



THE UNIVERSITY OF
WESTERN AUSTRALIA

Achieve International Excellence

The UWA Institute of Agriculture

Number 13 **March 2011**



LtoR: Mr Muhammad Arif Watto, W/Prof Kadambot Siddique (Director, UWA IOA), W/Prof Alan Robson (Vice-Chancellor, UWA), Mr Umar Farooq and Mr Arbab Ahmad.

Long-term rebuilding for Pakistan

The UWA Institute of Agriculture hopes two new PhD scholarships in agriculture will help in the long-term rebuilding of Pakistan following last year's devastating floods.

The 2010 floods affected some 20 million people and caused agricultural damage of more than \$3.7 billion, including extensive damage to crops over 3.25 million hectares. Pakistan is rapidly repairing the damage with its own funding and with assistance from other countries, including Australia.

The UWA Pakistan Flood Reconstruction Scholarship is a joint initiative between UWA's Vice-Chancellor and International Centre and provides two scholarships covering tuition fees and a living allowance of \$26,360 per year for up to four years. The first graduate student to study under the UWA Pakistan Flood Reconstruction Scholarship should arrive this year, with another starting in 2012.

Winthrop Professor Kadambot Siddique, Director of the UWA Institute of Agriculture, said scholarship

applicants must show their proposed research would be of demonstrable benefit to the restoration or improvement of agricultural capacity in relation to post-flood reconstruction efforts in affected areas of Pakistan.

The scholarship is open to citizens of Pakistan with preference given to graduates of the University of Agriculture, Faisalabad (UAF), but graduates from other universities in Pakistan will be considered. Faisalabad is also within the flood-ravaged region of Pakistan.

UWA signed a memorandum of understanding with the University of Agriculture, Faisalabad in 2008, which initiated cooperative teaching and research in crop and animal improvement, grassland-livestock interaction, biotechnology, natural resource management and agricultural policy research.

Under the above agreement, the universities have established a jointly funded PhD program with five high-quality PhD students from UAF currently

undertaking their research at UWA. After completing their PhD program, these students will join UAF Faculties to enhance agricultural teaching and research in Pakistan.

"The potential benefit for the study of agriculture is enormous in Pakistan because they still have issues with food security and environment," W/Prof Siddique said.

"It is the perfect time for Pakistan to revisit agricultural teaching, research and development. The most uplifting aspect of capacity building is that it empowers people and provides the opportunities that short term welfare opportunities can never match," he said.

W/Prof Siddique said that through agricultural development prosperity will come eventually. "Prosperity is important for global peace, which is why I feel satisfied stepping out of my academic role to organise this scheme," he said.



Director's column

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

Barely three months into 2011, the UWA Institute of Agriculture (UWA IOA) has already recorded a number of achievements in the ongoing efforts in positioning UWA's agriculture top ranking in Australia and internationally. UWA's Agriculture received an outstanding score of 5.0 in the recent Excellence in Research Australia (ERA) ranking (EARA10) which confirms our strength in this field.

In terms of our outreach activities, a recent highlight was the 21st Hector and Andrew Stewart Memorial Lecture (page 3) delivered by Dr John Angus (CSIRO) with a focus on the importance of innovation and crop management to improve the productivity, profitability and sustainability of Australian broad acre agriculture systems. Another example was the lecture delivered by Prof Philip White (Scottish Crop Research Institute) on "Contribution of plant mineral nutrition to global food security". In terms of research funding, the UWA IOA has been instrumental in securing a significant number of research grants, including six grants funded by the Grains and Research Development Corporation GRDC (page 18).

Examples of knowledge sharing and international collaboration included the recent visit by a high level Iraqi delegation in January (page 4), to strengthen their links with UWA and increase their technical knowledge in agriculture. The exploration of public-private partnership models (page 13), constituted another example, with one such partnership existing 'in-house' already, namely the Canola Breeders Pty Ltd, co-owned by COGGO, GRDC, NPZ, and UWA. This partnership has already delivered several superior canola varieties to Australian farmers.

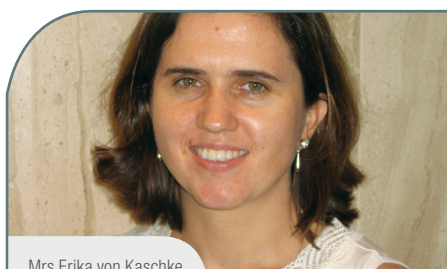
The Tenth International Conference on Development of Drylands (page 14), held in Cairo in December last year, confirmed the importance of collaboration and linkages: eighteen countries were represented and in a joint declaration recommended the formation of knowledge action networks, connecting experts in international and national communities with regional decision makers and local stakeholders.

Our commitment to collaboration and to the integration of all stakeholders has also been reflected in its approach to UWA's 'Future Farm', which has been using local community resources for services and supplies required on site, and UWA expertise from several faculties in the design stage: A fully automated weather station has been completed recently (page 14).

Last but not least I would like to emphasise, that the recent achievements and successes to which UWA IOA has contributed, are driven by the excellent team of staff and their outstanding commitment. Please join me in congratulating Wallace Cowling, Deputy Director of the International Centre for Plant Breeding Education and Research (ICPBER), on his recent promotion to Winthrop Professor. Congratulations also to Winthrop Professor David Pannell, on receiving a Distinguished Fellowship from the Australian Agricultural and Resource Economics Society (page 7).

On 25 March our External Advisory Board met under the chairmanship of Mr Bruce Piper and the Board was pleased with the outstanding achievements made by the UWA IOA since its operation began four years ago.

In this exciting time of rapid change both within the university and externally, I look forward to your continued support of UWA IOA initiatives to meet long-standing and emerging challenges in our quest for excellence in serving agriculture and the management of natural resources.



Mrs Erika von Kaschke

Farewell to Erika

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

It is with sadness that we have to say goodbye to Mrs Erika von Kaschke our Communications Officer for the past three years. Erika joined the UWA Institute of Agriculture in mid-February 2008. She started at a time where the Institute was still building a Communications base. During her time she has provided valuable work, especially in enhancing the quality of publications, our quarterly newsletter in particular. She has proved to be invaluable in designing marketing material, but also in liaising with UWA staff, alumni and industry partners. Erika will be moving on to the newly formed ARC Centre of Excellence for the History of Emotions. A big thank you to Erika for her significant contributions to UWA IOA and best wishes in her new position within UWA.



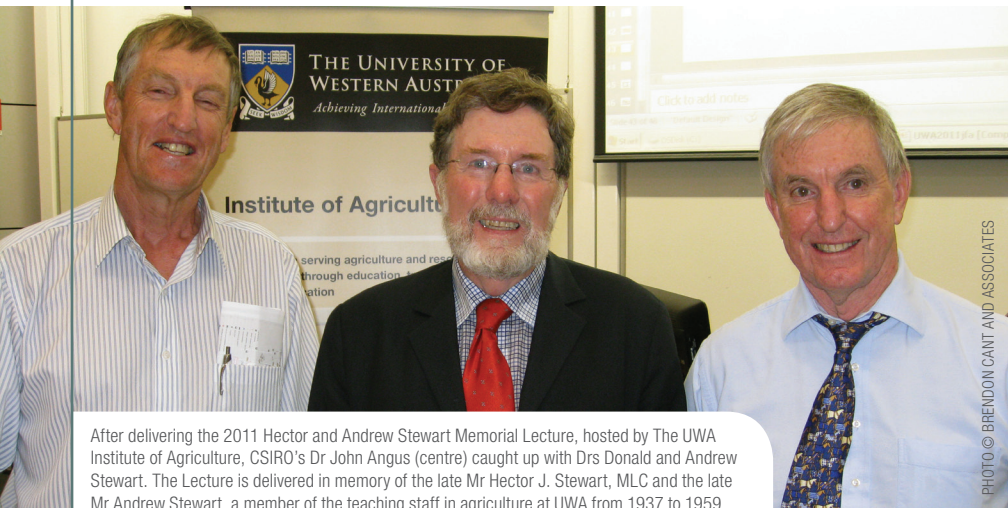
Prof JI Shuqin, Prof MENG Yuee, Prof HOU Dahu, Prof LI Shaoyu, Prof ZOU Qingpeng of HAAS, and W/Prof Kadambot Siddique, A/Prof Guijun Yan and Dr Ping Si of UWA.

UWA agriculture attracts Chinese visitors

The excellence of agricultural science training at UWA has attracted a visit from a delegation of Henan Academy of Agricultural Sciences (HAAS) in December 2010.

The delegation, led by Prof ZOU Qignpeng, Vice-president of HAAS, and five research scientists were particularly interested in UWA's research in the areas of animal science, crop (wheat, cotton) breeding, and horticulture.

The delegates met W/Prof Kadambot Siddique, Director of UWA Institute of Agriculture, Associate Prof Guijun Yan, Dr Ping Si, and Res Prof Shimin Liu on discussion on development of collaboration in agricultural research. Prof Zou invited W/Prof Siddique to visit the academy in 2011 for developing a program in wheat breeding.



After delivering the 2011 Hector and Andrew Stewart Memorial Lecture, hosted by The UWA Institute of Agriculture, CSIRO's Dr John Angus (centre) caught up with Drs Donald and Andrew Stewart. The Lecture is delivered in memory of the late Mr Hector J. Stewart, MLC and the late Mr Andrew Stewart, a member of the teaching staff in agriculture at UWA from 1937 to 1959.

Mixed messages for farmers

Reflecting on almost 40 years as a cereal agronomist, Dr John Angus of CSIRO Plant Industry, Canberra, holds the view that the ability of farmers to innovate will help ensure a positive and sustainable future for southern Australian broadacre farms.

The period from 1980 to 2000 saw fundamental changes to the mixed crop-livestock farms of southern Australia, namely increased farm sizes, more cropping, a greater proportion of broadleaf crops and improved wheat quality and yield.

Dr Angus proposed that the major contributors to improved wheat productivity had been breeding, including resistance to disease and stresses, crop management, including planting times, nutrition, stubble management and crop sequences and, lastly, but most importantly, adoption and innovation by farmers.

The greatest single contributor to improved wheat yield was crop management, to which he attributed about 65 per cent of the increase. He particularly commended Western Australian grain growers for their innovations in the stubble management and no-tillage space; WA farmers' readiness to innovate defied the trend of the traditional 80 year delay between research and on-farm adoption.

In Dr Angus' view, the next big challenge, or opportunity, which broadacre farmers face will be re-integrating livestock and grazing with cropping.

"Opportunities are there to introduce perennial pastures, grazing of crops and using failed crops as a feed source," Dr Angus told a packed audience at UWA, while delivering the 2011 Hector and Andrew Stewart Memorial Lecture, titled 'The remarkable improvements in Australian mixed farming' and hosted by The UWA Institute of Agriculture.

"An important, but previously underestimated management change, has been the break-crop benefit of broadleaf crops which control cereal diseases," Dr Angus said.

"Cereals following break crops are generally more healthy and respond better to nitrogen fertiliser, which can be top dressed strategically in favourable seasons.

"Greater spreading of lime, which is needed to grow canola on acid soils, which are especially prevalent in WA, improves the yield of subsequent crops, enabling the return of lucerne and barley to previously acidified regions.

"More water being used by higher yielding crops and by lucerne-based pastures is also reducing the risk of salinity and water logging."

While crop yields fell in the past decade, this was mostly due to the effect of droughts and because break crop benefits and supplementary nitrogen were not expressed in dry conditions.

Dr Angus believed break crops could improve the yields of subsequent wheat crops, suggesting lifts of 0.8 tonnes/ha after canola, 0.5 t/ha after oats and a staggering 1.82 t/ha after lupins.

Legumes such as lupin, chickpea, field pea and faba bean also offered the benefit of hydrogen fertilisation, which stimulated growth by up to 10 per cent due to increased hydrogen in the soil.

Dr Angus completed his doctorate at The University of Melbourne and worked briefly in the Australian Commonwealth Public Service, Canberra, before joining CSIRO in 1973. He worked in the Land Division until 1987 and has since been at CSIRO Plant Industry.

He is a Fellow of the Australian Institute of Agricultural Science and Technology and has been awarded a Medal of Australian Agriculture.

UWA Institute of Agriculture Director, Winthrop Professor Kadambot Siddique, thanked Drs Andrew and Donald Stewart and other members of the Stewart family for their attendance at the 2011 Hector and Andrew Stewart Memorial Lecture, and their continued support.

Collaboration with Chinese universities

W/Prof Lyn Abbott
(lynette.abbott@uwa.edu.au)
Res/Prof Shimin Liu
(shimin.liu@uwa.edu.au)

Excellence of UWA in agricultural education and research training is increasingly recognised by Chinese universities and research institutions. Two new MOUs and seven articulation agreements between UWA and a number of Chinese universities have recently been signed off, followed by the visits of two delegations from China (page 2, page 9).

