Hassan Warriach, (Project Manager, University of Veterinary & Animal Sciences, Lahore, PAKISTAN), Ms Maria Lilia Vega, (Research Project Coordinator, Visayas State University, PHILIPPINES), Mr Gideon Pama, (Manager – Freshwater Aquaculture, National Fisheries Authority, Port Moresby, PAPUA NEW GUINEA), Dr Malavanh Chittavong, (Vice Head of Faculty of Agriculture, National University of Laos, LAO PDR), Asst/Prof Mick Considine (UWA), Dr Andrew Taylor (DAFWA), W/Prof Kadambot Siddique (UWA).



# Beating fruitfly – are we up to the challenge?

Ms Isabel Arevalo-Vigne

Email: [isabel.arevalo-vigne@research.uwa.edu.au](mailto:isabel.arevalo-vigne@research.uwa.edu.au)

Mediterranean fruit fly (*Ceratitis capitata*), also known as 'Medfly', causes massive losses to Australian fruit growers each year and can devastate entire fruit growing areas if not controlled in time.

Unfortunately, even the most stringent measures taken by a grower to eradicate Medfly on individual property are likely to fail, unless the entire community participates in the effort.

PhD student Isabel Arevalo-Vigne (DAFWA Staff), from UWA's School of Agricultural and Resource Economics, is rising to this challenge: Her research project aims to identify the factors and obstacles that prevent people from adopting and participating in control measures to eradicate Medfly in urban, peri-urban and rural areas, and to investigate incentives that can facilitate community participation to solve the Medfly problem in Western Australia.

"Medfly cannot be controlled on a single property with a single control method. They can survive in backyards of private households, so successful eradication from a whole growing area depends strongly on the actions of household owners, now more so than ever before," says Isabel and explains the urgency of the situation:

"The impending ban of the traditional pesticide cover sprays Dimethoate and Fenthion has increased the pressure on commercial and backyard growers to adapt and adopt alternative measures to safeguard future production of quality produce."

Isabel sees the solution in the adoption of sustainable control measures on a large scale – as conceived in Area Wide Management (AWM). "Once we understand what drives people to participate cooperatively and actively



Isabel Arevalo-Vigne (left) interviewing Vivienne and Hugh Litson at their property in Bridgetown.

in Medfly eradication initiatives, we can tailor our initiatives accordingly."

Isabel conducted a state wide survey among commercial fruit growers, small landholders and the general public and found that less than 50% of people growing fruit trees applied control methods.

"Achieving community engagement is a complex matter, and there are indications that a person's likelihood to participate in or adopt control methods depends just as much on their understanding of the ecological issues involved as on (other) factors which may diminish their motivation (eg financial costs, time required). When we explained the benefits of controlling Medfly collectively, 65% of survey respondents agreed to implement control methods in the next six months – including those without fruit trees."

Isabel suggests that eradicating Medfly does not have to be complicated, but that it will take time and commitment from anybody growing fruit

trees – and an understanding of the enemy and its survival strategies.

In a pilot project, Isabel has selected the community of Bridgetown to analyse in-depth the issues that have emerged from the survey and from interviews with government officers, industry representatives and the general public. This information will be used to design and test a strategy for community engagement to control Medfly in Bridgetown which can serve as a model for other areas in the Southwest and which can be applied to fight plant biosecurity threats.

This project is supported by UWA, CRC Plant Biosecurity, FruitWest and DAFWA. Isabel's supervisors are Professors Ben White and Ross Kingwell, Assistant Professor Amin Mugera (School of Agricultural and Resource Economics and IOA), Professor Nancy Longnecker (Science Communication, School of Animal Biology and IOA) and Professor Iain Walker (CSIRO).

## Collaboration on crop stress resistance

The UWA Institute of Agriculture (IOA) and Guangzhou University's School of Life Sciences have been collaborating on crop stress resistance and genomic approaches with emphasis on barley. Their joint research has led to two key recent publications (PLoS One, 7 (5): e 37573. doi:10.1371/journal.pone.0037573; PLoS ONE 8(2):e56816. doi:10.1371/journal.pone.0056816).

Winthrop Professor Kadambot Siddique visited Guangzhou University in March and met with researchers and senior management and discussed strategies for future collaboration including the progress of a joint ARC-Linkage project application. While at Guangzhou University Siddique delivered several lectures to postgraduate students. He also visited the Guangdong Academy of Agricultural Sciences Crop Research Institute.



Professors Kadambot Siddique and Peiguo Guo (Guangzhou University) with students following the lectures.

# Lupin prospects improve with pinpointed disease causation

## ScienceNetwork WESTERN AUSTRALIA



Monica Kehoe inspecting lupin plants during her trial.

**Mr Joshua Rampling**

**Email:** [ramplingjosh@gmail.com](mailto:ramplingjosh@gmail.com)

The cause of a disease affecting the local lupin industry has been discovered in PhD research at UWA's Institute of Agriculture.

Black Pod Syndrome (BPS) is a severe necrotic disease of lupin pods which causes large crop losses and prevents many WA farmers from growing lupin, especially in the south-west coastal area of the state.

BPS causes the pods on lupin plants to turn dark brown or black and halts or reduces seed production.

UWA PhD researcher Monica Kehoe says the study has been able to cement suspicions that researchers have had on the cause of BPS.

"The most important result of the research is the confirmation that late infection with Bean yellow mosaic virus [BYMV] is the cause of BPS in narrow-leafed lupins," Ms Kehoe says.

BYMV is mostly found in high rainfall grainbelt zones and is endemic in south-western Australia.

The virus can infect clover plants next to pastures of lupin and is spread by aphids. It is especially difficult to control as it can survive from one growing season to the next in the infected clover.

Ms Kehoe says her research – which involved PCR and ELISA testing of lupin in five locations, and greenhouse cultivar studies – shows the timing of infection of the virus plays a large part in causing BPS.

"If the BYMV infection occurs before the primary pods are forming, the plant will turn fully necrotic

and die as we would expect with a typical early BYMV infection," she says.

"Infection after the primary pods have developed leads to symptoms of BPS ... and yields are greatly reduced."

Now that the cause has been found Ms Kehoe says farmers can more confidently plan prevention strategies to stop BPS from causing major losses.

"Ultimately a new variety of narrow-leafed lupin with resistance to BPS is the goal," Ms Kehoe says.

"The lupin breeding team at DAFWA screens huge numbers of accessions each year for a number of molecular markers that have already been located for various other traits including disease resistances.

So finding a molecular marker for BPS that can be incorporated into that process is the next logical step."

There is currently one variety of lupin - Jenabillup - that exhibits partial resistance to BPS and Ms Kehoe says resistance is something that DAFWA researchers are looking at.

Ms Kehoe's research has been supported by a GRDC scholarship, an Australian Postgraduate Award and in-kind support by DAFWA.

For more science news go to [www.sciencewa.net.au](http://www.sciencewa.net.au)

## 'Lupin Foods Australia' a winner in the Middle East

Western Australian Company 'Lupin Food Australia' took out the award for 'best new environmentally sustainable initiative' and was runner up for 'Best new Health Food or Beverage' at the Gulfood Awards 2014, hosted by the Dubai World Trade Centre on 28 February.

Gulfood is the world's biggest annual food and hospitality trade exhibition, attracting over 4,500 exhibitors and 20,000 brands this year.

More than 250 entries from 19 countries competed for twenty accolades including: best newcomer brand or business, best new halal food, best environmentally sustainable initiative.

Innovation was a key feature of this year's exhibition and ranked highly with the judging panel of international, independent industry experts.

Lupin Foods Australia is a wholly owned subsidiary of Co-operative Bulk Handling Limited ("CBH Group"), an organisation owned by the grain growers of Western Australia. "Being a part of the CBH Group means that Lupin Foods Australia has a direct stake in ensuring that the lupins we



David Fienberg and Sofi Sipsa accepting the Gulfood Award for Best Environmentally Sustainable Initiative.

process are sourced from growers employing the most sustainable farming systems," says General Manager David Fienberg, who is also a member of the Industry Advisory Board at UWA's Institute

of Agriculture. "The recognition from Dubai shows that our approach is working and is testament to the bright future our lupin food products have in the global arena."



# Farmer turns entrepreneur in Bangladesh



Field pea-seed entrepreneur Mr Pinto (front) and a fellow farmer in Bangladesh among the drying seeds harvested by Mr Pinto.

**Professor William Erskine**  
Email: [william.erskine@uwa.edu.au](mailto:william.erskine@uwa.edu.au)

A farmer becoming an entrepreneur – is not very common in rural Bangladesh. However, when scientists from UWA's Centre for Plant Genetics and Breeding (PGB) visited western Bangladesh as part of a travelling workshop they found Mr Minto, a demonstration

farmer retaining seeds of field pea after green pod harvest to sell next season to interested growers.

