THE UNIVERSITY OF WESTERN AUSTRALIA
Achieve International Excellence

The UWA Institute of Agriculture

Number 14 **August 2011**

Front centre: W/Prof. Graeme Martin (Deputy Director, The UWA Institute of Agriculture). Back row (from LtoR): W/Prof. Alan Dench, Mr Khalid Bashir, Mr Kevin Foster, Ms Jo Elliott, Mr Neil Young. Front row (from LtoR): Ms Catherine Bondonno, Ms Aidilla Mubarak, Ms Noraini Md Jaafar, Ms Chelsea Fancote, Ms Mariana Cruz Campos.

Photo: Brendan Cant and Associates

Postgraduate Showcase heralds major innovations in agriculture and food industry

Nine University of Western Australia (UWA) postgraduate students recently presented diverse PhD research projects at The UWA Institute of Agriculture (IOA) 'Frontiers in Agriculture' Postgraduate Showcase 2011, proving to an audience of farmers, academics, scientists, industry and government representatives that agriculture's future is as bright as its young graduates.

Opening the Showcase, Winthrop Professor Alan Dench, Dean of UWA's Graduate Research School, highlighted the potential of each student's research to affect the development of profitable and sustainable agriculture.

He welcomed the presenting students from the Faculty of Natural and Agricultural Science's Schools of Agricultural and Resource Economics, Earth and Environment, Plant Biology and Animal Biology and from the Faculty of Medicine, Dentistry and Health Sciences' School of Medicine and Pharmacology.

Chelsea Fancote, originally from a Brookton farm in Western Australia, began her PhD in 2008, researching the potential benefits of saltbush as a source of Vitamin E to improve sheep health and meat quality.

Her PhD supervisors are Professor Phil Vercoe, Dr Ian Williams, Dr Hayley Norman (CSIRO) and Dr Kelly Pearce (Murdoch University). Her research is supported by UWA, CSIRO and Future Farm Industries CRC.

"Feeding saltbush, a native shrub used to revegetate areas of dryland salinity, can provide a good dietary source of Vitamin E, which can then help reduce the unsightly browning of meat that can occur if animals are deficient in Vitamin E," Ms Fancote said.

Jo Elliott, who researched pigs during her first class honours in Agricultural Science at UWA in 2007, is now completing a PhD on why producers choose certain types of lamb survival strategies.

Her PhD supervisors are Associate Professor Dominque Blache, Professor Julie Lee and Assistant Professor Jo Sneddon. Her research is funded by UWA and the Sheep Research CRC.

One of Ms Elliott's conclusions is that minimising ewe and lamb disturbance at lambing and maximising feed availability was the most commonly used strategy.

Noraini Md Jaafar, from Universiti Putra Malaysia and sponsored by the Malaysian Government for her UWA PhD in the School of Earth and Environment, is assessing how biochar, a stable form of charcoal increasingly popular as a soil conditioner and in carbon sequestration, influences soil micro-organisms.

Her PhD supervisors are Winthrop Professor Lyn Abbott, Associate Professor Peta Clode and Associate Professor Daniel Murphy.

"Knowing more about how different types of biochars can affect the survival and activity of micro-organisms should help its practical applications in farming systems," she said.

Already, her research has noted that the type of biochar mainly affects microbial biomass.

continued on page 16

Director's column

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

Global investment in agricultural research, education and development has decreased over the past two decades and is directly linked to the decline in agricultural productivity.

In Australia investment in agricultural Research and Development (R&D) has fallen from a peak in the 1970s of 5% of gross value of production to 3% in 2007. Future gains in Australian agricultural productivity are at greater risk without significant increase in R&D investment in the near future.

While The UWA Institute of Agriculture's (UWA IOA) activities have been diverse, there is a key theme which has underpinned all our activities: the fostering of collaboration (with internal and external partners), in the recognition, that in order to address global and regional challenges successfully, we need an inclusive approach and combine our respective expertise and resources to make best use of them.

More and more institutions and countries are sharing this approach, as reflected by the high number of visiting scientists (see also page 18) currently working at UWA IOA, to gain from our expertise and share their own.

The value placed on collaboration and outreach was also evident during my recent visits to Vietnam, Germany, Jordan and Singapore, where the respective governments, research and teaching institutions and funding agencies, have made available significant resources (see also pages 5 and 13) to enable best research and education. The likely success of such ventures is clearly foreshadowed by stories such as Iraqi student at UWA, Mr Doraid Amanoel (see also page 15).

On research and commercial fronts, the phenomenal success of collaboration and of pooling resources has been highlighted in three of our ventures: the recent launch of joint CSIRO-UWA Plant Molecular and Crop Genomics Laboratory (see also page 7), the joint UWA-CSIRO Animal Production Laboratory and also the well-established private-public partnership of Canola Breeders (see also page 13).

Advances in science and technology will play a significant role in meeting the challenges of climate change, resource use efficiency and food security. The 2011 Postgraduate Showcase 'Frontiers in Agriculture' (see cover story) further illustrates the wide range of disciplines which can train our students to advance agriculture and the food production systems and reflects the growing popularity and interest in agricultural science and related areas among our brightest students.

The remainder of the year presents further opportunities for UWA IOA to continue to raise the profile of agriculture and related areas: We will be at the Dowerin Field Days on 24-25 August and at the UWA Future Farm Open Day on 18 October (see page 20) and hope you are able to join us at these events.

Chinese visiting weed scientist at UWA

Dr Mei Li (mei.li@uwa.edu.au)

Dr Mei Li, a herbicide and weed management specialist joined UWA's Australian Herbicide Resistance Initiative (AHRI) in February this year as a visiting academic from the Institute of Plant Protection at Shandong Academy of Agricultural Sciences, China. Dr Li is an experienced researcher and in China she leads a group in herbicide resistance and weed management. At AHRI, she will be working for a year on herbicide resistance mechanisms and fitness cost in wild radish supervised by Associate Professor Qin Yu and Winthrop Professor Stephen Powles.

Dr Li is fully funded by the Chinese Government. Her work and training at AHRI will benefit both China and Australia in the quest for better understanding and management of herbicide resistance.

Dr Mei Li

Young Dutch scientist joins UWA Institute of Agriculture

Dr Lars Kamphuis (lars.kamphuis@csiro.au)

Dr Lars Kamphuis (Photo: Hayley Casarotto)

Postdoctoral Fellow Dr Lars Kamphuis joined The UWA Institute of Agriculture in January this year in a joint appointment with CSIRO Plant Industry. Dr Kamphuis is based at the new CSIRO-UWA joint Laboratory for Molecular Plant Pathology and Crop Genomics in Floreat (see also page 7).

Following a Masters degree in Plant Breeding and Crop Protection from Wageningen University in the Netherlands, Dr Kamphuis completed his PhD with the Australian Centre for Necrotrophic Fungal Pathogens in Molecular Plant Pathology.

His postdoctoral career started with CSIRO Plant Industry in 2007, where he was the recipient of an Office of the Chief (OCE) – postdoctoral fellowship working on plant sap-sucking insect interactions. His current research activities include the genome sequencing of the narrow-leafed lupin, where the main focus is on rapid acceleration of the of marker discovery process and on identifying candidate genes for agronomic traits such as drought tolerance and disease resistance. Besides the lupin project Dr Kamphuis continues to work on plant-aphid interactions, to gain an in depth understanding of effective plant resistance mechanisms in order to generate stable resistance to these destructive pests.

Awards pave the way for UWA's Young Professionals in Agriculture

Three UWA students scooped the top three prizes at this year's Agricultural Science and Technology, WA, Young Professionals in Agriculture Forum.

Alana Shedley, a UWA Honours graduate in Soil Science claimed the top award at this year's Young Professionals in Agriculture Forum, ahead of fellow UWA graduates Rebecca Wallis (second prize) and Lizzy Lowe (third prize).

Participants were asked to submit an overview of their final year project objectives. The finalists then prepared a 3,000 word paper and delivered a 15 minute presentation.

Ms Shedley was awarded first prize for her work on nitrogen and phosphorus availability in soils under eucalyptus mallee belts and adjacent agricultural alleys in the Wheatbelt.

She is currently working as a sustainable agriculture project officer with the South West Catchments Council. "Winning the award has definitely opened doors for me within the organisation and given me a lot of freedom. Since my win, I have initiated three research projects and this has made my work even more interesting," says an enthusiastic Ms Shedley.

The research of second prize winner, Ms Rebecca Wallis, focused on the acceptability of native Australian shrub, *Rhagodia preissii*, as forage for sheep. Rebecca is now working at the Department of Agriculture and Food, Western Australia, in the sheep industries team in South Perth, and says: "While this wasn't a direct result of winning the award, it was helped along by some people I met on the day of the presentations. I did get a lot of media coverage by winning this award and I very much enjoy working in the industry and think my hard work at uni has finally paid off!"

Third prize and award for best presentation went to Ms Lizzy Lowe, who graduated in 2010 with first class honours in Zoology, examining the differences in genetic diversity and immunity of feral and managed honey bees. Reflecting on her award, Ms Lowe has a message for other students:

Agriculture and Food Minister Terry Redman with award winners Lizzy Lowe, Alana Shedley and Rebecca Wallis.

"The agriculture award has made me realise how important it is to be involved with different organisations in order to see the full impact of your work, as before preparing for the award I was not primarily focused on the impacts of beekeeping on agriculture."

WA Agriculture and Food Minister Terry Redman presented the awards and congratulated the recipients and all the participants for their hard work, enthusiasm and passion for food and agriculture.

Agricultural innovation in Iraq through GIS and Remote Sensing training at UWA

Assistant Professor Bryan Boruff (bryan.boruff@uwa.edu.au)

Iraqi GIS trainees with Australian colleagues at UWA Sunken Garden.

In June this year, UWA's School of Earth and Environment and The UWA Institute of Agriculture (IOA) hosted twenty trainees from the Directorate of Agriculture in Iraq over a four week period. The trainees came from different parts of Iraq. The group was engaged in Geographic Information Systems (GIS) and Remote Sensing Training, focused on agricultural and natural resource management applications.

