



THE UNIVERSITY OF  
WESTERN AUSTRALIA  
*Achieve International Excellence*

The UWA Institute of Agriculture

# Annual Research Report 2010



UWA AND CSIRO RESEARCH GROUP IN ONE OF FOUR CLIMATE CHANGE SIMULATION TUNNELS AT UWA'S SHENTON PARK FIELD STATION. WINTHROP PROFESSOR KADAMBOT SIDDIQUE WITH DR JAIRO PALTA, MR SAM HENTY (CSIRO), MR EDUARDO DIAS DE OLIVEIRA AND DR HELEN BRAMLEY. PHOTO COURTESY OF THE COUNTRYMAN.



Executive summary	1
The best of 2010 Vision, Commitment, Dedication, Leadership and Esteem	2
1. Integrated Land and Water Management	2
2. Animal Production Systems	4
3. Plant Production Systems	6
4. Rural Economy, Policy and Development	8
5. Education, Outreach and Technology Exchange	10
Education	14
Visitors to the Institute	16
Awards and industry recognition	17
New research projects	18
The UWA Institute of Agriculture team	20
Publications 2010	23

## 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.



# Executive summary

Agriculture at The University of Western Australia in 2010 can best be described by five words: vision, commitment, dedication, leadership and esteem. Like the visionary University Fathers who established agriculture at UWA as one of the first chairs at this University, agricultural scientists at the UWA Institute of Agriculture have a vision of providing lasting solutions to global food security.

Throughout 2010 our Integrated Land and Water Management, Animal Production, Plant Production, Rural Economy, Policy and Development, and Education, Technology and Outreach programs have shown commitment and dedication to agriculture education, research and management. Some of the world leaders in agriculture visited UWA and presented their findings as part of our Food and Agriculture lecture series. They were well-received and inspirational.

We have continued to nurture agriculture leaders of tomorrow. Our postgraduate showcase 'Frontiers in Agriculture' gave eight top agriculture-related postgraduates the opportunity to showcase their research. Researchers within the Institute have devised new ways of producing more food, in a clean, green and ethical manner. The UWA Future Farm hosted a Coping with Climate Change field day in October to share some of the latest climate change developments to growers and the industry.

During 2010, some of our researchers and students have been acknowledged for their leadership and vision in agriculture. UWA's esteem as a University was yet again proven when Life and Agricultural Sciences was ranked the highest in Australia and 34th in the world according to the prestigious Academic Ranking of World Universities (ARWU).

We have not only looked outward in 2010, but inward to determine how we can further strengthen agriculture education at UWA. Agriculture education for the future was the theme of the 2010 industry forum, one of the highlights on UWA's annual calendar. We have joined forces with industry to ensure that planning our new courses for 2012 meets industry requirements and future demands. Both postgraduate and undergraduate students had their say in what they believe is needed to shape the best agricultural science degree program in Australia.

At the UWA Institute of Agriculture we have a vision of sustaining productive agriculture for a growing world. We persevere to find solutions for regional and global food security and sustainability. Recently our vision was echoed by Mr Robert B. Zoellick, President of the World Bank, who urged the world to put food first. Figures released by the UN's Food and Agricultural Organisation show that costs for a range of basic commodities have now surpassed their peaks of 2008. Rising prices are re-emerging as a threat to global growth and social stability.

Without the support of our funding bodies, partner organisations and agriculture industry we would not be able to succeed in getting closer to attaining our vision. Our heartfelt thanks go out to them.



**Winthrop Professor  
Kadambot Siddique**

Chair in Agriculture and Director,  
The UWA Institute of Agriculture and  
Associate Dean (Research), Faculty of  
Natural and Agricultural Sciences

## Vision

(*ˌvɪʒən*) the ability or an instance of great perception, especially of future developments



THE PERFECT GIZMO FOR SOIL CO<sub>2</sub> MONITORING.

### 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.**

2010 has been the year where scientists have used their vision for the future to produce ground-breaking research:

##### **Perfect gizmo**

The UWA Centre for Land Rehabilitation (CLR) invented the perfect gizmo to keep tabs on soil CO<sub>2</sub>. The state-of-the-art automated soil surface CO<sub>2</sub> flux monitoring system logs surface evolution of greenhouse gases. These long-term, unassisted monitoring devices courier data to the researcher with real-time information. It uses dynamic chamber measurement techniques which means that CO<sub>2</sub> flux measurements are taken in almost ambient conditions with a measurement range of 0–3000 ppm. These instruments have huge potential to quantify soil greenhouse gas emissions especially in the context of emissions trading schemes in both agricultural and environmental settings.