W/Prof Lynnett Abbott and Res Prof Shimin Liu visited China recently for signing ceremonies at seven universities. During the visit, two new MOUs were established with Northwest Agricultural and Forest University (NWAUFU) and Nanjing Agricultural Universities (NAU), and seven Articulation Agreements were signed off with Shanghai Jiao Tong University, Zhejiang University Lanzhou University, NWAUFU, NAU, Huazhong Agricultural University and South China Agricultural University. These universities are on the "985 Project" or "211 Project" university list, ie, the top universities in China. The agreements are on collaboration in education of undergraduates in animal biological areas, which can also be expanded to other areas in agriculture. During the visit W/Prof Abbott and Res/Prof Liu also delivered presentations on UWA profiles, agricultural education and research training and progress, which attracted strong interest from both undergraduate and postgraduate students.

W/Prof Lynnett Abbott signed an Agreement with Prof Tang Kexuan, Dean of School of Agricultural & Biology, and Vice-Dean, Prof YU Yan (back row, third from left), Shanghai Jiao Tong University.





A high level Iraqi delegation visited UWA early this year.

Eminent Iraqi visitors to UWA

On Monday, 31 January 2011, eminent Iraqi delegates including officials from the Iraqi Prime Minister's Advisory Council, Ministry of Agriculture and Ministry of Water, and Department of Education visited UWA to meet with 117 AusAID funded Agriculture scholarship holders. They discussed issues such as water resource management, embryo transfer technology, zero-till cropping, farm management and general rural investment, and assistance with agricultural strategic planning.

The visit was prompted by the Iraqi government's quest for improvements in the agricultural sector: aims include to increase senior personnel's technical capacity in key areas; to improve links with Australia in critical areas of agriculture; to facilitate strategic planning of the Iraqi Agriculture sector; to inform agriculture programming in Iraq; to inform Australia's assistance to Iraq in the sector; to promote public diplomacy between the two countries; and to support the implementation of a Memorandum of Understanding (MOU).

Delegates included leading representatives from the Iraqi State company for industrial crops, the State company for livestock services, from the Al-Nahrain company for seed production and from the Training and Rehabilitation Centre.

They met with UWA Vice Chancellor, W/Prof Alan Robson, W/Prof Alistar Robertson (Pro Vice-Chancellor (Research)), W/Prof Kadambot Siddique (UWA IOA, Director), W/Prof Graeme Martin (UWA IOA, Deputy Director), Prof William Erksine (Director, CLIMA and ICPBER), W/Prof Alan Dench (Dean of Graduate Research School), Mr Kelly Smith (Director UWA International Centre), Ms Deb Pyatt (Manager, International Sponsored Student Unit) and UWA's AusAid funded Iraqi MSc students.

W/Prof Kadambot Siddique pointed out: "The Agriculture sector is the flagship of Australia's aid program to Iraq, and Australia is committed to assisting with the rehabilitation of agriculture in Iraq," The delegation fits within AusAID's current strategy for Iraq and assists to meet Whole of Government (WoG) partners' obligations under the MOU on Agriculture.

"This contributes to Australia's aim of forging a strong relationship with Iraq in Agriculture and will assist senior Iraqi officials with strategic planning in the sector. Dr Mahdi Dhamad Al-Kaisi, the Deputy Minister for Agriculture, was impressed with UWA's expertise and commitment and has promised to provide future funding for MSc and PhD scholarships," W/Prof Siddique said.



Dr Reza Ferasyi, former UWA PhD student, looks on as W/Prof Graeme Martin receives a memento from Dr Mahdi Abrar, DVM, Dean of the Faculty of Veterinary Medicine of Syiah Kuala University.

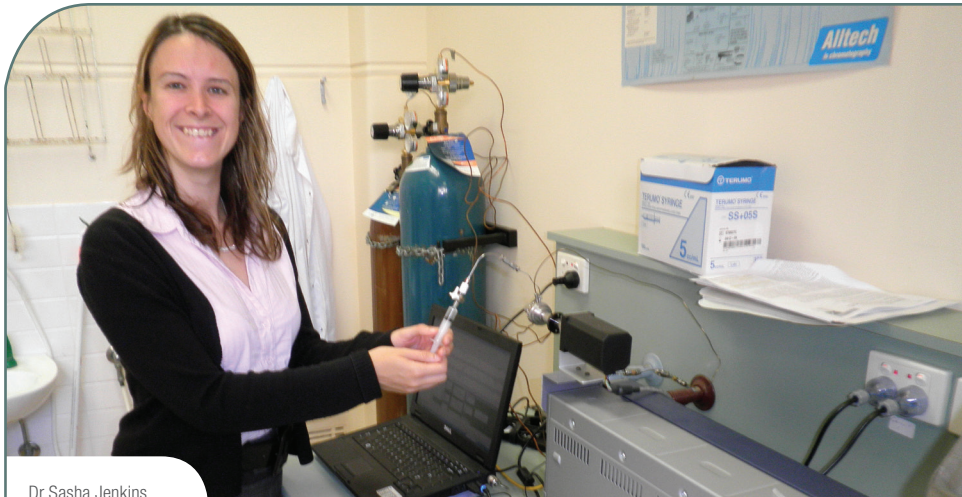
Think globally – act locally

Many people will remember Banda Aceh as one of the hardest struck places during the 2004 tsunami which struck the Indian Ocean. In October 2010 it was the location for the International Seminar entitled "Think Globally Act Locally: Entering the Global Market of Animal Health and Livestock through Utilising Local Resources Based on Green Vision at Syiah Kuala University."

The UWA Institute of Agriculture's Deputy Director, Winthrop Professor Graeme Martin represented UWA as one of the invited plenary speakers. Other speakers in the opening plenary session included Dr Ir. H. Suswono,

MMA (Minister of Agriculture of Republic of Indonesia) and Dr. Irwandi Yusuf, MSc. (Governor of Aceh). W/Prof Martin spoke on natural methods for increasing reproductive efficiency in small ruminants – the 'Clean, Green and Ethical' concept in action. He wrote this in collaboration with UWA graduate, Dr Teuku Reza Ferasyi of the Faculty of Veterinary Medicine, Syiah Kuala University.

In his presentation, W/Prof Martin said that Animal industries need to become 'clean, green and ethical' (CGE). "Food must be safe and healthy and from production systems with low environmental impact and high ethical standards," he said. It might come as a surprise, but implementation of these principles is not expensive or difficult. "All we need is research on adaptation to local genotypes and local conditions. The use of such clean, green and ethical tools in the management of our animals can be cost-effective, increase productivity and, at the same time, greatly improve the image of meat and milk industries in society and the marketplace," W/Prof Martin said.



Dr Sasha Jenkins

Covered anaerobic ponds: Converting piggery waste into biogas and soil improvers

Dr Sasha Jenkins
(sasha.jenkins@uwa.edu.au)

Currently, piggery waste is treated in effluent pond where the waste is gradually degraded by micro-organisms. The treated wastewater is then either evaporated or used for irrigation.

However, these effluent ponds generate a multitude of undesirable effects including green house gas (GHG) and odour emissions, heightening concerns over climate change. The pork industry is seeking more sustainable waste treatment systems and methane mitigation technologies, especially in light of the proposed Carbon Tax. According to Dr Sasha Jenkins, one simple and affordable option gaining increasing attention is the possibility of covering effluent ponds with geosynthetic materials (such as high-density polyethylene or polypropylene) to create a covered anaerobic pond (CAPs) digester that both treats the waste and captures the biogas. Biogas (methane and carbon dioxide) accumulates under the cover and is gradually removed and used either directly as a fuel or converted to electricity via a motor generator. Thus, CAP systems offer the potential to mitigate GHG emissions, provide renewable energy and improve community amenity via odour control.

"The technology is still in its infancy and there is limited knowledge about the micro-organisms which govern the waste degradation process including biogas production and how management practices can be altered to make conditions more favourable for microbial activities," she said. At the moment there are no widely available tools to enable scientists, advisors and/or producers to investigate the feasibility of installing a covered

pond or to evaluate the best management practices for maintaining and enhancing pond health or avoiding pond failure.

Dr Sasha Jenkins has been awarded two Australian Pork Limited (APL) grants on microbial communities in covered effluent ponds and quantifying the risks and benefits of using piggery waste by-products (including pond sludge) as soil improvers. These collaborative projects involve W/Prof Tony O'Donnell, Mr Ian Waite, Mr Ben Kyle and W/Prof Lyn Abbott from UWA Institute of Agriculture, Mr Hugh Payne and Dr Bruce Mullen from the Department of Agriculture & Food Western Australia (DAFWA), Mr Russell Cox from the Western Australia Pork Producers' Association (WAPPA) and local school student Ms Abbey Mardon, participant and semi-finalist in the Biogenius Challenge, Dept of Commerce.

The team wants to gain a better understanding of the microbial processes involved the degradation of waste inside the CAP; to develop monitoring tools for assessing pond health and to enhance the quality of the biogas and soil improvers (pond sludge) by manipulating the microbial activities through best management practices. The outputs of this research will be disseminated to the producers and the wider agricultural community through monitoring tools, log books, trouble-shooting guides and factsheets of Best Management Practices (BMPs) for waste management of CAPs and biogas capture. These outputs are timely as methane mitigation technologies and marketability of by products are being sought by other Australian industries where effluent waste treatment is an issue including Dairy Australia, Meat and Livestock Australia and the abattoir and meat processing sector.

Intensification of cropping in Bangladesh through short- duration food legumes

Prof Willie Erskine
(willie.erskine@uwa.edu.au)

A new project on the intensification of cropping through short-duration food legumes funded by the Australian Centre for International Agricultural Research (ACIAR) held its inception workshop 7-9 February 2011 at the Bangladesh Agriculture Research Institute (BARI), Joydehpore.

The project aims to increase resource capture in the cropping system by fitting in short-duration food legumes (lentil, field pea and mung bean) between successive rice crops. For this new niche we will fit new early maturing food legume cultivars into cropping management systems that include relay-sowing (broadcasting lentil or pea seed into the standing rice crop prior to its harvest).

In addition to BARI and local NGOs, the project has as international partners the International Rice Research Institute (IRRI), Philippines and the International Centre for Agriculture Research in the Dry Areas (ICARDA), Syria. Professor William Erskine (CLIMA Director) said the project has the potential to increase legume production locally through more efficient resource capture without reducing rice production. Thus, the capacity of rice and lentils to complement each other is now being explored on two fronts: as a staple diet and in crop growing.



LtoR: Dr Shiv Kumar (ICARDA), Prof William Erskine (CLIMA) and Dr Delowar Hossain, (Director Pulses (BARI) (centre) inspect the lentil crop on-farm trial with growers in Bangladesh.



LtoR: Mrs Sue Legge, Mrs Sorel Ewell, Mrs Rosemary McGlashin and Mrs Helen Carroll at the 2010 Mike Carroll Traveling Fellowship award ceremony.

Mike Carroll travelling fellowship

Mr Lalith Suriyagoda has won the 2010 Mike Carroll Travelling Fellowship, which is fast becoming one of the most sought-after awards at UWA. It honours the late Dr Mike Carroll, former Director-General of the WA Department of Agriculture. He was devoted to agriculture, working tirelessly to improve the lot of the WA farming sector, the wider community and his scientific colleagues. The Fellowship reflects the value he placed on international relationships.

Recipients are chosen for their academic ability, relevance of their studies to an important area of Australian broad acre agriculture, their potential to benefit from the experience, and their enthusiasm to impart the findings gained during their travels to the scientific, farming and wider community upon their return to Western Australia.

Lalith used the Fellowship to attend the Plant Nutrition Conference in Hanover, Germany, and study plant nutrient uptake modeling at the University of Göttingen.

"I learnt a lot from Prof Norbert Claassen who works on plant nutrient uptake and applying models to estimate the nutrient uptake like nitrogen, potassium and phosphorous in agricultural systems, across a range of plant across a range of plants/crops" Lalith said. Prof Claassen's models are widely used in a number of countries.

"I thought it would be a good opportunity to go there and learn their techniques. During my week long discussions with Prof Claassen I received valuable theoretical insight and practical experience of plant nutrient uptake and soil nutrient dynamics and how it changes over time," he said.

Over the last couple of years Lalith has studied native pasture legumes in the WA agricultural systems. He has collected a substantial amount of data from glass house-and fieldwork, and will be applying these models to other plants now. "I should be able to study the nutrient dynamics in the agricultural systems in the WA wheatbelt area, how often we have to fertilise, what is retained in the soil, and how much is lost from the system," he said.

Lalith's findings will be published in journals over the next year. This visit has also led to collaboration between University of Göttingen, Germany and the UWA Institute of Agriculture and UWA School of Plant Biology.

In his acceptance speech Lalith thanked The UWA IOA, School of Plant Biology, and Mike Carroll Fellowship.