The Rice-Pulse Project (funded by ACIAR), led by Professor William Erskine, focuses on developing new systems for peas in western Bangladesh to increase production, including 'squeezing in' a crop of short-season (60 day) large-seeded vegetable peas – between Bangladesh's two annual rice crops. "Bangladesh has a fallow window between the harvest of monsoonal rice in late October and the transplanting of spring irrigated rice in early February," explains Erskine. "In the previous three years the project focused on trials conducted at research farms, but this year we have started to involve Bangladeshi farmers - all of them small landholders."

The farmers were given short-season field pea seeds to plant on their land after the harvest of the monsoonal rice with the instruction, to harvest the green pods after 60 days, at which time they are ready to eat. The field pea seeds grew so well, that one of the farmers – Mr Minto- decided to delay planting the spring rice crop by two weeks, and leave his field pea crop in the ground for another two weeks to form seeds. "Mr Minto stands to make a tidy profit from his initiative," says Erskine. "He very quickly recognised, that this short duration field pea variety was very-well

suited to the local conditions and seasons and could lift production significantly: he anticipated the demand for seeds from other farmers, and the proceeds from selling the field pea seeds he grew far outweighed (will far outweigh) the yield decrease in his subsequent rice crop caused by the delayed planting."

The project 'Introduction of short duration pulses into rice-based cropping systems in western Bangladesh' is in its fourth year – notwithstanding the socio-political unrest in late 2013 – and aims to intensify winter cropping in Bangladesh using lentil and pea to intensify rice based cropping systems. Progress was monitored at 30 demonstration sites through a travelling workshop (9-14 February, 2014), attended by Erskine, Drs Ken Flower and Imran Malik (UWA), Dr Eric Huttner (ACIAR Research Programme Manager) and Dr M. Matiur Rahman (IRRI-Bangladesh) along with the Pulses Research Centre (PRC) team.

Not surprisingly, Erskine and his team were delighted with what they saw: "Farmers are starting to take up newly developed technology options on field pea and lentil in rice-based systems – and Mr Minto could be described as a trailblazer: Can there be a more promising indication for a project's success than adoption by the local farmers ahead of schedule?"

## New MoU strengthens UWA-CAAS collaboration

**Ms Uly Fritsch**  
Email: [ully.fritsch@uwa.edu.au](mailto:ully.fritsch@uwa.edu.au)

Six senior executives from the prestigious Chinese Academy of Agricultural Sciences (CAAS) visited UWA in February this year, to formalise a Memorandum of Understanding (MoU) designed to strengthen existing links and develop new collaboration between the two institutions.

The delegates were Professor Li Jiayang, Vice Minister of Agriculture and President of CAAS; Professor Zhang Lubiao, Director General, Department of International Cooperation, CAAS; Professor Mei Xurong, Director General, Department of Research Management, CAAS; Professor He Zhonghu, Institute of Crop Sciences, CAAS and Chief Scientist, International Maize and Wheat Improvement Center, Beijing; Professor Tom Guangzhi, Director General, Shanghai Institute of Veterinary Research, CAAS; Mr Niu Minjie, Secretary to CAAS President.

The visitors were welcomed by UWA's Winthrop Professor Tony O'Donnell, Dean of the Faculty of Science; Winthrop Professor Kadambot Siddique, Director of IOA; Professor Steven Smith, ARC



Professors Robyn Owens (Deputy Vice-Chancellor Research, UWA) and Li Jiayang (Vice Minister of Agriculture and President of CAAS) signing the MoU for UWA-CAAS collaboration at UWA in February.

Centre of Excellence, Plant Energy Biology and Ms Eva Chye, Principal Adviser, International Relations (North and South East Asia).

While the signing of the MoU was no doubt one of the highlights, the program for the one-day-visit was a resounding success and highly informative for visitors and hosts alike. The delegates met

with some of UWA's leading agricultural scientists across diverse disciplines, including Genetics and Breeding; Animal Production; Land and Water Management; Plant Diseases, Weeds and Pests; Bee Research; Plant Energy Biology and Plant Chemical Biology.

*continued on page 10*

## New MoU strengthens UWA-CAAS collaboration

*continued from page 9*

These meetings served to develop a collaboration strategy, in joint consultation, to provide a stocktake of current collaborations and outlines future initiatives, a major focus of which is 'Dryland Agriculture and Food Production Systems'.

UWA's existing collaborations extend across six CAAS Institutes: The Oilseed Crop Research Institute (canola drought, heat and disease tolerance screening); the Institute of Vegetables and Flowers (germplasm of vegetable crucifers); the Institute of Plant Protection (genetics and breeding of disease resistant wheat, barley and canola); the Institute of Crop Sciences (wheat drought and heat tolerance); the Institute of Agricultural Resources and Regional Planning (grassland animal production); the Institute of Animal Science and Veterinary Medicine (Reduction of methane emissions for livestock/livestock products).

The discussions also identified two further CAAS research institutes that have counterparts at UWA, which makes them a logical choice for future collaborations where the respective expertise and infrastructure complement each other and can drive innovation.

The CAAS Institute of Crop Sciences is set to collaborate with the UWA Institute of Agriculture in the area of genetics and breeding for terminal drought and heat tolerant wheat under dryland conditions.. The two institutes will also collaborate on the characterization of phenotypic plant responses and in plant breeding programs.

The CAAS Bee Research Institute and the UWA Centre for Integrative Bee Research (CIBER) combine a tremendous amount of expertise between them, with different technologies and platforms on both sides, which has great potential to speed up scientific progress in honey bee research (see also page 12).

The CAAS Institute of Quality Standard and Testing Technology for Agro-Products and the UWA Centre for Forensic Science will collaborate on food safety and traceability.

In addition, visitors and hosts agreed to incorporate postgraduate training, student exchanges and training of early career researchers in all collaborations.

It was also decided to hold a joint workshop on integrated dryland agricultural production systems in 2015.

# Fulbright Scholar names roots as key to next 'green revolution'



**Winthrop Professor Zed Rengel**  
Email: [zed.rengel@uwa.edu.au](mailto:zed.rengel@uwa.edu.au)

**A scientist from UWA's School of Earth and Environment and Institute of Agriculture, has received a prestigious Fulbright Senior Scholar award sponsored by Kansas State University (KSU), USA, to share and advance his research at KSU from July to December this year.**

Winthrop Professor Zed Rengel is an internationally renowned expert in nutrient uptake and ion toxicity in the soil-plant-water-microbe continuum whose research aims to improve the efficiency with which (crop) plants make use of the soil resources – nutrients- in order to achieve a sustained increase in food production.

"Food security is one of the biggest global challenges facing mankind," says Rengel. "While global population growth, climate change and variability pose significant problems, food security is also threatened by a decline in (average) yield increases of staple crops in recent years." He is convinced that a shift in thinking is required to address these challenges successfully: "The next 'green revolution' – with corresponding increases in crop yields – is likely to come from breeding for improved root systems, which are capable of efficient acquisition of water and nutrients from soils, because the arable area in the world is limited and continues to decline."

In Rengel's view the pathway to achieve this is clear. "Some of our existing crop genotypes do have a degree of tolerance to soil-related stresses, but this is mostly due to inadvertent (lucky) selection in the breeding process. What we need instead is a targeted breeding effort to transfer and accumulate defined tolerance traits into elite germplasm from which we can produce commercial varieties adapted to heterogeneous soils with resource-related stresses. Such targeted development of crop genotypes with increased efficiency of water and nutrient capture hinges on a better understanding of root structure and function followed by identifying molecular markers for root traits."

Rengel's research at KSU will focus on the identification of molecular markers associated with specific wheat root traits and the incorporation of that knowledge into a cost-effective computer simulation model.

"Simulation modelling plays an important role in understanding the complex root-soil interactions," says Rengel. "It provides an opportunity to investigate spatially and temporally dynamic processes at the rhizosphere, plant and whole-crop scales. We have developed and used the 3-D models to successfully simulate root architecture and function of diverse crop genotypes. The next significant innovation will be to incorporate existing genetic information on root traits into these 3-D root models to search for optimum root architecture and function in diverse environments. This will help us in breeding improved crop genotypes which are more efficient in taking up water and nutrients from soils."

Rengel's three KSU hosts cover a range of relevant disciplines, including crop physiology (Associate Professor Vara Prasad), soil science and agronomy (Professor Rob Aiken) and molecular genetics (Professor Guihua Bai), which complement Rengel's expertise in soil-root interactions, genetics and simulation modelling.

Rengel is looking forward to the work ahead: "This collaboration will enhance multidisciplinary capabilities of all staff involved because the project transcends the traditional boundaries between these disciplines by using computer simulation modelling (mathematics and computer science)."

