



THE UNIVERSITY OF
WESTERN AUSTRALIA

Achieve International Excellence

The UWA Institute of Agriculture

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Hon Terry Redman and W/Prof Kadambot Siddique
with The UWA Institute of Agriculture 2010
Postgraduate Showcase presenters.

PHOTO: BRENDON CANT AND ASSOCIATES

Showtime for UWA agriculture postgrads

Eight UWA postgraduate students from the four schools within the UWA Faculty of Natural and Agricultural Sciences (FNAS) presented diverse PhD research projects at The UWA Institute of Agriculture 'Frontiers in Agriculture Postgraduate Showcase 2010' on 9 June. They proved without a doubt to an audience of farmers, academics, scientists, industry and government representatives that agriculture's future is in very capable hands.

Welcoming guests to the showcase, UWA Chair in Agriculture and Institute Director, Winthrop Professor Kadambot Siddique highlighted the potential of each student's research to affect the development of agriculture.

"We have more than 300 postgraduate students in our faculty, which is among the top 50 agriculture faculties in the world and number one in Australia," he said.

In his opening address, WA Minister for Agriculture, Hon Terry Redman, himself a UWA Agricultural Science graduate, discussed his time as a student at UWA.

"I remember Professor Bob Gilkes saying that some of our best soil scientists are our farmers and that's a lesson that really stuck with me," Mr Redman said.

"There is a depth and breadth about the projects being presented today and I know these postgraduates will contribute to WA's eight billion dollar agri-food and agriculture industry.

"As meeting food security is increasingly important, not only for WA but internationally, I encourage these UWA students to not underestimate their role in trying to achieve that outcome," Mr Redman said.

Ms Parwinder Kaur (School of Plant Biology) won an international postgraduate research scholarship for her PhD at UWA to study white rust disease of Indian Mustard (*Brassica Juncea*).

Second up, Mr Lalith Suriyagoda (School of Plant Biology) is assessing and modelling how the perennial pasture legume *Cullen australasicum* responds to low water and phosphorous availability in the southern Australian grainbelt.

Mr Basu Dev Regmi (School of Earth and Environment) is researching the dynamics of zinc

accumulation in wheat grown in conventional and biological farming systems in WA. He found that characterising how zinc accumulated in wheat grown under different farming systems helped understand the mechanisms of zinc loading into grain from the wheat plant. This could contribute to human health.

Ms Alexandra Wells's (School of Animal Biology) PhD reviews what motivates farmers to make changes on-farm in response to growing community concerns about ethical issues in agriculture. With sheep mulesing as her case study, she found that controversy surrounding it was a compelling example of how society's concerns about farm animal welfare had resulted in demands for practice changes on-farm.

Ms Sharon Tay (School of Animal Biology) investigated the effect of high-salt diets during pregnancy in ewes and the effect on their offspring. Her experiments revealed that maternal high-salt intake altered traits apparently unrelated to salt balance, such as increased wool growth in the offspring.

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Director's column

Winthrop Professor Kadambot Siddique
(kadambot.siddique@uwa.edu.au)

The Group of Eight University's recent analysis on future demand for higher education in Australia indicates that: (i) a much higher rate of PhD enrolment among the younger population will be needed to offset the growth in older cohorts, without diminishing the quality of research training. (ii) Australia is increasingly reliant on overseas sources of PhD enrolments as domestic commencements decline or remain static in some fields especially science, technology, engineering and mathematics.

Each year, as part of our Education, Technology Exchange and Outreach program, The UWA Institute of Agriculture hosts two important events: the Postgraduate Showcase Frontiers in Agriculture, and the Industry Forum.

The Postgraduate Showcase Frontiers in Agriculture (see page 1) displays the excellence in postgraduate training at UWA. It provides students with an opportunity to present their findings to the industry and community. It is a true testament to the commitment of supervisors to their students.

The agrifood industry in Australia requires the best minds and a highly trained workforce to face the future challenges of agriculture and food production system. Recently, Australian Council of Agriculture Deans (ACDC) evaluated newspaper and internet advertisements for jobs in agriculture over a three-year period and demonstrated that the jobs market was around 15,000 per year, approximately 5,000 of which were for graduates. In absolute numbers, there are fewer than 800 graduates in agriculture and related courses per year from Australian universities; only a fraction

(20% or less) – of the market for graduates based on the above media advertisement. Our recent Industry Forum provided an opportunity to debate the above topic with various stake holders. Read more about this year's Forum entitled Agriculture Education for the future on page 3.

I would like to congratulate UWA's world renowned soil and plant nutrition scientist, Winthrop Professor Zed Rengel, who received the prestigious Humboldt Research Award for his work and its positive impact on agriculture and land rehabilitation in Australia and around the world. W/Prof Zed Rengel is also the leader of UWA IOA's Integrated Land and Water Management Program (see page 7).

In my closing address at the combined 5th International Food Legumes Research Conference (IFLRC V) and 7th European Conference on Grain Legumes (AEP VII), Antalya, Turkey, I reminded the audience that the transfer of long established and recently developed technologies related to food legume production to resource-poor rural communities could be hastened with more participatory approaches. At UWA we practise this approach in collaboration with Grower Group Alliance (GGA), Western Australian No Till Farmers Association (WANTFA), Greening Australia WA (GAWA) and the Food Industry Association of WA (FIA).

With the year already past the half way mark, we look towards another Big Day Out at the UWA Future Farm, Pingelly on 1 October. After the successful Open Day in 2009, the Future Farm Project is now showcasing Australia's Farming Future Climate Change Research Programme. Parts of this program will run on Ridgefield. The aim is to reduce greenhouse gas emissions from cropping and livestock enterprises. The day includes the opening of the ALVA House, a state-of-the-art design for homes in the country and the city, designed by students from the UWA Faculty of Architecture, Landscape and Visual Arts (ALVA).

International research collaboration plays a significant role in enhancing Australia's research and innovation. At UWA agricultural researchers have a strong record of international collaboration which has immensely benefitted the University and Australia. In this edition of UWA IOA newsletter we report on three Endeavour Scholars and the important research they will bring to UWA which will further strengthen our international engagement.

For more information on The UWA Institute of Agriculture and its activities go to
www.ioa.uwa.edu.au

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Ms Jessie Beltran's (School of Agricultural Resource Economics) PhD project (supported by a John Allwright ACIAR fellowship) looks at an economic analysis of weed management options in rice production. While she found that herbicide resistance affected farm income by reducing yields and increasing weed control costs, bio-economic simulation models, such as the WA developed Ryegrass Integrated Management (RIM), could improve weed management.

With Perth's water shortage impacting growth in several sectors, particularly intensive peri-urban horticulture, a PhD study by Fiona Gibson (School of Agricultural Resource Economics) is assessing community willingness to pay for recycled water. She said replenishing Perth's groundwater aquifers with recycled water may alleviate stretched resources and improve sustainable water supply. She found that some people were prepared to pay higher prices or receive compensation for using recycled water, but one third wasn't interested in compromising.

Mr Andrew Kennedy is doing his PhD on how genetic improvement and alternative lambing systems affect the profitability of sheep enterprises. He found that mathematical models are valuable to analyse complex farming systems that are economically and physically impossible to replicate at experimental scale. He found that although big ewes produced faster growing, bigger lambs, they were not always the most efficient and cost more to maintain.

Summing up the presentations, W/Prof Tony O'Donnell (Dean, FNAS) said it remains the Faculty's priority to stay in the world's top 50 agricultural faculties, with each postgraduate student's research contributing to that status.

GRDC Western Panel member and Dunn Rock farmer, Peter Roberts and WA Agricultural Region MLC and Moora farmer, Hon Philip Gardiner co-chaired the event.

UPCOMING MEETINGS AND EVENTS

The UWA Institute of Agriculture Events

Dowerin Field Days

August 25-26 2010, Dowerin, WA
www.dowerinfielddays.com.au

The Big Day Out

October 1 2010,
UWA Future Farm, Pingelly, WA
www.ioa.uwa.edu.au

Other Events

LambEx 2010

August 4-6, 2010
Burswood Entertainment Complex, Perth WA
Email: donna@estherprice.com.au
www.lambex.com.au



The team from Greening Australia WA at the UWA Shenton Park Field Station.

Greening Australia new arrivals at Shenton Park

Greening Australia, Australia's largest environmental non-profit organisation, has taken up residence at the UWA Shenton Park Field Station in July.

Greening Australia is a science-led organisation focused particularly on improving biodiversity in sustainable and productive agricultural landscapes.

"Co-location at Shenton Park cements a long-standing relationship with the University, and creates a closer connection for us to apply science in the field," Mr Hamish Jolly, CEO of Greening Australia WA (GAWA) said.

"With more than 27 years working in diverse landscapes from the Great Southern, Peel Region, Wheatbelt and more recently now in the Pilbara, our projects provide the perfect sandpit to convert research into practice," he said.

Being at UWA Shenton Park has also enabled GAWA to bring its administration and operational teams together into one place, with the added benefit of having access to adjacent field trial areas.

"We are already mapping joint research priorities with UWA's Faculty of Natural and Agricultural Sciences and The UWA Institute of Agriculture with a view to a range of joint industry-driven research initiatives." Mr Jolly said.



L-R W/Prof Kadambot Siddique (UWA), W/Prof Alan Robson (UWA) and Mr Rob Delane (DAFWA) during discussion time.

Ag: sunnyside up

The face of agriculture is changing rapidly, and must continue to diversify to meet future demands for food, fibre and fuel. Challenges and opportunities for highly skilled agriculture professionals will change the old fashioned doom and gloom image of agriculture into a more "sunnyside up" look.

These were some of the sentiments at The UWA Institute of Agriculture 2010 Industry Forum, entitled "Agriculture education for the future" held on 16 July.

In his opening address, Winthrop Professor Alan Robson, Vice-Chancellor of UWA (and Hackett Chair in Agriculture), expressed concern about a declining interest in agricultural education in Australia at a tertiary level, whilst the agricultural sector is growing in complexity.

"This requires us to take a more integrated approach to what is an interconnected set of disciplines. We need a systems approach that cuts across the whole food and fibre value chain," he said.

Last year UWA's agricultural and life sciences were ranked in the top 50 in the world by the Shanghai Jiao Tong University – the highest ranking of any Australian university. "Our high standing is an important reflection of the significance of agricultural teaching and research at UWA, as well as the importance of agriculture to the WA and Australian economy.

Professor Robson said it is vital to highlight, in a positive and understandable way, how our agricultural science and technology is keeping us at the forefront of world innovation and discovery. He said that agriculture should be promoted accurately as a dynamic sector which offers strong prospects.

"Agriculture not only provides food and fibre for the world, but also makes a direct and indirect contribution to the economic and social well-being of millions of people engaged in the industry".

UWA is taking a wider multi-disciplinary approach to these issues, producing graduates who not only have scientific, management and communication

skills, but who understand commercial realities, economics, politics and environmental realities.