Lalith obtained his B.Sc (Agric) degree from the University of Peradeniya, Sri Lanka in 2003 and M. Sc (Crop Science) in 2006 from the Saga University, Japan. In 2008 he completed an M.Sc (Statistics) degree from the University of Peradeniya and joined the Agriculture Faculty of the University of Peradeniya as a lecturer in Crop Modelling. In 2008 he received the SIRF/UIS scholarship offered by UWA to begin his PhD. studies on a topic relevant to Crop Modelling.

The future of biofuels

The Director of The UWA Centre for Energy, W/Prof Professor Dongke Zhang FTSE has developed a new concept of the 'four imperatives of energy' with significant implications for sustainable energy development.

In November 2010, Prof Zhang presented his concept in a plenary session to the China Energy Forum held in Beijing.

W/Prof Zhang points out the competing demands which set the context for his concept: "On the one hand rising food prices, concerns about sustainability and energy-equation challenges have led to a backlash against the use of biofuels, and on the other hand consumer demand for greener second-generation feedstocks continues to grow and the question of how to control best the emissions from power stations and the world's massive fleet of cars remains unresolved."

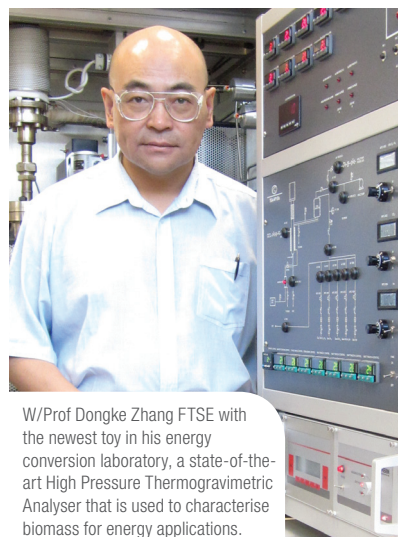
In his concept, W/Prof Zhang identifies 'four imperatives of energy' which – when taken together – allow a meaningful/comprehensive assessment of the various energy development options. The four imperatives of energy are Power Density, Energy Density, Cost, and Scale.

Power Density refers to the amount of power generated by a given primary energy source, per unit of area of land in the units of W (energy/time). The land taken into account is the total area used in the process, from extraction, through conversion, to final waste disposal; Energy Density refers to the amount of energy per unit of mass or volume of an energy source or carrier in the units of MJ/kg or MJ/m³; Cost includes both Capex and/or Opex; and Scale refers to the (large or small) capacity of a power generation or energy conversion installation.

The data collated by W/Prof Zhang for the various energy options reveal – not surprisingly – that any biofuel development will require massive areas of land, due to the low power density of any biofuels, not to mention the low energy density, high cost and extremely small scale, when compared to fossil fuels and nuclear based energy conversion and use.

W/Prof Zhang explains: "What people really want is NOT energy but power! It is the power that enables us to do things. While modern agriculture has lifted crop productivity, this enhanced productivity is really powered by petroleum (and coal and natural gas) for fertilisers, pesticides, the machinery used for farming and transportation of food. Any further increase in agricultural productivity will always be limited by the amount of light delivered by the Sun to the Earth and the basic physiology of photosynthetic efficiency."

The finite area of land on Earth and the quality of soil pose the ultimate limit to what we can derive from soil in terms of generating the three forms of energy essential to humans: food, electricity and liquid transport fuels.



W/Prof Dongke Zhang FTSE with the newest toy in his energy conversion laboratory, a state-of-the-art High Pressure Thermogravimetric Analyser that is used to characterise biomass for energy applications.

Based on his findings W/Prof Zhang argues, that the only sensible way forward for biofuels development in Australia is to integrate it with mining (e.g. mine rehabilitation), waste management (e.g. food waste, MSW and sewage sludge, etc) and agricultural wastes.

His conviction is echoed in his parting observation: While we are worried about 'peak oil', shouldn't we be more concerned with 'peak soil'?



W/Prof David Pannell

Distinguished fellow

One of the leaders in Agriculture and Resource Economics, W/Prof David Pannell, received a Distinguished Fellowship from the Australian Agricultural and Resource Economics Society (AARES) at their annual conference in Melbourne in early February 2011. Distinguished Fellowships are awarded to recognise members who, throughout their career, have made distinguished contributions to the advancement of agricultural and resource economics through research, teaching, extension, administration, business, or public service.

W/Prof David Pannell, Director of the Centre for Environmental Economics and Policy at UWA, initially wanted to become a plant breeder. However, after commencing a Bachelor of Science (Agriculture) course at UWA in 1980, he encountered Prof Henry Schapper and discovered the excitement of economics. After graduating, David worked for eight years at the Western Australian Department of Agriculture (completing a Bachelor of Economics and a PhD from UWA during that time). He worked on farming systems economics, including MIDAS, an influential whole-farm bioeconomic model that is still in use after 27 years.

Since moving to UWA in 1991, David's research has included a wide variety of topics in agricultural, environmental and resource economics, including resource conservation, environmental policy, farmer adoption of new practices, risk and weed management.

Particularly noteworthy have been his work on dryland salinity, for which he became the only social scientist to receive the W.E. Wood Award for salinity research in 2004, and the Investment Framework for Environmental Resources (INFFER), for which the project team received the Eureka Prize for Interdisciplinary Research in 2009. In 2007 he was awarded a prestigious Federation Fellowship from the Australian Research Council (ARC).

David's research combines theoretical rigour with a commitment to making a difference in the real world, fusing realistic complexity with pragmatic simplification, and integrating economics effectively with other disciplines.



The team behind Sustainable Cooperative Enterprise project.

What is 'best practice' for a sustainable co-operative enterprise?

The United Nations (UN) has announced 2012 as the International Year of Co-operatives, and the WA government has introduced a new legislative framework governing co-operatives (The Co-operatives Act WA 2009). Both incidents highlight, from a national and international perspective, the timeliness of a research project undertaken by *The UWA Business School and The UWA Institute of Agriculture*.

The research project, "Sustainable co-operative enterprise: an investigation into the factors influencing the sustainability and competitiveness of co-operative enterprises," is led by W/Prof Tim Mazzarol W/Prof Geoffrey Soutar, W/Prof John Watson, W/Prof Kadambot Siddique, Assist/Prof Joanne Sneddon, Mr Peter Wells and Dr. Elena Limnios. The industry partners of the project are: Co-operative WA, CBH Group and Capricorn Limited. This was one of only three business-related projects to receive an Australian Research Council (ARC) grant under the May 2010 round of the Innovation Australia Linkage Projects scheme.

These research leaders and a network of international researchers will review best practice co-operative business models from Australia and around the world. They will make recommendations about how co-operatives can improve their sustainability through implementing such best practice. The project will examine the measurement of member value, identify best practice examples of corporate governance, options for raising external capital, and the reasons why co-operatives seek demutualisation.

Co-operative enterprises, which some describe as the fourth sector of the economy, can be major contributors to local, national and international economies. Industries represented in Australia's list of top 100 co-operatives, credit unions and mutuals include agriculture, financial services, insurance and retailing. The list demonstrates the economic and social impact of co-operatives in Australia – generating in excess of \$14.5 billion in turnover per year. This suggests that co-operatives, credit unions and mutuals are a

viable alternative to private and public enterprise. Despite that, the sector has not received sufficient attention and recognition by researchers, policy makers, legislators and the public alike. Co-operative enterprise receives minimum attention in management textbooks and academic curricula, and specialised training programs for managers and executives of co-operatives are scarce within Australia. While continuing to be such an important part of the world's economy, co-operative enterprise has declined as a subject of academic research over the past sixty years in comparison to other fields of management and economics.

The traditional co-operative business model faces a number of generic challenges in relation to raising and retaining capital, which originate from the lack of transferability, liquidity, and lack of appreciation of members investment in their co-operative. Horizon and portfolio issues also arise as the members commonly have a shorter investment horizon than the organisation and do not always see a personal benefit from organisational decisions aimed at increasing the business' competitive position in the market. Managing a co-operative is therefore a complex task, as it commonly requires balancing member and organisational needs.

The study will run from 2010-2013 with early results expected in March 2011 to detail alternative structures for raising financial capital under the new legislation, including preliminary assessment of the likely impacts and effectiveness of each alternative. By the end of 2011 field data collection for national case studies will be completed, followed by focus groups, member surveys and international case study analysis. The last year will focus on the public release of reports, publication of scholarly works and development of teaching, executive development materials and coursework. This will include the publication of a book with case studies of organisational resilience in the co-operative business model, co-authored by the international research partners and an international library of case studies which will be controlled by the leading research team.



LtoR: Prof Martin Fey and Prof Cornie van Huyssteen.

Prestigious soil science award

Prof Martin Fey, Professorial Fellow in the School of Earth and Environment at UWA and UWA Institute of Agriculture, received the Gold Medal of the Soil Science Society of South Africa from its President, Professor Cornie van Huyssteen (right), at the annual congress of the Society held during January in Pretoria. The Gold Medal, recognising an exceptional contribution to soil science, is the highest award that the Society can bestow and it is only the fifth occasion the award has been made

since its inception in 1987. The award refers to the book 'Soils of South Africa: their distribution, properties, classification, genesis, use and environmental significance' which Professor Fey completed after moving to UWA in 2009. It was published last year by Cambridge University Press. More than half of the 2000 first edition copies have been sold in six months. Congratulations to professor Martin Fey.

Lambex honours UWA stalwarts

Over 500 delegates from the sheep industry gathered in Perth to see WA Minister for Agriculture, Hon Terry Redman, unveil the first edition of *The Australian Sheep and Lamb Industry Roll of Honour* late last year.

This list recognises "industry champions who have made a contribution to the way we breed, feed, manage and market Australian sheep and lamb." Several academics and graduates were listed on the Australian Sheep and Lamb Industry Roll of Honour.

W/Prof Graeme Martin, Deputy Director of the UWA Institute of Agriculture, E/Prof David Lindsay, Dr John Milton and the late Emeritus Professors Eric Underwood and Reg Moir were on the Roll. Mr Dawson Bradford, The UWA Institute of Agriculture External Advisory Board Member was also listed. UWA agriculture graduates listed on the Roll includes Rob Davidson, Peter Doyle, Ashley Herbert, Chris Oldham, Terry (TJ) Robinson, Sarah Wiese, Clive Francis, John Gladstones, John Lightfoot, Colin McDonald, Dennis Roberts, Reg Rossiter, and Jim Shepherd. The list also included Dale Park and Ian Robertson who graduated through the UWA Faculty of Economics.

W/Prof Graeme Martin presented an invited keynote paper, co-authored with Penny Hawken and Dominique Blache, titled "The psychology of the ewe".



Ms Deborah Temple

Pig welfare specialist visit UWA

Ms Deborah Temple, PhD student from the Universitat Autònoma de Barcelona, in her third year of a PhD on Pig Welfare Assessment visited UWA School of Animal Biology for three months at the end of 2010.

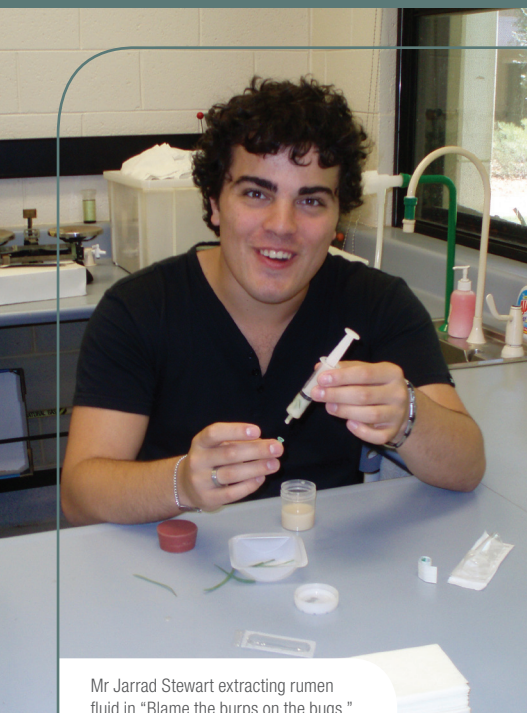
She is involved in the European project "Welfare Quality®" at the Universitat Autònoma de Barcelona, supervised by Xavier Manteca, Antoni Dalmau and Antonio Velarde.

The broad aim of this project is to develop a scientifically based system to assess pig welfare in commercial farms and slaughterhouses. A common framework has been developed among 13 European countries and four Latin American countries to evaluate welfare based on four main principles: good feeding, good housing, good health and appropriate behaviour. Within these principles, 12 independent but complementary, criteria have been identified.

For the porcine species, three monitoring protocols have been developed to measure each of the 12 criteria: sows and piglets on farm, fattening pigs on farm, and pigs at slaughter. For each protocol, up to 30 measures have been tested for their validity, repeatability and feasibility in pilot

studies. Preference has been given to animal-based measures. The sensitivity, reliability and practicability of the overall protocols is currently tested and discussed in different housing systems across Europe, ranging from more intensive to more extensive rearing conditions. Several methodologies are being developed to detect farms (or abattoirs) with given welfare deficiencies and to evaluate risk factors at commercial level with the aim to prevent welfare problems and provide advice to farmers.