##### **Ground penetrating radar**

Dr Michael Simeoni and Prof Bob Gilkes, from the UWA School of Earth and Environment, and Dr Paul Galloway of DAFWA used a new procedure called ground-penetrating radar (GPR) to create accurate maps of the depth of clay in duplex soils in the Great Southern, near Esperance. This will give growers a precise picture of the depth of clay, and combat crop yield variability.

Ground-penetrating radar is a non-destructive geophysical method

that uses radar pulses to image the subsurface. GPR instruments are small, rugged and easy to use in the field. If linked to a GPS, it also provides coordinate data.

Thus far, not many researchers have worked on the GPR's potential application in agriculture in Australia. A comparison of GPR results with physically-collected soil samples from across all sites found that GPR accurately measures the depth to the clay horizon of duplex soils to within 10 cm.

Even if the GPR works well in most soil conditions, it is severely restricted on saline soils with bulk soil conductivity greater than ~300 mS/m (milliSiemens per metre) or where standing water is present. The conductivity of saline soils and water is high and interferes with the electromagnetic signals from the GPR.

Although this method requires more 'soil unlocking', this is an exciting breakthrough in the delivery of more rapid and spatially-detailed soil information. The trials were funded by the GRDC and the National Heritage Trust and were supported by South Coast Natural Resource Management Inc.





### Assisting in management of China's rivers

UWA's Centre of Excellence in Natural Resource Management (CENRM) is involved in developing methods for managing the environmental health of China's rivers. As a partner in the International Water Centre (IWC), CENRM is working with Chinese management agencies and research institutions on the Australia-China Environmental Development Partnership (ACEDP). This partnership, funded by the Australian Government AusAID and People's Republic of China Initiative, aims to provide practical solutions to immediate water management challenges.

CENRM's Winthrop Prof Peter Davies and Assist/Prof Paul Close are involved in the ACEDP's River Health and Environmental Flow Project, which aims to develop frameworks and methodologies for measuring river health and assessing environmental water requirements. River health assessments provide scientific understanding of the threats to sustainable river function, using a range of indicators such as fish, aquatic macroinvertebrates and riparian vegetation, to support the implementation of targeted management actions. Assessment of a river's environmental water requirement is fundamental to sustainable management river health, as well as the management and allocation of water resources.

This project relies on a variety of tools and frameworks developed in Australia for assessing and reporting river health and determining environmental water requirements. Over the project's two-year timeframe, the researchers will trial international approaches to river health monitoring and environmental flow determination; develop a draft national framework for Environmental

Flow and Ecological Restoration; and build technical capacity in China to independently conduct and further develop river management strategies. IWC is a joint venture between UWA, Monash University, Griffith University and the University of Queensland.

### Water may be key control of soil biodiversity

Researchers at the UWA Institute of Agriculture have found evidence that water is a key controller of soil's vast microbial biodiversity. This research, funded by an Australian Research Council (ARC) Discovery Projects grant, shows how climate change may impact soil biodiversity and thus the soil microbial processes that are vital to food production.

Soil is a living system with an enormous biodiversity. Soil biologists are intrigued by how so many different bacterial species can coexist in soil. Recent findings by Professor Deirdre Gleeson and PhD student, Ms Jennifer Carson, have shown that bacterial diversity in soil increases as water levels decrease.

The research is using cutting edge technologies to study these microscopic organisms. The project makes use of a nanoSIMS (nano-scale secondary ion mass spectrometry), located at UWA and the only one of its kind in the southern hemisphere. This instrument allows researchers to see individual microorganisms without disturbing their soil habitat. UWA collaborates with Lawrence Berkley National Laboratories in the US using a technique that allows up to 9000 different bacteria and archaea to be characterised simultaneously, allowing us to track their response to changing soil water availability.



ASSIST/PROF DEIRDRE GLEESON AND PHD STUDENT, MS JENNIFER CARSON, INVESTIGATING THE EFFECT OF WATER CONTENT ON SOIL BIODIVERSITY.