Ms Sarah Panizza, an undergraduate student in agricultural science and commerce at UWA, and Dr Natasha Teakle, UWA alumni and currently a Research Fellow at UWA, both gave their experiences and views on what agricultural education should look like. Ms Panizza spoke highly of the quality of teaching and learning environment in smaller classes compared with her counterparts in Business and Engineering. Dr Teakle had an equally positive experience studying at UWA for her undergraduate and Ph D studies. She stressed the need for finding good postgraduate students and being able to pay them competitively. Dr Teakle said that international students should be linked with local industry, and that the limited local employment opportunities for post-PhD students in Perth could hinder attracting high quality students.

Mr Rob Delane, Director-General, Department of Agriculture and Food WA (DAFWA), said that we are living in exponential times. He said that with recent challenges and opportunities in agriculture, we need to see shifts in technology, science, changing our practices and how we work together. Different skill sets might be required of people working in agriculture.

"The Department will become more focused on those areas of the supply chain like input, production, economics and markets, where it can have the biggest impact. Our focus is moving away from on-farm production assistance to post farm supply chain facilitation," Mr Delane said.

It was abundantly clear from the forum that new generation agriculture education should cover the entire spectrum from paddock to plate – encompassing productivity, profitability and environmental sustainability.

Spicing up soil science

W/Prof Lyn Abbott (lynette.abbott@uwa.edu.au)

It is well established that students involved in programs of actual scientific value are more likely to continue studying science-based courses in their later school years, and onwards.

With the initiation and encouragement of Winthrop Professor Lyn Beazley, Chief Scientist of WA, staff of the SPICE Program at UWA collaborated with Winthrop Professor Lyn Abbott in developing the Monitoring Soil Science Project. The project is a soil science teaching resource for schools to bring home teaching and learning experiences related to soil science and embed it in school curricula. This resource specifically targets science curricula outcomes by using soil fauna to illustrate the concepts; interdependence of living things and sustainability of life and wise resource use.

The Monitoring Soil Science project expands knowledge of soil among teachers and school students creating an international network of soil science enthusiasts. It engages and connects students and teachers in ongoing research in soil science. Student-scientist partnerships enable students to participate in genuine and realistic science activities. The overall program includes a teaching resource that directly relates to science curricula using the context of soil, supporting procedural material for teachers, allocation of soil scientists as school mentors, a dedicated website and a reference suite of soil analyses for each school.

"The year 9 students felt really privileged and excited to be a part of a pilot project like this one. Teaching the project was easy as all the procedures were provided and easy to follow," a participating teacher said.

Monitoring soil fauna is not only an introductory step into soil science awareness; it opens up discussion of broader issues, like the diversity of landscapes and climate change. Students follow scientific protocols to collect valid and reliable data, distinguish between the physical, chemical and biological aspects of the soil ecosystem, and interpret patterns and trends in these data. They can also compare results with those of students from other schools, and develop their own soil science research project.

Most of the subject matter associated with the Monitoring Soil Science Project is new to science teachers. This project builds confidence through practical support like detailed professional learning and provides mentors with soil science expertise.

For more information contact Mr Bob Fitzpatrick (john.fitzpatrick@uwa.edu.au), Assoc/Prof Jan Dook (jdook@cyllene.uwa.edu.au), Ms Jenny Gull (jgull@cyllene.uwa.edu.au) or Dr Helen Billiald (billiald@cyllene.uwa.edu.au) from SPICE Program, Centre for Learning Technology, UWA.

L-R: Ms Athena Hain-Saunders (Teacher from Newton Moore Senior High School), Mr Ant Meczes (Teacher from Perth Modern School) and Ms Jenny Gull (Curriculum Consultant SPICE Program at UWA).



The sandalwood team: L-R: Ms Jessie Moniodis, Dr Liz Barbour, Prof Julie Plummer, Prof Emilio Ghisalberti, Dr Chris Jones and Dr Katherine Zulak.

Canadian Connections

Exciting developments have been happening behind the scenes in Professor Julie Plummer and Professor Emilio Ghisalberti's sandalwood lab. The team has recently completed an international patent application on the genes that code for santalene biosynthesis – a key ingredient in sandalwood oil and presented their findings at the prestigious Banff Plant Metabolism conference.

Dr Chris Jones was first off the mark with SaSSy genes from Tropical Sandalwood, *Santalum album*. Ms Jessie Moniodis, a PhD student, has identified SspiSSy genes from Australian Sandalwood, *Santalum spicatum*.

This research is strongly supported by collaboration with Professor Joerg Bohlmann, a leading terpene specialist from the University of British Columbia and Dr Liz Barbour, of the Forest Products Commission and now with UWA as Research Development Officer.

Visits by scientists have been truly trans-Pacific. Dr Katherine Zulak, a postdoc with Prof Bohlmann's lab has been at UWA to characterise the SauSSy gene she identified from *Santalum austrocaledonicum*. This completes the set of valuable genes from this unique genus. These three divergent members of the genus have provided a valuable evolutionary comparison, and go some way to explain the biological significance of santalene production.

Dr Jones, Ms Moniodis and Dr Zulak have returned to Prof Bohlmann's lab in Canada to search for the P450s, which convert santalenes to santalols – the scent of sandalwood. Breaking news for the team is that they have just been awarded an ARC-Linkage proposal with Forest Products Commission, Elders and Murdoch University. This will enable Katherine, who is an expert in the area, to return to UWA to investigate the link between disease resistance in sandalwood and oil biosynthesis.



Biodiversity, climate and agricultural stability

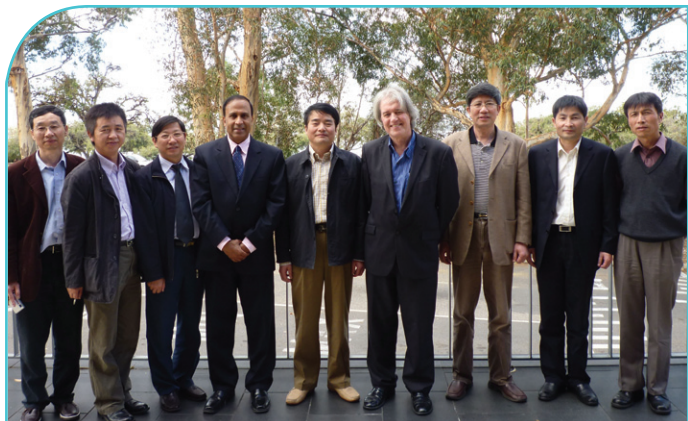
Prof Raphael Didham of the School of Animal Biology at UWA and CSIRO Entomology, Floreat hopes to quantify the synergistic effects of multiple drivers of global change on biodiversity and ecological resilience of remnant natural ecosystems within production landscapes.

He will be focusing on conserving invertebrate biodiversity and maintaining natural ecosystem services in particular. The research at UWA-CSIRO will deliver into three of CSIRO's strategic outcome domains: biodiversity, climate, and agricultural sustainability.

"The research will support the *Climate Adaptation Flagship* and the new *Sustainable Agriculture Flagship*. We are determining the relationship between climate, land-use intensification and biodiversity loss which represents the cornerstone of sustainable agricultural development in the future."

The major focus of his work is that addressing the individual components of land-use change, agricultural intensification, over-harvesting, species invasion and climate change separately will not lead to better prediction and management of human impacts on the environment when non-additive interaction effects appear to occur so frequently.

"To meet the future challenges inherent in simultaneously addressing both production and biodiversity goals in fragmented landscapes subject to variable climate scenarios, we need to take a quantum leap beyond the current focus on independent drivers of global change," he said.



Chinese Delegation

A delegation of the Hunan Provincial Department of Science and Technology and the Chinese Academy of Sciences L-R: (Dr Yang Zhiping, Vice-Director General of Hunan Science and Technology Department; Mr Pi Zuyu, Counsel of Hunan Foodstuff Department; Dr Tan Zhiliang, Vice-Director of Institute of Subtropical Agriculture, the Chinese Academy of Sciences; Mr Liu Shaojun, Division Director of Hunan Science and Technology Department; Mr Qiao Chunsheng, Senior Management Officer of Hunan Xin Wufeng Joint-Stock Company; and Mr Wang Zhongyan, Vice-Director of Institute of Gardening of Hunan Province) visited UWA from 13–15 May 2010. They were hosted by W/Prof Kadambot Siddique, Director, The UWA Institute of Agriculture (fourth, left), W/Prof Tony O'Donnell, Dean, FNAS (middle) and Res/ Assist Prof Shimin Liu (far right).



Hon Liza Harvey, MLA for Scarborough (middle), speaking to Year 9, People's Choice winners, Ms Laura Mwiragua and Ms Annie Nareh from Carine SHS.

More than investigating science

More than 450 high school students from nine Perth metro schools participated in the 2010 PICSE (Primary Industry Centre for Science Education) Science Investigation Awards on 29 June 2010.

Last year, only Year 10 students from just five schools participated in the first PICSE Science Investigation Awards. This year, Years 8, 9 and 10 students from Mirrabooka SHS, Duncraig SHS, Shenton College, John Forrest SHS, St Stephens School in Duncraig, Mt Lawley SHS, Carine SHS,

and Mercy College took part. They presented their investigations and findings to around 30 judges representing UWA, the food and agriculture industry and wider community.

Students designed and carried out a science investigation on a topic of their choice. Winners took home up to \$500 for their investigations. A special prize for the Most Innovative in Agriculture, sponsored by the UWA Institute of Agriculture, was awarded in each age group.

Shenton College was outstanding in the year 8 division taking out the majority of the prizes. The overall winners were Jessica Khoo and Milly Pendlebury for "How Much Weight Can a Home-Made Electromagnet Hold?" Obi Hedley and Indigo Ridley won the Most Innovative in Agriculture prize for "Plantastic pH".

In Year 9, top honours went to Alexander Slate and Connor Willis from Carine SHS for "Fizz-ics". The Most Innovative in Agriculture went to Melissa Dowding, Ashlee Green and Paul Doan from Mercy College for their investigation into "Plantacious Reactions".

The winner in the Year 10 category was Duncraig SHS student, Sara Stankovic, for "Sinking Ship". Robin Cook and Oliver Valentine from Duncraig SHS won the Most Innovative in Agriculture for "Does Red Bull Really Give You Wings?"

In her closing address Hon Liza Harvey, MLA for Scarborough, who spoke on behalf of the Minister of Education; Tourism, Hon Elizabeth Constable, drew upon her own family's experiences by saying that her 67-year-old father's biggest concern at age seventeen was that oil didn't run out before he had earned his driver's licence.

She aptly pointed out, in the words of Marie Curie, 'Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so we may fear less'.

Linking global crop data

Ms Sarah Mawson
(sarah.mawson@uwa.edu.au)

The UWA International Centre for Plant Breeding Education and Research (ICPBER) hosted the International Crop Information System (ICIS) developer's workshop at UWA earlier this year.

ICIS is a database system that provides integrated management of global information on crop improvement and management for both individual crops and for farming systems. It is being developed by agricultural scientists and information technologists in several centres of the Consultative Group for International Agricultural Research (CGIAR), in research institutions, in national agricultural research systems and private breeding companies.

ICPBER-hosted guest speaker was Dr Howard Eagles, of the Molecular Plant Breeding CRC at The University of Adelaide. Dr Eagles addressed the meeting on the value of ICIS in maintaining wheat pedigrees dating back to the 19th century in Australia. He uses pedigree analysis to identify the ancestral source and genetic contribution of key alleles for quality and agronomic attributes in wheat.