For further information visit [www.news.uwa.edu.au/201403046484/awards-and-prizes/fulbright-scholarships-awarded-three-uwa](http://www.news.uwa.edu.au/201403046484/awards-and-prizes/fulbright-scholarships-awarded-three-uwa).



# Cluster roots: the answer to increase crop yield and conserve phosphorus?

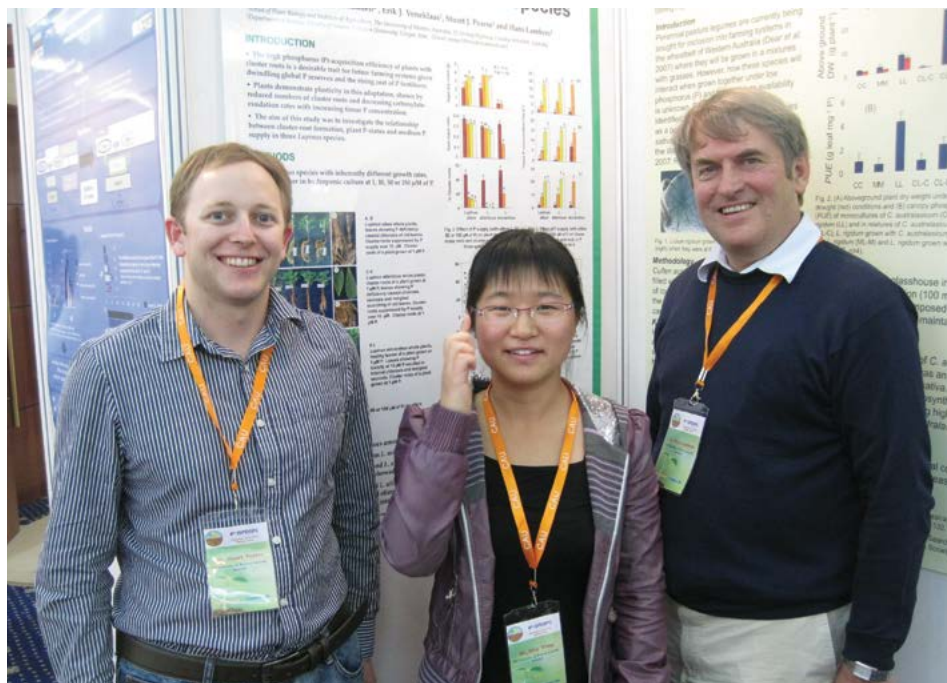
Ms Xing Wang

Email: wangx11@student.uwa.edu.au

A fascination with the strategies plants evolved to thrive under adverse conditions, especially a low availability of soil phosphorus (P), and a desire to learn from the best, attracted PhD student Ms Xing Wang to UWA, to research how plants develop 'desirable' traits that can help increase crop yield and conserve environmental resources.

Her research revolves around the P uptake of plants, and she explains her interest in this area. "Phosphorus (P) plays a critical role in crop yield, and with the world's rock P reserves for fertilisers dwindling, the scarcity of P may become a factor limiting crop production."

Wang's project focused on cluster roots and their functioning. "Many soils contain substantial levels of total P, but in forms not readily available for most crops like wheat and canola," explains Xing. "Cluster roots however, – in *Lupinus* as crop plants and some Australian/Chilean *Proteaceae* species – have an increased root surface area and are able to mobilize and absorb P from the soil where other plants fail. Therefore, the specialised cluster root structures and their functioning under a low soil P availability, are considered desirable traits which we aim to exploit for future crops in order to sustain high crop yield in the



Xing Wang with supervisors Stuart Pearse (left) and Hans Lambers (right) at the 4th International Symposium on Phosphorus Dynamics in the Soil-Plant Continuum, ISPPC in, Beijing, China (2010).

long-term for a growing population world and to conserve resources."

Wang's project investigated the cause of variation in cluster-root formation among cluster-root forming *Lupinus* species, and whether the variation in biomass allocation to cluster roots is an environmentally or genetically regulated process in different *Lupinus* species. She has submitted her thesis and one of her findings was recently published in *Annals of Botany*(2013) 112: 1449-1459.

Wang developed an interest in agriculture at an early age, despite growing up in a small town in China: "I spent my school holidays in the countryside at my grandmother's fruit and vegetable garden and quickly recognized the importance of agricultural production."

Consequently, Wang studied Agricultural Resources and Environmental Sciences in her undergraduate degree at Shanxi Agricultural University, China, followed by a Master of Science degree at Guangxi University, during which time she came to UWA as a visiting student.

Upon graduation Wang returned to UWA to pursue her PhD study in the School of Plant Biology and IOA under Winthrop Professor Hans Lambers and Adjunct Senior Lecturer Stuart Pearse. "I was fortunate to have had such excellent supervisors and such tremendous support and have been equally inspired by the encouragement and guidance I received throughout my PhD, as I have been by their scientific expertise. Thank you Hans and Stuart!"



## Good-bye from IOA News Editor

Dear All,

This is my last newsletter as editor of IOA News and I want to say a big thank you to you, the readers, for your constructive feedback; and to you, the scientists, research students and other IOA collaborators and supporters, for your stories, your research and your awards, without which there would have been no IOA News. My thanks also go to IOA director Kadambot Siddique, for his guidance, support ...and not least of all for his patience with my endless queries and at times, unorthodox approach. I am equally indebted to Siddique's Executive Assistant Cora Castens, who has kept me sane – more or less – and who helped me out any time I asked.

I will continue to follow the IOA development and next round of achievements closely – I will remain at UWA – and have no doubt that the combined efforts of the many outstanding people involved with IOA will do agriculture at UWA proud in the years to come. Best wishes, Uly Fritsch.

# Consul General of China visit strengthens UWA collaboration with China

**Emeritus Professor Lyn Abbott**  
Email: [lynette.abbott@uwa.edu.au](mailto:lynette.abbott@uwa.edu.au)

The Consul General of China, Dr Huang Qinguo and his Deputy, Dr Liu Yutong, visited IOA in January. Dr Huang was welcomed by Emeritus Professor Lyn Abbott, Deputy Director of IOA, Professor Boris Baer and Associate Professor Guijun Yan.

Abbott introduced the visitors to IOA and provided an overview of agriculture-related research at UWA. "Some parts of China face similar drought and heat problems as Western Australia and there is significant scope for collaboration in agriculture between China and Australia," said the Consul General.

The visit highlighted the already-strong links between UWA and some of China's leading organizations, such as the recent joint initiatives with the Chinese Academy of Science (CAS) (see also page 2) and Chinese Academy of Agricultural Sciences (CAAS) (see also page 9).

The Consul General and his Deputy also showed keen interest in the research activities conducted on honeybees at UWA.

Baer, an ARC Future Fellow and head of the Centre for Integrative Bee Research (CIBER, [www.ciber.science.uwa.edu.au](http://www.ciber.science.uwa.edu.au)) presented an overview of CIBER's research activities. Honeybees are central for human food production because of their pollination services for more than 80 crops of agricultural interest. However, major declines in managed bees have occurred globally, including in China.

CIBER uses an integrative approach, combining biochemical technology and evolutionary biology and working in close collaboration with the local beekeeping industry to develop approaches to counter and/or avoid future bee losses.

Baer recently visited CAAS to establish research collaborations with partners from the Institute of Apicultural Research in Beijing. His visit to China in 2013 revealed that both countries depend on a sustainable availability of bees, but that substantial research and development activities are required to achieve this. Combining different expertise and technologies through international partnerships will be a crucial component to successfully tackle the problems.



Perth Consul General of China, Huang Qinguo (4th from left) with his deputy Liu Yutong (3rd from left) meeting with Guijun Yan (2nd from left), Boris Baer (1st from left) and Lyn Abbott (right), during their visit to UWA.

## CAAS visit to UWA fast-tracks soil collaboration

Soil scientists from the renowned Chinese Academy of Agricultural Sciences (CAAS) have paid a 1-week-visit to UWA to fast-track collaboration focused on developing sustainable agricultural systems that underpin feeding the world.



Led by Professor Minggang Xu, Professor of Soil Science, Deputy Director General, Institute of Agricultural Resources and Regional Planning, Beijing CAAS, the scientists met with key researchers at UWA at a 'mini-workshop' in which scientists from both institutions presented an overview about their soil-related research and activities:

Professor Dan Murphy who holds a Visiting Professorship at CAAS and is Chair in Soil Science and Program Leader at the UWA's Institute of Agriculture (IOA) outlined existing UWA-CAAS collaborations; Winthrop Professor Tony O'Donnell, Dean of UWA's Faculty of Science, outlined the plans for a 'Soils Cooperative Research Centre'; Winthrop Professor Kadambot Siddique, IOA Director, presented an overview of agriculture at UWA and IOA engagement in China; Associate Professor Lousie Barton, leader of UWA's Soil Biology and Molecular Ecology Research Group and IOA, talked about UWA's research strengths in soil biology and molecular ecology and about opportunities for collaboration. Dr Frances Hoyle, Senior Research Scientist (DAFWA), and Adjunct Research Fellow (UWA) presented soil carbon sequestration work in Western Australian, while Associate Professor Wenju Zhang (CAAS) discussed soil carbon sequestration in arable land of China. Associate Professor Matthias Leopold (UWA) outlined 'Critical Zone science' (see also page 3) and Winthrop Professor Andrew Whiteley talked about an initiative focused on below-ground biodiversity of Western Australian soils.