Assistant Professor Bryan Boruff, Dr Ahmed Ali, Dr Natasha Pauli and Mr Nick Middleton coordinated, translated and delivered the unit under the Iraq Partnership Facility, Coffey International Development, funded by AusAID.

The group's training focused on the fundamentals of GIS and Remote Sensing, highlighting applications in agriculture relevant to Iraq with case studies from Western Australia. The course consisted of a series of lectures and practical training highlighting the concepts underlying spatial analysis. It also included examples from experts in the field and intensive computer-based training. The course covered a range of topics important for projects incorporating spatial analysis, including sample design, field data collection, data integration, model development and validation.

During their stay the delegates spent two days at the UWA Future Farm in Pingelly examining the farm's surface hydrology and soils, concluding in a full day of soil sampling. Georeferencing of collected field data allowed for the examination of soil characteristics in relation to a variety of geospatial information including topography and remotely sensed imagery. Other field experiences included a tour of the SP Hay facility in Brookton and an introduction to precision agriculture.

Whilst participants agreed that the training was intensive, field trips to Caversham Wildlife Park, Kings Park, AQWA and a boat trip to Fremantle exposed the delegates to the more enjoyable aspects of our city. Overall the course was very well received and participants expressed a desire to return for an advanced training course in the future.

Winthrop Professor Kadambot Siddique said: "The UWA Institute of Agriculture has been actively involved for sometime now in capacity building, research and development of agriculture in Iraq as reflected in three previous short term training programs, in postgraduate training of 13 Master of Science students currently enrolled at UWA and in UWA IOA's involvement in a large conservation agriculture project funded by the Australian Centre for International Agriculture Research and AusAID."

Winning combination – Lanzhou University and UWA forge ahead in world-class project

During a recent visit, the president of Lanzhou University (LZU), Professor Zhou Xuhong, has led a delegation to The University of Western Australia (UWA) as the two institutions combine forces in a world-class land, agriculture and environment project funded by the Chinese Government.

LZU is one of the top 10 universities in China and plays a leading role in agricultural and environmental education, as well as in research in dry and cold environments in the Gansu Province.

In 2007 LZU, in partnership with UWA, received funding from the Chinese Department of Education (CDE) for the 111 project which aims to invite 1,000 world-class academics from the world's top 100 universities to establish 100 innovative research bases in China.

The project has three main aims:

- to provide training for researchers and post-graduate students in specific fields of study, namely environmental characterisation of dry and cold eco-systems;
- to develop improved crop and pasture production technologies and animal husbandry practices; and
- to develop long-term strategies to adapt to climate change, using western China as a model.

During the recent visit to UWA Professor Zhou Xuhong and his colleagues have agreed to work with UWA to apply for funding for the second phase of the 111 project for another five years.

Another initiative under this project is to forge research links with the UWA Future Farm 2050 at Pingelly, since LZU is currently considering setting up a similar farm in the Gansu province.

Furthermore, a joint proposal is currently being developed by The UWA Institute of Agriculture and the LZU Key Laboratory of Arid and Grassland Ecology. The proposal aims to improve the water use efficiency of rainfed and irrigated farming systems in the arid and semi-arid regions of north-west China.

Other areas of collaboration include: establishing a joint laboratory in dryland agriculture and eco-system; undergraduate student exchange and articulation programs in selected areas; PhD student exchange and joint supervision; English language training for selected high achieving students from LZU; short term training of senior executive staff from LZU at UWA; joint publications and focused workshops to enhance scientific excellence and research links.

RESEARCH AND INDUSTRY RECOGNITION

Assistant Professor Marit Kragt

AARES Travelling North award (to provide young agricultural and resource economists with an opportunity for professional and personal development and international exchange)

Winthrop Professor Kadambot Siddique

Member of the Order of Australia
(see also page 10)

Associate Professor Dominique Blache

Perth Convention Bureau Professional Development Award (to attend the International Conference of the Global Consortium of Higher Education and Research for Agriculture in France)

Vietnam visit attracts postgraduate students to UWA

Ms Janine Tinley (janine.tinley@uwa.edu.au)

A change in AusAID scholarship rules and procedures combined with a recent visit to Vietnam by representatives from The UWA Institute of Agriculture and International Office has generated an increased level of interest in postgraduate courses at UWA from prospective scholarship holders.

Under Australia's aid strategy for Vietnam, up to 250 Australian Development Scholarships, including the Australian Leadership Award Scholarships (ADS/ALAS) are available this year for postgraduate study in Australia starting from 2012.

The AusAID Vietnam country program estimate for 2010/2011 is $96 million.

The three key areas targeted are human resource development, economic integration and environmental sustainability.

In a new move, candidates apply for both ADS and ALAS awards through one selection process and do not need to submit a university 'Letter of Offer' at application.

Ms Janine Tinley, Project Officer for the UWA International Sponsored Students Unit, and Winthrop Professor Kadambot Siddique, Chair in Agriculture and Director of The UWA Institute of Agriculture (IOA) were there to field questions from a large number of current and prospective scholarship applicants.

Reflecting on the ADS events Ms Tinley notes: "The most popular area of interest for the ADS applicants we met in Hanoi was for Science, particularly specialisations within natural and agricultural sciences. Professor Siddique's academic presence was a major draw-card for these prospective students. His expert knowledge and experience was highly beneficial in counseling the students to find the correct pathway for their interests and highlighting the current scientific projects and achievements at UWA. Professor Siddique's experience supervising research students and his extensive academic network at UWA helped match students with potential supervisors, which is crucial to the success of a student's research application."

Ms Tinley and Professor Siddique found the students they met in Hanoi focused and of a high academic standard, but all needing further English training. English Language competency requirement created a problem for a number of otherwise suitable candidates: funding by the Australian Scholarships for Development in Vietnam (ASDiV) for English language tuition prior to commencement of the degree program is limited to seven months, and those students who do not meet the minimum requirements either have to pay for further English tuition themselves or source alternative funding and defer commencement of their degree program.

Ms Janine Tinley ready to answer questios from propective students.

To meet the ADS eligibility criteria applicants must have at least two years' work experience and belong to one of three profile groups:

- government officials/development workers or
- disadvantaged persons (ethnic minorities, persons from designated poor rural areas and persons with disabilities) or
- tertiary lecturers and researchers.

The strong focus on these profile groups also led Professor Siddique to explore new opportunities for future collaboration between UWA and the Vietnamese Ministry of Agriculture and Rural Development (MARD).

In a meeting with Deputy Director General, Mr Tran Kim Long, he established that overseas Masters and PhD programs can be offered to Ministry staff for professional development purposes, provided top up funding for the scholarship can be arranged.

They also exchanged ideas about a potential joint development proposal between the Ministry of Education and Training, Ministry of Agriculture and Rural Development and UWA. Professor Siddique invited the Director and Deputy Director to visit the UWA Institute of Agriculture in the near future.

The prospective students for this period include 138 current ADS candidates undertaking English Language training in Vietnam, who will commence studies in Australia in Semester 1, 2012, and prospective scholarship candidates planning to apply in 2011, to start studies in 2012 or in Semester 1, 2013.

Dr Frederick Obese

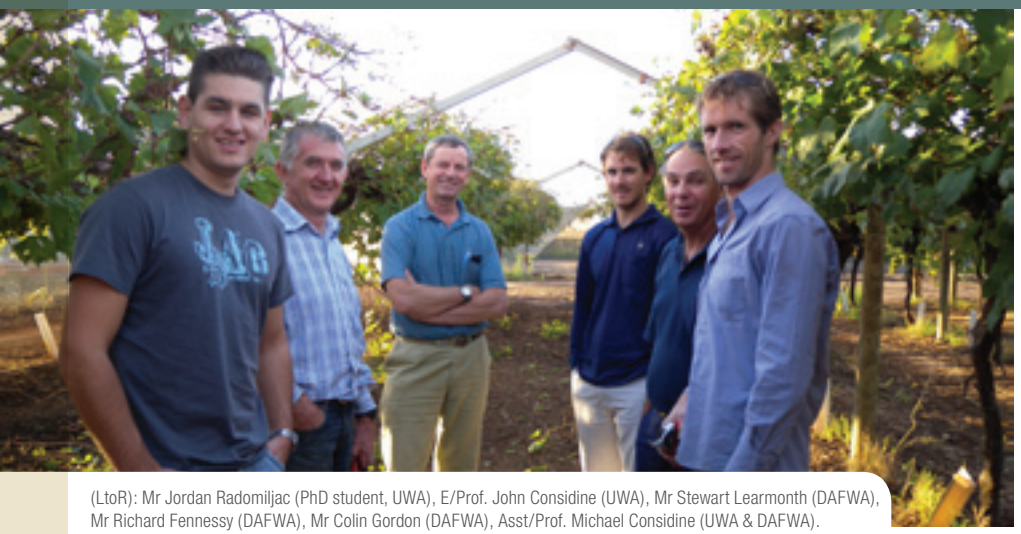
Ghana scientist visits School of Animal Biology

Dr Frederick Obese (fyobese@yahoo.com)

Dr Frederick Obese, a senior lecturer from the Department of Animal Science at the University of Ghana, is on a 6-week scientific visit at UWA's School of Animal Biology, under a Crawford Fund Training Award. Working with Winthrop Professor Graeme Martin and his team, Dr Obese hopes to increase his knowledge and insight about the measurement of hormones and metabolites playing key roles in energy homeostasis and reproduction in cattle.

He completed a Bachelor of Science (Agriculture) and a Master in Animal Science in his home country Ghana, followed by a PhD in Animal Science from the University of Melbourne in 2004. From 2004-2006 he was a Postdoctoral Fellow at the Department of Anatomy, Physiology and Pharmacology, College of Veterinary Medicine, Auburn University, Alabama, USA, and worked in the area of neuropeptides in appetite regulation and metabolism in sheep.

At UWA he will also participate in the team's discussions and practical processes in the area of nutrition–reproduction interactions in ruminants. UWA and University of Ghana have a Memorandum of Understanding (MoU) and ongoing collaboration including one staff member currently undertaking PhD studies within the School of Agricultural and Resource Economics, fully funded by UWA.



