



THE UNIVERSITY OF
WESTERN AUSTRALIA
Achieve International Excellence

The UWA Institute of Agriculture

Annual Research Report 2009



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Our Mission

“To advance research, education, training and communications in agriculture and natural resource management for the benefit of mankind.”

Our Vision

To be recognised for excellence in serving agriculture and the management of natural resources through research, education and training in a regional, national and international context.

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Executive Summary

It is three years since the re-launch of The UWA Institute of Agriculture, and 2009 showed that we are well on track in reaching our vision of being recognised for excellence in serving agriculture and the management of natural resources through research, education and training in a regional, national and international context.

2009 saw UWA ranked 113 in the world as defined by China's Shanghai Jiao Tong University rankings. UWA agricultural researchers continued to be some of the most highly cited in Australia and internationally (among the top 50 universities in the world). UWA Agriculture also persisted in its efforts of publishing high quality scientific papers in reputable international journals. The full list of publications appears on page 22 to 26.

In 2009 we attracted a number of externally funded research projects. This is a clear indication of the confidence funding bodies have in UWA's expertise in agriculture and natural resource management.

As one of the major players in agricultural education in Australia, we continued to attract a number of undergraduate and postgraduate students in agriculture and natural resource management areas. Student numbers in the BSc in Agriculture (and the combined degrees with Commerce and Economics) and Natural Resource Management have remained consistent over the last several years.

Our commitment to help Iraqi agriculture led to several Masters students in agriculture joining UWA. Another major highlight was the OECD Conference hosted by our International Centre for Plant Breeding Education and Research (ICPEBER) in late 2009. International engagement remains important to The UWA Institute of Agriculture.

The Institute is sustaining effective communication (through media statements, newsletters, public lectures

etc) of agricultural research and teaching activities at UWA to industry, farmer groups, collaborators, funding bodies, potential students and alumni. We stay in touch with on the ground agriculture through active partnership with grower groups (Grower Group Alliance, the WA No-Till Farmer Association) located on campus, Food Industry Association WA, CSIRO Floreat and Department of Agriculture and Food WA.

During 2009 the world increasingly realised the great challenge we are facing in feeding the world with diminishing resources. However, having food on their plate is not the only concern to consumers. They are demanding clean, green and ethical agricultural practices. The UWA Institute of Agriculture is constantly looking towards the future, and especially promoting sustainable agricultural practices. In November 2009 attendees at The UWA Future Farm Open Day, at Ridgefield, Pingelly had a snap shot of future best practices researched at the University. Read more about this day on page 12.

The UWA Institute of Food and Agriculture Lecture Series remains one of the highlights on the University calendar. Go to www.ioa.uwa.edu.au to access presentations by these international, interstate and local presenters.

Positive feedback from external groups suggests that these endeavours to increase the visibility of UWA agriculture amongst its collaborators and partners – research organisations, industry, growers, and agricultural advisors- are bearing fruit.



**Winthrop Professor
Kadambot Siddique FTSE**

Chair in Agriculture and Director,
The UWA Institute of Agriculture

Highlights 2009



1. Integrated Land and Water Management Program

The Integrated Land and Water Management Program aims to enhance the sustainability of farming systems by providing leadership in dealing with major challenges in managing land and water resources in agricultural and natural systems, and addressing industry issues and needs from a strong scientific base.

Top soil quality website transformation

The DAFWA/UWA Soil Quality website (www.soilquality.org.au) was transformed into one of the top soil quality websites, boasting new and better features following its relaunch in early 2009.

This website is the end product of a 'Healthy Soils' project conducted by UWA and DAFWA staff from 2005 – 2008. Up to 25 soil properties across nearly 1300 sites throughout WA's grain growing regions were benchmarked. Analysis of soils included basic physical and nutritional assessments to in-depth biological measurements of labile carbon, microbial biomass and biological soil nitrogen supply. Dr Andrew Wherrett from UWA said that detailed analysis for a wide range of soil quality indicators provides a 'snapshot' of soil performance at a point in time. The long term aim of revisiting these sites will relate variations in management and climate to changes in soil quality.

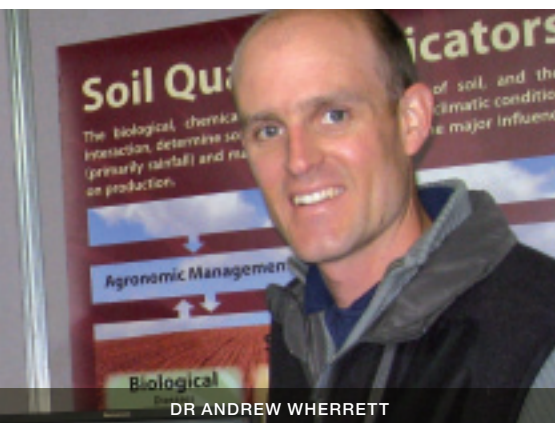
Website users can detect potential production constraints within a growing region by examining individual soil quality indicators. Users can enter specific soil analysis data and compare these results to those obtained through the 'Healthy Soils' project. Growers involved with the project can access individual results by entering a unique WebID, giving them a

better understanding of soil biological functioning through the 'relationships' section.

Users can now register with www.soilquality.org.au, allowing individual farm soil analysis results storage and claim sample sites from the 'Healthy Soils' project.

Access to information is a significant part of www.soilquality.org.au with a range of fact sheets available to view and download. These provide information on a range of soil issues – from potential management and production constraints, to interpretive guidelines and possible management solutions.

Another first is the 'Organic Matter Biomass' calculator. A lot of crop residue is needed to achieve significant changes in soil carbon levels. This calculator gives the growers a realistic idea of what is needed for a specific increase.



DR ANDREW WHERRETT

New project measuring soil carbon for climate change

UWA and the Department of Agriculture and Food Western Australia (DAFWA) are helping farmers increase soil carbon to adapt to climate change and improve soil fertility. This project is part of a national research program funded by the Department of Agriculture, Fisheries and Forestry (DAFF) and the Grains Research and Development Corporation (GRDC).