Presentations by the visitors complemented the program, with Professor Jizheng He (University of Melbourne and Chinese Academy of Sciences) discussing new mechanisms of nitrification in acid soils and Professor Minggang Xu providing an overview of long-term experiments, soil fertility involvement of arable land in China and possible collaborations.

Following the information exchange, hosts and visitors discussed future activities, staff collaboration and student exchanges.

"The visit was very productive for both sides and will definitely help with future collaborations," says Professor Dan Murphy, who coordinated the program. "We gained a better understanding of each other's current research interests and priorities and soil carbon research is clearly an area of particular interest to both institutions."

"China is now the largest user of inorganic fertilisers in the world. The increasing use of inorganic fertiliser and corresponding decline in the use of traditional inputs of organic plant residues and animal manures will lead to a future decline in C stocks. UWA – CAAS collaborations in this area are well advanced and focus on using climate models to predict future climate scenarios and expected future changes in soil carbon stock."

Following the CAAS visit to UWA, Murphy and Hoyle travelled to China to advance these collaborations further.



# A new burst of life to wine production

Ms Uly Fritsch

Email: [ully.fritsch@uwa.edu.au](mailto:ully.fritsch@uwa.edu.au)

Interest in wine – and its appreciation – is on the rise to the point where some even argue that “wine is the new golf”: It generates employment, pleasure and many hobby connoisseurs ready to argue the merits of colour and bouquet.

In recent years, considerable attention has focussed on vine biology, particularly flowering and fruiting; few people realise, however, that the ability of the vine to spring to new life after winter is one of its most important properties and of critical interest to the wine maker.

Scientists from UWA and the University of Leeds (UK) have teamed up to explore the process responsible for the ability of the vine to develop buds that can not only survive winter but can make the rapid transition from the dormant state to the vigorously growing vine once the good weather returns.

Assistant Professor Michael Considine explains: “Many winegrowers agree that this property underpins the successful vine and its sustainability: In nature, the buds burst randomly but the winegrower requires that all the buds burst within a few days of each other, so that the shoots and fruit develop together, which is essential to quality wine production and consistency.”

The bud is very important, because it houses the embryonic flowers, leaves and fruiting bodies.



Christine Foyer and Mick Considine inspecting vines in Western Australia's southwest.

Being able to awaken after a long winter sleep poses many problems for the embryo (that are poorly understood), including the need to handle oxygen.

“Oxygen metabolism is tricky for all living organisms,” says Professor Christine Foyer, Considine's UK partner and Winthrop Research Professor at UWA. “Oxygen can even be toxic and all organisms that exist in air have developed the ability to use oxygen for respiration while protecting themselves against the potentially harmful side effects of oxygen chemistry.”

The present research focus on how the bud handles oxygen to make this transition from the

dormant state to the vigorously growing vine has provided Considine, Foyer and their team with early indications which suggest that oxygen radicals – which accumulate within hours of warming following a winter chill – might act as the wake-up signal.

“We are now exploring this exciting possibility with two PhD students, Mrs Karlia Meitha and Ms Yazhini Velappan (both UWA),” says Considine, “and thanks to their contributions and expert supervision across the continents we are making rapid progress and are looking forward to deliver new knowledge that that can be used to help the grower achieve synchronous bud burst and generate lasting benefits for viticulture industry.”

## Strategies for efficient and sustainable livestock farming

Eight strategies to make ruminant livestock a more sustainable part of the food supply chain were recently outlined in a Comment paper published in the prestigious journal *Nature* by a team led by Professor Mark Eisler, University of Bristol UK and Winthrop Professor Graeme Martin, from The University of Western Australia's Institute of Agriculture. Among other partners in the project is Rothamsted Research, UK, which is the longest running agricultural research station in the world which Martin visited recently to establish further collaboration with UWA.

The authors emphasize the importance of keeping livestock in ways that work best for individuals, communities and the planet. Choosing appropriate feed is a good starting point. They point out that too much ‘human food’ is fed to livestock unnecessarily: “About 70 per cent of



From left: Johan Greeff (DAFWA) and Graeme Martin (UWA) visiting Rothamsted Research.

the grains used by developed countries are fed to animals but some of this is avoidable. Ruminants graze pastures and can eat hay, silage and high-fibre crop residues that are unsuitable for human consumption.”

Other strategies include the use of simple dietary supplements to help to boost productivity. “Dietary supplement can alter microbes in the rumen to improve animals’ nutrition, which means, that in some cases animals can produce more milk and meat for proportionally less greenhouse gas.”

Furthermore, they urge producers to focus their efforts on boosting yields from local breeds, rather than importing breeds that are successful elsewhere but may not adapt well to local conditions.

Finally, the authors explain how a network of research farms – known as farm platforms, exemplified at Rothamsted Research, North Wyke, UK; UWA Farm Ridgefield, Perth Australia, and Silent Valley, Kerala, India – is starting to evaluate economic and environmental benefits of these and other farming practices.

“In order to answer questions about sustainability of agriculture, scientists are increasingly dependent on the few remaining long-term research platforms around the world. This paper is a welcome reminder of the need for long-term strategic investment to secure future global food supply. Only by studying the behaviour of the whole production system, including total inputs, total outputs and its productivity over sufficiently long time can we eliminate unintended consequences such as intolerable levels of soil degradation, greenhouse gas emissions and biodiversity loss. The long-term research platforms are capable of providing all the necessary data, and the global network ensures the widest possible translation of research into practice change.”

To read the comment piece, visit [www.nature.com/news/agriculture-steps-to-sustainable-livestock-1.14796](http://www.nature.com/news/agriculture-steps-to-sustainable-livestock-1.14796).

# Zinc fertilization – a silver bullet against cadmium toxicity in food grains?

Mr Asif Naeem Email: [scoutuaf@gmail.com](mailto:scoutuaf@gmail.com)

A prestigious research fellowship from the Higher Education Commission (HEC) of Pakistan took PhD candidate Asif Naeem, Junior Scientist at the Nuclear Institute for Agriculture and Biology (NIAB) Faisalabad, Pakistan, to UWA, where he was hosted by Winthrop Professor Zed Rengel (School of Earth and Environment and IOA) and his group to work on the role of zinc (Zn) in alleviating cadmium (Cd) toxicity and decreasing Cd concentration in barley grain.

Naeem explains why Cadmium needs special attention: "It is one of the most toxic heavy metals, because of its high mobility in the soil-plant systems and toxicity to living organisms at very low concentration. Cadmium is listed as a (Class I) human carcinogen and in, extreme cases can also cause bone demineralisation, renal tubular dysfunction and shortness of breath."

Cadmium contamination of plant-based foods accounts for at least 70% of Cd intake by humans.

Even though Cd contamination of soil above a certain (threshold) level may cause significant plant growth inhibition and yield loss, a number of crop species can accumulate considerable amounts of cadmium without any significant yield loss, and thereby contribute significantly towards dietary intake of Cd by humans. Leading international health organisations have proposed a limit of 0.1 mg Cd kg<sup>-1</sup> of grain.

Cadmium enters the soil through untreated sewage water irrigation, application of contaminated phosphate-fertilizers and atmospheric deposition. Its uptake from soil and translocation within plant is regulated by a number of soil, environmental and plant factors.

During his stay at UWA, Naeem examined the soil factors involved in this process, focusing on the role of Zn. "Our hypothesis was, that low plant-available Zn could promote Cd uptake from soil and its translocation within plants," says Naeem. "We set out to determine whether Zn fertilization would lower the concentration of toxic Cd in addition to enhancing food grain quality through Zn-fortification. For this purpose we assessed yield response and Cd uptake in Zn-efficient and Zn-inefficient barley genotypes, both on low and optimum Zn-fertilized soil."

The glasshouse experiment showed that Zn alleviated Cd stress in both genotypes. "Under Cd stress, grain yield of Zn-fertilized plants was considerably higher. For Zn-efficient genotype



Asif Naeem at UWA's Centenary Celebration.

Zn fertilization decreased Cd concentration in all plant parts i.e. roots, straw and grain, whereas for Zn-inefficient genotype, a decrease in Cd concentration was observed only in roots."