There were 21 visitors from five countries participating in the workshop. The workshop will ensure that ICIS can continue to deliver a powerful tool to Plant Breeders and Genomic Resource managers for years to come. For more information on ICIS please go to http://cropwiki.irri.org/icis/index.php/Main_Page.

The ICPBER was established at UWA during 2008 to provide advanced education and research in plant breeding to enhance the world's future supply of plant-based food, fibre and industrial raw materials in an era of changing climates.

Participants at the International Crop Information System developer's workshop at UWA.



Left: Ms Charissa Wright in front of the UWA Albany Centre building. Right: Ms Bonnie Hargreaves.



Investing in country

Ms Erika von Kaschke
(Erika.vonKaschke@uwa.edu.au)

The Rural Industries Research and Development Corporation (RIRDC) is a true believer in hard working young rural Aussies. They have awarded the Investing in Youth scholarship to UWA's students, Ms Charissa Wright and Ms Bonnie Hargreaves.

RIRDC's Investing in Youth Undergraduate Studentship Program RIRDC will help Australian students (committed to contributing to Australia's rural sector) achieve their career goals by providing them with financial assistance throughout their degrees, relevant work placements, and support from experienced mentors. Government and industry organisations like Primary Industry Centre for Science Education (PICSE) at UWA are collaborating to fund and deliver the program.

Dr Peter O'Brien, Managing Director (RIRDC), said: "The program aims to encourage more young people to study agriculture courses at university, which will help to ensure Australia has an adequate supply of primary industry graduates in the future."

Applicants sent in a summary of what they hoped to achieve through the studentship. "There were a lot of industry-based questions to ensure my commitment to the primary industries and the career I wanted to follow," Ms Hargreaves said.

Ms Bonnie Hargreaves hails from Binningup, near Bunbury, WA. She is excited by the diversity of the primary industries sector and is particularly interested in agricultural economics. Her interest stems from the PICSE program. "PICSE at UWA has been the major influence in getting me to where I am now," Ms Hargreaves said.

"It's so amazing that I've been awarded this scholarship! It's good to know that I'm following

the right path and that RIRDC are happy to support me along it," she said.

She said that she appreciates having a mentor guide her through university and get some work experience in the industry. "I hope that this studentship will encourage other students to get involved with the primary industries and all that it involves. Agriculture is such a broad field. I'm sure my career path will be a very interesting one," she said.

Ms Charissa Wright hails from a large property in Boyup Brook. Her love of country has persuaded her to study a Bachelor of Science for Natural Resource Management at the UWA Albany Campus.

"I decided on this degree because it allowed me to combine my interests in both agriculture and the natural environment. I couldn't choose between them," she said.

Ms Wright believes that this will allow her to work in both fields in the future. "I will always be able to get a job; most importantly in the country!" she laughed. According to her, primary industries are having a hard time with the dry season and unpredictable weather patterns that seem to be happening more regularly. "Climate policies could potentially destroy the viability of some of the sectors — so I really want to look at salinity as growing tolerant and repairing soil crops and also environmental rehabilitation and also native foods grown as crops and the native flora as having high economic value," she said.

Its prestige and the fact that she could do her first year in Albany, close to friends and family made UWA the obvious choice. "I can't wait to study my options in second year, finish my degree to get out and actually take action against the many problems facing primary industry," Ms Wright said.



The microspectrometer.

UWA Eureka-prize winning technology for application in agriculture

Prof Dilusha Silva (dsilva@ee.uwa.edu.au)

In 2008 the UWA Microelectronics Research Group (MRG) won the prestigious Eureka Prize, for the development of a MEMS (micromachine) tuneable Fabry-Perot microspectrometer. The prize was awarded for outstanding science in aid of defence or national security. The team at MRG is now looking to develop and refine the prize-winning technology for applications in agriculture, aiming to revolutionize the use and deployment of infrared spectroscopy in the field.

Infrared spectroscopy is a standard technology for process control and material analysis. In agriculture, spectroscopically measurable quantities include levels of protein, starch, oil and moisture content of grains; and total carbon

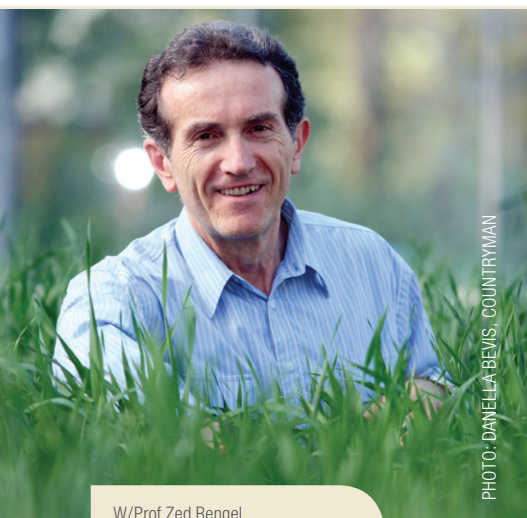
and mineralisable nitrogen in soils. Analysis of such properties has traditionally used benchtop spectrometers, which require costly calibration procedures by trained technicians. The size and cost of the traditional instruments has limited adoption of spectroscopic analysis as a widespread tool in agriculture. MRG is seeking to demonstrate a platform technology to deliver meaningful data directly to the farmer, using NIR and MIR spectroscopy, in a robust and cost effective instrument.

At the heart of the technology are microscopic devices that record the infrared spectra from the materials under analysis. The technology for fabricating these detection devices is similar to that employed to make silicon computer chips. This manufacturing method allows for incredible levels of device accuracy and process control. Device dimensions and alignment can be controlled with nanometer accuracy. The size and manufacturing

advantage of the microspectrometer should see rugged hand-held instruments in the hands of farmers performing analysis in the field.

A key feature separating the MRG microspectrometer from competing technologies is its potential for self-calibration. Eliminating manual calibration affords huge cost savings to the operator. Therefore, the microspectrometer research effort now focuses on realizing self-calibration.

Currently, microspectrometer development at MRG is funded by the Grains Research and Development Corporation (GRDC). Past funding sources include the Australian Research Council (ARC), Defence Science and Technology Organisation (DSTO) (part of the Australian Department of Defence), and Defence Advanced Research Projects Agency (DARPA) is an agency of the United States Department of Defense.



W/Prof Zed Rengel.

PHOTO: DANIELA BEVIS, COUNTRYMAN

Plant nutrition expert wins international recognition

Winthrop Professor Zed Rengel has been awarded the prestigious Humboldt Research Award for his work and its positive impact on agriculture and land rehabilitation in Australia and around the world.

The award, from the Alexander von Humboldt Foundation, honours von Humboldt (1769-1859), researcher, explorer, and 'father' of disciplines such as physical geography, climatology, ecology and oceanography. The Foundation promotes academic cooperation between excellent scientists and scholars from Germany and abroad.

W/Prof Rengel of UWA's School of Earth and Environment, and Centre for Land Rehabilitation, is also Program Leader of the UWA Institute of Agriculture's Integrated Land and Water Management program. His research interests are in nutrient uptake and ion toxicity in the soil-plant-water-microbe continuum. He has worked on natural and managed ecosystems in the field digging pits and holes to access soil, roots and groundwater, and studied specific ion transport mechanisms and soil-plant interactions in the glasshouse and the laboratory.

His research includes optimising fertilisation of crop and pasture plants, soil acidity and aluminium

toxicity, genotypic differences in nutrient acquisition and utilisation, and computer modelling of root growth and nutrient uptake.

W/Prof Rengel has edited six books, four special issues of the journal *Plant and Soil* and published more than 260 papers in refereed international journals. He has received funding from the Australian Research Council (ARC), Grains Research and Development Corporation (GRDC), Dairy Research Development Corporation, AusAID and other funding bodies.

His work has been recognised by 14 fellowship awards from Australia, UK, Germany, France, Austria and Japan and 10 Visiting/Honorary Professorships, including in Japan (Okayama University), Denmark (KVL) and USA (USDA/Cornell University). He is an elected Fellow of the Croatian Academy of Arts and Sciences and has an Honorary Doctorate of Science from Zagreb University.

The Humboldt Research Award is conferred in recognition of lifetime achievements in research. W/Prof Rengel has been invited to carry out research projects of his choice in cooperation with specialist colleagues in Germany.

Endeavour Research Fellows at The UWA Institute of Agriculture



Dr Paulina Rybnik-Trzaskowska and (left) Assoc/Prof Irek Malecki.

The tricky business of ostrich breeding

Ostrich farming is tricky business. It is based on natural mating where a 1:2 (male to female) ratio dominates. It sounds easy, but farmers don't get enough bang for their buck so to speak.

Although there is enough inherent genetic variation and good genetic progress, this narrow ratio means higher feeding cost for extra male birds. It also limits genetic progress because superior males can only mate with a few females in one season.

Artificial insemination (AI) could be a solution to these problems. Associate Professor Irek Malecki (UWA) and Dr Paulina Rybnik-Trzaskowska, an Australian Endeavour Research Fellow from Poland, devised a 'clean-green-ethical' approach to ostrich assisted reproduction techniques. They have been able to reliably collect semen and use female-friendly AI techniques. Previous methods were stressful to birds and the personnel involved. The new animal – and user-friendly semen collection methods involved the female (the teaser method), and the "substitute female" (the dummy method).

"There is no knowledge as to how frequently semen can be collected from ostriches, how ejaculates should be diluted, what the temperature of storage should be and what dose of spermatozoa should be used and how frequently it should be used to maintain female fertility at maximum. In poultry, there is no voluntary semen collection method so a comparison cannot readily be drawn", Dr Rybnik-Trzaskowska said. Dr Rybnik-Trzaskowska is at UWA on a 6-month fellowship to study sperm evaluation techniques, short and long-term storage of emu sperm protocols that she will apply in her research in South Africa.



Dr Edison Purba.

Deconstructing weeds

Dr Edison Purba is a visitor at the UWA based Australian Herbicide Resistance Initiative (AHRI). He is from the University of North Sumatra (Universitas Sumatera Utara (USU), Medan, Indonesia. His visit here is supported by an Australian Endeavour Award for a period of four months that commenced in May 2010.

Dr Purba completed his undergraduate degree in crop protection (weed science) in 1982. From 1983 to 1984 he worked for the Indonesian Department of Agriculture and an oil palm plantation company. In 1986 he started working at the University of North Sumatra. His PhD at the University of Adelaide began in 1989 where he studied paraquat resistance with supervisors W/Prof Steve Powles and Dr Christopher Preston. On completion of his PhD he returned home to take a position as a lecturer at USU. Since 1996 Edison has been the head of the Department of Agronomy at the Universitas Sumatera Utara.

Dr Purba has been active in Asian Pacific Weed Science Society and the Weed Science Society of Indonesia. In 1996 to 1999 he was a secretary-general of Weed Science Society of Indonesia.

While at AHRI Dr Purba will be working on the herbicide-resistant weed biotypes by looking at the GST enzyme activity in herbicide-resistant, and -susceptible populations of ryegrass and wild radish. He will also be working with Dr Heping Han and learn molecular biology techniques.