W/PROF BOB GILKES SPEAKING TO THE HOLT ROCK GROWER GROUP.



# Commitment

( kə' mitmənt ) to be engaged and involved



## 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 the animal science and production program at UWA.

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

*The UWA Institute of Agriculture's program is committed to clean, green and ethical animal production. We believe in engaging with national and international researchers and the consumer to find progressive solutions to today's food production.*





### Coping with Climate Change field day

The Coping with Climate Change field day was held on October 1, 2010 at the UWA 'Future Farm' Ridgefield farm, Pingelly. The day focused on showcasing the Reducing Emissions from Livestock Research Program (RELRP) as part of DAFF's Climate Change Research Program. It was also integrated with other projects underway at Ridgefield that are related to green house gas mitigation and adaptation on-farm. In an attempt to show the entire DAFF Climate Change Research Program more broadly, the reforestation project for the farm's non-arable land and a second DAFF project, the National Adaptation and Mitigation Initiative (NAMI), co-funded by the Grains Research and Development Corporation (GRDC), were also presented.

Prof Phil Vercoe introduced the main aim of the day as well as an overview of the RELRP program and various activities that have been initiated at Ridgefield that are linked to RELRP and more generally to the CCRP. The main presentations started after lunch with a number of 'onsite demonstrations' at specific locations around Ridgefield, which allowed attendees to interact with researchers. The emphasis was on how the research deals with climate change within the context of farming enterprises and how the results will lead to new farm management practices. Attendees also visited ALVA House'. This is a newly designed house with a vision for energy efficiency for farm infrastructure. It was designed and constructed by UWA's Faculty of Architecture, Landscape Architecture and Visual Arts (ALVA), through the Advanced Timber Concepts Research Centre, in collaboration with Optimum Resource Architects.



### Clean, green and ethical ostrich farming

Ostrich farming is a tricky business. It is based on natural mating where a 1:2 (male to female) ratio dominates. Although there is enough inherent genetic variation and good genetic progress, this narrow ratio means higher feeding costs for extra male birds, and limits genetic progress because superior males can only mate with a few females in one season.

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

There is no knowledge as to how frequently semen can be collected from ostriches, how ejaculates should be diluted, what the temperature of storage should be, and what dose of spermatozoa should be used and how frequently it should be used to maintain female fertility at a maximum. In poultry, there is no voluntary semen collection method so a comparison cannot readily be drawn.



### Bee keepers at UWA

Around 60 beekeepers, industry representatives and guest speakers congregated for the WAFarmers 2010 beekeepers section annual conference at Mahogany Inn in Mahogany Creek.

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

The conference was a great opportunity to catch up with the beekeeping industry. The 2010 meeting was characterised by a spirit of getting started to take action in order to safeguard honeybees, especially if Australia or WA should face the incursion of new diseases.

The meeting was such a success that it was extended for two days at UWA. The CIBER research group was invited to visit the Wescobee factory, the largest honeybee packer in WA. The extended meeting resulted in the initiation of CIBER-Mail, an e-mail distributor to quickly spread information related to honeybees.



# Dedication

( dɛdɪˈkeɪʃən ) complete and wholehearted devotion

## 3. Plant Production Systems Program

The Plant Production Systems program endeavours to contribute to productivity and sustainability of plant-based Australian agriculture through the application of science and technology. Australian agriculture includes extensive agriculture, with large land areas and 300–600 mm winter rainfall, devoted to rain-fed annual temperate crops, pastures and livestock; and 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.

### WAHRI goes national

The WA Herbicide Resistance Initiative at UWA has shed the ‘W’ when they transformed into the Australian Herbicide Resistance Initiative in August 2010. AHRI received funding of \$5.5 million for the next five years (2010–2015) from the Grains Research and Development Corporation (GRDC).

AHRI works closely with DAFWA, Department of Employment, Economic Development and Innovation (DEEDI) Queensland, University of Melbourne and University of Adelaide to understand the impact of herbicide resistance and facilitate a national approach to resistance management across Australia. Winthrop Professor Stephen Powles, an internationally recognised authority on all aspects of herbicide resistance, will continue to lead as Director.