(LtoR): Mr Jordan Radomiljac (PhD student, UWA), E/Prof. John Considine (UWA), Mr Stewart Learmonth (DAFWA), Mr Richard Fennessy (DAFWA), Mr Colin Gordon (DAFWA), Asst/Prof. Michael Considine (UWA & DAFWA).

Safer alternatives for sulfur preservatives

Assistant Professor Michael Considine (michael.considine@uwa.edu.au)

New research has revealed that sulfur activates innate defences in grape berries which opens the door for future technologies providing safer alternatives to sulfur preservatives.

The grape and wine industries have been heavily reliant on sulfur and sulfite preservatives since Roman times, despite the fact that the use of sulfur dioxide/sulfites is banned for all other fresh produce.

In joint research, Assistant Professor Michael Considine at UWA's School of Plant Biology, and colleagues from the Australian Research Council (ARC) Centre of Excellence in Plant Energy Biology at UWA, and from the Department of Agriculture and Food WA (DAFWA) are using the preservative against itself to help find safer alternatives. The research is supported by an ARC Linkage Project.

The researchers have demonstrated that the preservative effect of sulfur dioxide may be a combination of two distinct attributes, whereas up to now, it has always been presumed that sulfite acts only on the pathogen. They discovered, that sulfur dioxide also activates innate defences in the grape berry which may contribute substantially to the berry's post-harvest longevity. This will direct future research towards safer alternatives, which also activate the berry's innate defences.

"Sulfur dioxide is a pungent gas with known ill-health effects," says Assistant Professor Considine. "In the 1990s, a joint World Health Organisation/Food and Agriculture Organisation committee banned the use of sulfur dioxide/sulfites on fresh produce; this has since been enforced by legislation worldwide, with one exception: table grapes."

As he points out: "Grapes are susceptible to a plethora of diverse pathogens throughout the ripening period and particularly post-harvest. No other preservative acts against such a broad spectrum of pathogens, which may explain why the use of sulfur dioxide is not banned in wine or other preserved food."

Aside from the ill-health risks for humans, sulfites also have adverse effect on plants: "They attack key regulatory proteins, enzymes and lipids, leading to decline in photosynthesis and growth – even at levels of sulfite far below the legal limit for commercially grown table grapes," explains Assistant Professor Considine. "Reduction/oxidation (redox) processes are particularly affected, including antioxidants."

But it is not all bad news: Sulfur is a key component of defence compounds in plants and animals, and here is where the new research comes in: "While plants have developed many inducible defence mechanisms to cope with biotic and abiotic stress, to date no research has linked sulfite to the development of induced defences."

The question which therefore arose for the research team was this: Since sulfite affects redox metabolism, is it possible that it induces a tolerance response in the grape berry that contributes to resistance towards pathogen infection?

Using a transcriptomic approach, the team explored the changes in defence metabolism in grape berries in response to sulfur dioxide.

Their results confirmed that redox poise is altered dramatically by SO_2 treatment and indicated a broad perturbation of metabolic processes consistent with a large scale, long-term cellular response to oxidative stress.

These findings represent an important milestone and may be a turning point in the quest for a safer alternative to sulfites, as the research focus shifts to encompass a preservative's effects on a plant's innate defences. The direction of this research will now turn to the potential of other oxidative agents, such as UV-B and ozone, which was recently commercially developed for strawberry preservation.

Quest to make farmer groups in India more efficient

Professor Rajinder Kaur Kalra (rajinderkaurkalra@yahoo.com)

Professor Kalra has joined The UWA Institute of Agriculture to work with Winthrop Professor Kadambot Siddique and Professor Matthew Tonts on a six month Australian Endeavour Research Fellowship. Her project focuses on farmer-led self-help initiatives in northern India and through her case studies she hopes to identify strategies that can be used by other (self-help) farmer groups to improve agricultural productivity, profitability and sustainability.

Her project ties in with the Indian government's extension programs to assist both large-scale and small-scale farmers. Professor Kalra explains what attracted her to this project: "Historically extension programs in India were designed at national level and handed down from the top, but in the 1990s this changed and a participatory approach has been adopted since."

Her project examines both large farmer-initiatives which operate at state level and focus predominantly on economic development, and smaller self-help groups at local level, which focus primarily on social development through strategies like value-adding through home-processing.

"More than 80% of farmers in India own less than two hectares of land, so the effectiveness of small self-help farming initiatives is equally important to the well-being of the nation as a whole, as the large farming initiatives," explains Professor Kalra.

Professor Kalra's home institution is the Punjab Agricultural University (PAU), in northern India, where she teaches and researches within the Department of Extension Education. UWA and PAU signed a Memorandum of Agreement (MoU) in 2008 and have a number of collaborative research projects on chickpea and canola. Several students from PAU have completed their PhD studies at UWA successfully in recent years.

Prof. Rajinder Kaur Kalra

Photo: Hayley Casarotto

Front (LtoR): Dr Alistar Robertson (CSIRO), W/Prof. Alan Robson (UWA), Dr Jeremy Burdon (CSIRO). Back (LtoR): W/Prof. Kadambot Siddique (UWA), Dr Rob Delane (DAFWA), W/Prof. Tony O'Donnell (UWA), W/Prof. Karam Singh (CSIRO-UWA).

CSIRO-UWA joint research in molecular plant pathology and crop genomics

Winthrop Professor Karam Singh (karam.singh@uwa.edu.au)

A new CSIRO-UWA Crop Genomics Laboratory was officially opened on 4 May, providing a state-of-the-art agricultural research facility for molecular plant pathology and genomic research in Western Australia.

This laboratory is the latest milestone in a long-term and successful partnership between The University of Western Australia (UWA) and CSIRO Plant Industry.

Winthrop Professor Alan Robson, Vice-Chancellor of UWA, said in his opening address: "Our University is very pleased to be associated with CSIRO's Plant Industry Division – a division that is promoting profitable and sustainable agrifood, fibre and horticultural industries; developing new plant products; and improving natural resource management through world-leading research. I was particularly impressed by the division's strengths in crop genomics and plant–biotic interactions."

The new laboratory is home to an internationally renowned research team, with three scientists jointly funded by CSIRO and UWA, namely teamleader Winthrop Professor Karam Singh, Assistant Reserarch Professor Jonathan Anderson and Post-Doctoral Fellow Lars Kamphuis (see also page 2).

The group brings together expertise in the regulation of gene expression, plant genetics, genomics, molecular biology, microbiology and bioinformatics.

One key research focus is on legumes, in particular the pre-breeding of better and more disease-resistant legume crops in Australia.

"Legumes are vitally important for sustainable cropping through their unique ability to fix nitrogen," explains Professor Singh. "This ability reduces the requirement of expensive fertilisers – not only for the legume crop being grown but, by enriching the soil, for the cereal or oilseed crops that follow.

Furthermore, legumes serve as valuable disease breaks and they are vitally important as fodder for livestock and provide key sources of protein for both humans and animals."

Over the past decade, Professor Singh and his colleagues have made a major contribution to the (pre-)breeding of legumes with increased resistance to disease. They have developed world-leading projects analysing plant defence in legumes, such as soil-borne fungal pathogens and insect pests.

More recently, Professor Singh and his co-researchers have been able to translate their growing expertise in legume genomics to initiate projects which examine the lupin grain and its potential benefits for human health.

Medical research has linked the lupin grain increasingly to 'diabesity', the term used to describe research into the effects of obesity and diabetes.

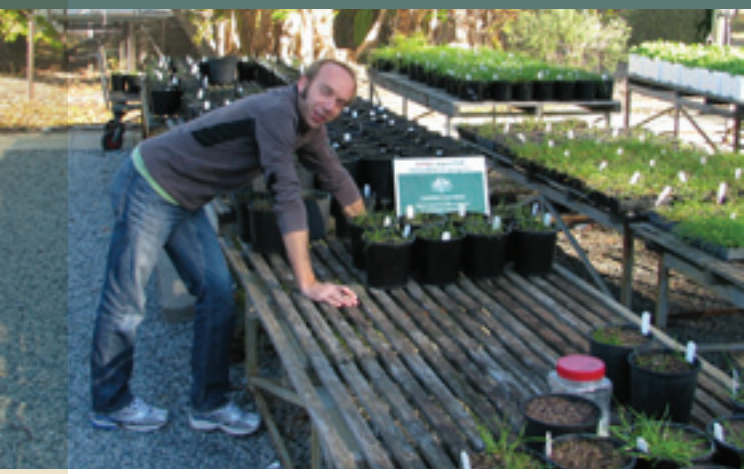
With substantial funding from the Grains Research Development Corporation (GRDC), Professor Singh and his colleagues work on sequencing the narrow-leaf lupin genome – the first major plant genome sequencing project to be led from Australia – with a major focus on the lupin grain and its role in diabesity.

"We have already identified lupin genes which may help reduce the risk of developing diabetes and obesity in humans," says Professor Singh.

Much of this work has taken place though their involvement with the Centre for Food and Genomic Medicine in partnership with leading medical, food and plant/agricultural scientists from various WA research organisations.

"This project will open up a host of new research and breeding opportunities for this important crop, which a few years ago we would only have been able to dream about," concludes Professor Singh.

The laboratory is fully equipped for molecular biology and genomic research with state-of-the-art instruments, including a fluid handling robotics station, a real time polymerase chain reaction, a highly sensitive imaging system and fluorescence microscopy. It also has excellent plant monitoring facilities including temperature controlled growth rooms and a quarantine microbiology facility.



Roberto's race…
… against rapid herbicide resistance

Dr Roberto Busi (roberto.busi@uwa.edu.au)

In a race against the clock, Dr Roberto Busi and his colleagues work to help make herbicides effective for longer and minimise the adverse impacts of herbicide resistance in weeds.

Australian agriculture is at risk because of the evolution of herbicide-resistant weeds. Ryegrass is ubiquitous in the southern Australian cropping regions and it is the most troublesome and damaging weed of Australian crops.

In a new, pro-active approach Dr Roberto Busi and his colleagues at UWA's Australian Herbicide Resistance Initiative (AHRI) are studying herbicides *before* weeds develop resistance. This includes the study of resistance evolution to herbicides recently introduced into the market, or even before their commercial release.