Assistant Professor Muhammad Farooq.

Climate change: can we adapt?

In the past many people believed that you either adapt or do nothing. One of the visiting Australian Endeavour Scholars is looking at alternatives to fight the odds.

Assistant Professor Muhammad Farooq, Department of Agronomy, University of Agriculture, Faisalabad (UAF), Pakistan is working with W/Prof Kadambot Siddique (UWA), Dr Helen Bramly (UWA) and Dr Jairo Palta (CSIRO) on drought and high temperature stresses resistance in wheat.

"Climate change may seriously threaten food production required to feed future generations across the globe. It has many facets, for instance changes in long-term trends in temperature and rainfall regimes as well as increasing variability in extreme events all affecting agricultural production," Assist/Prof Farooq said.

He believes that the changing and variable climate is affecting the wheat production worldwide. "My main focus of this research is on the mechanisms of adaptation to drought and high temperature stress in wheat," he said.

This is Assist/Prof Farooq's second visit to UWA. Last year he was invited to work at the UWA Institute of Agriculture for a short period to compile review articles and book chapters. This collaboration also strengthens ties between UWA and UAF.

A Memorandum of Understanding was signed between the two Universities in 2009. There are currently five candidates from UAF undertaking their PhD studies at UWA.



Working together to define bread quality. L-R: Mr Wayne Hawkins (DAFWA), Dr Sumana Bell (CSIRO / CGFI), Dr Mark Sweetingham (DAFWA), Prof Klaus Regenauer-Lieb (CSIRO / UWA), Mr Shuo Wang (CSIRO / CGFI), Dr Milan Patel (CSIRO / CGFI) and Dr Ali Karrech (CSIRO).

Using rocks to open the secrets in bread

Ms Merrin Fabre (Merrin.Fabre@csiro.au)

The Centre for Grain Food Innovation (CGFI) is developing methods for making high-quality breads using Australian grains. The Centre's main aim is to expand the use of Australian grain, especially for the export markets.

Working with the Western Australian Geothermal Centre of Excellence (WAGCOE) and The University of Western Australia (UWA), the CGFI will use an innovative approach – applying mathematical models normally used to predict the properties of rocks – to understand the mechanisms of bread making.

This research aims to define the quality of 'gold-standard' breads and identify methods for producing such quality using wheat flour from Western Australia (WA).

The cereals market is expanding, especially in traditionally non-bread eating Asian markets. Australian wheat, particularly in WA, is highly valued and widely used in export markets for noodle production but suffers from the perception that it is less suited to bread making. Breads made with Australian flour are also perceived to be sub-standard by consumers in South-East Asian countries.

In attempts to improve quality of breads made with Australian wheat flour, the Centre is collaborating with Winthrop Professor Klaus Regenauer-Lieb and his team at WAGCOE and adapting structure- mechanics models for rocks to describe bread texture.

Mr Shuo Wang will undertake a PhD with Prof Regenauer-Lieb at the School of Earth and Environment, UWA, to investigate structure- mechanics of breads using micro-tomography techniques and mechanical measurements. Like rocks, breads are also porous and exhibit hyper-elasticity. Such a model would be useful in understanding the mechanisms of bread making and further delineate the selection of flours in making breads. A validation for breads also helps to verify applicability of models to rocks, and help in understanding processes inside the earth. This collaboration is a win-win for WAGCOE and CGFI.



Beekeepers and industry representatives at UWA.

To bee or not to bee

No one knows better than beekeepers that bees may be small in size, but play a vital role in food production. Around sixty beekeepers, industry representatives and guest speakers recently congregated for the WA Farmers 2010 beekeepers section annual conference at Mahogany Inn in Mahogany Creek.

Assistant Prof Boris Baer, QEII Fellow at the UWA Centre for Evolutionary Biology (School of Animal Biology) and the Collaborative Initiative for Bee Research (CIBER) gave an update about CIBER and to further strengthen and update the firm links between scientists at UWA, beekeepers and researchers at the Department of Agriculture and Food WA (DAFWA).

CIBER facilitates interdisciplinary research on honeybees and offers a working platform for scientists to perform collaborative bee research alongside industry partners. They aim to better understand honeybees and counter or avoid dramatic losses. The CIBER combines expertise from beekeepers with decades of experience, sociobiologists, evolutionary biologists and molecular biologists.

"The conference was a great opportunity to catch up with the beekeeping industry and I really enjoyed being at this conference. The expertise and knowledge present on all aspects of honeybees are truly amazing," A/Prof Baer said.

"This year's meeting was characterised by a spirit of getting started to take action in order to safeguard honeybees, especially if Australia or WA should face the incursion of new diseases," A/Prof Baer recounts.

The meeting was such a success that it was extended for another two days at UWA. The CIBER research group was invited to visit the Wescobee factory, the largest honeybee packer of WA. Although honeybees pollinate more than 80 crops, the global importance of honeybees for ecosystems and human food production has been overshadowed by declines in both feral and managed populations worldwide. So far Australian bees have been spared from major destructive diseases, but the Australian honeybee industry faces significant challenges in the years to come. CIBER hopes that through their work and meetings like these, we are one step closer to ensuring bees stick around for keeps.

For more information on CIBER go to www.ciber.science.uwa.edu.au

Legumes inside out

At the end of April, participants to the 5th International Food Legumes Research Conference (IFLRC V) and 7th European Conference on Grain Legumes (AEP VII, Antalya, Turkey, spent five days comprehensively covering various aspects of legume science and technology under the theme “Legumes for Global Health: Legume crops and products for food, feed and environmental benefits.”

The conference was hosted by Turkey's Akdeniz University, Ministry of Agriculture and Rural Affairs and Turkish private sector, under the auspices of the international steering committee of IFLRC and the European Association for Grain Legume Research (AEP). W/Prof Kadambot Siddique, Director of The UWA Institute of Agriculture, was Chair of the International Steering Committee engaged with the organisation of the conference. The IFLRC is held every four to five years.

The conference dealt with all major grain legumes including chickpea, lentil, field pea, lupine, faba bean, common bean, cow pea, pigeonpea, grass pea and other grain and feed legumes. Over 280 participants from 70 countries attended the conference.

Prof Willie Erskine, Director, Centre for Legumes in Mediterranean Agriculture (CLIMA), moderated the

special workshop entitled CGIAR Centres: Food and Feed Legumes – The Next 25 Years. UWA was well represented with W/Prof Karam Singh (The UWA Institute of Agriculture and CSIRO), Dr Jens Berger (CSIRO and CLIMA) and Dr Ping Si (CLIMA) giving presentations. Several postgraduate students from UWA's School of Plant Biology working on legumes also presented their research results at the conference. On the final day, W/Prof Kadambot Siddique gave a key note presentation on “Innovations in Agronomy for Food Legumes.”

According to W/Prof Siddique the recent global yield and production trends in food/feed legumes suggest little evidence of genetic and agronomic improvements leading to upward trends. He said that on-going climate change poses an increasing threat to production of food legumes, requiring urgent implementation of agronomic and genetic means of addressing this threat.

W/Prof Siddique suggested that legume breeders focus on traits with greatest potential to increase yield. “New technologies must be developed to accelerate breeding through improving genotyping and phenotyping methods and by increasing the availability of genetic diversity in breeding germplasm,” he said. A top-down approach in delivering technology to resource poor farmers hinders adoption of new practices. He suggested that these economically accessible and readily



Dr Ping Si (CLIMA), Dr John Clements (CLIMA), Priyuk, Dr Galina Suvorova (All-Russia Research Institute of Legumes and Groat Crops (VNIIZBK), Orel, Russia) and Dr Larisa Priyuk (CLIMA).

disseminated technologies be delivered in developing countries.

“I believe that transfer of long established and recently developed technologies related to food legume production to resource-poor rural communities could be hastened with more participatory approaches. The challenge is for resource-poor farmers to take ownership of innovations in food legume production technology,” he said.



Dr Rui-Ying Guo.

Nitrogen expert from Lanzhou at UWA

Farmers agree on the importance of nitrogen to grow great crops. UWA has welcomed an expert in nitrogen in its midst. Dr Rui-Ying Guo from Lanzhou University, China, will be conducting research with Winthrop Professor Zed Rengel on soil organic matter that would give some new insights into fertilizer management.

Dr Guo's PhD from China Agricultural University, involved plant nutrition research of Nitrogen (N) control in root zone and summer catch crop planting for reducing N loss in greenhouse cucumber cropping systems.

Soil organic matter (SOM) is an important ecosystem property, regulating nitrogen supply to plants and microbes and CO₂ emission. This

matter consists of several discrete pools that decompose at a different rate.

“The quantity and quality of soil organic pools might depend on land management. It could eventually affect carbon and N mineralization. In contrast with conventional farming system, biological farming systems aim at minimising chemical additives by following the biological approach. We are not sure what will happen for soil organic C and N stock and decomposition under two different systems, and which systems will be benefit for maintaining and improving soil fertility in long term?” Dr Guo said.

In her study at UWA, Dr Guo will collect soils from biological farming systems and conventional farming systems in Merredin. The quantities and quality of different organic pool with conventional and biological farming system will be examined by dividing the soil into three classes e.g. coarse organic, fine organic C and biologically stable organic C using a size fraction method. The next step will be to examine the contribution of the different fractions to carbon and nitrogen mineralisation.

UWA and Lanzhou University have active collaboration in several research areas and postgraduate training.

Brazilliance in agricultural and natural sciences

Mrs Erika von Kaschke (erika.vonkaschke@uwa.edu.au)

World Cup fever is hitting the globe with Brazil as one of the front runners. UWA is also getting its dose of Brazilliance in agricultural and natural sciences: enter Mr Eduardo A Dias de Oliveira and Ms Mariana Cruz Campos, two postgraduate students from the UWA School of Plant Biology.

Mr Dias de Oliveira is a Biologist from Ribeirao Preto, 300 km from São Paulo. He completed his studies at the University of São Paulo before coming to UWA earlier this year. The title of his PhD research is Grain growth of wheat under elevated CO₂ and high temperatures. Eduardo's PhD research is supervised by Winthrop Professor Kadambot Siddique (UWA), Dr Jairo Palta (CSIRO) and Dr Helen Bramley (UWA).

"Like many other Biologists, I've always wanted to change the world. I find the fact that much of the world does not have enough to eat inadmissible. I think that my agriculture and climate change research at UWA could help me to achieve this dream, because of UWA's excellence in research and work with crop science," Eduardo believes some of the things that are most needed for today's world are: affection, kindness and respect. "These are some of the attributes that I found here at UWA," he said.

Ms Mariana Cruz Campos is in the third year of her PhD in Ecophysiology in native species. She was born in São Paulo, the largest city in Brazil. Ms Cruz Campos did her undergraduate degree and honours in the University of São Paulo. After working for a while she did her Master's degree on the Composition and structure of one hectare of Atlantic rainforest in relation to soil properties.

"When I was six months away from completing my degree, Winthrop Professor Hans Lambers visited my University to give a talk. I got to know him and thought it would be extremely interesting to research cluster roots and the specialisations of plants in P-impooverished environments, so I wrote a proposal to do such work and compare the specialisations across the Southern Hemisphere (Brazil, South Africa and Australia)," she said.