In future, carbon stored in agricultural soils may be used in emissions trading schemes to offset greenhouse gas emissions. Organic carbon in soil also has a range of benefits for soil fertility and plant growth. It is yet unknown which Australian soils have the most potential to store more soil carbon.

This project will measure soil carbon stocks across the agricultural region of WA and identify which soil types and land uses have potential to sequester more soil carbon. This research will help farmers to know whether the soil types on their properties can hold more organic carbon and which management practices will achieve that increase.

Soils have already been collected from the Esperance Sand Plains from perennial kikuyu pastures and annual pastures. These soil samples will help to determine what existing levels of soil carbon are in south coastal sandplain soils and whether perennial pastures (ie; kikuyu) affect carbon sequestration when compared to annual species.

The project will also compare the effect on organic carbon storage in soil of cropping vs pasture and tillage vs no-till.

This project is another testimony to UWA's international collaboration. Mr Mohd Rizal Ariffin, a PhD student, who came from Universiti Putra Malaysia, is studying his project "Assessing soil carbon sequestration under perennial pastures", funded by the Malaysian Ministry of Higher Education. He has found that potential carbon sequestration in agricultural soils should be researched to generate findings on which to base future policy decisions.

Findings of these research projects will contribute to sustainable soil management and help to ensure the continued viability of Australian agricultural industry in the face of climate change.

This project is funded by the Australian Government's Climate Change Research Program and includes the WA component of the GRDC's commitment to soil carbon research. The project is a collaborative activity between UWA, DAFWA and the Grower Group Alliance (GGA). Assoc/Prof Dan Murphy (UWA) and Dr David Hall (DAFWA) coordinate the project.

Nitrous Oxide: no laughing matter

Limiting the amount of nitrous oxide, commonly known as laughing gas, coming out of soils, is also one of the areas researched at UWA.

Assoc/Prof Louise Barton, UWA School of Earth and Environment, is researching ways to decrease the amount of nitrogen coming off cropping soils in South West WA.

She hopes this will lead to more efficient use of fertilisers. The advantage to farmers is that UWA might find approaches that will decrease the greenhouse gas footprint of their product, making them more competitive in future.

The project, funded by the Grains Research and Development Corporation (GRDC) in partnership with DAFF, will also determine if on-farm carbon dioxide emissions from urea can be decreased by substituting urea with grain-legume fixed nitrogen. Nitrous oxide emissions will be measured on a sub-daily basis from lupin-wheat rotations, using soil chambers connected to a fully automated system.

The equipment, purchased for the project by the Department of Food and Agriculture WA (DAFWA), enables simultaneous determination of greenhouse gases.



MR MOHD RIZAL ARIFFIN



MS DEBRA DONOVAN



2. Animal Production Systems Program

The animal production systems program works towards developing clean, green and ethical systems for improved animal production.

This concept is more than a major driver of our research because it is also incorporated into teaching of animal science and production program at UWA.

Most of the scientific effort in the Animal Productions Systems program focuses on pasture-based, extensive production systems. The group is also involved in the more intensive industries, such as aquaculture, pig meat, poultry and dairy cattle. They do significant research in the breeding of game birds, including ratites (the emu and ostrich).



Animals and climate change

Monitoring burping in sheep is one of the ways UWA strongly contributes to the international investigation of climate change.

During 2009 The UWA Institute of Agriculture was the only institution in Australia to receive funding from the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF) as part of the Climate Change Research Program for research into all three greenhouse gas areas - methane, nitrous oxide and carbon dioxide.

Institute researchers will share in the national funding scheme launched in early 2009, to help adapt agriculture to climate change, in the Australian Government's initiative for primary industries known as 'Australia's Farming Future'.

Over the next four years, \$26.8 million will support 18 projects to investigate ways to decrease greenhouse gas emissions from livestock and research teams investigating soil carbon and nitrous oxide emissions will receive almost \$32 million.

Funding for this highly collaborative program comes from a variety of sources across Australia, including universities, industry groups and state departments.

One of these projects, based at UWA, led by Prof Phil Vercoe is looking at how to minimise the methane output from grazing livestock. The methane mitigation from livestock program is coordinated by Meat and Livestock Australia. An individual sheep burps out about 20 litres of methane a day and cattle up to 280 litres.

If grazing livestock could be bred or fed to produce less methane there would be less greenhouse gas in the atmosphere and the efficiency of meat and wool production could be improved. UWA's sheep breeding project aims to reveal how much of the methane production in sheep is related to their genetics. Developing a simple, quick on-farm method, such as breath testing, will enable methane measurements from large numbers of sheep in the field in a short time.

Merino ewes reading the novel ram effect

Research conducted at The UWA Institute of Agriculture and School of Animal Biology has shown that when it comes to getting sheep in the mood and those reproductive juices flowing, nothing beats a little novelty.

PhD student, Ms Trina Jorre de St Jorre has been examining the 'ram effect' on ewes where the sudden introduction of rams has merino ewes ovulating within two to three days.

The 'ram effect', also known as 'teasing', is a cheap and efficient way to synchronise mating and lambing in a flock, offering farmers a non-hormonal way to control reproduction. This husbandry management method has been used since the 1940s, with UWA conducting pioneering research into it.

One of the practical problems with the 'ram effect' is that ewes must be isolated from the rams for it to work. Ms Jorre de St Jorre's research clearly shows that separating ewes from rams really isn't necessary if the rams used to tease the ewes are novel. Her research also examined the minimum time of separation necessary for a familiar ram to become novel again.



MS TRINA JORRE DE ST JORRE

This research might eventually lead to farmers eliminating the use of hormones for timing reproduction.

Ms Jorre de St Jorre's research could be vitally important to the future of sheep farmers in Australia. Consumers are increasingly demanding clean, green, ethical sources of meat that are hormone free. This excellent combination of fundamental and applied research will provide farmers with natural techniques to control reproduction and manage the timing of reproduction in their flocks.