The results led to the conclusion that Zn-efficient plant genotypes could efficiently exclude Cd from getting into grains and help produce Cd-free food grain.

"It has been a privilege to have the guidance of an internationally renowned expert in this field and access to UWA's excellent facilities. My time at UWA has given me a deeper insight into the mechanisms underpinning decreased Cd concentration through Zn fertilization/fortification and I look forward to putting this new-found knowledge to good use to help improve the quality and yield of food grains in my home country."

## Agricultural economist delivers advice to global farmers

**ScienceNetwork**  
WESTERN AUSTRALIA



Photo by Marc Corbeels

Geoff Vivian

Email: [vivian@kimberleypage.com.au](mailto:vivian@kimberleypage.com.au)

A LOCAL agricultural economist has been leading a research team working to help developing countries choose economically viable soil conservation practices.

Winthrop Professor David Pannell, from UWA's School of Agricultural and Resource Economics and Institute of Agriculture says there is a serious need for improved soil conservation in Africa and south Asia, where loss of soil and nutrients cause long-term productivity loss and can gradually clog up rivers and water reservoirs.

A package of zero tillage, mulching and crop rotation has been widely promoted to resource-poor farmers under the title of 'conservation agriculture', but has often met considerable resistance.

Professor Pannell attended a workshop in Lincoln, Nebraska last year that aimed to understand why.

"Some of the resistance was justified in the sense that it's not a one size fits all solution to these problems," he says.

"If a farmer's choosing to do something new like conservation agriculture, initially, before they have experience with it, it's likely to be something about which they have a lot of uncertainty.

The benefits of conservation agriculture don't happen immediately.

It's possible that in the short term your yields and profits will actually decline before they increase.

Since we're talking about poor farmers they may not be able or willing to put up with things getting worse before they get better."

He says other economic negatives are not always considered, giving the example of leaving crop residues on the soil.

While it minimises water and wind erosion, improves nutrient retention and improves water holding capacity, it may mean forgoing important feed for livestock.

The team identified a number of these complexities, assigning numerical values to each that could be applied to various scenarios and circumstances in African farms in a new computer application.

They trialled this in a case study in northern Zimbabwe.

"We looked at four different farm sizes with different levels of resource availability, different levels of labour, different levels of capital," he says.

Pannell says the size of the farms and resources available turned out to be critical, and they found that the economics of conservation agriculture were adverse for smaller, poorer farmers.

"The existing conservation agriculture package does need to be targeted to particular regions and/or particular types of farms and probably to larger wealthier farms in these regions," he says.

"For other farmers, further development of more appropriate soil conservation practices is needed," he says.

"Our modelling tool can easily be adapted to other regions to assess the local viability of conservation agriculture."

For more science news go to  
[www.sciencewa.net.au](http://www.sciencewa.net.au)



## New staff



**Dr Rémi Crété**

**Email:** [remi.crete@uwa.edu.au](mailto:remi.crete@uwa.edu.au)

Dr Rémi Crété has been appointed as a Research Associate within the School of Plant Biology. He holds a PhD from the University of Angers, France, and has been investigating the factors affecting the spread of Apple Scab in the French region of the Loire valley.

In his new role he will be working on a GRDC & DAFWA project investigating the spread of the fungus-borne 'blackleg' disease in canola, which causes significant yield loss.



**Dr Hui Liu (Helen)**

**Email:** [hui.liu@uwa.edu.au](mailto:hui.liu@uwa.edu.au)

Dr Hui Liu has been appointed as a Research Officer within the School of Plant Biology and IOA, where she is known as 'Helen'.

She completed her PhD at UWA and acquired postdoctoral experience at the National Institute of Floricultural Science, which forms part of the National Agriculture and Food Research Organization, Japan.

Prior to joining UWA, Helen worked as a Research Officer at Canola Breeders WA. In her new role at UWA she works on the Wheat/Barley Fast Generation Project and will focus on developing a 'fast generation' plant breeding system in Australian wheat and barley varieties.



**Emeritus Professor Lyn Abbott**

**Email:** [lynette.abbott@uwa.edu.au](mailto:lynette.abbott@uwa.edu.au)

Leading soil scientist, Professor Lyn Abbott has been lured out of a short-lived retirement to take up the honorary position of Deputy Director of The UWA Institute of Agriculture.

Previously she was Vice Dean of UWA's Faculty of Natural and Agricultural Sciences and Winthrop Professor in the School of Earth and Environment. Her appointment follows the (temporary) departure of former Deputy Director, Winthrop Professor Graeme Martin, who is spending a year on sabbatical leave in the United Kingdom (see also page 13). Professor Abbott's career includes an impressive track record in agricultural research, teaching and extension in soil biology related to land management and nutrient use efficiency.



**Dr Hari D. Upadhyaya**

Dr Hari D. Upadhyaya, from the International Crops Research Institute for the Semi-arid Tropics (ICRISAT) has been appointed as an Adjunct Professor within IOA. At ICRISAT Dr Upadhyaya holds the position of Principal Scientist and Head of the Genebank.

His expertise encompasses groundnut breeding, grain legumes, crop genetic resources and their utilisation in crop improvement including the use of molecular techniques.

Dr Upadhyaya has published over 219 journal articles and is an Adjunct Professor at Kansas State University. His appointment as Adjunct Professor within IOA will greatly strengthen research and joint supervision collaboration of postgraduate research students between ICRISAT and UWA in agriculture and related areas.

## Staff awards and industry recognition

NAME	AWARD
Res/Assoc/Prof Ramin Rafiei	Viticulture and Oenology 2014 Science and Innovation Award for Young People in Agriculture <a href="http://www.news.uwa.edu.au/201403066497/research/national-innovation-award-ground-breaking-water-stress-sensor">www.news.uwa.edu.au/201403066497/research/national-innovation-award-ground-breaking-water-stress-sensor</a>
ARC Centre of Excellence in Plant Energy Biology	Winner of the Chevron Science Engagement Initiative of the Year. <a href="http://www.news.uwa.edu.au/201311226278/awards-and-prizes/arc-plant-energy-biology-wins-2013-wa-science-award">www.news.uwa.edu.au/201311226278/awards-and-prizes/arc-plant-energy-biology-wins-2013-wa-science-award</a>
Prof Ryan Lister	Tall Poppy WA Award recognizing the brightest young scientists in WA. <a href="http://www.news.uwa.edu.au/201311276286/awards-and-prizes/biological-scientist-named-states-tall-poppy">www.news.uwa.edu.au/201311276286/awards-and-prizes/biological-scientist-named-states-tall-poppy</a>
W/Prof Zed Rengel	Fulbright Scholar Award (see also page 10)
Dr Mike Perring	Winner of Alan Robson Medal, awarded for research excellence in agriculture and related areas. Title of his winning paper: The Ridgefield Multiple Ecosystem Services Experiment: Can restoration of former agricultural land achieve multiple outcomes?
Asst/Prof Marit Kragt	Winners (as a team) of the 2013 AARES Quality of Research Communications Award. <a href="http://www.news.uwa.edu.au/201403066498/awards-and-prizes/uwa-team-wins-quality-research-communication-award">www.news.uwa.edu.au/201403066498/awards-and-prizes/uwa-team-wins-quality-research-communication-award</a>
W/Prof Martin Barbetti	Elected Fellow of the Society for Rapeseed-Mustard Research of India for his contributions to Brassica research.
W/Prof Roger Jones	Elected Fellow of The American Phytopathological Society for his many and significant contributions to plant virology.

## New postgraduate research students

STUDENT NAME	TOPIC	SCHOOL	SUPERVISOR(S)	FUNDING BODY
Ms Anna Aryani Amir	Effects of plant extract and plant secondary compounds (PSC) from grazing shrubs on in vitro oocytes maturation, embryo development and ovulation rate in ewes.	Animal Biology and IOA	W/Prof Graeme Martin, Assoc/Prof Dominique Blache	self-funded
Ms Karen Frick	Genomic approaches to improve narrow-leaved lupin as a human food.	Plant Biology, IOA and CSIRO	W/Prof Kadambot Siddique, Dr Rhonda Foley (CSIRO), Assist/Prof Lars Kamphuis (CSIRO and IOA)	UPA and UWA safety-net top-up scholarship

## Visitors

VISITOR	VISITORS' ORGANISATION, COUNTRY	HOST DETAILS/PURPOSE	DATES
Dr Yanlei Du	Institute of Arid Agroecology, School of Life Sciences, Lanzhou University, Lanzhou, China	W/Prof Neil Turner, W/Prof Kadambot Siddique, W/Prof Tim Colmer, Dr Jiayin Pang	15 Jun – 15 Dec 2014
Ms Junlan Xiong	Institute of Arid Agroecology, School of Life Sciences, Lanzhou University, Lanzhou, China	W/Prof Neil Turner, W/Prof Kadambot Siddique	Mar 2014 – Mar 2015