"It was a great opportunity to continue to study soil-plant interactions and even greater to have the chance to live in WA and study at such a good university in the ecophysiology field," she said.

She believes that learning about the ecophysiology of native species might give agronomists further insight into native traits that could benefit breeding of grain species. Mariana's PhD supervisors are W/Prof Hans Lambers, Asst/Prof Stuart Pearse and Dr Rafael Oliveira (External supervisor – Universidade Estadual de Campinas).



L-R: Ms Mariana Cruz Campos and Mr Eduardo A Dias de Oliveira.



L-R: Dr Nazrul Islam and Dr Salim Ruhulamin.

Can R&D investment offset the negative impact of climate change on agricultural productivity?

Prof Ross Kingwell (ross.kingwell@agric.wa.gov.au)

Over the last decade the negative impact of climate change on agricultural activity has been a hot topic of debate. At a recent seminar at UWA's School of Agricultural and Resource Economics, Dr Nazrul Islam, Senior Economist, DAFWA in collaboration with Dr Ruhulamin Salim, Senior Lecturer at Curtin University hosted a seminar on the topic of agricultural research and development productivity growth and climate change in Western Australia. These experts examined the short- and long-run impact of R&D and climate change on the productivity growth of broadacre agriculture in Western Australia (WA).

They found that R&D and climate change both affect the long-run productivity growth of broadacre agriculture in WA. Climate change lessened the productivity of agriculture in the long run whilst R&D boosted this productivity.

The researchers applied sophisticated statistical tests to the productivity data to reveal positive causality between R&D expenditure and productivity growth both in the short- and long-run. Their analyses also revealed that a significant portion of output and productivity growth in the long run was explained by R&D expenditure. "These results suggest that an increase in agricultural R&D investment is critical to improving and sustaining the long-run productivity growth of WA broadacre agriculture in the face of adverse climate change", Dr Islam said.

They concluded that R&D investment in agriculture can lessen the adverse impacts of climate change. The potential worsening of climate due to global warming, when combined with other challenges such as the loss of productive land due to land use competition, salinity, wind erosion and soil acidity, indicate agriculture in WA faces serious challenges.

According to Dr Salim, investing in agricultural R&D is one way of addressing these challenges to ensure productivity growth in agriculture is supported, thereby helping maintain agriculture's beneficial role in bolstering the State's economic prosperity.

"R&D to drive innovation is an acknowledged main source of productivity growth. The development and application of technologies generated through R&D boosts agriculture's productivity," Dr Salim said.

Agricultural R&D activities in Australia and in most other developed economies such as the USA, Canada and the UK have relied heavily on government funding. However, in spite of the serious challenges facing WA agriculture and the acknowledged benefits from investing in R&D, the intensity of government investment in Australian agricultural R&D is falling. For full details of this study go to: www.agric.wa.gov.au



Participants visiting an experiment station of IGDB in Shijiazhuang, Hebei Province.

The First Australia-China Wheat Genetics and Breeding Workshop

Assoc/Prof Guijun Yan (gyan@plants.uwa.edu.au)

Over the past 100 years wheat breeding has led to better quality Australian wheats and a significant increase in yields in Australia. China has also come a long way in terms of wheat genetics and breeding. These are some of the reasons behind The UWA Institute of Agriculture being instrumental in organising the successful first Australia-China wheat genetics and breeding workshop in Beijing, China during May.

With the help of co-organisers The State Key Laboratory of Plant Cell and Chromosome Engineering, Institute of Genetics and Developmental Biology (IGDB), Chinese Academy of Sciences, this workshop attracted some key Australian and Chinese cereal geneticists and breeders. The aim of the workshop was to improve collaboration between the two countries in this area by sharing wheat breeding knowledge and technology. The workshop, sponsored by Australia-China Council (ACC) of the Australian Department of Foreign Affairs and Trade, and Carl Zeiss Far East Co. Ltd.

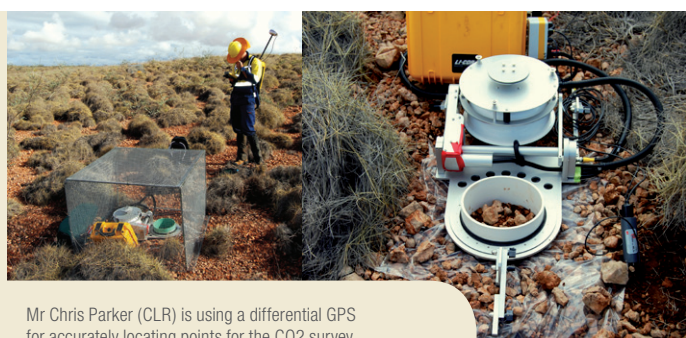
"We hope this meeting will encourage the exchange of wheat germplasm between Australia and China, especially germplasm that will facilitate the production of new cultivars adapted to future climate change and variability," W/Prof Kadambot Siddique said.

Experts from both countries presented their findings, followed by panel discussions and field and lab visits. Some of the topics included "The contribution of distant hybridization with decaploid *Agropyron Elongatum* to wheat improvement in China", "Genetic and physiological functional analysis of wheat genes involved in ascorbic acid biosynthesis", and "Characterization of Glu-3 loci of bread wheat at genomic, transcriptional and protein levels". W/Prof Kadambot Siddique (UWA) presented his paper on "The role of production agronomy in wheat yield improvement in Australia". Assoc/Prof Guijun Yan (UWA) gave a presentation on the "Application of MAS in wheat breeding – an Australian story".

A focused working group was formed to look at key traits and activities related to wheat adaptation to climate change and potential development of mutually beneficial projects. Participants discussed future directions for cooperation and visited various laboratories and several field experiments.

"The interaction between breeders, agronomists and crop physiologists has made significant contribution to the growth of Australian wheat industry in the past. The future strategy to maintain and or increase productivity under conditions of seasonal variability is to use both tactical and strategic management practices to close the gap between actual and potential grain yield in Australia," W/Prof Siddique advised attendees at the workshop.

The organisers hope to continue this series of workshops with the next one in Australia in 2011.



Mr Chris Parker (CLR) is using a differential GPS for accurately locating points for the CO₂ survey.

Perfect gizmo for keeping tabs on soil CO₂

Dr Suman George (suman.george@uwa.edu.au)

Looking more like a robotic space probe, the automated soil surface CO₂ flux monitoring system logs surface evolution of greenhouse gases. These state-of-the-art soil CO₂ flux systems are the gold-standard in long-term, unassisted monitoring.

With the further option of wireless transfer of logged data, these devices can courier data to the researcher and thereby give a real-time monitoring capability. These instruments are not just restricted to measuring CO₂ but can also be used to collect samples of various trace gases for further analysis. These instruments can also work as a team (as many as 16 at a time) when linked through a multiplexer thereby giving it additional power to map spatial variation in soil CO₂ flux, in addition to temporal changes.

Currently, the UWA Centre for Land Rehabilitation (CLR) is using three of these machines to test background soil surface CO₂ levels at the Gorgon Gas Project's proposed geosequestration site on Barrow Island, off the Pilbara coast, WA. The instruments nicknamed 'Billy, Bob and Noddy' are being put through their paces on the Island by Mr Tim Lardner, the UWA Centre for Land Rehabilitation (CLR). These instruments have huge potential to quantify soil greenhouse gas emission especially in the context of emission trading schemes in both agricultural and environmental settings. 'These instruments are highly accurate mainly because it is uses a dynamic chamber measurement technique thereby CO₂ flux measurements are taken in almost ambient conditions and have a measurement range of 0-3000 ppm,' the Centre's Director, Prof Mark Tibbett commented. Contact Prof. Mark Tibbett at Tel 6488 2635 or Email Mark.Tibbett@uwa.edu.au for further information regarding these instruments.



Prof Wallace Cowling (second from left) at the opening of the Rapeseed Museum at Shayang, Hubei Province, with Prof Fu Tingdong (third from right) of Huazhong Agricultural University, Prof Wang Hanzhong, Director General of the Oil Crops Research Institute in Wuhan, and other agricultural officials.

Crops worthy of a festival

Prof Wallace A Cowling (wallace.cowling@uwa.edu.au)

More avenues of collaboration in rapeseed and canola breeding might be on the cards between UWA, Huazhong Agricultural University (HZAU) and Zhejiang University (ZJU). Prof Wallace Cowling and Dr Sheng Chen (UWA School of Plant Biology) visited China from 24 March to 7 April, 2010 to exchange seed and knowledge on breeding higher ploid Brassica or rapeseed on an Australia-China Science Linkages project.

Prof Cowling represented UWA and Australia at the official opening of the Rapeseed Museum and Rapeseed Festival at Shayang, Hubei Province, as guest of Prof Fu Tingdong, HZAU. "Arguably, this is the only dedicated rapeseed museum in the world, and the only Festival holiday in the world to celebrate this crop. The museum has artifacts of field rape cultivation and storage dating back 6000 years, and wooden oilseed crushing machines from the early 20th century," Prof Cowling said.

Shayang is in the middle of the fertile upper Yangzi Valley in the "demographical centre" of China. The people of Shayang have good reason to be proud of this crop – it is grown on 60-70% of the land area every winter. The yellow flowers decorating the landscape in spring resulted in rapeseed being promoted to a tourist attraction. Prof Fu is the elder statesman of rapeseed breeding in China. HZAU helped to fund the building of the museum. After the Festival, the delegation visited field trials and displays in the countryside. Dr Chen and Prof Cowling also gave talks on UWA's research to a large audience at HZAU, in the National Key Laboratory of Crop Genetic Improvement.

During the visit to HZAU, Prof Cowling paved the way for the visit of UWA Endeavour Postdoctoral Fellowship Awardee, Ms Annaliese Mason, who will be visiting HZAU for 6 months in October 2010. Ms Mason is currently finishing her PhD on genomic interactions in higher ploid Brassica. This is a hot topic of research at HZAU.

Prof Cowling also visited Prof Weijun Zhou at ZJU, in the city of Hangzhou. They discussed joint research on microspore culture in rapeseed, as part of the Australia-China Science Linkages project, and joint publications on genetic control of microspore embryogenesis, supported by a UWA Research Collaboration Award.

Prof Cowling also drafted a preliminary proposal for a future joint laboratory between UWA, HZAU and ZJU on "Brassica Genomics and Genetic Improvement". There may be other Australian partners in this venture. He also explored other avenues of collaboration in rapeseed and canola breeding.



L-R: Workshop participants, Dr Richard Bennett (CSIRO), Dr Lindsay Bell (CSIRO), Associate Professor Megan Ryan (UWA), Professor Shahal Abbo (Hebrew University), Dr Dai Suter (George Weston), and Professor Willie Erskine (CLIMA), examine four native legumes.

Do Australian native legumes have potential as grain crops?

Assoc/Prof Megan Ryan (megan.ryan@uwa.edu.au)

A one-day workshop was recently held at UWA to examine whether Australian native herbaceous legumes have potential to be developed as grain legumes crops? Australian native legumes are likely to include species well adapted to low and variable rainfall and poorly fertile soils. These adaptations may be especially important in the face of a drying climate and the running down of world phosphorus reserves. The workshop was coordinated by CLIMA and sponsored by RIRDC and the School of Plant Biology, UWA. George Weston Foods was an industry partner for the RIRDC project.