The natural approach is also very cost effective for farmers, as it relies on behavioural intervention to control reproduction, rather than expensive methods based on hormones. It will help give Australian farmers a competitive advantage over their European counterparts.



METHANE RESEARCH ON SHEEP



3. Plant Production Systems Program

The Plant Production Systems program endeavours to contribute to the productivity and sustainability of plant-based Australian agriculture through the application of science and technology. Australian agriculture includes a large land area (300-600 mm winter rainfall) devoted to rain-fed annual temperate crops, pastures/livestock. There is also much more intensive agriculture in areas of high rainfall and/or irrigation with crops (cotton, vines, orchards, vegetables, flowers etc), perennial pastures/livestock and other higher value agricultural products. The UWA Institute of Agriculture Plant Production Systems activities come under two areas of extensive and intensive agriculture.

Excellence training: Linking practical plant breeding and association genetics

At the end of 2009 UWA hosted 80 of the world's leading scientists from 13 countries at the first OECD-sponsored conference held in WA. The topic was Genome-wide association mapping. Grains Research and Development Corporation (GRDC) and UWA were the event's co-sponsors.

This conference came at a time when major advances are occurring through genome association mapping in humans, animals and some plant species. The challenge of this conference was to provide plant breeders with a clear path towards the application of association mapping to plant genetic improvement.

The keynote speaker at the event was a world expert in the human genome: Prof Bruce Weir, Chair and Professor of Biostatistics, and Adjunct Professor of Genome Sciences, at the University of Washington, USA. Prof Weir is Director of the GENEVA project, a consortium of 14 whole-genome studies. He was selected to spearhead the conference because of his bio-statistical experience



DELEGATES AT THE OECD SPONSORED CONFERENCE

– considered to be invaluable in guiding plant scientists in the area of association genetics, which while highly developed in humans, is just starting in plants.

All the OECD-invited speakers were international experts in molecular marker discovery, plant genetic mapping, new biometrical approaches to plant breeding, human genetics and animal breeding.

The OECD Co-operative Research Program's Biological Resource Management for Sustainable Agricultural Systems funded the 16 invited international speakers to travel to Perth. A number of PhD students, representing the future of plant breeding, also attended courtesy of GRDC sponsorship which allowed a generous subsidy to students at this conference.

Novel alternatives show potential for WA pastures

Research conducted by the UWA School of Plant Biology and The UWA Institute of Agriculture has demonstrated that several herbaceous legumes may be viable alternatives to lucerne under low phosphorus conditions for West Australian farmers in areas where lucerne performs poorly.

The research compared the growth of 10 native and exotic herbaceous legumes to lucerne growing in glasshouses, supplied with different levels of phosphorus.

The study found that four species, *Bituminaria bituminosa*, *Glycine canescens*, *Kennedia prostrata*, and *K. prorepens*, grew better than lucerne in low phosphorus conditions and that two species, *B. bituminosa* and *G. canescens*, used phosphorus applied to soil more efficiently than other species where low phosphorus was a problem.

Funded by the Australian Research Council (ARC), Department of Agriculture and Food Western Australia (DAFWA) and Heritage Seeds, Research

Associate, Dr Jiayin Pang, School of Plant Biology says that the research could have important implications for WA farmers, because developing new perennial pasture legumes that take up or use phosphorus more efficiently than lucerne is important in the face of dwindling global phosphorus reserves and the rising cost of fertilisers.

Many farmers need a viable alternative to lucerne because it's poorly adapted to acidic sandy soils, waterlogging and salinity and doesn't do well in hot and dry conditions. Many of the legumes tested were native species well adapted to local environmental conditions, such as low rainfall, acidic soils and low fertility.

The research also found that exotic perennial legumes, such as *B. bituminosa*, could also fill low phosphorus niches where lucerne production was poor. Even though it is promising, the results of this glasshouse study will need to be validated with long term field studies. These will identify if native perennials can accumulate large

amounts of phosphorus from heavily fertilised, high phosphorus soils. Many native legumes regulate phosphorus uptake poorly when soil phosphorus supply is increased, resulting in phosphorus toxicity.

Dr Pang's research will also determine if native and exotic legumes can use phosphorus already in the soil more efficiently, thereby reducing the need for additional fertiliser application.

Large scale use of phosphorus has seen a rapid depletion of global reserves, which are expected to halve by 2060. This poses a significant challenge for Australian agriculture with its phosphorus deficient soils and the heavy use of phosphorus fertiliser.

Australian native and novel exotic perennial legumes, such as those identified and currently being developed by Future Farm Industries CRC and UWA, could alleviate this problem. Other project collaborators include ChemCentre, Facey Group and the Mingenew Irwin Group.



DR JIAYIN PANG



4. Rural Economy, Policy and Development Program

The overall objective of the Rural Economy, Policy and Development program is to enhance the sustainability of rural industries, communities and regions. More specifically, the program aims to provide innovative research and education that: improves the productivity and prosperity of agricultural industries; addresses the environmental challenges facing rural regions; contributes to the broader economic and social development of rural industries, communities and regions; and enhances decision-making and rural policy.



ASSIST/PROF AMIN MUGERA, PROF BEN WHITE, AND DR JAMES FOGARTY AT UWA

Staying on top of agricultural economics:

Increasing numbers of undergraduate and postgraduate students enrolling in the UWA School of Agricultural and Resource Economics (SARE) shows a renewed interest, especially in agribusiness.

SARE has backed this up by employing two lecturers, Assistant Professors James Fogarty and Amin Mugera. They bring expertise in the economics of food and beverage production, agricultural marketing and their wider effects on farm management and labour.

Dr Fogarty, a UWA graduate, has published a paper on Australia's fine wine production sector, while Dr Mugera, from Kansas State University, USA, has written broadly on agribusiness.

The appointments come on the back of UWA's strong showing at this year's Australian Agricultural and Resource Economics Society awards, where its researchers picked up four honours, including two of the most prestigious, for 'best published article' and 'quality of research discovery'.

These appointments will help UWA to maintain its leading international standing, while meeting the growing needs of the regional agricultural economy.