Ms Temple's three month stay at UWA is supported by the Spanish Ministry of Science and Innovation. It gives PhD students the opportunity to learn about different working methodologies and scientific approaches to complement their learning process during their PhD. "This visit has allowed me to have a broader approach on animal welfare assessment, to work with a different species (sheep) and to acquire a critical view point on my PhD," she said. "I really encourage PhD students to stay for a short period of time in a different country working among a foreign team. Besides being a great experience, it is an essential component of the scientific development of a PhD student," she said.



Mr Jarrad Stewart extracting rumen fluid in "Blame the burps on the bugs."

PICSE travelling scholarships opens up awareness

Two students and two teachers had a new science world open up to them after being awarded the PICSE travelling scholarship. The Primary Industry Centre for Science Education (PICSE) offers an annual travelling scholarship for teachers to go to another PICSE Activity Centre, and provides an Industry Placement Scholarship to selected students to attend an Industry Placement camp in another state.

Mr Jarrad Stewart of Churchlands SHS and Mr Torrin Rowe from Albany SHS took the road to South Australia in December 2010 as a part of a Travelling Student Scholarship they were awarded on top of their PICSE Industry Placement Scholarship. Their Traveling Scholarship was co-funded by the Chief Scientist of WA, Horticulture Australia Ltd and Fisheries Research and Development Corporation (FRDC).

"Both the agricultural science and the conservation and sustainability aspects of the PICSE GrowSmart camp really helped me to understand where I could end up after studying science at a tertiary level. The role of an agricultural scientist is more defined for me now after this experience, Jarrad recalled after the South Australian GrowSmart program.

"Traveling to South Australia was an experience for which I am grateful as it gave me the ability to see a different side of primary industry in which we mainly focused on marine and aquaculture areas," said Torrin who travelled to Flinders University.

Two teachers, Mr Richard Rose from Manea Senior College and Mr Gary Foster from Guildford Grammar School were selected for the travelling

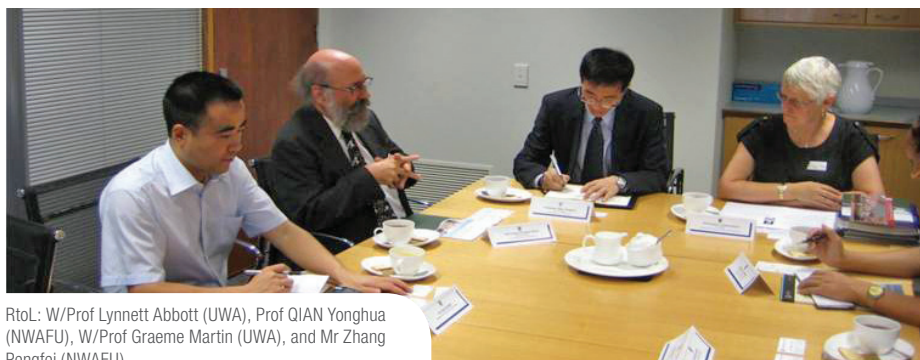
teacher scholarship co-funded by the Chief Scientist WA, Grains Research and Development Corporation (GRDC), and Fisheries Research and Development Corporation (FRDC).

"This year's Adaptations to Climate Change theme was approached differently due to the potential impacts on the localities. It was interesting to see how each state views the future," Mr Richard Rose said.

Both teachers returned to their schools excited at the prospects of applying their new knowledge and experience in their classrooms. Torrin and Jarrad gained invaluable insight into a greater array of careers in primary industry, and hold clear aims for their future careers in agriculture.

Jarrad started a Science Degree at UWA in the Faculty of Natural and Agricultural Sciences. Torrin is taking a gap year working in the industry, and will start an Agricultural Science Degree next year.

PICSE is funded by the Federal Government's Diversity and Structural Adjustment Fund, University of Tasmania, UWA, University of New England, University of Southern Queensland, University of the Sunshine Coast, Flinders University, Charles Sturt University and the Grains Research and Development Corporation (GRDC), Cotton Research and Development Corporation (CRDC), Fisheries Research and Development Corporation (FRDC), Dairy Australia, Horticulture Australia Ltd, Cotton CRC, Murray Darling Basin Authority, Dow AgroSciences and National Centre for Groundwater Research and Training.



RtoL: W/Prof Lynnett Abbott (UWA), Prof QIAN Yonghua (NWAUFU), W/Prof Graeme Martin (UWA), and Mr Zhang Pengfei (NWAUFU).

Good ties renewed

Continued good relations between UWA and China's Northwest Agriculture and Forestry University was reaffirmed during a visit by a delegation from NWAUFU in Jan 2011.

This visit comes after several visits by UWA delegates to NWAUFU, including one by W/Prof Graeme Martin, Deputy Director of the UWA Institute of Agriculture in 2008 and one by W/Prof Lyn Abbott, Dean, Faculty of Natural and Agricultural Sciences in 2010.

The delegation, led by Prof QIAN Yonghua, Vice-president, and Mr QIAO Wenjun (Deputy

director, Office of International Cooperation and Exchanges), met W/Prof Bill Loudon, Senior Deputy Vice-Chancellor, Ms Eva Chye, Mr Kelly Smith, W/Prof Lyn Abbott, W/Prof Graeme Martin, Dr Sato Juniper, and Ms Joanne Francis on discussions of the articulation student programs and the UWA-China scholarship program.

A number of students from this university wish to apply for the scholarship in 2011 for PhD studies at UWA.

Weeds collaboration

The world of weed science revolves at a cutting-edge pace and scientists often collaborate across vast distances. Dr Scott Nissen a Professor of Weed Science at Colorado State University in Fort Collins, Colorado, USA, visited the Australian Herbicide Research Initiative (AHRI) at UWA in December and January. His research program in the USA includes integrated weed management in crops such as onions, potatoes, and dry beans, along with studies on herbicide fate in the environment.

Dr Scott Nissen



Spotlight on lupin genome project

WA scientists have secured nearly \$1.5 million to map the lupin genome – a task set to shed light on how the grain can be grown more successfully, including for use in treating obesity and type 2 diabetes.

As part of the first major plant genome sequencing project managed in Australia, researchers will soon start sequencing the narrow leaf lupin genome.

This three-year grant was awarded to the Western Australian Institute for Medical Research-based (WAIMR) Centre for Food and Genomic Medicine (CFGM) by the Grains Research and Development Corporation (GRDC) following a competitive national tender process.

WAIMR scientists Prof Grant Morahan and Res/Assoc Abdul Baten will work on the project in conjunction with the CSIRO, UWA, DAFWA and biotechnology company Proteomics International.

The research is being conducted in collaboration with the Centre for Food and Genomic Medicine (CFGM) in Perth, WA. The team will build upon established resources and employ powerful next-generation sequencing technologies and innovative bioinformatics techniques in their efforts to sequence the genome.

CFGM director Prof Peter Leedman said the grant provided a great injection to the CFGM's work. "This project will help us maximise the potential of narrow leaf lupin, which is the major grain legume grown in Australia and which our Centre's research has shown, when added to foods as a flour, may be beneficial in reducing the impact of diabetes and obesity by increasing insulin sensitivity and reducing appetite," he said.

"Understanding the genetic makeup of the narrow leaf lupin, now possible thanks to the genome revolution, will help us unravel the many mysteries that still exist about how the grain works to boost insulin sensitivity and create a feeling of being full."

Lupins, members of the legume family, are a valuable winter rotation crop that farmers can use to prevent diseases surviving from season to

season in cereal crops such as wheat. They have the added benefit of fixing nitrogen in the soil.

Australia is one of the world's biggest producers of sweet lupins and, at the moment, the majority of lupin crops are grown for stock feed.

The CFGM team will interact with national and international collaborators in China, Europe, Japan and the USA with sequencing and bioinformatic expertise. Most of the project will be conducted at the new CSIRO/UWA joint Crop Genomics laboratory at Floreat, in Perth WA. It will be led by W/Prof Karam Singh from CSIRO and the UWA Institute of Agriculture. Lupins are also a good source of protein and dietary fibre. "We have already identified genes in lupins which produce proteins that impact on the nutritional content of the grain," W/Prof Karam Singh said.

Studies conducted by the CFGM have shown that these proteins have important wide ranging benefits for humans and may provide cardiovascular health benefits in terms of increasing insulin sensitivity and reducing blood pressure. The proteins have the potential to reduce the risk of diabetes and obesity by increasing a person's sensitivity to insulin and creating the sensation of being "full".

Established in 2006 with \$4.5 million seed funding from the Government of Western Australia, the Centre brings together scientists from such diverse sectors as biotechnology, medical research, agriculture and food technology, so they can investigate jointly new ways of fighting these medical conditions which are becoming more and more prevalent across affluent societies

"Our major focus is to decipher as much of the gene space sequence as possible and to use this valuable information twofold: to speed up the process of marker discovery significantly and to identify candidate genes for agronomic traits such as drought tolerance and disease resistance," he said.

The research from this grant could hold the key to developing improved breeding programs for the narrow leaf lupin and other lupin crops.



LtoR: Dr Lingling Gao, Dr Rhonda Foley, Prof Karam Singh, Ms Hayley Casarotto.

The battle of the sexes

Scientists have uncovered a rare insight into a war between genes to control the sex of a plant.

The researchers, from the ARC Centre of Excellence in Plant Energy Biology and the School of Biomedical, Biomolecular and Chemical Sciences at UWA have described the evolution of a *restorer to fertility* (Rf) gene that influences sex determination.

The findings, published in the prestigious journal *Proceedings of the National Academy of Sciences*, have important implications for agricultural science and medicine.

Plant cells, like human cells, contain tiny mitochondria which produce energy for the cell. Mitochondria are thought to be descended from bacteria that entered the cell over two billion years ago and contain their own genes. Some of these genes produce proteins which can turn a hermaphrodite plant into a female by preventing the male parts of the flower from forming.

Researcher Dr Sota Fujii said: "Mitochondria are more likely to pass on their genetic information when the plant is female."

However, plants have a defence mechanism, according to the published paper. Dr Fujii and co-workers describe the evolution of *restorer to fertility* (Rf) genes which produce proteins that block the action of the mitochondrial male-sterility inducing genes by binding to the RNA they produce.

This finding demonstrates a 'civil war' between the nucleus and the mitochondria over the determination of the sex of the plant which has been going on for millions of years.

Chief Investigator W/Prof Ian Small said: "Our analysis of the evolution of *Rf* genes not only strongly supports their role in sex determination, it also gives us clues as to how they work exactly. The ability to silence destructive products in the cell has obvious applications in agricultural science and in medicine. The potential to control the sex of a plant is also important in commercial crop breeding."

"The UWA Institute of Agriculture and ARC Centre of Excellence in Plant Energy Biology are collaborating in translational research to underpin basic science on crop improvement issues," said W/Prof Kadambot Siddique.

Camera action on Buiatrics

Late last year, Animal Scientist literally had the camera on them at the XXVI World Buiatrics Congress in Santiago, Chile, in November 2010.

W/Prof Graeme Martin, Deputy Director of the UWA Institute of Agriculture represented UWA at the congress. He presented an invited keynote paper on "Rethinking the management of health and reproduction in small ruminants". The paper, co-authored by Ms Samantha Bickell, Res/Assist/Prof Zoey Durmic, Assoc/Prof Dominique Blache and Prof Phil Vercoe, was well received. Buiatrics is the study of cattle and their diseases.

An interesting aspect of the conference and was that organisers of the Congress set up a small television studio in the trade displays area. Several conference presenters were interviewed in languages ranging from English, French, German to Spanish. The interviews were edited into small TV clips and placed on the website of "Studio Bovine" (www.studiobovine.com). W/Prof Martin was interviewed twice, both times about sheep 'psychology'. Dr Annemieke de Keijzer interviewed him on Clean, green and ethical sheep production – role of memory, and Dr Philippe Houfschmitt on Reproduction ovine – nouveautes sur la memoire.

What is food security?

Each year the UWA Institute of Agriculture (UWA IOA) invites several international and national agriculture experts to deliver broad perspective lectures as part of its Food and Agriculture Lecture series.

In February this year The UWA IOA hosted Prof Philip J. White, Leader of the Environment Plant Interactions Programme at the Scottish Crop Research Institute. Prof White is Special Professor in Plant Ion Transport at the University of Nottingham and Visiting Associate Professor at the Comenius University, Bratislava. His lecture reflected upon the definition of food security as having sufficient, safe and nutritious food to meet the dietary needs of an active and healthy life. He provided an introduction to plant mineral nutrition and illustrated the contribution of mineral fertilisers to increasing crop yields during the Green Revolution. He said: "in the immediate past, increased crop production was underpinned by agricultural intensification and by the reduction of losses to weeds, pests and diseases. Food availability in the future will depend upon further reductions in 'yield gaps', reducing wastage, and the production of more with less input."