The workshop commenced with a keynote presentation by Professor Shahal Abbo from the Hebrew University of Jerusalem, giving an overview of the domestication process of Near Eastern legumes and crops. Existing knowledge on Australian natives was covered by a range of speakers. Dr Dai Suter (George Weston Foods) provided a broader context by covering the main qualities required by commercial processors. Dr Jon Clements (CLIMA) concluded with an overview of the process of lupin domestication here in WA.

There is a large range of native legumes, both native and exotic, which possess a number of favorable traits. Although no standout species was identified, species from a number of genera including Cullen, Swainsona and Kennedia merit further research. While there is little published evidence of use by Australian aboriginals, it would be useful to search for more information. There is some evidence of good drought tolerance and, in particular, interesting traits to overcome phosphorus limitations among the natives. Selection and breeding activities should be undertaken only after a clear idea of the final use (such as a pharmaceutical) and market has been developed. The story of lupin domestication in WA emphasised the substantial investment required to domesticate a new species and the critical role of publicly funded research in this process.



Dr Yinglong Chen with lupin plants grown in rubbish bins.

Better root traits to be found in rubbish bins?

W/Prof Zed Rengel (zed.rengel@uwa.edu.au)
Dr Yinglong Chen (yinglong.chen@uwa.edu.au)

W/Prof Zed Rengel, W/Prof Kadambot Siddique and Dr Yinglong Chen (UWA); Dr Art Diggie (DAFWA), Professor Jonathan Lynch (Pennsylvania State University, USA) and Dr Vanessa Dunbabin (University of Tasmania) have established a phenotyping platform to map root growth of narrow-leaved lupin in rubbish bins!

One of the aims of this ARC Discovery project is to characterise root traits associated with increased efficiency of capturing water and phosphorus by crops growing in soils with limiting and heterogeneous supply of these resources. A core collection of narrow-leaved lupin (*Lupinus angustifolius* L.) comprising 125 genotypes selected for diversity by DArT (Diversity Array Technology) was screened for root traits in a novel 'bin' system at the UWA glasshouse.

The system uses 240-L mobile bins and allows root growth of up to 1-m depth, with repeated observations and measurements of 2-D root structure without the need for destructive sampling. It permits digital mapping of growth dynamics of tap and lateral roots over time. This growing system overcomes the long-standing unsolved problem of phenotyping large sets of genotypes for rooting traits, which is particularly important for identification of quantitative trait loci (QTLs) and characterization of molecular markers that may be useful in breeding. The extensive data sets acquired from our growth system can be used in root growth models, such as ROOTMAP (UWA) and SimRoot (Pennsylvania State University, USA) that simulate 3-D root structure and function relevant to acquiring water and nutrients from a heterogeneous soil profile.

The follow-up modelling experiments with selected genotypes that have interesting root traits will enable simulation of root structure and function in drying and/or P-deficient environments to develop a computer-aided design of efficient root systems suited to particular environments. This approach has the potential to revolutionise the field of breeding for desirable root traits by reducing the time taken to produce superior genotypes.



Prof Ed Barrett-Lennard at salt tolerant cereal trial at a field site near Lake Grace.

Selecting cereals for saltland

Prof Ed Barrett-Lennard (egbarrettlennard@agric.wa.gov.au)

Western Australia has a major problem with the salinisation of arable land. Many farmers often feel a tangible sense of failure when their land becomes too saline to grow cereals, so the prospect of developing more salt tolerant cereals has its attractions. But what should such plants look like? This is a question that has been occupying the Prof Ed Barrett-Lennard (UWA Centre for Ecohydrology and DAFWA) and Prof Tim Colmer (UWA).

Over the last two years, Professors Barrett-Lennard and Colmer have been working in a project of the Future Farm Industries CRC comparing the growth of a salt tolerant wheat/sea barley grass amphiploid with wheat and barley cultivars.

Prof Barrett-Lennard believes that the question researchers should be asking is: "how can we most rapidly improve grain production from saltland?" This is a very different question from: "how can we increase plant salt tolerance?"

The Barrett-Lennard/Colmer team has made several really interesting observations in their field work. Firstly soil salinity is highly variable during the growing season: salinity starts out being high at germination, but decreases as salt is leached by winter rains, and then increases as the soil dries out again in late spring. The second surprising factor that they observed is that the cereals were affected by another stress that occurs on saltland – boron toxicity.

"These results are changing views about what a cereal well-adapted to mildly affected saltland might look like: it would need an ability to germinate under saline conditions, it would have tolerance to high boron concentrations in the soil, and it would have a short growing season that enabled it to complete its life cycle in the narrow growing season window when salinities in the soil are lower. These factors are nearly never considered in breeding programs for salt tolerant cereals", Prof Barrett-Lennard said.

Job well done Dr Peter McInnes

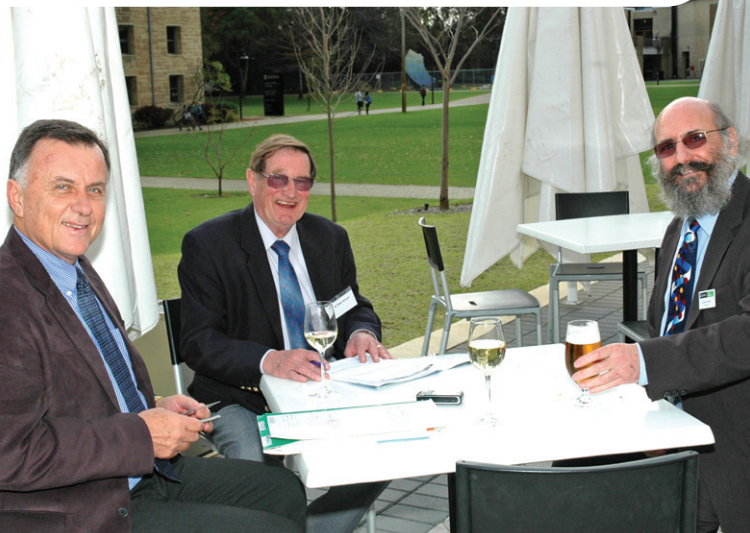
Dr Peter McInnes has retired as part-time Research Manager of the Rural Industries Research and Development Corporation (RIRDC). Over the past fifteen years this Corporation has funded many research and development projects at UWA covering production, processing and marketing for the emu, ostrich, gamebird, milking sheep and fibre goat industries. Many staff, postgraduates and post doctorates have expanded their careers from these projects. As a result of these R&D projects from UWA many industries have commenced and expanded.

Dr McInnes commenced his links with UWA when he enrolled in a PhD in 1967 under the supervision of Professor Reg Moir. He was one of many postgraduates that this outstanding scientist developed in sheep and cattle nutritional research. From the group many subsequently occupied senior positions in research and administration in Universities, CSIRO and Departments of Agriculture.

During the period that Dr McInnes was at UWA in the late 1960's, besides researching in nitrogen and glucose metabolism in sheep, he was elected as President of the UWA Postgraduate Association, and was instrumental in obtaining for students an increase in the value of the postgraduate awards. His subsequent career included Chief of Animal Production in the NSW Agriculture Department, Dean of Agriculture at the now UQ campus at Gatton and many international assignments for the World Bank, FAO, UNDP and Australian aid agencies.

During May this year Peter reviewed several current RIRDC projects being implemented by UWA. "I was pleased to assess the effectiveness of the research, contributing to scientific and technological advances for many emerging animal industries. It was a privilege to observe the quality of the science of the present staff, postgraduates and post doctorates in the Faculty and within The UWA Institute of Agriculture. I have been very fortunate and thankful to have been associated with UWA over nearly 50 years," he said.

Dr Peter McInnes (middle) with (left) Dr Andy Sierakowski (Director, Office of Industry and Innovation, UWA) and (right) W/Prof Graeme Martin (Head, School of Animal Biology).



Professor
Henry Paul
Schapper
(19 July 1918
to 27 April 2010)

Prof Ben White (benedict.white@uwa.edu.au)

Prof Henry Paul Schapper was born in Victoria. He left school at 15, worked as a farm labourer and received a Diploma in Agriculture in 1938. He moved to New Zealand and combined farm work with studying Master of Commerce at Canterbury College.

He took up a research position at the UWA (1952), and received a PhD (UWA) in 1957. He was Reader in Agricultural Economics from 1958 until his retirement in 1983. During this period he developed a distinctive approach to farm management and extension. His initiatives led to the establishment of a network of farming groups with their own management advisors. He introduced the idea that farm management requires a more rigorous 'scientific' approach by establishing UWA Farm Management Service Laboratory. This initiative probably contributed to the rate of technological change seen in WA Agriculture during the 1960s and 1970s. He established the Farm Policy Journal to disseminate new ideas on farm management and agricultural policy. He was also a founding member of the Australian Agricultural Economics Society and served as its president in 1964.

Dr Schapper had a profound understanding of the farm income problem and the role of economics. He was a strong advocate of competition and free enterprise. Although the principle of fostering competition is now widely accepted, this was a relatively unpopular point of view in 1960s and 1970s in relation to agricultural policy. For instance writing in Farm Policy in 1973: 'To ignore market forces and to politicize for stable and guaranteed cost of production prices, and for government control of marketing and of quotas are in accordance more with belief in social and economic privilege for farmers than with belief in social and economic justice for farmers'.

Prof Schapper's most widely cited paper, written jointly with Dr Roger Mauldon, 'Random Numbers for Farmers' (Australian Institute of Agriculture Journal, 1970) exemplifies his (and his coauthor's) ability to enliven an economic concept and refute conventional wisdom. He concludes this paper with a lucid explanation of the importance of the marginal principle in agriculture when applying variable inputs such as fertilizer: "With such allocations before him the farmer may get closer to best answers should he ask of each item of income and outgo, would a little more, a little less or no change in input and output have resulted in more profit? This is the thinking required of management, not how efficiency ratios might be changed." With the advent of precision agriculture these concepts remain as important now.

On any measure Prof Schapper's career as academic economist was an unconventional one. When other economists embraced the trend towards mathematical abstraction emanating from the US, he favoured analysis and commentary from a political economy standpoint and built influential institutions like the Farm Management Foundation.

Prof Schapper combined clear, forceful writing, with a broad intellect, making him one of the most influential Agricultural Economists in WA from the fifties through to the seventies. He single handedly built up the then Department of Agricultural Economics at UWA into one of the strongest departments in the country. Through his undergraduate teaching he influenced many students who later rose to senior positions in agribusiness, academia and the public service.

Alumni



Mr Rob Delane

Director General, DAFWA

Mr Rob Delane took up the appointment as Director General of the Department of Agriculture and Food WA (DAFWA) on 2 November 2009.

Prior to this appointment he held the position of Deputy Secretary, Biosecurity Services Group and Executive Director Australian Quarantine Inspection Service (AQIS) with the Commonwealth Department of Agriculture, Fisheries and Forestry (DAFF).