Enrolments at FNAS surged almost 10 percent in the last year alone, to top off a half decade of growth that has seen numbers swell to about 700 full time students. This expanding demand reflects the industry's need for smart solutions to economic, environmental and social challenges in agriculture. All the research and intellectual tools UWA delivers must be affordable and the Agricultural and Resource Economics School ensures The University delivers that value ie; providing an economic analysis of the science.

In a recent benchmarking study that compared UWA's School of Agricultural and Resource Economics against leading university agricultural schools from around Australia and the world, it was found UWA published more papers on agricultural economics than any competitor. Its research was also cited more than twice as much as research from any other Australian university.

UWA's agricultural and resource economics group ranked number one against the best in Australia and also performed against comparable schools in North America and Europe. Although already in a strong position, these new appointments will help UWA to continue to improve its track record for delivering top quality research and training.



CANOLA BREEDERS INSPECTING BREEDING TRIALS

New centre brings together environment and economics

A new centre that recognizes the crucial role of research in bringing environmental, economic and social benefits to Australia was opened in July 2009 at UWA by Professorial Fellow and former WA Premier, Dr Carmen Lawrence.

The Centre for Environmental Economics and Policy, in FNAS aims to develop and apply models and decision frameworks that push forward the frontiers of environmental policy design, focusing on scientific outcomes within an economic framework.

CEEP houses a team of researchers who are experts at integrating the disciplines of Physical Sciences, Biology, Social Sciences and Economics, and who work closely with practitioners and Government agencies.

The Centre's research covers issues such as biodiversity conservation, native vegetation, pollution of waterways, environmental pests, climate change and land degradation.

Led by Director, UWA Australian Research Council Federation Fellow W/Prof David Pannell, the Centre encourages collaborative and innovative research. W/Prof Pannell has an outstanding track record of linking research to policy to enhance natural resource management outcomes.



THE CENTRE FOR ENVIRONMENTAL ECONOMICS AND POLICY LAUNCH



DR QIN YU

5. Education, Outreach and Technology Exchange Program

The Education, Outreach and Technology Exchange program has the following objectives:

- To attract and train outstanding undergraduate and post-graduate students in a range of scientific disciplines leading to careers in agriculture and natural resource management;
- To provide professional training to people already in the workforce to augment their skills to better serve the agricultural and natural resource management industries;
- To facilitate opportunities for technology exchange and knowledge transfer to industry and the rural community;
- To communicate the role of The University of Western Australia in education, training and technology exchange to farmer groups, agribusiness, collaborators (national and international), funding bodies and potential students, highlighting the benefits contact with UWA may bring; and
- To raise public awareness and understanding of the significance of agriculture and natural resource management to WA and the national economy.

Eureka prize winner offers agricultural value

The development of an advanced colour near infra-red spectrometer has not only won W/Prof Laurie Faraone, W/Prof John Dell, and the Microelectronic Research Group at UWA the Inaugural Defence Science and Technology Organisation Eureka Prize for Outstanding Science Award, but it is also good news for the agriculture sector.

This technology's sophisticated optics, mainly intended for combat situations, allows for calibration to measure grain moisture, and protein and soil nutrient levels. Another bonus is the size of the spectrometer's package: fast, accurate, portable, robust and low cost.

The Microelectronics Research Group, led by W/Prof Faraone, developed a filter which enables creation of colour images. The filter enables scanning smaller areas. This means less data is required to generate images and improve real-time use of infrared.

This technology could be used in real-time soil monitoring and characterisation of grain during harvesting.

This work has attracted \$1.5 million funding from the Grain Research and Development Corporation (GRDC) to measure starch, protein and oil for sorting the grain and getting the best value for it. The original program was funded by the US Defence Department at the Defence Advance Research Projects Agency.

Future applications of this technology will include monitoring of soils for carbon sequestration.



MR WARREN SNOWDEN, MINISTER FOR DEFENCE SCIENCE AND PERSONNEL, WITH W/PROFS JOHN DELL AND LAURIE FARAONE

UWA 2009 Industry Forum

The 3rd UWA Institute of Agriculture Industry Forum, held on 31 July 2009 was attended by 60 people representing industry, growers, postgraduate students and the research community. The Forum entitled, "Healthy farming- stronger communities?" explored a diverse range of issues and challenges affecting farmers. W/Prof Alan Robson, AM, Vice Chancellor, UWA officially opened the forum.

Speakers from Interstate, WA and UWA included: A/Prof Bill Pritchard (University of Sydney), Dr Neil Argent (University of New England), Ms Wendy Newman (Heartlands regional branding group) and Ms Jacqui Biddulph (Challenge Dairy Cooperative). A/Prof Bill Pritchard (University of Sydney) made the case for *the economic and social embeddedness of family farms in local economies*. He was followed by Dr Neil Argent (University of New England) who spoke about *"The shifting demographic structures of agricultural regions"*. Other topics included *"Living Standards and Western Australian Agriculture in Regional Economic Development Perspective"* (Dr Nazrul Islam), *"The Heartlands regional branding group"* (Ms Wendy Newman), *"The Challenge Dairy Cooperative- Farmers work together: the influence on the rural community"* (Ms Jacqui Biddulph), *"When the family farm hits the health food market"* (Mr John Foss), *"Adding value whilst being compliant with Environmental Management Systems"* (Ms Rachel Bagshaw),

"Indigenous economic development and agriculture" (Mr Graham Ellis-Smith and Mr Oral McGuire), *"The human face of agricultural regions: the example of men's health"* (Mr Julian Kreig) and *"Labour shortages"* (Prof Matthew Tonts).

For a more in depth look at the Industry Forum go to www.ioa.uwa.edu.au/papers/industryforum.

Iraqi training program

UWA and its Institute of Agriculture continued to play an important role expanding the capacity of Iraqi agriculture; training Iraq's brightest and best graduate agriculture students during 2009.