## Agriculture online and on the air

TOPIC	ACCESS FROM
720 Perth Radio interview of Isabel Arevalo-Ligne with Sabrina Hahn about how to ensure community-wide participation in fruit-fly control initiatives	<a href="http://www.abc.net.au/local/audio/2013/11/16/3912539.htm">www.abc.net.au/local/audio/2013/11/16/3912539.htm</a>
A selection of interviews with leading UWA scientists involved in agricultural and related research	<a href="http://www.ioa.uwa.edu.au/publications/videos">www.ioa.uwa.edu.au/publications/videos</a>
Professor Dan Murphy talks about the GRDC Soil Initiative II	<a href="http://www.soilquality.org.au/videos">www.soilquality.org.au/videos</a>

## New research funded projects

TITLE	FUNDING PERIOD	FUNDING BODY	SUPERVISORS
Molecular mechanisms underlying extensive replacement of phospholipids by galactolipids and sulfolipids in Hakea prostrata during leaf development	2014 – 2016	ARC Discovery Projects	W/Prof Hans Lambers, Assoc/Prof Patrick Finnegan, Dr Patrick Gialvalisco
Revealing novel mechanisms conferring evolution of resistance to glufosinate and glyphosate in Eleusine indica	2014 – 2016	ARC Discovery Projects	W/Prof Stephen Powles, Assoc/Prof Qin Yu
Measuring protein turnover in vivo in plant mitochondria and chloroplasts to identify protease targets	2014 – 2016	ARC Discovery Projects	W/Prof Andrew Millar, Dr Shaobai Huang, Dr Adriana Pruzinska
Unique epigenetic states in plant stem cell niches for safeguarding genome integrity	2014 – 2016	ARC Discovery Projects	Prof Ryan Lister
Understanding the biological functions of the karrikin-responsive signaling system of plants in growth, development and responses to the environment	2014 – 2016	ARC Discovery Projects	W/Prof Steven Smith
Characterizing the regulators of mitochondrial biogenesis in Arabidopsis thaliana	2013 – 2017	ARC Future Fellowships	Dr Monika Murcha



TITLE	FUNDING PERIOD	FUNDING BODY	SUPERVISORS
Dissecting novel roles of succinate dehydrogenase in stomatal aperture and root elongation in plants	2013 – 2017	ARC Future Fellowships	Dr Shaobai Huang
Evolutionary adaptation of the chemical language of nutrient acquisition strategies in higher plants	2014 – 2016	ARC Discovery Early Career Researcher Awards	Dr Margaretha van der Merwe
Round 2 Nitrate and sulphate rich shrubs to reduce methane and increase productivity	2013 – 2015	CSIRO ex DAFF Carbon Farming Futures Filling Research Gap	Dr Hayley Norman, Assoc/Prof Philip Vercoe, Prof Edward Barrett-Lennard, Assoc/Prof John Milton
Options for improved insecticide and fungicide use and canopy penetration in cereals and canola	2013 – 2015	GRDC	Assoc/Prof Christian Nansen
Long term no-till farming systems	2013 – 2015	GRDC	Dr Kenneth Flower
Phenotyping and simulation of barley root architecture for edaphic stress adaption	2014 – 2015	Group of Eight DAAD German Research Cooperation	W/Prof Zed Rengel, Dr Johannes Postma, Dr Yinglong Chen
ARC Centre of Excellence in Plant Energy Biology 2014 (CPEB2)	2014 – 2020	ARC Centres of Excellence	W/Prof Andrew Millar, Dr Barry Pogson, Prof Stephen Tyerman, Prof Ian Small, Prof James Whelan, Asso/Prof Justin Borevitz, Prof Ryan Lister, Dr Owen Atkin, Adj/Prof Rana Munns
Scientific visits to Japan - Meeting future Australian pasture crop challenges: whole genome sequence of subterranean clover	2014	Australian Academy of Science	Dr Parwinder Kaur
PhysiTrace: Retailer standard compliance and logistics and implementation plan	2014	Australian Pork Limited	W/Prof Garry Lee, W/Prof Roger Watling, Ms Heather Channon
Reassessing the value and use of fixed nitrogen	2013 – 2015	CSIRO ex GRDC	Assoc/Prof Michael Renton
Upskilling the Western Australian grains industry in disease surveillance for a more productive and biosecure future	2014 – 2016	COGGO	Prof Nancy Longnecker, Ms Dominic Wright
Synthetic restorer genes for creation of hybrid wheat	2014 – 2015	Groupe Limagrain Vilmorin & Cie	Prof Ian Small
Organics metals salts interactions in food safety and environment protection - combined experimental and modelling approach	2013 – 2014	Marie Curie Fellowship	Prof Davor Romic, W/Prof Zdenko Rengel
Round 2 Innovative livestock systems to adapt to climate change and reduce emissions	2013 – 2015	Meat & Livestock Australia	Assoc/Prof Philip Vercoe
CRC Impact grain industry delivery sites	2013 – 2016	Mingenew Irwin Group ex CRC Plant Biosecurity	Assoc/Prof Christian Nansen
Enhancing immune competency to improve lamb and weaner survival	2013 – 2014	Murdoch University ex Meat & Livestock Australia	Prof Shimin Liu
Floor laying as welfare and economic issues in duck farming	2013 – 2016	Poultry CRC Ltd	Assoc/Prof Dominique Blache, Prof Shane Maloney, Assoc/Prof Ireneusz Malecki

TITLE	FUNDING PERIOD	FUNDING BODY	SUPERVISORS
Domestication of Kakadu Plum <i>Terminalia Ferdinandiana</i>	2014 – 2016	Rural Industries Research & Development Corporation	Dr Liz Barbour, Adj/Asso/Prof Margaret Byrne, Mr Kim Courtenay, Dr Isabela Konczak, Mr Julian Gorman, Mr Cameron McConchie
Transitioning to resilient perennial pasture systems to abate greenhouse gases and sequester carbon	2013 – 2016	Ternes Agricultural Consulting ex DAFF Carbon Farming Futures Action on the Ground	Assoc/Prof Philip Vercoe
Development of salinity tolerant wheat and barley	2013 – 2015	University of Adelaide ex GRDC	Prof Ed Barrett-Lennard, W/Prof Timothy Colmer, Dr Roy Stuart
National Variety Trials project (NVT)	2013 – 2014	University of Wollongong ex GRDC	Dr Aanandini Ganesalingam
Putting the Focus on Profitable Break Crop and Pasture Sequences in WA	2013	DAFWA ex GRDC	Assoc/Prof Michael Renton, Dr Arthur Diggle
Building soil carbon in cropping systems and impact on greenhouse gas emissions using cattle feedlot compost	2014 – 2017	WA Lot Feeders Association (WALFA) ex DAFF Carbon Farming Futures Action on the Ground	Dr Zakaria Solaiman, E/Prof Lynette Abbott, Mr Steve Jones
UWA led ancient soils and modern land use: A challenge for Critical Zone Science international workshop and summer school	2013	Worldwide Universities Network (WUN)	Asst/Prof Matthias Leopold, Assoc/Prof Deirdre Gleeson, Dr Gavan McGrath, Assoc/Prof Andrew Rate

## IOA Publications 2013 (November onwards)

### Refereed journals

Anderson JP, Lichtenzweig J, Oliver RP and Singh KB (2013). Medicago truncatula as a model host for studying legume infecting Rhizoctonia solani and identification of a locus affecting resistance to root canker. *Plant Pathology*. DOI: 10.1111/j.1365-3059.2012.026294.x.

Annisa, Chen S and Cowling W (2013). Global genetic diversity in oilseed *Brassica rapa*. *Crop & Pasture Science* **64**: 993-1007.

Athorn RZ, Stott P, Bouwman EG, Blackberry MA, Martin GB and Langendijk P (2013). Feeding level and dietary energy source have no effect on embryo survival in gilts despite changes in systemic progesterone levels. *Animal Production Science* **53**: 30-37.

Banik B, Durmic Z, Erskine W, Ghamkhar K and Revell C (2013). In vitro ruminal fermentation and methane production differ in selected key pasture species in Australia. *Crop and Pasture Science* **64** (9): 935-942.

Bashir MK and Schilizzi S (2013). How disaggregated should information be for a sound food security policy? *Food Security* **5** (4): 551-563.

Borger CPD, Riethmuller GP, Ashworth M, Minkey D, Hashem A and Powles SB (2013). Increased carrier volume improves pre-emergence control of *Lolium rigidum* in zero-tillage seeding systems. *Weed Technology* **27**: 649-655.

Dion NL, Finlayson J, Colmera TD and Ryan MH (2013). Opportunistic Mediterranean agriculture – using ephemeral pasture legumes to utilize summer rainfall. *Agricultural Systems* **120**: 76-84.