According to Prof White crop production is often limited by low phyto availability of essential mineral elements and/or the presence of excessive concentrations of potentially toxic mineral elements. He said that current research in agronomy and plant breeding is addressing the problems of mineral toxicities in agricultural soils to improve food security and the optimisation of fertilizer applications for economic and environmental sustainability. He concluded by showing how agriculture can produce edible crops that contribute sufficient mineral elements for adequate animal and human nutrition through a combination of appropriate agronomic and genetic strategies.



LtoR: W/Prof Hans Lambers (Head, School of Plant Biology), Prof John Raven, Prof Erik Veneklaas with Prof Philip White.



LtoR: Prof Phil Vercoe and Mr Bruce Maynard at the stress-free stockmanship workshop.

Stress-free stockmanship workshop

Dr Joy Vadhanabhuti (joy.vadhanabhuti@uwa.edu.au)

Physical, physiological and mental stress impairs animals welfare and their performance. When animals are stressed they reproduce at lower rates, grow slower and get sick more often. Human-animal interactions can be a source of mental stress mainly because people's beliefs about animals often translate straight into their handling skills. "Improving stockhandling skills can be achieved by training people to understand the 'psychology' of livestock during workshop such as 'Stress-free stockmanship' workshop," Professor Phil Vercoe, Leader of the Animal Production Systems Program at the UWA Institute of Agriculture said.

A two-day workshop was recently held at UWA Ridgefield farm, Pingelly. The 'Stress-free stockmanship' workshop was conducted for members of the RSPCA and UWA School of Animal Biology. The workshop was co-ordinated by the UWA Future Farm manager, Dr Ian Williams, and conducted by Mr Bruce Maynard, a stress free stockhandling trainer from New South Wales.

It was an enjoyable and informative two-day training event with a strong emphasis on practical results which can make a difference for a livestock based operation. The course compiled theories, principles and practical exercises to master stress free handling techniques. Bruce conducted group coaching to give participants confidence in the newly acquired skills. He showed ways for anybody handling livestock to save time and stress. Bruce put it simply: "If animals are handled correctly they do not feel threatened and so they are less likely to cause direct or indirect injuries to you and/or to themselves."

He demonstrated how important it is to learn that our position determines which way the animals move off. The correct way to move animals is to enter their 'pressure zone' where they can see you, and also to release the pressure by moving away or backing out of their zones. The basic principle is straightforward: "When dealing with animals, keep looking at how the animal is reacting. So you can adjust your position and distance relative to the animals and get them moving 'stress-free'."



Assoc/Prof Anu Rammohan in India.

Institutions for food security: global insights from rural India

Associate Professor Anu Rammohan
(Email: anu.rammohan@uwa.edu.au)

The recent global rise in food prices has increased food insecurity dramatically, particularly in developing countries such as India which is home to an estimated 200 million food insecure individuals. Although India's GDP has grown at an average annual rate of 7.4% since 2001, and the country is now a net food exporter, an estimated 28% of the world's undernourished population live in India.

Associate Professor Rammohan from the UWA Business School and her colleagues from University of Sydney, Griffith University and Tata

Institute of Social Sciences (India), are working on an ARC Discovery Project, seeking to analyse how some vulnerable sectors of the rural populations in India are dealing with the increase in food prices.

"For small landowners and the landless poor, the immediate impact of rising food prices is negative. In order to achieve food security policy and investment reforms are needed on multiple fronts, including human resources, agricultural research and development, rural infrastructure, water resources, and farm- and community-based agricultural and natural resources management. The problem in India has its origins in regional disparities, particularly in economic, political and agro-climatic zones," Assoc/Prof Rammohan said.

Data collection is currently underway. Researchers will interview 800 randomly selected rural households from eight strategically selected border districts across eight Indian states. These include the food-secure districts in Punjab, Haryana and Himachal Pradesh; moderately food-secure districts in Karnataka, Uttarakhand and West Bengal and food-insecure districts in Andhra Pradesh and Orissa. The dataset will provide detailed information on a range of characteristics: demographic, economic (including information on land ownership, income and livelihood sources), labour market and educational profiles of all household members, access to credit and so on. Researchers will also collect data on anthropometric measures, household perception of food security, food consumption habits and detailed data on food consumption.

Analysis of the data will help the researchers in their aim to provide detailed food security assessments for these strategically targeted communities over time, focusing on the three core elements of food security: access, availability and utilisation). The analysis will provide answers to the three interlinked questions at the heart of the global food security debate: (i) How do higher prices impact on food security/insecurity amongst different rural population segments? (ii) In what ways do institutional environments and livelihood strategies interact to create food security outcomes? (iii) what institutional arrangements should policy makers promote to help ensure food security resilience?



Prof Ulrich Zimmermann and Dr Helen Bramley clamping a ZIM-probe to a wheat leaf.

Plants signal when they need water

Dr Helen Bramley
(Email: Helen.bramley@uwa.edu.au)

Monitoring the stress a crop experiences due to water shortage has been made easier by novel magnetic pressure probes. Emeritus Professor Ulrich Zimmermann of University of Würzburg and ZIM Plant Technology, Germany, invented the probes after many years of research investigating the mechanisms of water transport in plants.

Each ZIM-probe consists of two magnets which are clamped either side of a leaf. The attraction of the two magnets applies an external pressure to the leaf, which is opposed by the turgor pressure of leaf cells. A sensitive pressure sensing element within each probe detects changes in leaf turgidity, by monitoring the change in pressure opposing the magnetic force. Because leaf turgidity is related to the water status of a plant, monitoring changes in turgor will indicate when a plant needs water. Transmitters connected to the probes, capture and send the data to a remote controller, which communicates with an online server so that plant water status can be checked at anytime and anywhere in the world. The ZIM-probe technology has been tested on a variety of plant species, particularly horticultural crops where it is being adapted for irrigation scheduling.

During a recent visit to the UWA Institute of Agriculture (and co-hosted by CSIRO Plant Industry), E/Prof Zimmermann demonstrated how the probes operate. Professor Zimmermann also delivered a public lecture entitled, "How do plants take up water in a drying climate?" at The UWA Institute of Agriculture. In Australia, where water is a critical resource, technology such as the magnetic pressure probes could help improve irrigation practices by more closely aligning water supply with plant needs.

The probes may also aid pre-breeding research in rainfed crops. With future climate predictions of less rainfall and more prolonged droughts in many of the major crop growing regions, developing high yielding, more drought resistant crops is a high priority. Dr. Helen Bramley (UWA IOA), in collaboration with Dr Jairo Palta (CSIRO), is evaluating the magnetic pressure probes for use with wheat plants. If successful, the probes could be a rapid, non-destructive method for screening genotypes for greater water use efficiency and tolerance to water stress, as well as facilitating genotype assessment in a range of field environments.



Dr Cami Ryan

Science meets social science

an ASSA funded project exploring pulse breeding and public-private partnerships in Australia and Canada

Dr Cami Ryan (cami.ryan@usask.ca)

The public-private partnership (PPP) is one new model of centerless or networked governance that has emerged in recent years. This project, funded by Academy of Social Sciences in Australia (ASSA), examines the development and use of these types of partnership models in the management and funding of pulse breeding programs in both Canada and Australia.

Early in 2010, the ASSA announced the availability of funding for projects that linked science and social science across international boundaries. Dr Camille (Cami) D. Ryan, a Professional Research Associate with the Department of Bioresource Policy Business and Economics in the College of Agriculture and Bioresources at the University of Saskatchewan and Co-Investigator, W/Prof Kadambot Siddique of the UWA Institute of Agriculture have developed this project with collaborator Dr. Peter Phillips of the Johnson-Shoyama Graduate School of Public Policy at the University of Saskatchewan, Canada. The research builds upon previous work conducted on global pulse breeding and research networks.

The project methodology incorporates both primary interview data and secondary statistical data analysis to characterise national pulse breeding systems in both Canada and Australia. "To date, we have conducted 18+ interviews in Australia with government, university, industry groups and the private sector. We will initiate the same process in Canada in March and April 2011," Dr Ryan said during a recent visit to UWA. This project employs case studies and social network analysis to investigate three key issues facing public research managers in both geographical contexts, namely: how can public-private partnerships (P3s) be structured in order to increase investment in plant breeding; to increase global knowledge, plant genetic resources and technologies; what role do personal relationships and social networks play in facilitating the exchange of knowledge and resources and in developing public-private partnerships; and what are the comparative benefits or costs of different models between Australia and Canada and how can these jurisdictions learn from one another?

"Ultimately, our goal here is to cultivate networks between Australian and Canadian pulse breeding systems. We will compile our secondary data, analyse and compare the qualitative and quantitative results and then generate and deliver a report to ASSA by August 31, 2011," Dr Ryan said.



W/Prof Kadambot Siddique meeting with the Hon. Minister for Agriculture, Government of Kerala, Mr Mullakkara Retnakaran (left) and Prof Prasado Rao, Kerala Agricultural University.

Note to Kerala: farmers are climate champions

"Essentially, farmers, the climate champions, should be developing strategies to combat climate change with existing technology. They also should bring researchers on board, so that over a period, something is achieved," Winthrop Professor Kadambot Siddique, Director of the UWA Institute of Agriculture told attendees at a three-day national workshop in Thiruvananthapuram, India, on December 14 – 16, 2010, on "Natural resource management and human development paradigms in climate change perspective – adaptive strategy options for Kerala."

The workshop, organised by the Environment Management Agency Kerala and the Kerala Planning Board, was inaugurated by Hon Chief Minister of Kerala and presided by Honourable Vice Chairman, Kerala State Planning Board. Nobel laureate Dr R K Pachauri, Chair, Inter governmental Panel on Climate Change delivered the Key Note Address. In his address Dr Pachauri said that the time has arrived to do away with the fetish for calibrating growth in terms of GDP numbers alone. He said the issue at stake is that the world is following an unsustainable path of development, of which climate change forms a significant sub-set. "The world must learn to adapt to live with the issues thrown up by climate change, and to tackle the inertia which has met these issues in various forms so far," he said.

Winthrop Professor Siddique echoed this. Addressing a gathering of teachers and students at the College of Agriculture, Vellayani, Kerala he said the State could make use of the models developed by the UN Intergovernmental Panel on Climate Change (IPCC) to develop a long-term programme to combat climate change.

He said that there is extensive scientific evidence that climate will change over the next thirty years. He believes that a 'wait and see' attitude would only lead to a lot of damage.

He urged policy makers to make long-term plans to deal with the problems faced by Kerala in the agriculture sector. "A multi-dimensional task force can identify the problems and come up with strategies to address agricultural problems, socioeconomic challenges, labour issues, introduction of new varieties etc. "Highlighting the need to adopt new technology, he stressed, "He believes that if we continue on the same path, we will not reach anywhere."

"Bringing politicians on board in terms of adoption of new technology and adaptability to climate change, is vital. Although only part of the solution. To deal with climate change as a whole, farmers, scientists and policy makers working together in a participatory system would be ideal. "To deal with challenges posed by declining crop yield, poor soil health and resistance to new technology, farmers have to be involved in the development of technology. A grassroots level approach will ensure that technology is not isolated," he said.



W/Prof Kadambot Siddique and Dr M.V.K Siva Kumar, Director World Metrological Organisation, Geneva who co-chaired the session.

Meeting the challenge of sustainable development in drylands under a changing climate

Drylands are among the world's most fragile ecosystems and support some of the world's poorest populations. 148 Agricultural leaders from 18 countries, representing 12 international and regional organisations, attended The Tenth International Conference on Development of Drylands: Meeting the challenge of sustainable development in drylands under a changing climate – moving from global to local from 12-15 December 2010 in Cairo, Egypt.

Winthrop Kadambot Siddique Director of UWA Institute of Agriculture was invited to give a keynote paper on "Adaptation Strategies to Climate Variability and Climate Change in Dryland Agriculture in Southwest Western Australia." He co-authored the above paper with Dr Helen Bramley (UWA IOA) Adjunct Associate Prof Jairo Palta (CSIRO/UWA) and Adjunct Prof Senthil Asseng (CSIRO/UWA).

The inaugural session was held under the patronage of H.E. Mr. Amin Abaza, Minister of Agriculture and Land Reclamation, Egypt, who expressed his conviction that it will be valuable to develop adaptive and mitigation strategies and getting policy and institutional support to help communities in dry areas to counteract the adverse effects of climate change more effectively.

In his opening address, the Chair of the IDDC, Prof. Dr. Adel El-Beltagy highlighted the serious impact climate change would have on agriculture and natural resources in dry areas. He said urgent action was needed to develop effective coping mechanisms, risk aversion and management strategies for vulnerable communities in the dry areas. "The first prerequisite for developing successful adaptation and mitigation strategies is to have a very precise assessment of the impacts of climate change at the local level because the current global and regional assessments mask local differences," he said. In his view developing countries with large dry areas should undertake precise local climate change assessments in different agro-ecological regions.