Ten graduate students joined UWA in early 2009 to study their Master of Science degrees in Animal Science, Plant Pathology, Genetics and Breeding and Agricultural Resource Economics. These students are employed by the Iraqi Ministry of Agriculture, and funded by Australia-Iraq Agricultural Scholarships provided by the Australian Government under the AusAID Scholarship Program.

In September 2009 W/Prof Siddique met with Iraqi Agriculture Ministerial staff, ICARDA and Australian collaborators in Aleppo, Syria, to discuss the conservation cropping project's progress and future direction. This includes two Masters students and one PhD student from Iraq joining UWA in 2010.

While in Syria, he also discussed UWA's involvement with further capacity building in Iraq with His Excellency Robert J Tyson, Ambassador, Australian Embassy, Baghdad.

The major outcome of UWA's assistance to Iraqi agriculture is helping the country's national agricultural agencies develop sufficient technical capacity to plan, implement and monitor R&D programs that will make it more self sufficient in food

The School of Earth and Environment at UWA hosted a "Land Management and Soil Fertility" course for trainees from Iraq funded by AusAID through Coffey International in August 2009.

The group of 24 attended a series of specialised lectures, practical sessions, field trips and laboratory visits during their five week stay. The sessions were presented by UWA staff and scientists and managers from government and industry. Participants discussed various aspects of land management with experts in the field and forged professional relationships. All the trainees presented their work at a seminar day held at the end of the course.

The trainees were from a variety of scientific backgrounds, many from managerial roles within the Iraqi Ministry of Agriculture. Some work in more remote provinces of Iraq including Babylon, Al Mushraq and Dhi-Qar. Their research interests include work with salinity, tomatoes, date palms and irrigation.



TEN IRAQI STUDENTS JOINED UWA TO STUDY MASTER OF SCIENCE DEGREES IN AGRICULTURE



POSTGRADUATE SHOWCASE



UWA FUTURE FARM OPEN DAY

2009 Postgraduate Showcase

2009 Frontiers in Agriculture postgraduate showcase on June 23 was no exception to previous years and proved the high quality education in agriculture at UWA. Eight students from the four schools within the Faculty of Natural and Agricultural Sciences (FNAS) presented their work at the showcase, displaying a high quality of research and communication skills. All the presentations are available on The UWA Institute of Agriculture website (www.ioa.uwa.edu.au). See table 1 below.

Table 1: 2009 Postgraduate Showcase Frontiers in Agriculture

Session 1:	
Mr Ahmed Ali	Use of Pectinases to Improve the Nutritive Value of Lupins for Poultry
Ms Trina Jorre de St Jorre	Non-hormonal control of ovulation in sheep
Ms Annaliese Mason	On the road to a Super Brassica crop species: investigating problems of infertility and instability through cytogenetics
Mr Sudheesh Manalil	The effect of low rates of herbicides on the gene flow and evolution of herbicide resistance in <i>Lolium rigidum</i> (ryegrass) and its modeling
Mr Dion Nicol	Agronomic and ecophysiological studies of <i>Cullen cinereum</i> and <i>C. graveolens</i> as potential pasture legumes in low rainfall regions of the southern Australian wheatbelt
Session 2:	
Ms Jennifer Carson	Influence of rock fertilisers on soil microorganisms in an organic pasture
Ms Bronwyn Crowe	The design of biodiversity conservation contracts under uncertainty
Mr Gus Rose	Changing the ownership-management paradigm in broadacre farming: will crop-dominant farming systems be more profitable if farmers outsource their sheep management?

UWA Future Farm Open Day

About 200 researchers, industry members and the wider agricultural community, including local farmers and grower group leaders from the region, flocked to UWA Future Farm on 20 November for its opening by Honourable Robyn McSweeney, Minister for Child Protection, Community Services, Women's Interests and Seniors and Volunteering.

Guests included: W/Prof Lyn Beazley (Chief Scientist WA), Mr Ray Marshall (Councillor and farmer, Pingelly), Mr Rob Delane (Director-General DAFWA), and W/Prof Alan Robson (Vice-Chancellor, UWA). The Open Day drew many journalists and was featured extensively in agricultural publications. The event was advertised widely within agricultural and rural papers.

The research displayed and presented was: cropping, canola, rainfall simulation, regional development, soil quality, ecological restoration, herbicide resistance, clean, green and ethical animal production, GIS, Forest Products Commission, Carbon Neutral, Faculty of Agriculture, and projects with CSIRO and DAFWA.

The complete newsletter article can be found online at http://www.ioa.uwa.edu.au/_nocache/?a=631366.

Dowerin Field Day

The UWA Institute of Agriculture, as part of its Technology Exchange and Outreach programme, showed its commitment by displaying at Dowerin Field Day for the third consecutive year from 25 – 26 August. The display showcased some of the latest agricultural research at UWA.

Field Day goers could get information on the UWA Institute of Agriculture, FNAS undergraduate courses, *Ascochyta Blight* resistant chickpeas, salt tolerant wheat, glyphosate resistant ryegrass, novel pasture species, Soil Quality website, biochar and a mulesing survey. The IOA Communication Officer, Mrs Erika von Kaschke, and FNAS Marketing Officer, Mrs Chris Hale, ran the booth situated in the Education Pavilion.

The involvement of the UWA Institute of Agriculture in the Dowerin Field Days, which attract over 16,000 people, is a useful promotional exercise to illustrate the educational opportunities and research capabilities in natural and agricultural sciences at UWA. The majority of the visitors to the display were farmers, parents of primary and secondary school students, or students enrolled at UWA or other tertiary institutions.

IOA newsletter reaching wider audience

The UWA Institute of Agriculture aims to bring high quality relevant information on its activities to alumni, agribusiness, growers and industry, funding bodies, research institutions, and UWA staff. The newsletters were published during March, August and December 2009.

Media releases and publications

The UWA Institute of Agriculture sustained its presence in the media during 2009. The Institute with the support from Brendon Cant and Associates, issued 21 media statements during the year. These media statements received several hits nationally and internationally.