"Herbicides to control ryegrass have been around for more than thirty years, but unfortunately some of them have become redundant, as ryegrass plants have developed resistance against them," says Dr Busi.

Historically, research into this problem has been re-active, commencing *after* resistance has developed. Adopting a pro-active focus, Dr Busi has conducted experiments and field research with new herbicides – *before* the onset of any resistance – especially focusing on the adverse evolutionary consequences of use of low herbicide doses (below the recommended label rate).

According to Dr Busi, the speed at which this threat occurs is concerning: **"**Herbicide resistance is a great example of rapid evolution. If we compare herbicide resistance evolution with classic examples of Darwinian evolution it is like comparing a 100m sprint to a 42.2 km marathon. The WA grain belt is a great laboratory to study herbicide resistance evolution."

At AHRI, Dr Busi's work on the evolution of herbicide resistance induced by low-dose herbicide use, has made a significant contribution to the Australian cropping industry, particularly by warning about the detrimental use of cut herbicide rates in the attempt to minimise herbicide resistance and prolong the life of future herbicides. Major funding for this work has come from the Grains Research & Development Corporation (GRDC) and – more recently – from the Rural Industries Research and Development Corporation (RIRDC) to study the 'sustainability of wheat-selective pre-emergent herbicides in a changing climate' (see also page 17).

"Hopefully, my work will improve the profitability and sustainability of the cropping industry and provide benefits to Australian agriculture," concludes an inspired Dr Busi.

External Advisory Board assessed the progress of The UWA Institute of Agriculture

At its March meeting of The UWA Institute of Agriculture's External Advisory Board (EAB), members were delighted with the progress of UWA IOA projects, activities and developments.

Winthrop Professor Graeme Martin provided an update on UWA's Future Farm project, aimed at establishing a farm that fits the ideal envisaged for 2050. Food production must be 'clean, green and ethical' and the enterprise must be economically self-sustaining and also make a positive contribution to the local community.

The project will also serve as a major link between research and industry and between UWA and the rural community, reconnecting city inhabitants to the site of food production.

The Future Farm will be accessible to the public and interest groups on the 'Big Day Out' Open Day (see also page 20), and provide hands-on demonstrations on how project goals were achieved. To facilitate links between research and industry and communication on a national and international scale, a website is being developed. The website will also to report on the status of the project and serve to establish links with similar projects overseas. An automated weather station is already in operation and accessible via the website, www.ioa.uwa.edu.au/research/future-farm.

Winthrop Professor Karam Singh reported on the highly successful CSIRO-UWA Initiative in Plant and Crop Genomics, which recently led to the creation of a brand new research laboratory jointly funded by CSIRO and UWA (see also page 7).

Research Director and Winthrop Professor Wallace Cowling delivered a presentation on the 'Operation of a Public-Private Model of Crop Breeding in the UWA Environment' (see also page 13), based on his involvement with the company 'Canola Breeders' which is comprised of four partners: UWA, Grains Research Development Corporation (GRDC), Council of Grain Grower Organisations Ltd (COGGO) and NPZ (a canola breeding company based in Germany with operations in Europe and Canada).

Board members learned that the success of the company is based on its technical excellence, which has been stimulated by the UWA research environment. Benefits flow both ways in this public-private model of plant breeding.

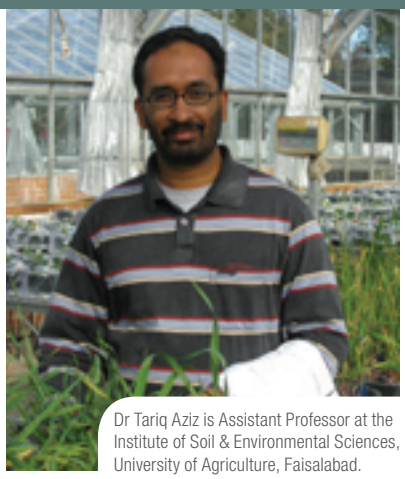
Winthrop Professor Kadambot Siddique briefed members on the achievements made by UWA IOA during the reporting period. The next EAB meeting will be held on 30 September this year.

The EAB provides UWA IOA with industry feedback on agricultural industry needs and issues, and provides independent advice to the Director on policy and direction.

(From left): Mr David Fienberg (CBH Group), W/Prof. Kadambot Siddique (UWA IOA Director), Mr Bruce Piper (Chairman of EAB and COGGO), Mr Andrew Ritchie (AAAC) and Dr Jim Fortune (Agricultural Consultant).

Study of phosphorus efficiency in plants strengthens collaboration between UWA and Pakistan

Dr Tariq Aziz (draziz@uaf.edu.pk)



Dr Tariq Aziz is Assistant Professor at the Institute of Soil & Environmental Sciences, University of Agriculture, Faisalabad.

Similar climate and soil problems in Pakistan and Australia have lured Dr Tariq Aziz from the University of Agriculture, Faisalabad (UAF) in Pakistan to join UWA's School of Plant Biology, under a postdoctoral fellowship funded by Pakistan's Higher Education Commission (HEC) for young scientists.

Dr Aziz has joined Winthrop Professor Hans Lambers' and Associate Professor Megan Ryan's groups and works on a research project aimed at increasing phosphorus (P) efficiency in agriculture, as more than 90% of all soils of Pakistan are deficient in available phosphorus.

Salinity, drought, nutrient deficiency, and in particular phosphorus deficiency are problems common to both countries. As addition of P fertilisers is not a viable option (in Pakistan) due to low P-use efficiency, high prices, fear of depletion of rock phosphate reserves and environmental issues, Dr Aziz's project focuses on exploring the mechanisms which native plants have adopted to cope with P deficiency in soil. He is particularly interested in *Ptilotus* (an Australian genus) as it has the unique ability to maintain its growth at both low and high P.

"Very little is known about these native species, so identifying coping mechanisms in these species – such as reduction in growth, changes in root morphology, release of carboxylates, metabolic adjustments and P-responsive gene expression – can help breeders and biotechnologists to produce crops for both low and high P areas," says Dr Aziz.

Besides this project, Dr Aziz is also working in a collaborative study with Associate Professor Patrick Finnegan and Dr Ricarda Jost, on differential expression of genes encoding P transporters in two wheat cultivars under P deficiency. This project will generate a genetic marker for large-scale screening of wheat germplasm for P efficiency.

"The School of Plant Biology has a very friendly and cooperative environment and I am really enjoying my stay and research at UWA," says Dr Aziz. "In addition to its excellence in research, I have been inspired by the school's student summer school, weekly seminars and student teacher interactions and I will try to introduce them at my university."

Dr Aziz's project will strengthen further the ties between UWA and UAF. The two universities have already signed a Memorandum of Agreement (MoU) and five faculty members are currently undertaking their PhD studies at UWA.

UWA student of Agriculture an investment

Matthew Rowbottom, currently in his first year of a Bachelor of Agricultural Science degree at UWA, claimed one of eight studentships awarded under this year's 'Investing in Youth Studentship' program.

Applicants are selected on the basis of their commitment to primary industries and to a career in this field. In Mathew's case, this took the form of two gap years after high school, during which he gained exposure to a range of agricultural enterprises, both in Australia and the United Kingdom.

Matthew Rowbottom

His interest in science and agriculture however, started well before then: During his final year at high school Mathew participated in the Primary Industry Science Education (PICSE) program, the Siemens Science Experience and was part of the CSIRO Science Leadership program.

Matthew's career ambitions lie in the broad area of agronomy and plant and soil science. "I would really like to be able to make a contribution that will help farmers achieve highly productive and sustainable farming practices."

The 'Investing in Youth Studentship' program is a collaborative effort across industry and government to attract undergraduate students to the rural sector. It provides participants with financial support, a mentor and industry placements for up to four years.

Canadians inspired by contemporary Australian crop research system

Prof. Richard Gray and his PhD student Ms Katarzyna Bolek

Canadian visitors to The UWA Institute of Agriculture are confident that their research of the contemporary Australian crop research system willl help advance the Canadian grain industry.

Professor Richard Gray, an agricultural economist and his PhD student Ms Katarzyna Bolek, from the University of Saskatchewan, Canada, recently visited Winthrop Professor Kadambot Siddique and several faculty staff at The UWA Institute of Agriculture. They had extensive discussions on Australia's grains industry, especially crop improvement, with Professor Siddique.

Professor Gray is undertaking a study for the Western (Canadian) Grains Research Foundation examining the key features of the Australian crop research system, including the Australian Grains Research Development Corporation (GRDC) and the end-point royalty system. Professor Gray is particularly interested in how the current institutions were created, how they evolved over time, how well they currently function, and what issues and challenges lie ahead.

Ms Bolek's PhD dissertation will explore the commercialisation of wheat breeding in Australia, including the operations of InterGrain, and the dynamic pricing of end point royalties.

During their one-month visit in WA, the pair interviewed Professors Wallace Cowling, Ross Kingwell, Robert Lindner, Stephen Powles, Kadambot Siddique, as well as a contingent of current and former employees of DAFWA and InterGrain. Professor Gray believes that the system in Australia has addressed some of the major challenges in funding crop research creatively, and hopes to take home some important lessons for Canada.

New high school (TER) courses in agriculture

Emeritus Professor Marcus Blacklow
(marcus.blacklow@bigpond.com)

Surveys by the Grains Research and Development Corporation (GRDC) in 2006 noted a strong decline in undergraduate students interested in agricultural sciences, as well as a shortage of postgraduate students. Furthermore, the surveys observed that 'scholarships and positions were not filled' and concluded that this state of affairs had adverse implications for ongoing research and development.

This trend could be counteracted by the recent introduction of two new courses in agriculture for study at high schools and colleges. The new courses are 'Animal Production Systems ' (APS) and 'Plant Production Systems' (PPS). The syllabi of the new courses cover the range from 'Preliminary Courses' through to Stages 2 and 3 for study in years 11 and 12.

Assessment of the Stage 2 and 3 courses consists of a school-based component (50%) and an external exam (50%), set by the Curriculum Council of Western Australia. The Stage 2 and 3 results can be used in the calculation of a tertiary entrance score and ranking (ATAR). Hence, the levels of difficulty of the courses in agriculture are designed to be equivalent to comparable courses such as 'Biological Sciences' and 'Earth and Environmental Science'.