The scientific program addressed all aspects of climate change which affect dry areas including assessment of climate change; local impacts on water, land, and biodiversity and the productivity of agriculture (including fisheries); national case studies; enhancing resilience of local agricultural communities through adaptation strategies involving improved methods for water capture, management infrastructure; it also examined the use, development and selection of crops and varieties adapted to low moisture regimes and high temperature stress, and appropriate agronomic management practices including conservation agriculture; mitigation strategies based on reducing greenhouse gas emissions from agriculture and food chains, through advances in the development and use of solar energy and other renewable energy sources, and through carbon sequestration.

The program also examined the strategy of blending indigenous/traditional knowledge and heritage with modern science, particularly with respect to water use; and socioeconomic, institutional and policy considerations for the development in dry areas affected by of climate change.

Scientists from dryland countries across the world presented the findings of their scientific efforts undertaken in a range of disciplines, to assess the impact of climate change, to develop coping mechanisms and to enhance the resilience of the communities in the dry areas affected by climate change, including drought and the degradation of natural resources of land, water and biodiversity.

The findings clearly established that drylands are among the most fragile ecosystems and support some of the world's poorest populations. The global temperature rise, the regional precipitation decreases, the changing seasonal patterns, and the increasing occurrence of intense events driven by climate change are already placing considerable stress on dryland agriculture and these will intensify in the future.

Based on these deliberations, delegates compiled the Cairo 10th ICDD Declaration, urging international organizations such as the World Bank, the CGIAR programs, UN Agencies and regional Organisations to help implement recognition and management of adaptation, mitigation, and development as linked processes. They stressed the importance of minimising risks to rural livelihoods from possible climate change and extreme events and recommended that dryland regions across the world should begin by assembling a knowledge action network which would connect experts in the international and national communities with regional knowledge leaders and decision-makers, and these to local stakeholders and news media.

Delegates had the opportunity to reflect on the origins of agriculture and its advances through visits to the Ancient Agricultural History Museum in Dokki, Giza and to the BELCO Farm which is known for its modern technology and efficient use of water and land resources, resulting in the economic production of high-quality crops as well as 'greening of the desert'.

The conference was organized by the International Dryland Development Commission (IDDC), hosted by the Agricultural Research Centre (ARC) of Egypt, and co-sponsored by a range of prominent international research and development institutions/centres.

UWA Future Farm ... latest developments

- Stage 1 of a 5-stage re-fencing program, planned over the next two years, has been completed and Stage 2 should be starting as this newsletter goes to press.
- The new farm manager's home, the ALVA-Ideal house should be operational early in 2011 and planning is underway for the sheep-facility education-research building.
- An automated weather station has been established with comprehensive data available online to the management team and to researchers with projects on the farm.

- The website has gone live and – although still under construction- provides access to news on farm development, research projects, and the weather station.
- Mr Ashley Herbert (*Agrarian Management*, Katanning) has agreed to act as farm consultant for the Future Farm Project and will begin interacting with the farm management committee in 2011.

For more on the Future Farm visit
<http://www.ioa.uwa.edu.au/research/future-farm>

Trees for carbon *and* biodiversity at UWA Future Farm

Assistant Professor Rachel Standish
(rachel.standish@uwa.edu.au)

Conflict between biodiversity conservation and agriculture has played out in landscapes across the globe for centuries. The emerging carbon market has the potential to reduce this conflict by providing a financial incentive for large-scale ecological restoration in agricultural landscapes. Consequently, there is a need to develop farming systems which maximize carbon storage as well as outcomes for biodiversity. Understanding the link between the two is the focus of a new research project at the UWA's Future Farm.

In August 2010, a team of researchers from the W/Prof Richard Hobbs' Ecosystem Restoration and Intervention Ecology Research Group (www.plants.uwa.edu.au/research/ecosystem_restoration) and an army of volunteers planted ~12 000 trees over 21 ha of former farmland. Despite record-low rainfall in the weeks leading up to and then following the planting, the tree seedlings have survived to mid-summer in remarkably high numbers. Apart from the 'Green Thumb', researchers attribute the successful establishment of the seedlings to the lucky arrival of summer rain, the hardiness of the native species and soil preparation prior to planting.

Assist/Prof Geoff Woodall, highly regarded for his pioneering work on native-plant agronomy and recipient of the Great Southern Development Commission Medal for Excellence in Natural Resource Management in 2010, agrees that soil preparation – chiefly deep ripping and weed management – is critically important for establishing native trees on ex-farmland. "Deep ripping the soils helps to alleviate compaction from farm machinery, allows the roots to penetrate the soil rapidly and reach moisture stored at depth before their first summer drought," Geoff said.

The next task for the researchers is to develop methods for carbon and biodiversity accounting. Methods for carbon accounting are relatively simple and can be borrowed from the forestry sector for application at UWA Future Farm. In stark contrast, biological diversity and the functions it performs are multi-faceted and so require a more sophisticated approach. The core team – Drs Mike Perring, Kris Hulvey, Lori Lach and Rachel Standish, and ably assisted by Mr Tim Morald and Ms Rebecca Parsons – will rely on expertise from the UWA Schools of Plant Biology, Animal Biology and Earth and Environment to complete this task.



Banksia sessilis – one native of many planted for carbon and biodiversity benefits at the Future Farm. Photo by M. Perring.

UWA Future Farm engages with industry to reduce emissions

Dr Joy Vadhanabhuti
(joy.vadhanabhuti@uwa.edu.au)

Currently the UWA Future Farm is used as the demonstration site for the Reducing Emissions from Livestock Research Program (RELRP).

RELRP aims to provide farmers with the tools and information they need to decrease the amount of methane their livestock produce. This will not only be good for the environment, but also increase the efficiency of livestock production. The focus of the project is on obtaining a reliable, on-farm measurement of methane production and how to lower methane production in livestock through genetic selection, rumen manipulation and management of animal wastes. The Livestock emissions project is part of a broader project called Climate Change Research Program and the demonstration site for Western Australia is at the UWA Future Farm 'Ridgefield', Pingelly.

Leader of the project at UWA Future Farm, Professor Phil Vercoe said that "Livestock production systems in Australia are highly varied and the most effective abatement measures are likely to differ between production systems or involve a combination of measures. Ridgefield Farm is one of the regional sites being established as part of the program to support the transition of outcomes of the applied research and development activities in the Reducing Emissions from Livestock Research Program. We will use demonstration sites to engage with livestock producers and ensure that the research is translated to practical on-farm practices and measures."

RELRP consists of 18 projects across Australia that are jointly funded by the Department of Agriculture, Fisheries and Forestry and Meat and Livestock Australia (MLA).

One of the projects in RELRP examines the use of native Australian shrubs with bioactive properties. When livestock graze these shrubs as part of their diet, it may lower the amount of methane they produce. One shrub in particular, *Eremophila* spp. has produced promising results in *in vitro* experiments. Seedlings of *Eremophila* were planted at the demonstration site last year and will be used to see whether the effects in the lab also occur in the animal and in the field.

Another RELRP project focuses on breeding sheep which emit less methane. Individual sheep vary considerably in the amount of methane they emit and it is possible that some of that variation is due to genetics. Over 2000 sheep across Australia, mainly from the Sheep CRC Information Nucleus Flock, have been screened using a short-term method for measuring methane production. The data collected will be used to estimate heritability of the methane trait as well as correlations to other production traits. 200 sheep have been classified as being 'high' or 'low' methane emitters. To understand the biology behind this, the digestive physiology, net feed intake and rumen microbiology of these sheep will be studied to examine why they produce less methane.

To gauge carbon emissions on a whole-farm scale, Prof. Ross Kingwell (School of Aeroculture and Resource Economics and DAFWA) will be modelling the UWA farm to determine the relative contributions of different enterprises. There will also be a demonstration at Ridgefield of how methane can be measured in the paddock. The information collected from the demonstration site at Ridgefield will be disseminated to producers and rural professionals through advisor and farmer forums, and a field day at Ridgefield later in the year.

For further information contact Prof Phil Vercoe (phillip.vercoe@uwa.edu.au)

Solutions to climate change challenges

Climate change continues to bring real challenges to cereal farmers. Winthrop Professor Kadambot Siddique, Director of The UWA Institute of Agriculture was invited to share some of the possible solutions to this challenge to members of the South East Premium Wheat & Barley Growers Association (SEPWA).

Southwest Western Australia's Mediterranean climate means that farmers have to contend with winter-dominant rainfall and hot, dry summers. They mainly sow the majority of their crops in autumn and harvest in late spring.

"Agricultural production in much of the region contends with hostile soils, low rainfall and inter-seasonal variability, with terminal drought in spring causing the greatest reduction in yields. In addition, global climate change is already impacting WA through lower average winter rainfall," W/Prof Siddique said.

Despite many of these constraints, agricultural production increased during the twentieth century due to improved agronomic practices, new varieties and diversification of farming systems.

"Climate change is a serious threat to future production levels in the region. Farmers could have to face increased risk of prolonged drought, higher average temperatures particularly during the critical stage of grain filling, and more extreme temperatures," he said.

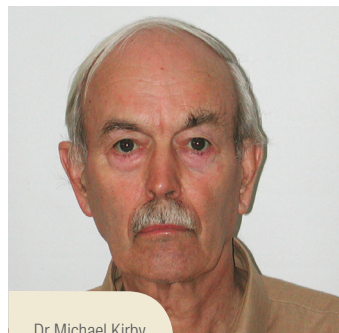
With high seasonal variability it is essential that maximum grain yields are achieved in average and better seasons. W/Prof Siddique believes that simulation models could assist with forecasting and identify management strategies that may optimise potential grain yields.

"Crop simulation models have been widely used to assess the impact of climate change, but the lack of adequate experimental data hinders the accuracy of predictions," he said.

He believes that the greatest advances in addressing the challenges presented by that climate change will come from research leading to a better understanding of crop physiology and genetics which can enhance further genetic improvements.

"This research is needed now to develop crops adapted to the future climate in targeted growing regions," he said.

LtoR: Mr Steve Graham (farmer), W/Prof Kadambot Siddique (Director, UWA IOA) and Mr Andrew Heinrich (agronomist).



Dr Michael Kirby

Dr E.J.M. (Michael) Kirby (2/10/1928 – 4/2/2011)

Dr Miles Dracup (miles.dracup@watercorporation.com.au)

Dr Michael Kirby was born in Henley on Thames in 1928. He studied agriculture at Durham, and then the Nottingham School of Agriculture at Sutton Bonnington for his PhD, which was on "Host-parasite relations in the choke disease of grasses." After a short time at Glasgow, Michael moved to Cambridge, first to the University and then to the Plant Breeding Institute (PBI).

Michael married Mabel in 1958 in St Bride's Episcopal Church in Glasgow. They spent 52 happy years together raising four children, and creating a series of beautiful and interesting gardens. Michael was also a gifted photographer, talented woodworker, and a good fast bowler as a young man. He was also an inspiring instructor to his children and all those who worked with him.

WA agricultural scientists were very lucky to host Michael during several extended visits to Perth between the mid 80s and mid 90s. Michael's infectious interest in agricultural science spawned much local work on cereals and lupin at UWA and the then Department of Agriculture, leading to many world class publications jointly with local scientists. Michael's publication "Cereal Development Guide" has made an important contribution in the breeding of new wheat and barley varieties in Australia. Michael's similarly adept and keen interest in photography has a legacy in some of those publications, and the many shots he took while exploring WA with Mabel, and which included at least one award-winning shot of Perth.

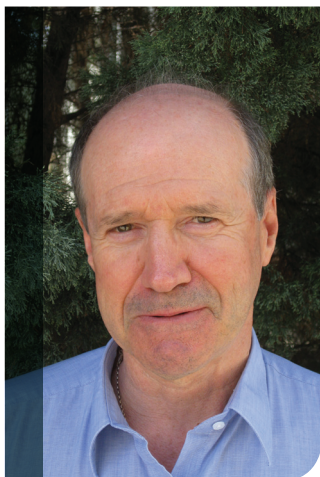
We were not only fortunate to know Michael as a scientist, but also as a person. He was a man of great integrity, with a dry and understated sense of humour – one never quite knew when he was joking and when he was serious. He was very friendly, patient and happy to spend time with anyone who wanted to learn about plants and meticulous in his investigations and record keeping. He was fortunate to live in a science era conducive to following and living and breathing a passion and was deservedly highly respected amongst his international peers. But he also had the common touch, relishing opportunities to talk with farmers and people with a 'lay' interest in plants and their husbandry.

Michael wrote more than 100 papers in his professional career, mostly to do with how cereals grow. The papers span 47 years from 1957 to 2004. Michael's papers were cited nearly 2,500 times in papers written by other scientists: most scientists regard a citation count as a true measure of a scientist's worth, and 2,500 is a first class contribution.