Table 2: 2009 Media Statements

Date released	Media Statements
20 January 2009	<i>UWA agriculture moving up in the world</i>
20 February 2009	<i>Agriculture expert lauded in India</i>
24 February 2009	<i>Mason builds on UWA Super Brassica research in France</i>
29 April 2009	<i>UWA agriculture moves from strength to strength</i>
11 June 2009	<i>Finding quality time for your sheep</i>
15 June 2009	<i>UWA wins \$833,000 funding to future-proof table grape industry</i>
17 June 2009	<i>Computer model looks at classical swine fever outbreak in feral pigs</i>
1 July 2009	<i>Novel alternatives show potential for WA pastures</i>
7 July 2009	<i>New centre brings together environment and economics</i>
22 July 2009	<i>UWA Institute of Agriculture postgraduates explore new agricultural frontiers</i>
6 August 2009	<i>Merino ewes reading the novel ram effect</i>
25 August 2009	<i>UWA and Chinese Universities hatch plans for collaboration</i>
5 September 2009	<i>No ordinary Bloecker</i>
21 October 2009	<i>UWA masters at aiding Iraq</i>
11 November 2009	<i>Human genome experts to help plant breeders feed the world</i>
11 November 2009	<i>A variety of findings for young and old</i>
13 November 2009	<i>Clean green farm will make every raindrop count</i>
30 November 2009	<i>Saving freshwater fish – and human health</i>
10 December 2009	<i>Down to earth approach to climate change</i>
11 December 2009	<i>New staff help keep UWA on top of agricultural economics</i>
21 December 2009	<i>Climate change no laughing matter at UWA</i>

Website – www.ioa.uwa.edu.au

The UWA Institute of Agriculture's website is packed with vital information. It is the first port of call for information on UWA agriculture related activities. The website is updated regularly, holding current and archived data. The archived lecture papers and presentations, and news receive the most hits by internet users.

Food and Agriculture Lectures

- There were four public lectures and two occasional lectures (Table 2) arranged under the banner of The UWA Institute of Agriculture "Food and Agriculture" attracting audiences of between 30 and over 90 people.
- The local and international speakers were all very well received and their subject matter provoked interest and discussion in a range of areas.
- Details of these public lectures are available on the IOA website (www.ioa.uwa.edu.au).

Mike Carol Traveling Fellowship

Ms Annaliese Mason, agricultural science PhD student at UWA, was awarded the prestigious 2008 Mike Carroll Travelling Fellowship early February 2009.

She spent six weeks in France researching how to combat potential problems of abnormal chromosome associations in Super Brassica plants.

Mrs Helen Carroll said the Fellowship honoured her deceased husband, former Director General of the WA Department of Agriculture, Dr Mike Carroll.

Recipients are chosen on their academic abilities, relevance of studies to an important area of Australian broadacre agriculture, their potential to benefit from the experience and their enthusiasm to impart the findings of their travels to the scientific, farming and wider community on their return to WA.

Table 3: Food and Agriculture Lectures 2009

Date	Presenter	Organisation	Title
3 March	Dr Doug Edmeades	Managing Director, agKnowledge Ltd, New Zealand	"Science under threat. Why and what must be done?"
24 March	Assoc/Prof Patrick J Tranel	University of Illinois, USA	"The ongoing battle between humans and weeds: Who is winning?"
10 July	Dr William D Dar	International Crops Research Institute for the Semi Arid Tropics (ICRISAT)	ICRISAT: Champions of the poor of the semi-arid tropics
17 August	Dr Yunbi Xu	Applied Biotechnology Center International Maize and Wheat Improvement Center (CIMMYT), Mexico	A roadmap from the genomics revolution to a new era in public plant breeding
Occasional lectures			
29 July	Prof Prasada Rao	Department of Agricultural Meteorology and Associate Director Research, Kerala Agricultural University, India	Climate change adaptation initiatives in Kerala (India) under the humid tropics
18 August	Assoc/Prof Sven-Erik Jacobsen	Department of Agriculture and Ecology University of Copenhagen, Denmark	Climate proof cropping systems and the potential for under-utilised species in the Mediterranean environment

Research facts

Agriculture and agricultural research has long been recognized as a major strength at UWA nurtured over many years by a succession of innovative agricultural scientists. It has also been identified in the Operational Priorities Plan for the University (2009-2013) as one of the University's six strategic research areas.

Flowing from this, the University has analysed the impact of our research publications over the period 2001-2007.

The analysis compared UWA's research performance with all other Australian universities listed in the Thomson Reuters University Science Indicators (36 universities) database and also with a group of four internationally recognised universities positioned above UWA on the Shanghai Jiao Tong University Rankings (<http://www.arwu.org/rank2008/EN2008.htm>).

This international group included the University of Wisconsin Madison (US), the University of Toronto (Canada), the University of Bristol (UK) and the University of Sheffield (UK). For agricultural sciences our international benchmark was the University of Wisconsin Madison, which is widely recognized as one of the world's leading agricultural universities.

The data presented in Table 5 clearly shows the strength of this research base and its standing nationally and internationally. In USI subject fields directly related to agriculture (Agronomy, Agricultural Economics & Policy, Agricultural Soil Sciences, Plant Sciences, and Agricultural Dairy and Animal Sciences) UWA produced more indexed publications than any other Australian university and in three of the five areas out-performed all of the international benchmark universities.

A measure of the impact of our research is provided by the number of times these publications are cited. Again, in Agronomy, Agricultural Economics & Policy and in Agricultural Soil Sciences our cited works rank #1 in Australia and against the international benchmark universities.

In plant sciences our citations rank second to ANU in Australia with both Australian universities ranking behind the University of Wisconsin Madison. For Agricultural Dairy & Animal Science, UWA is ranked #6 on both the number of outputs and citations and #8 relative to the international benchmark universities.

All of the Australian universities are positioned behind the University of Wisconsin Madison and the University of Bristol in this field. This is an excellent performance that testifies to the standing of agricultural sciences in WA.