Both new courses share a similar structure and embrace a student-centred learning approach. In addition, they both emphasise that production takes place in landscapes and that sustainability criteria need to be met in order to satisfy the 'triple bottom line' of economic, environmental and social criteria.

This means, that all students participate in the theory and practice of the 'Management of selected enterprises for sustainability'.

The syllabus-structure of the new courses is shown below:

- Knowledge foundations
- Systems ecology
- Plant structure and function (Animal anatomy and physiology)
- Environment (including nutrition and water)
- Protection (pests, diseases, weeds)
- Improvement
- Economics and markets
- Requirements for sustainable production
- Improving knowledge, skills and practices through investigation and communication
- Management of selected enterprises for sustainability
- Select and produce for purpose
- Budgets and finance
- Nutrition and water
- Insects, diseases and weeds.

UWA's Faculty of Natural and Agricultural Sciences held an information evening for Year 11 students and their parents in late 2010 to promote these new opportunities and to strengthen the interface between secondary and tertiary courses in agriculture.

The evening proved popular with students and parents alike and generated substantial interest in related tertiary courses.

The syllabi for the new secondary courses in Animal Production Systems (APS) and Plant Production Systems (PPS) can be accessed via: www.curriculum.wa.edu.au/internet/Senior_Secondary/Courses/WACE_Courses.

Royal honours to the director

Director of The UWA Institute of Agriculture and Chair in Agriculture, Winthrop Professor Kadambot Siddique, in this year's Queen's Birthday honours list, became a member of the Order of Australia (AM). The citation recognised his lifetime's work in advancing agricultural science as an academic and researcher in the area of crop improvement and agronomy, including his contributions to professional associations. He is an international leader in crop science and is credited with the establishment and development of the pulse industry in Australia. In recent years he has expanded his academic role to assist in building capacity in agricultural science in Australia, southern Asia and other emerging economies.

"I am humbled and overwhelmed by this honour," he said of his award, "and would like to say a big thank you to my family and friends, colleagues, students and to the farming community for their encouragement and support throughout my career in agriculture in Australia."

In 2005 Professor Siddique was elected as a 'Fellow of the Australian Academy of Technological Sciences and Engineering' (FTSE). In 2009 he received a gold medal and citation from the former President of India, Dr A.P.J. Abdul Kalam, for his international contribution to pulse research and education. In 2001, Professor Siddique received the prestigious 'Urrbrae Memorial Award' for his contribution to Australian agricultural science and the industry.

Born in India, Professor Siddique moved to Australia with his wife in August 1981 and completed his PhD at UWA. In 1985 he joined the Department of Agriculture and Food, Western Australia (DAFWA) as a cereal crop physiologist and worked his way up to principal scientist and leader of DAFWA's Pulse Productivity Program. In 2001 he became the Director of UWA's Centre for Legumes in Mediterranean Agriculture (CLIMA) and remained in this position until 2006 when he was appointed to establish and lead The UWA Institute of Agriculture. Professor Siddique is also currently the Associate Dean, Research, at the Faculty of Natural and Agricultural Sciences at UWA.

WA BioGENEius Challenge opens doors for young WA semi-finalist

Ms Ully Fritsch (ully.fritsch@uwa.edu.au)

Thomas Gambuti

An outstanding research project on the salinity tolerance of messina legume pasture won Thomas Gambuti, then aged 14, a spot in the semi-finals in last year's WA BioGENEius Challenge.

The BioGENEius Challenge of Western Australia is an annual science competition where some of the top students from years 8-12 complete a research project of their own under the mentorship of an experienced scientist. The 'Challenge' aims to raise public awareness, especially among high school students and teachers, about biotechnology and to attract more students to a career in this field.

Thomas was matched to Dr Natasha Teakle from UWA's Centre for Ecohydrology and School of Plant Biology, whose expertise in salinity and waterlogging tolerance provided a 'perfect fit' for Thomas' research project.

"Growing up in Lake Grace I could see the problems with soil salinity and waterlogging right on my doorstep, so that's what got me interested in this," says Thomas.

With the encouragement from his science teacher at Shenton College, Mr Warwick Mathews, and the support of his mentor Dr Teakle, Thomas embarked on an applied project with a 'hands-on' approach that involved glasshouse experiments and molecular laboratory tests.

In a glasshouse experiment, Thomas investigated messina growing under four salinity and waterlogging treatments. He also looked at changes in DNA and identified some genes responsible for tolerance to salinity and waterlogging.

"Thomas is really good at laboratory work," confirms Dr Teakle, "and his applied method of investigation was definitely one of the factors that really impressed the judges," she explains. "Most of the other projects investigated processes at molecular or cell level only."

Another impressive feature of Thomas' success, is that he was only in Year 9 at the time and most fellow competitors were one or two years older. "When you consider that there are only ten semi-finalists from the entire state, Thomas definitely earned his spot among them," says Dr Teakle.

Since his success at the WA BioGENEius Challenge, Thomas has been a guest presenter at the 'Creative Science Competition' in China, and has attended the Singapore Science Festival on behalf of Shenton College.

"BioGENEius was the most exciting and challenging experience for me," says Thomas.

"The experiences and skills I have gained from working at UWA at such a level of research has changed me completely. It extended my understanding of science beyond my belief but it also taught me things like time management, dealing with success and failure, goal setting, interpersonal skills and many other valuable life skills. So I want to do BioGENEius this year again, and see how much further this activity can improve me on both an academic and on a personal level."

The international **BioGENEius Challenge** has run in the USA and Canada since 2002. Western Australia is the first region to participate outside North America. Each year, the two winners from WA will compete against finalists from the United States.

Iranian PhD student visits UWA

Morteza Hosseini Ghaffari is a visiting PhD student at UWA's School of Animal Biology where he works on a project under Dr Zoey Durmic and Professor Philip Vercoe looking at effects of *Tedera* (*Bituminaria bituminosa*) on Rumen Fermentation in *In Vitro* Batch Culture and Rusitec system.

Morteza's home university is Ferdowsi University of Mashhad (Iran) and his PhD research focuses on ruminant nutrition.

He completed a Master of Science degree and worked as a lecturer in Elmi Karbordi Isfahan University.

Upon completion of this project at UWA in September this year, Morteza will return to his home university and complete his PhD.

Morteza Hosseini Ghaffari

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AusAID Fellowship offers Argentinean scientist weed research and extension skills at UWA

An Australian Leadership Award (ALA) Fellowship has been awarded to visiting Argentinean researcher, Dr Martin Vila-Aiub to develop scientific and communication skills by working with the Australian Herbicide Resistance Initiative (AHRI), a dynamic research team based in the School of Plant Biology at UWA.

Dr Martin Vila-Aiub

Dr Vila-Aiub will train in different techniques to determine target site herbicide resistance mechanisms in the two most important weeds of Australia: *Lolium rigidum* and *Raphanus raphanistrum*. Using DNA extraction and nucleotide sequentation, Dr Vila-Aiub hopes to determine the existence of particular herbicide resistance genes and alleles in the mentioned plant species. These laboratory techniques are essential to determine the presence of herbicide resistance genes in agro-ecosystems.

Working closely with his Australian colleagues, Dr Vila-Aiub will also participate in group sessions and discussions in order to organise workshops and extension activities for farmers and agronomists. The AusAID Fellowship program aims to improve his ability to communicate scientific results and develop these skills by actively giving seminars and conferences to Australian audiences.

Dr Vila-Aiub was appointed Research Associate at the Institute for Agricultural Plant Physiology and Ecology (Buenos Aires, Argentina) in 2005. Since then he has developed an extensive research program on 'Herbicide Resistance Evolution in Plants'.

French connection at The UWA Institute of Agriculture

Dr Helen Bramley (helen.bramley@uwa.edu.au)

Can the small plant *Brachypodium distachyon* help unravel the complex mechanisms controlling water uptake in wheat?

Ms Younna Jiquel is investigating this possibility during her training at UWA. Younna, a Masters student from the University of Rennes (France), is undertaking a 4-month internship at The UWA Institute of Agriculture with Dr Helen Bramley, and in collaboration with Dr Cathie Colas des Francs Small (ARC Centre of Excellence, Plant Energy Biology). Dr Laurent Leport, Lecturer at the University of Rennes (former Post-doctoral Fellow at CLIMA) approached Winthrop Professor Kadambot Siddique to arrange the above placement for Younna.

Ms Younna Jiquel scrutinising her *Brachypodium distachyon* plants.

Younna is studying the hydraulic properties of *Brachypodium* and the genes that regulate production of water conducting proteins, called aquaporins.

Brachypodium's genome was recently sequenced and made publicly available by the International Brachypodium Initiative and because *Brachypodium* is a temperate grass species closely related to wheat, it is an ideal genetic model for wheat. Younna's research is targeting aquaporins that are involved in uptake and transport of water by roots. Given the challenges facing many wheat cropping regions in Australia with climate change, knowledge about mechanisms controlling water use is essential for adapting and developing new cultivars for the future.

'Monitoring Soil Science' project

Winthrop Professor Lyn Abbott (lynette.abbott@uwa.edu.au)

A global science education project seeks to establish innovative student-scientist partnerships through ongoing soil-based research. The project is a soil science teaching resource which aims to expand knowledge of soil among teachers, school students and other interest groups to create an international network of soil science enthusiasts.

The project was initiated by WA's Chief Scientist Professor Lyn Beazley, staff of the SPICE Program at The University of Western Australia (UWA), and by Vice Dean of UWA's Faculty of Natural and Agricultural Sciences, Winthrop Professor Lyn Abbott. School teachers have contributed to developing this resource which illustrates the importance of soils in the environment and in the climate change debate.

Resource tools include support material for teachers, allocation of soil scientists as school mentors, a dedicated website, guidelines for setting up a soil monitoring program, and a reference suite of soil analyses for each school.

While these tools were created primarily with high school students in mind, its benefits reach beyond the classroom, as Professor Abbott points out: "This project is effectively a community resource and reference tool, for anyone involved or interested in collecting soil samples and wanting to find out about the biological, chemical and physical properties of their soil."