Michael also wrote nearly 40 papers and letters in retirement, about antlions, bees, wasps, gorse mites, fungi, lichens and more, in and around Westleton, Suffolk. The last of them appeared just a few months before he died. In the last few weeks of his life, Michael was planning new investigations into solitary bees on Westleton Common.

Michael died peacefully on 4th February 2011 and is survived by his wife Mabel and children John, Alex, Stephen, and Sarah.

New Staff



Professor Roger Jones

Prof Roger Jones was appointed Research Professor in Plant Virology at UWA in August 2009, and holds a position funded jointly by UWA and DAFWA. Formerly the Principal Plant Virologist at DAFWA, he also has experience as a Plant Virologist working in Europe, South America and Australia, and has made substantial contributions in diverse aspects of Plant Virology. His research has focussed on viruses transmitted by insects, mites

and fungi, and includes diverse pathosystems such as viruses of cereals, oilseeds, grain and pasture legumes, root and tuber crops, vegetables, weeds and native plants.

His main research themes have been: new plant viruses; virus aetiology, phylogeny and evolution; virus vector transmission; seed transmission; virus ecology and epidemiology; spatial and temporal analyses of virus epidemics; predictive models; integrated virus disease management; host resistance; cultural and chemical control; quantification of losses.

His publications on plant viruses include 180 refereed research papers, 32 reviews or refereed book chapters, 18 refereed virus descriptions, and 41 un-refereed conference proceedings and bulletins. He was awarded fellowships by the Australasian Plant Pathology Society (2003) and the Australian Institute for Agricultural Science and Technology (2002), and he was Chairman of the International Plant Pathology Society International Plant Virus Epidemiology Committee (1998-2007),

Email: roger.jones@uwa.edu.au

Alumni



Professor John Pluske

Director, Animal Research Institute, Murdoch University

John completed his BSc. (Agric.) at UWA in 1987 and his PhD in Animal Nutrition and Physiology in 1993, the latter under the supervision of Dr Ian Williams. He then spent 18 months as a post-doctoral fellow at the University of Alberta, Edmonton,

Canada, investigating nutrition-reproduction interactions in sows. He returned to WA in 1996 to work with Professors Hampson and Pethick in the School of Veterinary Science at Murdoch University undertaking studies in nutrition-disease of pigs, and then spent 3 years at the Monogastric Research Centre at Massey University in New Zealand conducting pig, poultry and companion animal research. John then accepted an offer as Senior Lecturer in the Division of Veterinary and Biomedical Sciences at Murdoch University in June 1999. He is currently Director of the Animal Research Institute, a grouping of staff, post-doctoral fellows and postgraduate students in the University who study animal and veterinary science. John also leads an active research team specialising in issues particular to pigs. John says that undertaking the 4-year Agricultural Science degree and then a PhD at UWA cemented lifelong friendships and provided a sound basis for his career



Mr Geoff Fosbery receives the Seed of Light award from Mr Neil Young (GRDC WA Panel Chair and External Advisory Board Member of the UWA Institute of Agriculture).

Geoff Fosbery wins Seed of Light award

**Principal Technical Consultant
ConsultAg, Northam, Western
Australia**

Geoff completed his B. Sc. (Agric) Hons. degree from UWA in 1980. He began work with the WA. Department of Agriculture at Merredin in 1981 as an Advisor. During his six years in Merredin he worked on research and extension in weed control for direct drilling crop establishment systems, use of soil ameliorants for hard setting and acid soils plus most importantly his relationship with his wife Allison.

In 1987 Geoff became the Officer-In-Charge at Three Springs where he and his team targeted early sowing of cereals using no-till crop establishment systems. After three years he decided private enterprise was worth a shot and joined Elders as one of their first Agronomists in WA.

In 1992 Geoff took a big leap and started his own business (Farm Focus Consultants) consulting to individual farm businesses and farmer groups in the central and northern wheat belt of WA. Over the next decade he strengthened his collaboration with local farming groups and his involvement with on-farm research in areas including crop row spacings, plant available water and development of the Yield Prophet® computer model.

In 2008 Geoff's business joined the ConsultAg Group which provides technical, marketing, financial and business planning advice to farmers.

Geoff has established himself as an effective communicator with farmers and agribusiness groups, and for which he has received recent industry recognition: In February this year he became the 2011 recipient of the prestigious Seed of Light award, which is awarded annually by the Grains Research and Development Corporation (GRDC) for significant contributions to communicating the outcomes of research.

Geoff works closely with research and development institutions and regularly speaks at research conferences. He is an active contributor to research projects aimed at addressing local problems in local regions, including the GRDC-funded Agribusiness Trial Extension Network initiative, which is investigating ways of improving sustainability and reducing risks associated with growing cereals in WA's low to medium rainfall areas.

Geoff, Allison and their two sons are "travelaholics" and have enjoyed many parts of Australia and the world.

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	2010-13	Grains Research and Development Corporation (GRDC)	Prof Roger Jones
Monitoring Middle East feedlot temperatures	2010-13	Meat and Livestock Australia Research Program	Prof Shane Maloney
Interactions in subtropical tadpoles at threat from agriculture and Cane toads	2011	ANZ Philanthropy Partners Holsworth Wildlife	W/Prof John Roberts and Ms Jennifer Francis
From source to sink: a national initiative of biochar research	2011-12	CSIRO Ex DAFF	Assoc/Prof Daniel Murphy, Dr Natasha Banning
Drought hardy and Carbon Conscious grazing systems		CSIRO Ex DAFF	Prof Philip Vercoe
Tender 1.1.01a – genome sequencing in narrow leafed lupins	2010-12	Grains Research And Development Corporation (GRDC)	W/Prof Karam Singh, E/Prof Craig Atkins, Prof Grant Morahan, Dr Richard Lipscombe, and Dr Jen Taylor
Molecular indicators for soil quality	2010-13	Grains Research And Development Corporation (GRDC)	W/Prof Tony O'Donnell
Screening for high-yielding cereals in Water-limited agricultural landscapes	2010-11	Grains Research And Development Corporation (GRDC)	Prof Ed Barrett-Lennard
Building national capacity in education and research in applied entomology	2010-15	Grains Research And Development Corporation (GRDC)	W/Prof Kadambot Siddique, W/Prof Graeme Martin, and W/Prof Tony O'Donnell
Innovative approaches to resistance to necrotrophic Pathogens and sap-sucking insect Pests	2011-15	Grains Research And Development Corporation (GRDC)	W/Prof Karam Singh
Australian Herbicide Resistance Initiative – Phase 4	2011-15	Grains Research And Development Corporation (GRDC)	W/Prof Stephen Powles
Climate Change impacts on ecosystem function mediated by biodiversity'	2011	Group of Eight DAAD German Research Cooperation	Dr Michael Perring and Prof Wolfgang Cramer
Sandalwood Oil – genetic solutions developed to improve Quantity and Quality'	2010	Rural Industries Research And Development Corporation	Assoc/Prof Julie Plummer
Initiating the Australian Bush plum (<i>terminalia ferdinandiana</i> <i>excell.</i>) collection	2011	Rural Industries Research And Development Corporation	Dr Liz Barbour and Assoc/Prof Julie Plummer

New PhD Students

NAME	TOPIC	SCHOOL	SUPERVISOR(S)	FUNDING BODY
Mr Tas Thamo	TBA	Agriculture Resource Economics	W/Prof David Pannell Assist/Prof Maksym Polyakov	Grains Research and Development Corporation (GRDC), Prescott Post Graduate Scholarship UWA Top Up Scholarship
Ms Monica Kehoe	Unravelling the cause of black pod disease of narrow-leafed lupin and developing a control solution	Plant Biology	Prof Roger Jones Adjunct A/Prof Bevan Buirchell Prof Martin Barbetti	Australian Research Council Studentship Grains Research and Development Corporation (GRDC) Studentship Top Up
Ms Brenda Coutts	Studies on the epidemiology and control of virus disease of oilseeds, legumes and vegetables in WA	Plant Biology	Prof Roger Jones Prof Martin Barbetti	Department of Agriculture and Food WA (DAFWA)
Ms Heidi Waddell	Phosphorus-use efficiency of Austrodanthonia	Plant Biology	Assoc/Prof Megan Ryan and W/Prof Hans Lambers	Australian Postgraduate Award (APA)
Mr Mike Ashworth	Evolved Glyphosate resistance in wild radish (<i>Raphanus raphanistrum</i> L) populations with the use of Glyphosate resistant genetically modified canola	WANTFA/AHRI/ Plant Biology	W/Prof Steve Powles, Assoc/Prof Mike Walsh and Dr Ken Flower	Grains Research and Development Corporation Scholarship (GRDC), APA/UPA
Mrs Renu Saradadevi Biju	Root-shoot signal in water transport in wheat under drying climate	Plant Biology and UWA Institute of Agriculture	W/Prof Kadambot Siddique, Dr Helen Bramley and Dr Jairo Palta (CSIRO)	Australian Endeavour Fellowship
Ms Chandima Ariyaratna	Rice-wheat comparative and functional analysis of novel genes associated with salt tolerance	Plant Biology	Prof Tim Colmer	UWA IPRS/SIRF and UWA Institute of Agriculture
Mr. Manoj Rajakaruna Mudalige	The efficiency equity trade off and poverty impact of rice sector policies in Sri Lanka	Agriculture Resource Economics	Assist/Prof Amin Mugera and Professor Ben White	Australian Endeavour Fellowship

Publications (2010) (August – December) (not reported previously)

Refereed journals

Amdi C, Williams AR, Maloney SK, Tauson AH, Knott SA and Blache D (2010). Relationship between behavioural reactivity and feed efficiency in housed sheep. *Animal Production Science* **50**: 683-687.

Anderson JP, Gleason C, Lichtenzveig J, Oliver R, and Singh KB (2010). The B-3 Ethylene response factor MterF1-1 mediates resistance to a subset of root pathogens in *Medicago Trunculata* without adversely affecting symbiosis with rhizobia. *Plant Physiology* **154**: 1-13.

Bever JD, Dickie IA, Facelli E, Facelli J, Klironomos J, Moora M, Rillig MC, Stock W D, Tibbett M and Zobel M (2010). Rooting theories of plant community ecology in soil microbial interactions. *Trends in Ecology and Evolution* **25**: -478.

Bickell SL, Poindron P, Nowak R, Ferguson DM and Blache D (2010). Maternal behaviour at parturition in outdoor conditions differs only moderately between single bearing ewes selected for their calm or nervous temperament. *Animal Production Science* **50**: 675-682.

Blache D and Bickell SL (2010). Temperament and reproductive biology: emotional reactivity and reproduction in sheep. *Revista Brasileira de Zootecnia* **39**: 401-408.

De Blasio MJ, Blache D, Gattford KL, Robinson JS and Owens JA (2010). Placental restriction increases adipose leptin gene expression and plasma leptin and alters their relationship to feeding activity in the young lamb. *Pediatric Research* **67**: 603-608.

Carson JK, Gleeson DB, Clipson N and Murphy DV (2010). Afforestation alters community structure of soil fungi. *Fungal Biology* **114**: 580-584.

Carson JK, Gonzalez-Quinones V, Murphy DV, Hinz C, Shaw JA and Gleeson DB (2010). Low pore connectivity increases bacterial diversity in soil. *Applied and Environmental Microbiology* **76**(12): 3936-3942.

Delany KK, Auldish MJ, Thompson P, Blache D, Macmillan KL, Grainger

C and Nicholas KR (2010). Blood plasma concentrations of metabolic hormones and glucose during extended lactation in grazing cows or cows fed a total mixed ration. *Journal of Dairy Science* **93**: 5913-5920.

Digby S, Blache D, Masters DG and Revell DK (2010). Responses to saline drinking water in offspring born to ewes fed high salt during pregnancy. *Small Ruminant Research* **91**: 87-92.

Garg H, Sivasithamparam, K., Barbetti, M.J. (2010). Scarification and environmental factors that enhance carpogenic germination of sclerotia of *Sclerotinia sclerotiorum*. *Plant Disease* **94**:1041-1047.

George SJ, Kelly RN., Greenwood PF and Tibbett M (2010). Soil carbon and litter development along a reconstructed biodiverse forest chronosequence of South-Western Australia. *Biogeochemistry* **101**: 197-209.

Gleason C, Foley RC, Singh KB (2011). Mutant analysis in *Arabidopsis* provides insight into the molecular mode of action of the auxinic herbicide Dicamba. *PLoS ONE* **6**(3): e17245. doi:10.1371/journal.pone.0017245.

Gleeson DB, Müller C, Banerjee S, Mad W, Siciliano SD and Murphy DV (2010). Response of ammonia oxidizing archaea and bacteria to changing water filled pore space. *Soil Biology & Biochemistry* **42**: 1888-1891.

Gray SJ, Martin GB, Chadwick A, Milton JTB and Greeff JC (2010). National evaluation of sires for the production of quality cashmere. *Rural Industries Research & Development Corporation Publication* No. 10/153; Project No. UWA-84A.