UWA AGRICULTURAL SCIENCE UNDERGRADUATES

Table 4: UWA's Research performance in agricultural and environmental research*

Subject	Institution	# Papers	Rank Australia	# Cites	Rank Australia	International Benchmark ¹
Agronomy	UWA	241	1	1443	1	1
	Queensland	200	2	694	3	5
	Adelaide	155	3	746	2	4
	Melbourne	81	4	475	4	6
	Sydney	81	5	420	5	7
Agricultural Economics & Policy	UWA	54	1	179	1	1
	ANU	27	2	77	2	3
	UNE	25	3	69	3	4
	Sydney	17	4	29	7	7
	Melbourne	15	5	27	8	8
Agricultural Soil Sciences	UWA	238	1	1058	1	1
	Adelaide	123	2	703	2	2
	Queensland	91	3	326	6	6
	Sydney	85	4	515	3	3
	Melbourne	60	5	392	5	5
Plant Sciences	UWA	622	1	5336	2	3
	ANU	531	2	5568	1	2
	Adelaide	492	3	3665	3	5
	Queensland	447	4	2581	5	9
	Melbourne	404	5	3274	4	7
Agricultural Dairy & Animal Sciences	Queensland	135	1	289	4	6
	New England	123	2	503	2	4
	Melbourne	121	3	410	3	5
	Sydney	109	4	504	1	3
	Adelaide	56	5	183	5	7
	UWA	41	6	117	6	8
	Murdoch	28	7	89	8	10
	Monash	26	8	116	7	9

* Publication impact of Australian Universities over the period 2001-2007. Data only presented for the top 5 Universities (# papers) in each of the subject fields. The top 8 are shown for Agricultural Dairy and Animal Science. Analysis prepared using the Thomson Reuter's University Science Indicators database.

¹ International benchmark refers to the performance of 4 international universities in each of the selected fields. All of the Universities, University Wisconsin Madison (US), University of Toronto (Canada), University of Bristol (UK) and University of Sheffield (UK) are positioned above UWA on the Shanghai Jiao Tong University Rankings.



DR WILLIAM DAR, DIRECTOR-GENERAL, ICRISAT, (RIGHT) VISITED UWA DURING JULY 2009

National and International Engagement



PROF DOUG MCEACHERN (UWA) EXCHANGING AN MOU WITH PROF MANJIT KANG (PAU)



CHINESE AGRICULTURE DEANS DURING THEIR VISIT TO UWA

The UWA Institute of Agriculture has maintained its excellent relationship with several international Universities. New ties were strengthened by signing several Memorandums of Understanding (MoU's).

The Institute continues to make linkages with organisations and Universities across the globe. During 2009 we received almost a hundred national and international visitors including His Excellency Mr Mahmoud Movahhedi (Ambassador of the Islamic Republic of Iran), Dr Michel Thibier (Conseiller Scientifique, French Embassy) and Prof Dyno Keatinge (Director General, AVRDC-The World Vegetable Centre, Taiwan).

- Four MoU's were signed with: Punjab Agricultural University (India), Beijing Forestry University (China), South China Agricultural University (China), and Kerala Agricultural University (India).
- New projects: Australian Research Council (ARC), Grains Research and Development Corporation (GRDC), Rural Industries Research and Development Corporation (RIRDC), The Council of Grain Grower Organisations (COGGO), Australian Centre for International Agricultural Research (ACIAR), etc.

- During August 2009 thirteen Deans from six agricultural universities around China visited UWA for a three-day workshop on agricultural research and education. UWA participants included W/Prof Tony O'Donnell (Dean, FNAS), W/Prof Kadambot Siddique (Director, IOA), W/Prof Graeme Martin (Head, School of Animal Science), and W/Prof Hans Lambers (Head, School of Plant Biology). The visiting Deans were impressed by the world leading position of UWA in agricultural research and teaching, the research facilities, and by efforts of UWA to establish and strengthen long-term partnerships with renowned Chinese universities.

Awards



RES/ASSIST/PROF SALLY MARSH AND W/PROF DAVID PANNELL (THE AUSTRALIAN RESEARCH COUNCIL EUREKA PRIZE FOR EXCELLENCE IN RESEARCH BY AN INTERDISCIPLINARY TEAM)

The UWA Institute of Agriculture and associated staff and students were recognised for their successes and achievements in their fields during 2009.

Notable ones are:

- W/Prof Lyn Beazley (Officer of the Order of Australia for her work in scientific research, education and outreach),
- Dr Alexander Campbell (Honorary Doctor of Science),
- Res/Assist/Prof Sally Marsh and W/Prof David Pannell (The Australian Research Council Eureka Prize for Excellence in Research by an Interdisciplinary Team),
- W/Prof Kadambot Siddique (Gold medal from the Indian Society of Pulse Research and Development), and
- W/Prof Alan Robson (Citizen of Western Australia).