Doole G, Vigiak O, Roberts AM and Pannell DJ (2013). Cost-effective strategies to mitigate multiple pollutants in an agricultural catchment in North-Central Victoria, Australia. *Australian Journal of Agricultural and Resource Economics* **57** (3): 441-460.

Durmic Z, Moate PJ, Eckard R, Revell DK, Williams SR and Vercoe PE (2013). In vitro screening of selected feed additives, plant essential oils and plant extracts for rumen methane mitigation. *Journal of the Science of Food and Agriculture*. DOI: 10.1002/jsfa.6396.

Fang X-W, Turner NC, Palta JA, Yu M-X, Gao T-P and Li F-M (2013). The distribution of four Caragana species is related to their differential responses to drought stress. *Plant Ecology*. DOI: 10.1007/s11258-013-0285-8.

Hawken P, Luckins N, Tilbrook AJ, Fiol C, Martin GB and Blache D (2013). Genetic selection for temperament affects behaviour and the secretion of adrenal and reproductive hormones in sheep subjected to stress. *Stress* **16**: 130-142.

Hodgson JM, Croft KD, Woodman RJ, Puddey IB, Fuchs D, Draijer R, Lukoshkova E and Head GA (2013). Black tea lowers rate of blood pressure variation: a randomized controlled trial. *The American Journal of Clinical Nutrition* **97**: 943-950.

Hodgson JM, Woodman RJ, Puddey IB, Mulder T, Fuchs D and Croft KD (2013). Short-term effects of polyphenol-rich black tea on blood pressure in men and women. *Food Function* **4**: 111-115.

Hulvey KB, Hobbs RJ, Standish RJ, Lindenmayer DB, Lach L and Perring MP (2013). Benefits of tree mixes in carbon plantings. *Nature Climate Change* **3**: 869-874.

Ivey KL, Lewis JR, Lim W, Lim EM, Hodgson JM and Prince RL (2013). Associations of proanthocyanidin intake with renal function and clinical outcomes in elderly women. *Plos One* **8** (8): e71166.

Ivey KL, Lewis JR, Prince RL and Hodgson JM (2013). Tea and non-tea flavonol intakes in relation to atherosclerotic vascular disease mortality in older women. *British Journal of Nutrition* **110**: 1648-1655.

Li H, Zhang F, Rengel Z and Shen J (2013). Rhizosphere properties in monocropping and intercropping systems between faba bean (*Vicia faba* L.) and maize (*Zea mays* L.) grown in a calcareous soil. *Crop and Pasture Science* **64**: 976-984.

Li ZT, Li XG, Li M, Yang JY, Turner NC, Wang XY and Li FM (2013). County-scale changes in soil organic Carbon of croplands in Southeastern Gansu Province of China from the 1980s to the Mid-2000s. *Soil Science Society of America Journal* **77** (6): 2111-2121.

Liu AH, Bondonno CP, Croft KD, Puddey IB, Woodman RJ, Rich L, Ward NC, Vita JA and Hodgson JM (2013). Effects of a nitrate-rich meal



on arterial stiffness and blood pressure in healthy volunteers. *Nitric Oxide* **35**:125-130.

Li X, Durmic Z, Liu SM, McSweeney CS and Vercoe PE (2013). *Eremophila glabra* reduces methane production and methanogen populations when fermented in a Rusitec. *Anaerobe* **10**: 175-173.

Ma Q, Tang H, Rengel Z and Shen J (2013). Banding phosphorus and ammonium enhances nutrient uptake by maize via modifying root spatial distribution. *Crop and Pasture Science* **64**: 965-975.

Mazzarol T, Mamouni Limnios E and Reboud S (2013). Co-operatives as a strategic network of small firms: Case studies from Australian and French co-operatives. *Journal of Co-operative Organization and Management* **1** (2): 27-40.

Mubarak A, Hodgson JM, Considine MJ, Croft KD and Matthews VB (2013). Supplementation of a high fat diet with chlorogenic acid is associated with insulin resistance and hepatic lipid accumulation in mice. *Journal of Agricultural and Food Chemistry* **61**:4371-4378.

Pacini GC, Gabellini L, Roberts AM, Vazzana C, Park G and Pannell DJ (2013). Assessing the potential of INFFER to improve the management of agri-environmental assets in Tuscany. *Italian Journal of Agronomy* **8**, e7. DOI: 10.4081/ija.2013. e27.

Payne SE, Kotze AC, Durmic Z and Vercoe PE (2013). Australian plants show anthelmintic activity toward equine cyathostomins in vitro. *Veterinary Parasitology* **23**: 12.

Pedrana G, Viotti MH, Souza E, Sloboda D, Martin GB, Cavestany D and Ortega HH (2013). Apoptosis-related protein expression during pre- and post-natal testicular development after administration of glucocorticoid in utero in the sheep. *Reproduction in Domestic Animals* **48**: 795-802.

Perring MP, Standish RJ and Hobbs RJ (2013). Incorporating novelty and novel ecosystems into restoration planning and practice in the 21st Century. *Ecological Processes* **2**: 18.

Rosales Nieto CA, Ferguson MB, Macleay CA, Briegel JR, Martin GB and Thompson AN (2013). Selection for superior growth advances the onset of puberty and increases reproductive performance in ewe lambs. *Animal* **7**: 990-997.

Rosales Nieto CA, Ferguson MB, Macleay CA, Briegel JR, Wood DA, Martin GB and Thompson AN (2013). Ewe lambs with higher breeding values for growth achieve higher reproductive performance when mated at age 8 months. *Theriogenology* **80**: 427-435.

Savage D, Borger C and Renton M (2013). Orientation and speed of wind gusts causing abscission of wind-dispersed seeds influences dispersal distance. *Functional Ecology* DOI: 10.1111/1365-2435.12234.

Shen Y, Ward NC, Hodgson JM, Puddey IB, Wang Y, Zhang D, Maghzal G, Stocker R and Croft KD (2013). Dietary quercetin attenuates oxidant-induced endothelial dysfunction and atherosclerosis in apolipoprotein E knockout mice fed a high-fat diet: a critical role for heme oxygenase-1. *Free Radical Biology and Medicine* **65**: 908-915.

Singh RP, Rybnik-Trzaskowska PK, Farooq U, Malecki IA, Sastry KVH and Martin GB (2013). In vitro initiation of the acrosome reaction in the emu (*Dromaius novaehollandiae*). *British Poultry Science* **54**: 259-264.

Sulpice R, Ishihara H, Schlereth A, Cawthray GR, Encke B, Gialvalisco P, Ivakov A, Arrivault S, Jost R, Krohn N, Kuo J, Laliberté E, Pearce SJ, Raven JA, Teste F, Veneklaas EJ, Stitt M and Lambers H (2013). Low levels of ribosomal RNA partly account for the very high photosynthetic phosphorus-use efficiency of Proteaceae species. *Plant, Cell and Environment* DOI: 10.1111/pce.12240.

Uloth MB, You MP, Finnegan PM, Banga SS, Banga SK, Sandhu PS, Yi H, Salisbury PA and Barbetti MJ (2013). New sources of resistance to *Sclerotinia sclerotiorum* for crucifer crops. *Field Crops Research* **154**: 40-52.

Viñoles C, Paganoni BL, McNatty KP, Heath DA, Thompson AN, Glover KMM, Milton JTB and Martin GB (2013). Follicle development, endocrine profiles and ovulation rate in adult Merino ewes: effects of early nutrition (pre- and post-natal) and supplementation with lupin grain. *Reproduction* **147**: 101-110.

Yang X, Bondonno CP, Indrawan A, Hodgson JM and Croft KD (2013). An improved mass spectrometry based measurement of NO metabolites in biological fluids. *Free Radical Biology and Medicine* **56**: 1-8.

## Book Chapters

Hawken PAR and Martin GB (2013). Socio-sexual stimuli and reproductive function: emerging perspectives of the male effect in sheep and goats. In: East ML and Dehnhard M (Eds) *Chemical Signals in Vertebrates 12*, Springer Science + Business Media, New York, SBN 978-1-4614-5927-9; pp. 397-413.

## IOA Publications 2014 (to March)

Al-Saady NA, Nadaf SK, Al-Subhi AS, Al-Hinai SA, Al-Farsi SM, Al-Habsi KM, Esehie HA and Siddique KHM (2014). Multicrop legume germplasm collection in Oman. *International Journal of Agriculture and Biology* **16** (2): 231-241.

Aryamanesh N, Zheng Y, Byrne O, Hardie DC, Al-Subhi AM, Khan T, Siddique KHM and Yan G (2014). Identification of genome regions controlling cotyledon, pod wall/ seed coat and pod wall resistance to pea weevil through QTL

mapping. *Theoretical and Applied Genetics* **127**: 489-497.