Mr Delane has 30 years experience with DAFWA. He started his career as a Rice Agronomist at Kununurra (5 years). He was based at Geraldton for 14 years in the roles of Research Officer, District Manager, Regional Manager and Pulses and Oilseeds Program Manager. After moving to Perth in 1998 Rob has held a number of Senior Executive Service positions.

Mr Delane has extensive knowledge of WA agriculture industries including tropical, temperate and rangelands regions, irrigated and dryland production, animal and plant industries, research and development, technology transfer and industry development, biosecurity and natural resource management, policy, regulation and promotion. He has held a number of national board and advisory committee positions.

He holds a Master of Science in Agricultural Science (1988) and a Bachelor of Science in Agricultural Science with first class honours (1979) from UWA.

In 2007 Mr Delane received a Public Service Medal for outstanding

service to the agricultural industries and community of Western Australia.

Mr Delane is proud to lead an organisation that employs many UWA graduates and is a strong collaborator with the University.



Dr Richard Richards

Chief Research Scientist and Program Leader 'High Performance Crops for Australia, CSIRO Division of Plant Industry, Canberra

Dr Richard Richards, a Fellow of the Australian Academy of Technological Sciences and Engineering (2004) received his BSc at Melbourne University in 1971. The following year he completed a B Sc (Hons) (First Class) at LaTrobe University. From 1975 Dr Richards took up a position of lecturer in the Botany Department at UWA. He completed his PhD from the then Agronomy Department at UWA in 1976.

He was appointed as Research Scientist, CSIRO, Division of Plant Industry, Canberra between 1976 and February 1980. Later that year he became a Research Agronomist, Agronomy and Range Science Dept, University of California, Davis (1980 - May 1981). He returned to CSIRO in 1981 as Research Scientist.

Over the years Dr Richards has held various positions like Principal Scientist HRZ Wheats Pty Ltd (since 2002) and an editorial position for several international agricultural science journals. He is a world renowned scientist on drought and crop water use and has won the CSIRO Medal: Leader – Delta carbon water use efficiency team 2002. He sits on the Advisory Committee to Enhance US education and research capacity for drought tolerance (2006 – 2010). He was President of the Wheat Breeding Society of Australia from 1994-1996. Dr Richards is currently an Adjunct Professor within the School of Plant Biology at UWA.



Mr John Davis

Lecturer, School of Sustainability, Murdoch University, WA

Mr John Davis completed an Agricultural Science degree in 1977. Over the next eight years, he helped establish a rural development program in Bangladesh. In 1989, a casual meeting with the then Dean of the UWA Faculty of Agriculture, Prof David Lindsay led him straight into a Masters in Natural Resource Management. That led to work in the Department of Agriculture WA during the establishment of the National Landcare Program, of which he became the State Coordinator. From 1994 to 2000 John taught in the Faculty of Agriculture and Centre for Environmental Studies of Satya Wacana University in Indonesia.

In addition to teaching and research at Murdoch University John continues to consult internationally in community development. He deeply appreciates the opportunity he had as an undergraduate to work closely with world class researchers in the School of Agriculture- their rigour and encouragement, and the strong community of staff and students that lasts to this day.

New staff



Prof Raphael Didham

Prof Raphael Didham is a newly-appointed Professor of Ecology in the School of Animal Biology at UWA. He

holds a joint research position at CSIRO Entomology. Prof Didham received his PhD from Imperial College London in 1997. He completed a postdoctoral fellowship at the University of Delaware, USA, and a teaching fellowship with Boston University and the School for Field Studies in Canada. He held a faculty position at the University of Canterbury, in New Zealand, for the past 10 years.

Prof Didham brings a wealth of ecological and applied research experience to WA. He contributes directly to conceptual synthesis of the science underpinning the interactive effects of multiple drivers of global change on biodiversity and ecological resilience.

Email: raphael.didham@csiro.au



Dr Mingpei You

Dr Mingpei You obtained her PhD in Plant Pathology from UWA in 1994. Her career includes working as Research Officer at the Department of Agriculture and Food, Western Australia (DAFWA); managing a commercial vegetable hydroponic operation (1995-6); and Research Officer in CLIMA on root rot disorders of annual medic pastures (1997-8). Since 1998, she has worked in various positions as a Research Officer at DAFWA, e.g. identification of new pasture legume resistances to a range of root and foliage diseases; development of molecular markers for breeding lupins with resistance against anthracnose disease; plant pathogen diagnostics; risk analyses and emergency response planning in relation to exotic pathogens coming into WA; and development of protocols for detecting exotic pathogens being carried into WA on plant materials and by travellers. Dr You will be working on biotic and abiotic stress interactions in Phaseolus beans with Profs Martin Barbeti and Tim Colmer.

Email: mingpei.you@uwa.edu.au

New PhD Students

NAME	TOPIC	SCHOOL	SUPERVISOR(S)	FUNDING BODY
Ms Kelsie Moore	How do fibre characteristics affect insulation of alpaca?	Animal Biology	Assoc/Prof Dominique Blache and Prof Shane Maloney	TBA
Mr Muhammad Arif Watto	Social and Political Conflicts on Water Entitlements among Different Stakeholders in Pakistan	Agricultural Resource Economics	Asst/Prof Amin Mugeru and Prof Ross Kingwell	UAF Pakistan and UWA SIRF Scholarship
Ms Alison Wilson	Linking groundwater and surface water: management and policy options for the NSW cotton industry	Agricultural Resource Economics	W/Prof David Pannell	Cotton CRC and Cotton R&D Corp, via National Centre for Groundwater Research and Training
Mr Jordan Radomiljac	Role of redox metabolites in grapevine (<i>Vitis vinifera</i> L.) tissue under Mediterranean and Sub-tropical conditions.	Plant Biology	Assist/Prof Michael Considine, W/Prof Jim Whelan and Emeritus Prof John Considine	Australian Postgraduate Award (APA) Scholarship

Visitors to The UWA Institute of Agriculture

NAME OF THE VISITOR	VISITORS' ORGANISATION AND COUNTRY	HOST DETAILS	DATES
Prof John Raven	University of Dundee	W/Prof Hans Lambers	10 March 2010–29 March 2010
Dr Fabio Fiorani	Senior Scientist, Plant Evaluation CropDesign N.V. – A BASF Plant Science Company	W/Prof Hans Lambers and W/Prof Kadambot Siddique	13 April
Mr Ali Al-Subhi	Sultan Qaboos University, Oman,	Assoc/Prof Guijun Yan, Dr Nader Aryamanesh and W/Prof Kadambot Siddique	1 May 2010–23 July 2010
Dr Yang Zhiping, Mr Pi Zuyu Dr Tan Zhiliang Mr. Liu Shaojun Mr Qiao Chunsheng Mr Wang Zhongyan	General of Hunan Science and Technology Department; Hunan Foodstuff Department Institute of Subtropical Agriculture The Chinese Academy of Sciences Hunan Science and Technology Department Hunan Xin Wufeng Joint-Stock Company Institute of Gardening of Hunan Province	Dr Shimin Liu	14 May
Dai Suter	George Weston Foods, Australia	Assoc/Prof Megan Ryan	29 June
Dr Lindsay Bell	CSIRO Sustainable Ecosystems, Toowoomba, QLD	Assoc/Prof Megan Ryan	29 June–1 July
Professor Shahal Abbo	The Hebrew University of Jerusalem, Israel	Assoc/Prof Megan Ryan	29 June–1 July
Assistant Professor Muhammad Farooq	Department of Agronomy, University of Agriculture, Faisalabad, Pakistan	W/Prof Kadambot Siddique	July–October 2010
Dr Pooran Gaur	ICRISAT	W/Prof Kadambot Siddique	18-22 October
Mr Yunchao Zeng	Sichuan Agricultural University, China	Assoc/Prof Guijun Ya	5 October 2010–4 March 2012
Mrs Mei Li	Institute for Plant Protection, Shandong Academy of Agricultural Sciences, Shandong China	Assoc/Prof Yu Qin	October 2010
Mr Ishaq Mian	World University Network Exchange Scholar from University of York, UK	Prof Mark Tibbett & Dr Suman George	15 April–30 June 2010
Mr. Mathieu Kudla	École Nationale Supérieure de Techniques Avancées, Paris	Prof Mark Tibbett & Dr Suman George	1 May–31 July 2010

New Research Projects

TITLE	FUNDING PERIOD	FUNDING BODY	SUPERVISOR(S)
Phylogeny Pathogenecity and Epidemiology of Potato Spindle Tuber Viroid and Related Pospoviroids in Australia	2010–2012	CRC Plant Biosecurity	Prof Martin Barbetti
Western Australian No Tillage Farmers Association, Planfarm: 'Long Term no Till Farming Systems'	2009–2011	Grains Research And Development Corporation (GRDC)	Dr Kenneth Flower, Dr David Minkey, Mr Neil Cordingley, Mr Cameron Weeks
Bioengineering the Microbial Communities in Pig Effluent Waste to Maximise Biogas Production in Retrofitted Effluent Ponds	2010–2012	Australian Pork Limited	Dr Sasha Jenkins
Climate Change Ready Wheat Cultivars for China and Australia	2010	Department of Foreign Affairs and Trade Australia China Council	Assoc/ProfGuijun Yan
Developing Biotechnology Solutions for improving Phosphate Acquisition in Plants using Functional Genomics in Rice	2010–2013	ARC Super Science Fellowships	W/Prof James Whelan, W/Prof Andrew Millar, W/Prof Ian Small, and Prof Stephen Tyerman
Developing and Promoting Integrated Pest Management in Australian Grains	2009–2011	Grains Research And Development Corporation (GRDC)	Associate Professor Helen Spafford; Dr Daryl Haride, W/Prof Kadambot Siddique and W/Prof Graeme Martin
Demonstration Projects for On Farm Practical Methane Management Strategies – UWA Ridgefield	2010–2012	Meat And Livestock Australia Ex Department Of Agriculture Fisheries and Forestry	Professor Philip Vercoe
Central Coast employment strategy	2010	Wheatbelt Development Commission	Professor Matthew Tonts
Better rural fertiliser management to improve the health of coastal waterways	2010	Department of Agriculture and Food WA	Associate Prof Neil Coles
Affect of landscapes on pest and beneficial invertebrates on broadacre cropping systems	2010	Department of Agriculture and Food WA	Associate Prof Neil Coles
The application of factor analytic models with correlated genetic relationships to improve the efficiency of hybrid rice breeding for international environments	2010–2012	Bayer South East Asia Pty Ltd	Prof Wallace Cowling
Evaluation of the effectiveness and environmental risks of the application of lime-amended biosolids-clay blends to Bassendean Sands	2010	Department of Agriculture and Food WA	Ms Rebecca Ovens and Dr Neil Coles
Factors responsible for host resistance to the pathogen Sclerotinia sclerotiorum for developing effective disease management in vegetable brassicas	2010–2013	ARC Linkage Department of Agriculture and Food WA	Prof Martin Barbetti, W/Prof Krishnapillai Sivasithamparam
Exploiting subterranean clover genetic variation for methane mitigation and ruminant health challenges to the Australian livestock industries	2010–2013	ARC Linkage Department of Agriculture and Food WA	Prof William Erskine, Prof Philip Vercoe, Prof Rudi Appels, Dr Phillip G Nichols, Dr Andrew N Thompson, Dr Clinton K Revell, Mr Richard Snowball, Ms Fiona M Jones
Anticipating closure of bauxite refineries in Western Australia: the water quality implications of a proposed new design in residue storage areas	2010–2013	ARC Linkage Alcoa of Australia Ltd Worsley Alumina Pty Ltd	Prof Martin V Fey, Prof Christoph B Hinz, Prof Andries B Fourie, Prof Richard W Bell, Dr Ian R Phillips
Behaviour of a cementing slurry in a full-scale mining stope	2010–2013	ARC Linkage Barrick Gold of Australia Limited Panoramic Resources Ltd	Prof Andries B Fourie, Prof Martin Fahey
Sustainable cooperative enterprise: an investigation into the factors influencing the sustainability and competitiveness of cooperative enterprises	2010–2013	ARC Linkage Capricorn Society Limited – Australia CBH Group Co-operatives WA	W/Prof Tim W Mazzarol, W/Prof Geoffrey N Soutar, W/Prof Kadambot Siddique, W/Prof John Watson, Asst Prof Joanne N Sneddon, Mr Peter T Wells, Dr Elena A Mamouni Limnios
Molecular characterisation of the fungal disease defence response in tropical sandalwood (Santalum album)	2010–2013	ARC Linkage Forest Products Commission WA, Integrated Tree Cropping Ltd	Prof Julie A Plummer, Prof Emilio L Ghisalberti, Dr Treena I Burgess, Dr Elizabeth L Barbour, Prof Joerg C Bohlmann