New research projects

Table 5: New research projects

Title	Funding Period	Funding Body	Supervisor(s)
Quantifying a prototype machine to destroy weed seeds during the grain harvest operation	2009-2011	Grains Research and Development Corporation (GRDC)	W/Prof S Powles and Dr M Walsh
SaltCap and SaltDecide	2008-2011	Future Farm Industries (FFI) CRC	Dr R George , Adjunct Associate EG Barrett-Lennard and Dr SJ Bennett
Improving food and biofuel production in changing climates – development of new brassica polyploids in Australia and China	2009-2010	International Science Linkages (ISL) - Australia-China Special Fund for S&T Cooperation Funding Agreement	W/Prof Kadamot Siddique, Prof Wallace Cowling, A/Prof Guijun Yan and collaborators from Huazhong Agricultural University and Zhejiang University.
Optimising biodegradation and removal of organic and inorganic pollutants in wastewater using constructed wetlands	2008-2011	Australian Research Council (ARC) Linkage	W/Prof Z Rengel and K Meney
Biofiltration of stormwater	2009-2010	Department of Water WA, Perth	W/Prof Z Rengel
Strengthening the capacity of the counterpart organisation to both assess the flow of antioxidants and omega-3 fatty acids within the ecosystem of the Tibet Plateau and defining their protective roles in the health of Tibetan pastoralists.	2009-2010	AusAID	A/Prof Philip Vercoe, Dr Shimin Liu
Breakthrough methods for antioxidant research in grape: implications for nutritional quality	2009	British Council	Dr Michael Considine
Weed Seed Wizard	2008	CFC for Australian Weed Management	Dr Michael Renton
Modelling transplant growth in <i>Posidonia</i> species	2008	Cockburn Cement Ltd	Dr Michael Renton
Quantifying and predicting agricultural systems- protein in wheat	2008-2009	Department of Agriculture and Food WA	Dr Michael Renton
Development of conservation cropping systems in the drylands of Northern Iraq	2008-2011	ICARDA	W/Prof Kadamot Siddique
QBA- Animal welfare objectives measures research program- Qualitative behavioural assessment as an integrated measure of welfare	2007-2010	Murdoch University ex Meeat and Livestock Australia	Assoc/Prof Dominique Blache
Drought tolerance of novel perennial legumes	2008-2010	Rural Industries Research and Development Corporation	Dr Megan Ryan
Greenhouse gas abatement and feed efficiency	2009	Sheep CRC Ltd	A/Prof Phil Vercoe and Dr Zoey Durmic
Water resources and freshwater biodiversity	2008-June 2013	Australian Federal Government (the Department of Climate Change)	Prof Peter Davies
Developing a 3D movie generation system for use with ROOTMAP	2008-2009	University of Tasmania	Assist/Prof Michael Renton
Forecasting spread for rapid response	2008-2011	CRC Plant Biosecurity	Assist/Prof Michael Renton
Development of a salt and waterlogging tolerant wheat	2010-2011	Future Farm CRC ex GRDC	Prof Tim Colmer, Adjunct Associate Prof. Edward Barrett-Lennard and Dr Rafiq Islam
Development of native plant industries for an innovative sustainable and profitable Great Southern Region	2009	Great Southern Development Commission	Dr Geoff Woodall
Assessment of sediment erosion and soil sampling methods applied in WA	2009	WA Department of Agriculture and Food	Dr Karen Homes and Dr Neil Coles

Title	Funding Period	Funding Body	Supervisor(s)
Determining root longevity in an Australian perennial monocotyledon	2009	AINSE Research Training	Dr Michael Shane
Development of methods for freezing ratite semen as part of a long term goal to develop a viable artificial insemination technology for ratites	2009	Australian Academy of Science: International programs	Dr Irek Malecki
Pollen-mediated gene flow in weed species from adjacent farms into organic farms	2009	Department of Agriculture Fisheries and Forestry (DAFF)	Dr Roberto Busi, W/Prof Steve Powles and Dr Qin Yu.
Optimal investment in R&D for Plant Biosecurity	2009-2011	CRC Plant Biosecurity	Prof Benedict White
Influence of High Temperature on Phenology, Metabolism and the Fate of Auxillary Buds and Inflorescences in Grapevine	2009-2014	Gascoyne Table Grape Growers Association Department of Agriculture and Food Western Australia	Assist/Prof Michael Considine, W/Prof Jim Whelan, Dr Colin Gordon
Mechanisms and Manipulation of Seed Dormancy Maintenance in Annual Ryegrass and other Weed Species	2009-2011	Botanic Gardens and Parks Authority	W/Prof Steve Powles, Adjunct Prof Kingsley Dixon
Simulation Technology for Modelling Extreme Bushfire Behaviour	2009-2013	Fire and Emergency Services Authority of Western Australia Landgate	W/Prof George Milne and Prof John Dold
Overcoming paraquat resistance: The potential for herbicide mixtures to reverse paraquat resistance	2009	Department of Agriculture, Fisheries and Forestry (DAFF)	W/Prof Stephen Powles,
Identifying the basis of dual glyphosate and paraquat resistance in <i>Lolium rigidum</i> selected at reduced rates of glyphosate	2009	Department of Agriculture, Fisheries and Forestry (DAFF)	W/Prof Stephen Powles,
Overcoming and avoiding metabolism based herbicide resistance in <i>Lolium rigidum</i>	2009	Department of Agriculture, Fisheries and Forestry (DAFF)	Dr Todd Gaines and W/Prof Stephen Powles
Conference sponsorship application: Exploiting genome-wide association in oilseed <i>brassicac</i> s: A model for genetic improvement of major OECD crops for sustainable future farming.	2009	Grains Research and Development Corporation (GRDC)	Prof Wallace Cowling and Prof Willie Erskine
Travel grant: Fourteenth Australasian Plant Breeding Conference.	2009	Grains Research and Development Corporation (GRDC)	Res/Assist/Prof Jon Clements
Generation of genetically modified herbicide tolerant narrow leaf lupin	2009-2013	Grains Research and Development Corporation (GRDC)	Prof Willie Erskine, Assoc/Prof Susan Barker and W/Prof Kadambot Siddique
Interspecific hybrids in lupins- stabilisation and trait transfer to fixed lines for lupin crop improvement	2009-2011	Grains Research and Development Corporation (GRDC)	Res/Assist/Prof Jon Clements
Agricultural benefits of green manuring leaf biomass from Bioenergy crops	2009-2012	Rural Industries Research and Development Corporation (RIRDC)	Dr Robert Sudmeyer and Dr Neil Coles
Feed efficiency maternal productivity and responsible resource use	2007-2010	WA Department of Agriculture and Food Ex Beef CRC	Assoc/Prof Dominique Blache
Predicting ethical consumers intentions to purchase wool apparel and their willingness to pay for ethical attributes	2010	UWA Research Development Award Scheme	Assist/Prof Joanne Sneddon
Sexual conflict in honey bees- the molecular response of queens to seminal fluid	2010	UWA Research Development Award Scheme	Dr Veronica Poland
Pasture soil amelioration with chicken litter	2009-2010	BHP Billiton Worsley Alumina	Prof Mark Tibbett

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Research Publications 2009

Refereed journals

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