Barbetti MJ, Banga SK, fu TD, Li YC, Singh D, Liu Sy, Ge XT and Banga SS (2014). Comparative genotype reactions to *Sclerotinia sclerotiorum* within breeding populations of *Brassica napus* and *B. juncea* from India and China. *Euphytica* **197**: 47-59.

Busi R, Todd A. Gaines TA, Vila-Aiub MM and Powles SB (2014). Inheritance of evolved resistance to a novel herbicide (pyroxasulfone). *Plant Science* **217-218**: 127-134.

Coutts BA, Cox BA, Thomas GJ and Jones RAC (2014). First report of *Wheat mosaic virus* infecting wheat in Western Australia. *Plant Disease* **98** (2): 285.

Fang Y, Xu W, Liu L, Gu Y, Liu Q, Turner NC and Li F-M (2014). Does a mixture of old and modern winter wheat cultivars increase yield and water use efficiency in water-limited environments? *Field Crops Research* **156**: 12-21.

Gaines TA, Lorentz L, Figge A, Herrmann J, Maiwald F, Ott M-C, Han H, Busi R, Yu Q, Powles SB and Beffa R (2014). RNA-Seq transcriptome analysis to identify genes involved in metabolism-based diclofop resistance in *Lolium rigidum*. *The Plant Journal* DOI: 10.1111/tpj.12514.

Goggin DE and Powles SB (2014). Fluridone: a combination germination stimulant and herbicide for problem fields? *wileyonlinelibrary.com* DOI 10.1002/ps.3721.

Gunasinghe N, You MP, Banga SS and Barbetti MJ (2014). High level resistance to *Pseudocercospora capsellae* offers new opportunities to deploy host resistance to effectively manage white leaf spot disease across major cruciferous crops. *European Journal of Plant Pathology* **138**: 873-890.

Kotula L, Colmer TD and Nakazono M (2014). Effects of organic acids on the formation of the barrier to radial oxygen loss in roots of *Hordeum marinum*. *Functional Plant Biology* **41**(2): 187-202.

Li L, Tilman D, Lambers H and Zhang F (2014). Plant diversity and overyielding: insights from belowground facilitation of intercropping in agriculture. *New Phytologist* DOI: 10.1111/nph.12778.

Li Kwok Cheong JD, Croft KD, Henry PD, Matthews V, Hodgson JM and Ward NC (2014). Green coffee polyphenols do not attenuate features of the metabolic syndrome and improve endothelial function in mice fed a high fat diet. *Archives of Biochemistry and Biophysics* DOI: 10.1016/j.abb.2014.02.005.

Liu CA, Zhou LM, Jia JJ, Wang LJ, Xi L, Pan CC, Siddique KHM and Li FM (2014). Maize yield and water balance is affected by nitrogen application in a film-mulching ridge-furrow system in a semiarid region of China. *European Journal of Agronomy* **52**: 103-111.

Manalil S (2014). Evolution of Herbicide Resistance in *Lolium rigidum* under Low Herbicide Rates: an Australian experience. *Crop Science* **54**: 1-14.

Mason AS, Batley J, Bayer PE, Hayward A, Cowling WA and Nelson MN (2014). High-resolution molecular karyotyping uncovers pairing between ancestrally related *Brassica* chromosomes. *New Phytologist* DOI: 10.1111/nph.12706.

Nansen C, Coelho A Jr, Vieira JM and Parra JRP (2014). Reflectance-based identification of parasitized host eggs and adult *Trichogramma* specimens. *The Journal of Experimental Biology* **217**: 1187-1192.

Nansen C, Zhang X, Aryamanesh N and Yan G (2014). Use of variogram analysis to classify field peas with and without internal defects caused by weevil infestation. *Journal of Food Engineering* **123**: 17-22.

Pang J, Palta JA, Rebetzke GJ and Milroy SP (2014). Wheat genotypes with high early vigour accumulate more nitrogen and have higher photosynthetic nitrogen use efficiency during early growth. *Functional Plant Biology* **41**(2): 215-222.

Prager SM, Martini X, Guvvala H, Nansen C and Lundgren J (2014). Spider mite infestations reduce *Bacillus thuringiensis* toxin concentration in corn leaves and predators avoid spider mites that have fed on *Bacillus thuringiensis* corn. *Annals of Applied Biology* DOI:10.1111/aab.12120.

Samadi F, Phillips NJ, Blache D, Martin GB and D'Occhio MJ (2014). Interrelationships of nutrition, metabolic hormones and resumption of ovulation in multiparous suckled beef cows on subtropical pastures. *Animal Reproduction Science* **137**: 137-144.

Saradadevi R, Bramley H, Siddique KHM, Edwards E and Palta JA (2014). Contrasting stomatal regulation and leaf ABA concentration in wheat genotypes when split root systems were exposed to terminal drought. *Field Crops Research* <http://dx.doi.org/10.1016/j.fcr.2014.02.004>.

Savage D and Renton M (2014). Requirements, design and implementation of a general model of biological invasion. *Ecological Modelling* **272**: 394-409.

Suriyagoda LDB, Ryan MH, Renton M and Lambers H (2014). Plant responses to limited moisture and phosphorus availability: a meta-analysis. *Advances in Agronomy* **124** (4): 133-200.

Tran HS, You MP, Lanoiselet V, Khan TN and Barbetti MJ (2014). First report of *Phoma glomerata* associated with the Aschocyta blight complex on Field Pea (*Pisum sativum*) in Australia. *Plant Disease* **98** (3): 427.

Ul Haq T, Akhtar J, Steele KA, Munns R and Gorham J (2014). Reliability of ion accumulation and growth components for selecting salt tolerant lines in large populations of rice. *Functional Plant Biology* **41**: 379-390.

Uloth M, You MP, Finnegan PM, Banga SS, Yi H and Barbetti MJ (2014). Seedling resistance to *Sclerotinia sclerotiorum* as expressed across diverse cruciferous species. *Plant Disease* **98**: 184-190.

Vila-Aiub M, Goh SS, Gaines TA, Han H, Busi R, Yu Q and Powles SB (2014). No fitness cost of glyphosate resistance endowed by massive EPSPS gene amplification in *Amaranthus palmeri*. *Planta* DOI: 10.1007/s00425-013-2022-x.

Vincent, SJ, Coutts BA and Jones RAC (2014). Effect of introduced and indigenous viruses on native plants: exploring their disease causing potential at the agro-ecological interface. *PLoS ONE* **9** (3): e91224. DOI:10.1371/journal.pone.0091224.

## Book Chapters

Farooq M, Wahid A and Siddique KHM (2014). Physiology of grain development in cereals. In: Pessaraki M (ed) *Handbook of Plant and Crop Physiology*. Third Edition. Taylor and Francis Group, LLC 6000 Broken Sound Parkway, Suite 300, Boca Raton, FL 33487 USA. pp: 301-308.

Wahid A, Farooq M and Siddique KHM (2014). Implications of oxidative stress for plant growth and productivity. In: Pessaraki M (ed) *Handbook of Plant and Crop Physiology*. Third Edition. Taylor and Francis Group, LLC 6000 Broken Sound Parkway, Suite 300, Boca Raton, FL 33487 USA. pp: 549-556.

## Books

Considine JA and Frankish E (2014). *A Complete Guide to Quality in Small Scale Wine Making*. Academic Press, Oxford UK and Waltham, USA; ISBN 978-0-12-408081-2, pp 224.

Mazzarol T, Reboud S, Limnios EM and Clark D (2014). *Research Handbook on Sustainable Co-Operative Enterprise: Case Studies of Organisational Resilience in the Co-operative Business Model*. Edgar Elwyn Publishing, UK, ISBN 978 0 85793 777 3, pp 608.

## UPCOMING MEETINGS AND EVENTS

### Local Events

#### Postgraduate Showcase 2014

Thu 5 June (1.30-6.05 pm)  
[www.ioa.uwa.edu.au](http://www.ioa.uwa.edu.au)

#### Industry Forum 2014

Thu 3 July  
[www.ioa.uwa.edu.au](http://www.ioa.uwa.edu.au)

## HELP US REDUCE WASTE



To receive this newsletter in electronic format only, please send an email to [ioa@uwa.edu.au](mailto:ioa@uwa.edu.au)

## UWA IOA MISSION

To advance research, education, training and communication in agriculture and resource management, for the benefit of mankind.

## CONTACT DETAILS

Editor: Uly Fritsch  
Email: [ioa@uwa.edu.au](mailto:ioa@uwa.edu.au)  
The UWA Institute of Agriculture  
Tel: +61 8 6488 4717  
[ioa.uwa.edu.au](http://ioa.uwa.edu.au)

The University of Western Australia  
M082, 35 Stirling Highway  
Crawley, WA 6009