Synthetic natural gas and biochar from biomass for energy services in remote communities and soil carbon sequestration	2010–2015	ARC Linkage ANSAC Pty Ltd BHP Billiton Iron Ore Pty Ltd Department of Agriculture and Food WA ENN	Prof Dongke Zhang, Prof Zhihong Xu, Prof John W Cairney, Dr Chengrong Chen, A/Prof Hong Yang, A/Prof Ian C Anderson, Prof Vishnu K Pareek
An innovative two-phase anaerobic process for biogas production from green waste and animal droppings for remote communities	2010–2013	ARC Linkage Qingdao Institute of Bioenergy and Bioprocessing Technology South Coast Natural Resource Management Inc	Prof Dongke Zhang, Prof Jinhu Wu

Research and Industry Recognition

NAME	AWARD
W/Prof Zed Rengel	Humboldt Research Award
Dr Suman George	Endeavour Research Fellowship

Publications (2009)

(not reported previously)

Refereed journals

He ZX, Sun ZH, Liu SM, Zhang QL, Tan ZL. 2009. Effects of early malnutrition on mental system, metabolic syndrome, immunity and the gastrointestinal trace. *Journal of Veterinary Medicine and Science* **71**: 1143–1150.

Publications (2010)

(March–July)

Refereed journals

Anderson JP, Gleason CA, Foley RC, Thrall PH, Burdon JB and Singh KB (2010). Plants versus pathogens: an evolutionary arms race. *Functional Plant Biology* **37**: 499–512.

Barrett-Lennard EG and Setter TL (2010). Developing saline agriculture: moving from traits and genes to systems. *Functional Plant Biology*, **37**, iii–iv.

Barton L, Murphy DV, Kiese R, and Butterbach-Bahl K (2010). Soil nitrous oxide and methane fluxes are low from a bioenergy crop (canola) grown in a semi-arid climate. *GCB Bioenergy* **2**: 1–15, doi: 10.1111/j.1757-1707.2010.01034.x

Barton L, Butterbach-Bahl K, Kiese R and Murphy DV (2010). Nitrous oxide fluxes from a grain–legume crop (narrow-leaved lupin) grown in a semiarid climate. *Global Change Biology* doi: 10.1111/j.1365-2486.2010.02260.x

Celi P, Miller DW, Blache D and Martin GB (2010). Interactions between nutritional and opioidergic pathways in the control of LH secretion in male sheep. *Animal Production Science* **117**: 67–73.

Chanvallon A, Blache D, Chadwick A, Esmaili T, Hawken PAR, Martin GB, Vinales C and Fabre-Nys C (2010). Sexual experience and temperament affect the response of Merino ewes to the ram effect during the anoestrous season. *Animal Reproduction Science* **119**: 205–211.

Chen S, Zou J, Cowling WA and Meng J (2010). Allelic diversity in a novel gene pool of canola-quality Brassica napus enriched with alleles from *B. rapa* and *B. carinata*. *Crop and Pasture Science* **61**(6): 483–492.

Coutts BA, Webster CG, and Jones RAC (2010). Control of Beet western yellows virus in Brassica napus crops: infection resistance in Australian genotypes and effectiveness of imidacloprid seed dressing. *Crop & Pasture Science* **61**: 321–330.

Digby S, Masters DG, Blache D, Hynd PI and Revell DK (2010). Offspring born to ewes fed high salt during pregnancy have altered responses to oral salt loads. *Animal* **4**: 81–88.

Flowers TJ, Gaur P, Gowda CLL, Krishnamurthy L, Samineni S, Siddique KHM, Turner NC, Vadez V and Colmer TD (2010). Salt sensitivity in chickpea. *Plant, Cell and Environment* **33**: 490–509.

Flowers TJ, Galal HK and Bromham L (2010). Evolution of halophytes: multiple origins of salt tolerance in land plants. *Functional Plant Biology* **37**: 604–612.

French RJ (2010). The risk of vegetative water deficit in early-sown faba bean (*Vicia faba* L.) and its implications for crop productivity in a Mediterranean-type environment. *Crop & Pasture Science* **61**: 566–577.

Garg H, Atri C, Sandhu PS, Kaur B, Renton M, Banga SK, Singh H, Singh C, Barbeti MJ, SS Banga (2010). High level of resistance to *Sclerotinia sclerotiorum* in introgression lines derived from hybridization between wild crucifers and the crop Brassica species *B. napus* and *B. juncea*. *Field Crops Research* **117**: 51–58.

Green ID, Diaz A, Tibbett M (2010). Factors affecting the concentration in seven-spotted ladybirds (*Coccinella septempunctata* L.) of Cd and Zn transferred through the food chain. *Environmental Pollution* **158**: 135–141.

Henry BA, Blache D, Dunshea FR and Clarke IJ (2010). Altered “set-point” of the hypothalamus determines effects of cortisol on food intake, adiposity, and metabolic substrates in sheep. *Domestic Animal Endocrinology* **38**: 46–56.

Jones RAC, Salam MU, Maling TJ, Diggle AJ and Thackray DJ (2010). Principles of Predicting Plant Virus Disease Epidemics. *Annu. Rev. Phytopathol* **48**: 179–203.

Ma J, Li HB, Zhang CY, Yang XM, Liu YX, Yan GJ and Liu CJ (2010). Identification and validation of a major QTL conferring crown rot resistance in hexaploid wheat. *Theor Appl Genet* **120**: 1119–1128.

Ma X, Li H, Sivasithamparam K and Barbeti MJ (2010). Infection Processes and Involvement of Defense-Related Genes in the Expression of Resistance in Cultivars of Subterranean Clover (*Trifolium subterraneum*) to *Phytophthora clandestina*. *Phytopathology* **100**: 551–559.

Maccarone LD, Barbeti MJ, Sivasithamparam K and Jones RAC (2010). Molecular Genetic Characterization of *Olpidium virulentus* Isolates Associated with Big-Vein Diseased Lettuce Plants. *Plant Dis.* **94**: 563–569.

Maccarone LD, Barbeti MJ, Sivasithamparam K and Jones RAC (2010). Comparison of the coat protein genes of Lettuce big-vein associated virus isolates from Australia with those of isolates from other continents. *Archives of Virology* **155**: 765–770.

Mason AS, Huteau V, Eber F, Coriton O, Yan G, Nelson MN, Cowling WA and Chèvre A (2010). Genome structure affects the rate of autopolyploidization and allopolyploidization in AABC, BBAC and CCAB Brassica interspecific hybrids. *Chromosome Research* DOI 10.1007/s10577-010-9140-0

Matthiesen CF, Blache D, Thomsen PD, Hansen NE and Tauson AH (2010). Effect of late gestation low protein supply to mink (*Mustela vison*) dams on reproductive performance and metabolism of dam and offspring. Archives of Animal Nutrition **64**: 56–76.

Miller DR, Blache D, Jackson RB, Dowling E and Roche JR (2010). Metabolic maturity at birth and neonate lamb survival and growth: Association among maternal factors, litter size, lamb birth weight, and plasma metabolic and endocrine factors on survival and behaviour. Journal of Animal Science **88**: 581–593.

Palta JA, Ganjeali A, Turner NC and Siddique KHM (2010). Effect of transient subsurface waterlogging on root growth, plant biomass and yield of chickpea. Agricultural Water Management. Agricultural Water Management 97: 1469–1476.

Pang J, Ryan MH, Tibbett M, Cawthray GR, Siddique KHM, Bolland MDA, Denton MD and Lambers H (2010). Variation in morphological and physiological

parameters in herbaceous perennial legumes in response to phosphorus supply. Plant Soil **331**: 241–255.

Pedersen O, Malik AI and Colmer TD (2010). Submergence tolerance in *Hordeum marinum*: dissolved CO₂ determines underwater photosynthesis and growth. Functional Plant Biology, **37**: 524–531.

Powles SB and Yu Q (2010). Evolution in Action: Plants Resistant to Herbicides. Annu Rev Plant Biol **61**: 317–347.

Pradhan A, Plummer JA, Nelson MN, Cowling WA and Yan G (2010). Trigenomic hybrids from interspecific crosses between *Brassica napus* and *B. nigra*. Crop and Pasture Science **61**(6): 464–474.

Teakle NL, Snell A, Real D, Barrett-Lennard EG and Colmer TD (2010). Variation in salinity tolerance, early shoot mass and shoot ion concentrations within *Lotus tenuis*: towards a perennial pasture legume for saline land. Crop & Pasture Science **61**: 379–388.

Tonts M, Yarwood R and Jones R (2010). Global geographies of innovation diffusion: the case of the Australian cattle industry. The Geographical Journal **176** (1): 90–104.

Zhang H, Turner NC, Simpson N, and Poole ML. Growing-season rainfall, ear number and the water-limited potential yield of wheat in south-western Australia. Crop & Pasture Science **61**: 296–303.

Book Chapters

Bramley H, Tyerman SD (2010). Root water transport under waterlogged conditions and roles of aquaporins. In: S Mancuso, S Shabala (eds) Waterlogging, Signalling and Tolerance in Plants, Springer-Verlag, Berlin, pp 151–180.

Tibbett, M (2010). Large-scale Mine Site Restoration of Australian Eucalypt Forests After Bauxite Mining: Soil Management and Ecosystem Development. In: Ecology of Industrial Pollution L.C. Batty & K. Hallberg, (Eds), pp. 309–326. Cambridge University Press, UK.

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CONTACT DETAILS

If you wish to be included on the mailing list or receive this publication by email or hard copy please contact us.

Editor: Erika von Kaschke
Erika.vonKaschke@uwa.edu.au
The UWA Institute of Agriculture
Tel: +61 8 6488 4717
Web: www.ioa.uwa.edu.au

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



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