Hancock GR, Murphy D and Evans KG (2010). Hillslope and catchment scale soil organic carbon concentration: an assessment of the role of geomorphology and soil erosion in an undisturbed environment. *Geoderma* **155**: 36-45.

Henry BA, Blache D, Rao A, Clarke IJ, and Maloney SK (2010). Disparate effects of feeding on core body and adipose tissue temperatures in animals selectively bred for nervous and calm temperament. *American Journal of Physiology* **299**: R907-R917.

Jones RAC, Salam MU, Maling TJ, Diggle AJ and Thackray DJ (2010). Principles of Predicting Plant Virus Disease Epidemics. *The Annual Review of Phytopathology* **48**: 179-203.

Kehoe MA, Coutts BA and Jones RAC (2010). Resistance phenotypes in diverse accessions, breeding lines, and cultivars of three mustard species inoculated with turnip mosaic virus. *Plant Disease* **94**: 1290-1298.

Kilburn MR, Jones DL, Clode PL, Cliff JB, Stockdale EA, Herrmann AM and Murphy DV (2010). Application of nanoscale secondary ion mass spectrometry to plant cell research. *Plant Signaling & Behavior* **5**(6): 1-3. Landes Bioscience.

Li X, Renshaw D, Yang H and Yan G (2010). Development of a co-dominant DNA marker tightly linked to gene tardus conferring reduced pod shattering in narrow-leaved lupin (*Lupinus angustifolius* L.). *Euphytica* **176**: 49-58.

Martin GB, Blache D, Miller DW and Vercoe PE (2010). Interactions between nutrition and reproduction in the management of the mature male ruminant. *Animal* **4**: 1214-1226.

Matthiesen CF, Blache D, Thomsen PD and Tauson A-H (2010). Feeding mink (*Neovison vison*) a protein-restricted diet during pregnancy induces higher birth weight and altered hepatic gene expression in the F2 offspring. *British Journal of Nutrition* **104**: 544-553.

Norman HC, Cocks PS and Galwey NW (2010). Influence of stocking rate and phosphate fertiliser application on the composition of annual legume seedbanks within a Mediterranean grassland. *Crop and Pasture Science* **61**(12) 988-1000.

Rahman T, Spafford H and Broughton S (2010). Single versus multiple releases of predatory mites combined with spinosad for the management of western flower thrips in strawberry. *Crop Protection* doi:10.1016/j.cropro.2010.11.027.

Rahman T, Broughton S and Spafford H (2010). Effect of spinosad and predatory mites on control of *Frankliniella occidentalis* in three strawberry cultivars. *Entomologia Experimentalis et Applicata* 1-8, DOI: 10.1111/j.1570-7458.2010.01085.

Rose TJ, Damon P and Rengel Z (2010). Phosphorus-efficient faba bean (*Vicia faba* L.) genotypes enhance subsequent wheat crop growth in an acid and an alkaline soil. *Crop and Pasture Science* **61**(12) 1009-1016 doi:10.1071/CP10205.

Singh R, Singh D, Salisbury P and Barbetti MJ (2010). Field evaluation of indigenous and exotic Brassica juncea genotypes against Alternaria blight, white rust, downy mildew and powdery mildew diseases in India. *Indian Journal of Agricultural Sciences* **80**: 155-159.

Singh R, Singh D, Salisbury P and Barbetti MJ (2010). Field evaluation of Indian and exotic oilseed Brassica napus and B. juncea germplasm against Sclerotinia stem rot. *Indian Journal of Agricultural Sciences* **80**: 1067-71.

Snowball R, D'Antuono MF, Cohen BJ, Gajda K and R Bennett (2010). The value of germplasm nurseries in selecting species for field evaluation. *Crop and Pasture Science* **61**(12) 957-969 doi:10.1071/CP10126.

Viñoles C, Paganoni B., Glover KMM, Milton JTB, Blache D, Blackberry MA and Martin GB (2010). The static and immediate effects of nutrition on ovulation rate in ewes – the application of a 'first-wave' model to study ovarian follicular dynamics. *Reproduction* **140**: 865-874.

Book chapters

Bickell SL, Durmic Z, Blache D, Vercoe PE and Martin GB (2010). Rethinking the management of health and reproduction in small ruminants. In: *Updates on ruminant production and medicine* (Proceedings of the 26th World Buiatrics Congress, Santiago, Chile) Eds.: F. Wittwer, R. Chihuailaf, H. Contreras, C. Gallo, J Kruze, F. Lanuza, C. Letelier, G. Monti & M Noro; pp. 317-325 [Andros Impresores: Chile].

Riley IT and Barbetti MJ (2010). Seed-gall nematode. In: *Compendium of wheat diseases*. Eds W.W. Brockus, R.L. Bowden, R.M. Hunger, W.L. Morrill, T.D. Murray, R.W. Smiley. APS Press, The American Phytopathological Society, St Paul, Minnesota, USA. pp. 94-95.

Riley IT and Barbetti MJ (2010). Dilopospora twist and leaf spot. In: *Compendium of wheat diseases*. Eds W.W. Brockus, R.L. Bowden, R.M. Hunger, W.L. Morrill, T.D.

Murray, R.W. Smiley. APS Press, The American Phytopathological Society, St Paul, Minnesota, USA. pp. 28-29.

Turner, D.W., Fortescue, J.A. and Thomas, D.S. (2010) Bananas: Environment and Crop Physiology. In: DaMatta F. (Ed) Ecophysiology of Tropical Tree Crops. Nova Science Publishers, Inc. New York. Pp 7-36.

Viñoles-Gil C, Gonzalez-Bulnes A, Martin GB, Sales Zlatar F and Sale S (2010). Chapter 11: Sheep and Goats. In: Practical Atlas of Ruminant and Camelid Reproductive Ultrasonography (Eds.: L. DesCôteaux, J. Colloton & G. Gnemmi) pp. 181-210. Wiley-Blackwell (Ames, Iowa, USA).

Publications (2011) (January-March)

Refereed journals

Aryamanesh N, Al-Subhi A M, Snowball R, Yan G and Siddique KHM (2011). First report of Bituminaria witches' broom in Australia caused by a 16SrII phytoplasma. *Plant Disease* **95**(2): 226.

Asseng S, Foster I and Turner NC (2011). The impact of temperature variability on wheat yields. *Global Change Biology* **17**: 997-1012.

Balint T and Rengel Z (2011). Amino acid composition of xylem and phloem sap varies in canola genotypes differing in nitrogen- and sulfur-use efficiency. *Crop and Pasture Science* **62**(3): 198-207.

Conning SA, Renton M, Ryan MH and Nichols PGH (2011). Biserrula and subterranean clover can co-exist during the vegetative phase but are out-competed by capeweed. *Crop and Pasture Science* **62**(3) 236-247.

Croser JS, Lulsdorf MM, Grewal R, Usher K and Siddique KHM (2011). Isolated microspore culture of chickpea (*Cicer arietinum* L.): Induction of androgenesis and cytological analysis of early haploid divisions. *In Vitro Cellular and Developmental Biology-Plant* DOI: 10.1007/s11627-011-9346-7.

Farooq M, Jabran K, Cheema ZA, Wahid A and Siddique KHM (2011). The role of allelopathy in agricultural pest management. *Pest Management Science* DOI 10.1002/ps.2091.

Farooq M, Siddique KHM, Wahid A, Rehman H and Aziz T (2011).

Rice direct seeding: Experiences, challenges and opportunities. *Soil and Tillage Research* **111**:87-98.

Hua Li, Ge, X., Han, S., Sivasithamparam K, Barbetti MJ (2011). Histological responses of host and non-host plants to *Hyaloperonospora parasitica*. *European Journal of Plant Pathology* **129**: 221-232.

Hussain SS, Ali M, Ahmad M, Siddique KHM (2011). Polyamines: Natural and engineered abiotic and biotic stress tolerance in plants. *Biotechnology Advances* **29**: 300-311.

Klironomos J, Zobel M, Tibbett M, Stock WD, Rillig MC, Parrent JL, Moora M, Koch AM, Facelli JM, Facelli E, Dickie IA and Bever JD (2011). Forces that structure plant communities: quantifying the importance of mycorrhizal symbiosis. *New Phytologist* **189**: 366-370.

Krishnamurthy L, Turner NC, Gaur PM, Upadhyaya HD, Varshney RK, Siddique KHM and Vadez V (2011). Consistent variation across soil types in salinity resistance of a diverse range of chickpea (*Cicer arietinum* L.) genotypes. *Journal of Agronomy and Crop Science* doi:10.1111/j.1439-037X.2010.00456.x.

Kumari M, Clarke HJ, Small CC, Small I, Khan TN and Siddique KHM (2011). Albinism in plants: Albinism does not correlate with biparental inheritance of plastid DNA in interspecific hybrids in *Cicer* species *Plant Science* doi:10.1016/j.plantsci.2011.01.003.

Lesniewska K, Ksikiewicz M, Nelson MN, Mahé F, Ainouche A, Wolko B, Naganowska B (2011) Assignment of three genetic linkage groups to three chromosomes of narrow-leaved lupin. *J Heredity* (Advanced Access: doi:10.1093/jhered/esq107).

Li X, Yang H, Buirchell B and Yan G (2011). Development of a DNA marker tightly linked to low-alkaloid gene iucundus in narrow-leaved lupin (*Lupinus angustifolius* L.) for marker-assisted selection. *Crop and Pasture Science* **62**(3) 218-224.

Nelson MN, Parkin IAP, Lydiate DJ (2011) The mosaic of ancestral karyotype blocks in the *Sinapis alba* L. genome. *Genome* **54**: 33-41.

Owen MJ, Michael PJ, Renton M, Steadman KJ and Powles SB (2011). Towards large-scale prediction of *Lolium rigidum* emergence. I. Can

climate be used to predict dormancy parameters? *Weed Research* **51**: 123-132.

Owen MJ, Michael PJ, Renton M, Steadman KJ and Powles SB (2011). Towards large-scale prediction of *Lolium rigidum* emergence. II. Correlation between dormancy and herbicide resistance levels suggests an impact of cropping systems. *Weed Research* **51**: 133-141.

Pande S, Sharma M, Gaur PM, Tripathi S, Kaur L, Basandrai AK, Khan T, Gowda CLL and Siddique KHM (2011). Development of screening techniques and identification of new sources of resistance to *ascochyta blight* disease of chickpea. *Australasian Plant Pathology* **40**: 149-156.

Pradhan A, Nelson MN, Plummer JA, Cowling WA, and Yan G (2011). Characterization of *Brassica nigra* collections using simple sequence repeat markers reveals distinct groups associated with geographical location, and frequent mislabelling of species identity. *Genome* **54**: 50-63.

Rogers ME, Colmer TD, Nichols PGH, Hughes SJ, Frost K, Cornwall D, Chandra S, Miller SM and Craig AD (2011). Salinity and waterlogging tolerance amongst accessions of messina (*Mellilotus siculus*). *Crop and Pasture Science* **62**(3): 225-235.

Samineni S, Siddique KHM, Gaur PM and Colmer TD (2011). Salt sensitivity of the vegetative and reproductive stages in chickpea (*Cicer arietinum* L.): Podding is a particularly sensitive stage. *Environmental and Experimental Botany* **71**: 260-268.

Takahira J, Cousin A, Nelson MN and Cowling WA (2011). Improvement in efficiency of microspore culture to produce doubled haploid canola (*Brassica napus* L.) by flow cytometry. *Plant Cell Tissue Organ Cult* **104**: 51-59.

Tibbett M, George SJ, Davie A, Barron A, Milton N and Greenwood PF (2011). Just add water and salt: the optimisation of petrogenic hydrocarbon biodegradation in soils from semi-arid Barrow Island, Western Australia. *Water Air and Soil Pollution*. **216**: 513-525.

Book Chapters

Mohapatra PK, Panigrahi R and Turner NC (2011). Physiology of Spikelet Development on the Rice Panicle: Is Manipulation of Apical Dominance Crucial for Grain Yield Improvement? In Donald L. Sparks, editor: *Advances in Agronomy*, Vol. 110, Burlington: Academic Press, pp. 333-359.

Toker C, Canci H and Siddique KHM (2011). Noninfectious disorders: Nutrient disorders. In: W. Chen, H.C. Sharma and F.J. Muehlbauer (eds) 'Compendium of chickpea and lentil diseases and pests'. The American Phytopathological Society, St. Paul, Minnesota, USA, pp126-131.

UPCOMING MEETINGS AND EVENTS

The UWA Institute of Agriculture Events

Postgraduate Showcase 2011
9 June 2011
www.ioa.uwa.edu.au

Industry Forum
22 July 2011
www.ioa.uwa.edu.au

National Events

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

UWA IOA MISSION

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

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
Email: ully.fritsch@uwa.edu.au
The UWA Institute of Agriculture
Tel: +61 8 6488 3756
Web: www.ioa.uwa.edu.au

UWA, M082, 35 Stirling Highway
Crawley, WA 6009