Students will upload their data to the *Monitoring Soil Science* project website which will connect students, scientists and soil science enthusiasts across the world.

The project website has received financial support from the International Union of Soil Sciences and is expected to go live shortly.

For further information please email lynette.abbott@uwa.edu.au

Canola Breeders' Board members and associates at NPZ in Germany in June 2011. From left, Mr John Harvey (Managing Director, GRDC), Mr Keith Perrett (Chairman, GRDC Board), Mr Bruce Piper (Chairman, COGGO and Director, CB), Mr Mark Tucek (Chief Executive Officer, COGGO), Mr Frank Grosse (NPZ International Commercial Manager and Director, CB), Mr David Crawford (retiring Executive Chairman, CB), W/Prof. Wallace Cowling (Research Director, CB), Mr David Strong (Commercial Director, CB), W/Prof. Kadambot Siddique (Director, The UWA Institute of Agriculture and Director, CB) and Mr Peter Reading (in-coming Executive Chairman, CB, from 1 July 2011).

Canola Breeders: a decade of successful public-private partnership at UWA

Winthrop Professor Wallace Cowling (wallace.cowling@uwa.edu.au)

Canola Breeders[1] (CB) is a growing force in the Australian canola breeding arena. The University of Western Australia (UWA) has been the home base for technical operations in Canola Breeders since its inception in 2001, and UWA is a founding shareholder in Canola Breeders. One decade later, it is worthwhile examining the model of public-private partnership upon which this company was built.

Winthrop Professor Wallace Cowling of The UWA Institute of Agriculture (IOA) is Research Director of Canola Breeders, and leads the CB project at UWA for canola genetic improvement and pre-breeding. The CB project employs 70% of Professor Cowling's time plus several staff at UWA, including Assistant Professor Matthew Nelson. The remaining 30% of Professor Cowling's time is dedicated to academic research and teaching at UWA. The two activities are clearly separated by legal agreements between the company and UWA. UWA holds rights to intellectual property (IP) developed in university-funded research, but the company maintains its rights to IP developed in the CB project at UWA.

The inaugural shareholders in Canola Breeders one decade ago were 'Export Grains Centre Ltd' (EGC), UWA and the 'Council of Grain Grower Organisations (COGGO) Ltd' – a group of grain grower organisations that invested in plant breeding in Western Australia. The Grains Research and Development Corporation (GRDC) later took over the shares of EGC, and remains a major partner in the company. In 2002, and of pivotal importance to the young company, an international investor joined Canola Breeders – 'Norddeutsche Pflanzenzucht Hans-Georg Lembke KG (NPZ)', the most successful hybrid canola breeding company in Europe. NPZ has partnerships in canola breeding in many countries, including eastern and western Europe, the United Kingdom, Canada and Australia.

The company now has a Commercial Director, Mr David Strong, based in the CB Melbourne office. The Canola Breeders suite of commercial varieties includes the world's first triazine tolerant hybrid canola (HT® canola) – a critical development made possible by NPZ hybrid technology and know-how. Other benefits of the NPZ connection include the release of Roundup Ready®' hybrid canola at the time this genetically modified canola was first approved for use in Western Australia in 2009.

NPZ and COGGO have also been strong supporters of academic research at UWA. A spin-off from this research includes prominence of UWA in national and international *Brassica* research, including the development of a new hexaploid canola in collaboration with Chinese researchers (as reported in Issue 12, Dec 2010, of The UWA Institute of Agriculture Newsletter). Several PhD students have graduated under the supervision of Professor Cowling and Assistant Professor Matthew Nelson over the past decade.

In August 2011, Mr David Crawford retires from the position of Executive Chairman of Canola Breeders after more than 10 years with the company. Mr Crawford is a highly respected board director and chairman in many successful companies in Australia, and is President of the National Competition Council, to which he was elected in 2006. Mr Crawford has been a key player in the transformation from public to private ownership of plant breeding in Australia since the late 1990s, when he took on the role of Executive Director of EGC.

In 2000, Mr Crawford successfully negotiated with UWA to set up the CB project at UWA, and subsequently to form the new company. Mr Crawford paved the way to establish Canola Breeders under a unique public-private partnership model that was soundly based on best business practice. Key to the long-term success of Canola Breeders was Mr Crawford's insistence on high standards of financial, commercial and technical management in the company, and legal and commercial independence from UWA.

At a recent meeting at NPZ in Germany, the Board elected Mr Peter Reading to succeed Mr Crawford as Executive Chairman from 1 July 2011. Mr Reading is a prominent agricultural industry leader in Australia, and was Managing Director of GRDC in Canberra from February 2004 to February 2011.

The Director of CB and of The UWA Institute of Agriculture, Winthrop Professor Kadambot Siddique, said: "UWA is committed to its partnership in the company because Canola Breeders is delivering superior varieties to Australian farmers, and its pre-breeding activities are significantly advancing plant breeding and genetics' research and teaching at UWA."

1 Canola Breeders is the trading name of Canola Breeders Western Australia Pty Ltd

Dr Magdalena Kroc (Institute of Plant Genetics, Polish Academy of Sciences, Poznan, Poland), Assistant Prof. Jon Clements and Assistant Prof. Matthew Nelson (UWA) in a field plot of a new yellow lupin variety at Plant Breeding Smolice Ltd during the field trip at the 13th International Lupin Conference.

13th International Lupin Conference: new discoveries and new collaborations

Assistant Professor Jon Clements (jon.clements@uwa.edu.au)

More than 120 delegates from over twenty countries – including five scientists from Australia – attended the 13th International Lupin Conference, held in the city of Poznan in Poland from 8–13 June 2011.

Assistant Professor Jon Clements from UWA's Centre for Legumes and Mediterranean Agriculture (CLIMA) observed that active breeding lupin breeding programs were also represented: "With rapidly rising soy prices, Europe is keen to grow a plant protein source like lupins, that is considered environmentally sustainable with a grain production for the feed and newly emerging lupin food products market."

"A novel source of anthracnose resistance has been reported in Germany which is different to Australian sources of stem resistance," says Assistant Professor Clements. "This is exciting because when these sources are combined they could produce cultivars with both foliar/stem and pod resistance. Therefore, both forms are now being combined in the Western Australian breeding program."

Another focus of interest at the conference was the wealth of lupin species diversity: The western *New World* clade of species (>190 species) from North- and South America includes the 'Andean (pearl) lupin' (*Lupinus mutabilis*), which has the most impressive seed quality of all lupin species. *New World* lupins offer a valuable genetic resource for the potential production of a number of combinations of plant types for agriculture. "There is a lot of interest in producing higher yielding 'Andean Pearl' lines for food and feed end uses, particularly in northern Europe," says Assistant Professor Clements. "Because of its high protein and oil content, this grain is considered to be of premium value when both oil and protein fractions are used."

The lupin breeding communities are also set to benefit from a project right on our doorstep, namely the narrow-leafed lupin genome sequencing project that has begun in Perth (see also page 7). Winthrop Professor Karam Singh (CSIRO and The UWA Institute of Agriculture) outlined the potential outcomes through this project involving UWA researcher Assistant Professor Matthew Nelson, along with other collaborators.

Emeritus Professor Craig Atkins from UWA presented a talk on lupin phloem-derived protein and micro RNA (miRNA) signaling molecules – a relatively recent area of research.

"The conference promoted exciting findings, new directions and new opportunites for collaboration and networking across the board – it clearly was a winner for all involved!" concludes Assistant Professor Clements.

AHRI commits to weed research initiatives with RIRDC funds

Ms Neree Martinez (neree.martinez@uwa.edu.au)

Significant new funding for the Australian Herbicide Resistance Initiative (AHRI) from the Rural Industries Research and Development Corporation (RIRDC) highlights AHRI's commitment to tackle big industry issues.

The University of Western Australia (UWA) based AHRI has been awarded five RIRDC grants (see also page 17) commencing in July 2011, from a total pool of $6.1 million in Federal funding aimed at tackling some of Australia's most invasive pest plants.

Leading resistance expert and Director of AHRI, Winthrop Professor Stephen Powles believes this research will benefit Australian growers and the future management of herbicide resistant weeds.

"Australia has the world's greatest herbicide resistance problem, costing the grains industry big money in lost production each year. Understanding resistance evolution from the molecular level right through to management at the paddock is essential to ensure the future of the grains industry," Professor Powles points out.

The new research projects commenced in March 2011 and aim to:

Investigate a method for weed seed destruction at harvest: Dr Michael Walsh will further evaluate uses for the Harrington Seed Destructor (HSD) in the eastern states whilst assessing the HSD's potential in different cropping systems. In addition, growers will have an opportunity to learn more about harvest weed seed management techniques through a series of workshops destined for South Australia, Victoria and New South Wales.

Develop diagnostic tools to detect non-target-site metabolism-based herbicide resistance: Associate Professor Qin Yu will work on developing a diagnostic tool to detect non-target–site, metabolism-based resistance to help determine and monitor the extent and frequency of non-target-site metabolism based herbicide resistance in Australian major weeds and assist with future biochemical and molecular studies to identify cytochrome P450 genes that are responsible for enhanced herbicide metabolism.

"While target-site gene mutations that endow herbicide resistance can be precisely identified and rapidly diagnosed using PCR-based molecular markers, non-target-site metabolism based herbicide resistance is relatively difficult to positively diagnose," says Associate Professor Yu.

Quantify the weed fitness costs associated with resistance: Dr Martin Vila-Aiub has returned to Australia from Argentina to investigate the fitness costs associated with ACCase and ALS resistance mutations in ryegrass (see also page 12).

Predict rates of herbicide resistance evolution to pre-emergence herbicides in ryegrass under a range of climatic and management scenarios: Dr Roberto Busi will investigate the rates of resistance evolution to several pre-emergent herbicides under a changing climate (see also page 8).

"This research will allow us to make predictions about resistance evolution risk to new and current herbicides and how this risk can vary across geographic regions. Modelling simulations will be performed in collaboration with Dr Michael Renton at UWA's School of Plant Biology to better understand

continued on page 15

(LtoR) Dr Martin Vila-Aiub, Dr Michael Walsh, Dr Qin Yu and Dr Roberto Busi, looking at treated and untreated Wild radish plants.

AHRI commits to weed research initiatives with RIRDC funds continued from page 14

how climatic variability may affect herbicide resistance evolution. This information will help farmers and agronomists minimise the risk of herbicide resistance, particularly to herbicides not yet commercially available," explains Dr Busi.

Develop a toolkit for farmers and landholders to assess the longevity of weed seeds in the soil: Dr Rowena Long will develop a toolkit for weed managers and researchers to assess the persistence of weed seeds in the soil.

"We know that a crucial part of managing weeds is understanding how long their seeds remain alive in the soil seed bank, and this toolkit will assist growers by providing the tools with which to estimate seed persistence. We hope this will then allow growers to implement control measures to drive weed numbers down," says Dr Long.

"Herbicides remain the most cost effective form of weed control and their sustainability is essential for world food production. Through our continued research we hope to ensure herbicides will continue to be an effective tool in controlling crop weeds for future generations," concludes Professor Powles.

Iraqi student tops class in Animal Nutrition at UWA

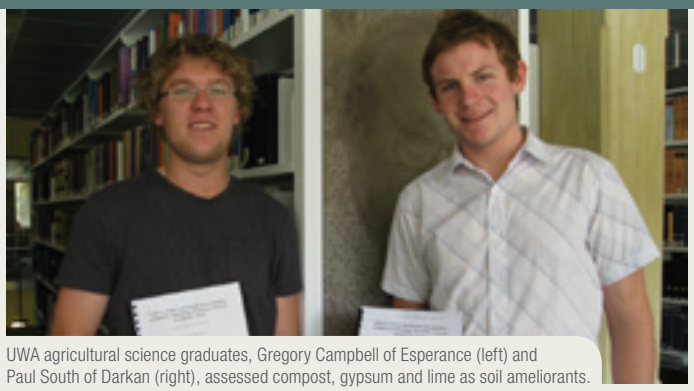
Earlier this year, Iraqi student Doraid Amanoel won the R.J. Moir Prize , which is awarded annually at UWA to the top student in the third year undergraduate unit 'Animal Nutrition'.

Doraid Amanoel

Doraid had only been in Australia just over one year, when he achieved this outstanding result.

After completing a Bachelor of Science degree in Animal Production in his home country, he worked for five years as a Livestock Industry Officer for the 'General Directorate of Agriculture' in Iraq and was responsible for the Livestock Department where he managed projects and delivered extension programs to local farmers such as the 'bird flu' epidemic extension program in 2007.

In 2008 he received an AusAID scholarship as one of thirteen Australia – Iraq Agricultural scholarships at UWA. Doraid is looking forward to commencing his Masters degree in Animal Science at UWA next year: "I believe that this education will help me build an agricultural career based on modern scientific knowledge, innovation, and contribute to rebuilding agricultural research and development in my country. I am lucky to gain admission to a Masters program in Agriculture at UWA, which is a world-class university."



UWA agricultural science graduates, Gregory Campbell of Esperance (left) and Paul South of Darkan (right), assessed compost, gypsum and lime as soil ameliorants.

'Smart' scholarship students seek soil solutions

Thanks to the Sir Eric Smart Scholarship for Agricultural Research, two fourth year agricultural science honours students at The University of Western Australia are trialling innovative methods to improve or amelioratate poor WA soils.

Esperance farmer's son Gregory Campbell investigated the 'effectiveness of compost and gypsum as a soil amendment and their influence on mycorrhizal colonisation', under the supervison of Winthrop Professor Lyn Abbott.

While the compost and gypsum amendments did not significantly improve crop growth in the single growing season studied, the gypsum amendment showed a significant though inconsistent effect on mycorrhizal colonisation.

Mr Campbell's father, David, is now trialling the production and application of compost on his two farms and testing his son's hypothesis that soil amended with compost will have better cation exchange capacity and higher mycorrhizal root colonisation after one season, compared to control and inorganic fertilised soils.

"Practical on-farm testing and potential subsequent commercial adoption of research by such capable young students from UWA's Faculty of Natural and Agricultural Sciences, is a fantastic outcome," says Professor Abbott.

Supervised by Winthrop Professor Zed Rengel, Darkan farmer's son, Paul South, assessed whether or not lime was a better soil ameliorant than gypsum with respect to alleviating aluminium toxicity stress in susceptible wheat.

"With one third of WA agricultural soils affected by sub-surface acidity and with this very likely to increase soluble aluminium, which is toxic to plant root growth, the issue was worth assessing from economic and agronomic perspectives," Mr South said.

Mr South's honours project compared the effectiveness of genetic and chemical (lime and gypsum) strategies in resolving the aluminium toxicity issue.

While identifying that a combination of lime and aluminium tolerant crops was the most effective approach, Mr South recommended further comparisons between genetic and chemical options.

"The next step is to determine what's most likely to be adopted by farmers, because the most effective strategy may not be the most economical and therefore may have limited adoption by farmers," he said.

The late Sir Eric Smart was a pioneer cereal producer and was once the world's largest individual wheat grower. Upon his death in 1973, Sir Eric showed his appreciation of science by endowing substantial funds to UWA and this was later supplemented by a gift from his son Peter.

"He wanted to see science improve agricultural production," says The UWA Institute of Agriculture Director, Winthrop Professor Kadambot Siddique, "and founded a scholarship to encourage bright students in UWA's Faculty of Natural and Agricultural Sciences to research ways of improving the productivity and profitability of crops growing in the light soil types of WA."

Gregory Campbell and Paul South aim to do exactly that on their respective family farms.

Postgraduate Showcase heralds major innovations in agriculture and food industry

continued from page 1

Brazilian Mariana Cruz Campos, of UWA's School of Plant Biology, is researching phosphorus nutrition, which is the most limiting factor for growth of native Australian plant species.

Her PhD supervisors are Winthrop Professor Hans Lambers, Assistant Professor Stuart Pearse and Professor Rafael Oliveira (Universidade Estadual de Campinas, Brazil). Her research is funded by UWA, the Brazilian Council for Research, the ANZ Holsworth Wildlife Foundation and Mary Janet of Yanchep Memorial.

Acknowledging that natives are very good at sourcing and retaining phosphorus, Ms Campos believes that by studying positive traits in native species, some of those traits could be used in commercial crop species, by using natives in rotations or co-existing with crops, or even using genetic modification techniques.

Kevin Foster, also from the School of Plant Biology, is on study leave from the Department of Agriculture and Food WA (DAFWA), where he has worked for twenty years.

His UWA PhD is researching the drought resistance qualities of the perennial herbaceous novel legume known as *Tedera*.

Mr Foster's PhD supervisors are Winthrop Professor Hans Lambers, Associate Professor Megan Ryan and Dr Daniel Real. His research is sponsored by UWA, Future Farm Industries CRC and DAFWA.

Commonly used as a summer green feed for sheep and goats on the Canary Islands, *Tedera* has highly evolved mechanisms for withstanding severe drought.

Mr Foster described *Tedera* as a highly light adapted plant which avoids water deficits by maximising water uptake through its tap and lateral roots and minimising water loss by excellent stomatal control and leaf folding to reduce transpiration and light interception.

Jessie Moniodis, for her PhD, is assessing factors controlling oil biosynthesis in WA sandalwood.

She expects her research will aid future tree improvement, conservation and also potential metabolic engineering for desirable oil constituents.

"This is important because unsustainable harvesting of native sandalwood has placed greater reliance on plantation sandalwood," she said.

Her PhD supervisors are Professor Julie Plummer, Associate Professor Emilio Ghisalberti, Dr Chris Jones, Dr Liz Barbour and Professor Joerg Bohlmann (University of British Columbia, Canada). Her research is supported by UWA, the Australian Research Council, the University of British Columbia and the Forest Products Commission.

South African-born Catherine Bondonno, a former industrial microbiologist in South Africa and New Zealand, is now doing her PhD at UWA on the health effects of flavonoid rich apples, which can positively impact nitric oxide and its functional outcomes for cardiovascular disease.

"Eating flavonoid rich apples can be a natural, low cost approach to reducing the cardiovascular risk profile of the general population and this is significant as cardiovascular disease is the leading cause of death in Australia," she said.

Her research is funded by UWA, the Australian Research Council, NHMRC, DAFWA and the Australian National Apple Breeding Program.

Aidilla Mubarak, sponsored by the Malaysian Government for her UWA PhD, is investigating the links between plant polyphenol compounds and dietary health.

"Dietary polyphenols have been associated with reduced risk of heart disease and fruits such as plums are a rich source of polyphenolic antioxiodants," she said.

PhD supervisors for Ms Bondonno and Ms Mubarak are Professor Jonathan Hodgson, Assistant Professor Michael Considine and Professor Kevin Croft.

The final presenter at the UWA IOA 'Frontiers in Agriculture' Postgraduate Showcase 2011 was Pakistani Khalid Bashir of the School of Agricultural and Resource Economics.

His postgraduate studies, jointly funded by UWA and the University of Agriculture Faisalabad, Pakistan, aim to identify ways of improving food security policies.

Mr Bashir, whose PhD supervisors are Associate Professor Steven Schilizzi, Professor Ben White and Assistant Professor Ram Pandit, described food insecurity as a 'global menace', with 90% of undernourished people living in developing countries.

UWA Institute of Agriculture Director, Winthrop Professor Kadambot Siddique, said UWA effectively had a seat at the world's 'food table' with its many international collaboration projects and student exchanges, especially with developing countries.

"We believe that we can contribute positively to global food security and world peace, especially through capacity building and developing novel technologies and we continually strive to do exactly that," he said.

The nine presentations can be viewed at www.ioa.uwa.edu.au/publications/showcase

Ethics in meat supply chain the key focus for visiting Uruguay researcher

Dr Elize van Lier (elize.vanlier@uwa.edu.au or evanlier@fagro.edu.uy)

Dr Elize van Lier

Dr Elize van Lier is on her second visit to UWA from her home university in Montevideo, Uruguay, where she is Associate Professor in Physiology and Reproduction at the Faculty of Agronomy (Deptartment of Animal and Forage Sciences).

At UWA she is working with Associate Professor Dominique Blache (School of Animal Biology) and Dr Joanne Sneddon (Business School) on the ethics in decision-making in the meat supply chain. "While any food chain nowadays has to deal with a wide range of ethical issues – such as food safety and quality, labour rights and conditions, environmental impact and animal welfare – efforts to improve their ethical standards usually focus only on a few issues," says Dr Van Lier. "Our aim is to develop a tool that will guide the ethical decision-making of stakeholders in the meat supply chain."

The above research is a spin off from previous collaborative work with Associate Professor Blache on Animal Welfare and the 'Workshop on Clean, Green and Ethical Animal Production' that was held in Uruguay in 2009. This workshop was a joint venture between The UWA Institute of Agriculture and the Faculties of Agronomy and Veterinary Medicine and the National Institute of Agricultural Research (INIA) from Uruguay.

"The research I am doing here at UWA can be translated to Uruguayan conditions and will further strengthen the collaboration between the two universities," explains Dr Van Lier.

New research projects

TITLE	FUNDING PERIOD	FUNDING BODY	SUPERVISOR/S
Wheat curl mite wheat streak mosaic and high plains virus – detection transmission epidemiology and management	2010 – 2012	University of Melbourne ex Grains Research Development Corporation (GRDC)	Prof. Roger Jones
Development of chemical provenance establishment protocols in selected Australian native plants – Macadamia nuts	2011	Ainse Research Training	Prof. Garry Lee
Development of microbial indicators of soil quality to quantify the benefits of risks associated with applying piggery by-products to land	2011 – 2014	Australian Pork Limited	Dr Sasha Jenkins, W/Prof. Tony O'Donnell, W/Prof. Lynette Abbott
The application of in vitro techniques to generation acceleration in legumes	2011	GRDC	Prof. William Erskine, Asst/Prof. Janine Croser
Soil salinity management in central and southern Iraq	2011 – 2013	ICARDA Ex Australian Centre for International Agricultural Research (ACIAR)	Prof. Edward Barrett-Lennard, Prof. Neil Coles
Development of Hydstra import tool to consolidate water quality and bore site metadata	2011	Department of Agriculture and Food WA (DAFWA)	Prof. Neil Coles
Genome sequencing in chickpea	2011 – 2012	GRDC	W/Prof. Karam Singh
Demonstrating adaptation to climate change in the wheatbelt of WA through innovative on-farm and virtual-farm approaches (NAMI – National Adaptation and Mitigation initiative)	2011 – 2012	DAFWA	Assist/Prof. Kenneth Flower, Dr Geraldine Pasqual
Second generation sequencing to identify genes controlling flowering in oilseed brassica plants	2011	UWA-UQ Bilateral Research Collaboration Award	W/Prof. Wallace Cowling, Dr Jacqueline Batley, Assoc/Prof. David Edwards, Asst/Prof. Matthew Nelson, Miss Yiming Guo, Mr Kaitao Lai
Evaluate fitness costs in herbicide resistant annual ryegrass	2011	Rural Industries Research & Development Corp (RIRDC)	W/Prof. Stephen Powles
Sustainability of wheat-selective pre-emergent herbicides in a changing climate	2011 – 2012	RIRDC	Dr Roberto Busi
Diagnostic tools for detection of non target site herbicide resistance	2011 – 2012	RIRDC	Assoc/Prof. Qin Yu, Dr Shaofang Wang, W/Prof. Stephen Powles,
Tackling Australia's weed seed bank liability with the seed persistence tool kit	2011 – 2012	RIRDC	Dr Rowena Long
The impact of lime-amended bioclay (LABC) in soil biological processes	2011 – 2013	Water Corporation WA	W/Prof. Lynette Abbott, Dr Robert Humphries
Arsenic and copper cycling in the soil-plant continuum in water-limited mining environments	2011 – 2014	Newcrest Mining Ltd, Outback Ecology Services	W/Prof. Zed Rengel, Prof. Mark Tibbett, Adj/A/Prof. David Jasper
Sterol interference as a new approach to the control of insect pests of crops		Hexima Limited, Australian Research Council (ARC)	W/Prof. Steven Smith
Sustainability of wheat-selective pre-emergent herbicides in a changing climate	2011 – 2012	RIRDC	Dr Roberto Busi, Asst/Prof. Michael Renton, W/Prof. Stephen Powles
The application of in vitro techniques to generation acceleration in legumes	2011	GRDC, Visiting Fellowship Award	Dr Monika Lulsdorf, Res/Prof. Janine Croser Prof. William Erskine
Seeds of Life (SOL III)	2011 – 2015	ACIAR & AusAID	Prof. William Erskine, Adj/Prof. Harry Nesbitt, W/Prof. Kadambot Siddique
Farm practices that increase soil organic carbon	2011 – 2014	Wheatbelt NRM	Assoc/Prof. Daniel Murphy, Dr Andrew Wherrett
Presentation of harvest weed seed management forums and cropping tour in northern NSW and southern QLD	2012	GRDC	W/Prof. Stephen Powles

Current and upcoming visitors to IOA

VISITOR	VISITORS' ORGANISATION, COUNTRY	HOST DETAILS	DATES
Dr Tariq Aziz	University of Agriculture, Faisalabad (UAF), Pakistan; HEC Research Fellow	W/Prof. Hans Lambers, Assoc/Prof. Megan Ryan	8 Dec 2010 – 5 Oct 2011
Dr Mei Li	Institute of Plant Protection, Shandong Academy of Agricultural Sciences, China; visiting scientist	Assoc/Prof. Qin Yu and W/Prof. Stephen Powles	Feb 2011 – Feb 2012
Dr Elize van Lier	University Montevideo, Uruguay; visiting professor	Assoc/Prof. Dominique Blache, Assist/Prof. Joanne Sneddon	2 Feb – 30 Aug 2011
Mr Morteza H. Ghaffari	Dept of Animal Science, Ferdowsi University of Mashhad, Iran; visiting researcher	W/Prof. Graeme Martin	26 Feb – 15 Sep 2011
Ms Younna Jiquel	Université de Rennes, France; visiting researcher	W/Prof. Kadambot Siddique, Dr Helen Bramley	18 Apr – 31 Aug 2011
Prof. Rajinder Kaur Kalra	Punjab Agricultural University, India; visiting professor; Endeavour Fellowship	W/Prof. Kadambot Siddique, Prof. Matthew Tonts	1 May – 30 Nov 2011
Dr Martin Vila-Aiub	Institute for Agricultural Plant Physiology and Ecology, Buenos Aires, Argentina; visiting professor, AusAID fellowship	AHRI	1 Jun – 28 Feb 2012
Dr Frederick Obese	University of Ghana, College of Agriculture and Consumer Sciences; visiting professor; Crawford Fund Training Award	W/Prof. Graeme Martin	10 Jun – 19 Jul 2011
Dr Maria Hötzel	Universidade Federal de Santa Catarina, Brazil; visiting professor	Dr Dominique Blache	1 Jul 2011 – 28 Feb 2012
Dr Ricardo Rüther	Universidade Federal de Santa Catarina, Brazil; visiting professor	Prof. Brett Nener, W/Prof. Graeme Martin	1 Jul 2011 – 28 Feb 2012
Mr Lourenço Borges Fontes	Director General of Timor-Leste Ministry of Agriculture and Fisheries (MAF)	Prof. William Erskine, Adj/Prof. Harry Nesbitt, W/Prof Kadambot Siddique	6 July 2011
Dr Omar Ali	Bangladesh Agriculture Research Institute; visiting professor	Prof. William Erskine	11 – 12 July 2011
Dr Elizabeth Stockdale	University of Newcastle, UK; visiting professor	Assoc/Prof. Daniel Murphy	15 Jul – 15 Oct 2011
Assist/Prof. Erkut Pekşon	University of Ondokuz Mayis, Turkey; Endeavour Research Fellow	Assist/Prof. Jon Clements, CLIMA	20 Jul – 14 Dec 2011
Dr Nayan Kanwal	Universiti Putra Malaysia; visiting professor	W/Prof. Kadambot Siddique	19 – 31 Aug 2011
Prof. Iqrar Ahmed Khan	University of Agriculture, Faisalabad (UAF), Pakistan; visiting Vice-Chancellor	W/Prof. Alan Robson	27 – 30 Aug 2011

Alumni

Dr Anthony Robinson


Photo by Sasha Key

Anthony completed a Bachelor of Science degree in Horticulture and Viticulture with first class honours at UWA with a specialisation in Oenology from the University of Adelaide. Following this he was employed as a Viticultural Research Officer at UWA and then went on to undertake a PhD at Murdoch University relating the sensory characteristics of wines to the chemical composition.

He was awarded the inaugural Fulbright Western Australia Scholarship in 2008 to continue this research at the Department of Viticulture and Enology, University of California, Davis working with Professor Hildegarde Heymann, a world leader in the field of Sensory Science and Sensometrics. This work was presented at international conferences, in Australia, and produced five peer-reviewed publications including the 'Best Enology Paper' for 2010 in the *American Journal of Enology and Viticulture*. Anthony completed his PhD studies in 2010 and is currently employed as a graduate winemaker at Treasury Wine Estates based at the Lindemans Karadoc Winery, Victoria.

In addition to his studies, Anthony has worked in a number of roles in the wine industry including retail, viticulture, winemaking and research. He has also been a committee member for the Margaret River and Perth Royal Wine Shows and judged wines at regional, national, and international wine shows in Australia and the USA. His commitment to the Australian Wine Industry was recognised in 2006 when he was awarded the Young Achiever of the Year Award from the Wine Industry Association of WA.

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(March – August 2011)

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UPCOMING MEETINGS AND EVENTS

The UWA Institute of Agriculture events

Food and Agriculture Lecture Series
'Increase in crop productivity and nutrient use efficiency in China's intensive agricultural systems'
Professor Fusuo Zhang
26 September 2011
www.ioa.uwa.edu.au

Big Day Out
UWA Future Farm 'Ridgefield'
Focus: Whole-farm carbon emissions
18 October 2011

Other events

Dowerin Field Days
24-25 August 2011
www.dowerinfielddays.com.au

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

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