Late in 2010, AHRI hosted three half-day seminars in Wubin, Corrigin and Kojonup focusing on harvest weed seed management techniques. With support from the GRDC, Wheatbelt NRM and the South West Catchment Council, these workshops addressed the importance of harvest weed seed management

and how to successfully implement a chaff cart, windrow burning, baling and harvest weed seed destruction system. Researchers—Associate Professor Michael Walsh (AHRI, UWA) and Dr Peter Newman (DAFWA)—covered how to optimise weed seed management systems and discussed the successful use of weed seed targeting systems in an integrated weed management program. Darkan farmer and inventor of the Harrington Seed Destructor (HSD), Mr Ray Harrington, spoke about the HSD, a unique seed destruction system that has helped him to achieve lower weed levels across his farm. Finally, Corrigin grower, Mr Lance Turner, discussed the benefits of using a chaff cart and how this has enabled him to drive down weed numbers in his farming operation.





### Testing traits in rubbish bins

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

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

The system uses 240-L mobile bins and allows root growth up to 1-m depth, with repeated observations and measurements of 2-D root structure without the need for destructive sampling. Over time, growth dynamics of tap and lateral roots was mapped digitally. The extensive data sets acquired can be used in root growth models, such as ROOTMAP (UWA) and SimRoot (Pennsylvania State University, USA) that simulate 3-D root structure and function relevant to acquiring water and nutrients from a heterogeneous soil profile.

### Climate ready cereals

CSIRO Plant Industry and The UWA Institute of Agriculture with a research team at UWA's Shenton Park Field Station have set up a simulation tunnel to show wheat breeders how climate change and variability will affect the genetic traits they select for. The sealed tunnels were designed and built as part of the 'Climate Ready Cereals' project funded by the Federal Department of Agriculture, Forestry and Fisheries (DAFF), with the WA component managed by CSIRO in collaboration with the UWA Institute of Agriculture.

Most previous studies showed individual effects on wheat yield of increased CO<sub>2</sub>, higher temperature and drought, but it was unclear how the three variables interacted and affected grain yield for different cultivars. The CSIRO and UWA research team believed they could unravel the impact of this interaction during wheat growth and the critical stages of flowering and grain filling.

Tunnel temperatures vary from ambient to ambient+6°C and CO<sub>2</sub> levels vary from ambient (approx. 380 ppm) to about double at 700 ppm. WA is forecast to become drier, with all regions likely to be exposed to higher temperatures and elevated CO<sub>2</sub>.

The UWA Institute of Agriculture Research Fellow, Dr Helen Bramley and Australian Endeavour Research Fellow, Dr Muhammad Farooq, from the University of Agriculture, Faisalabad, Pakistan, are researching high temperature and drought, which complements the 'Climate Ready Cereals' project.

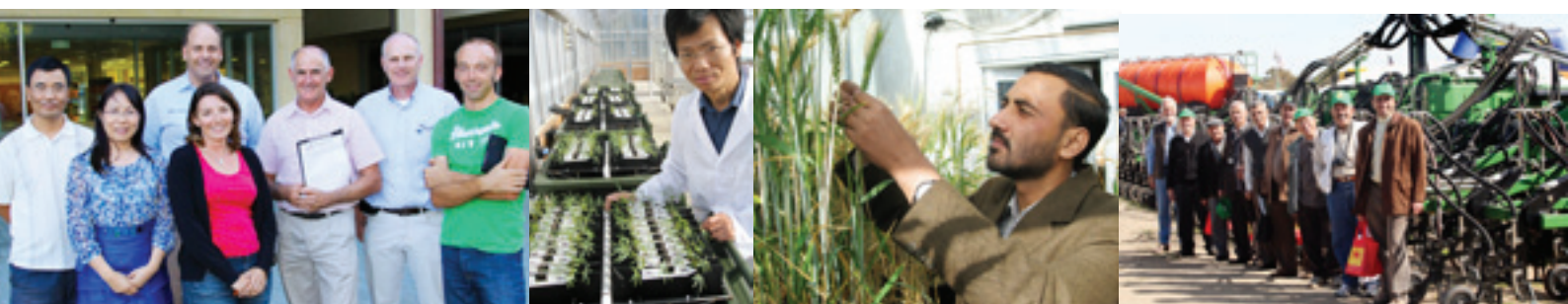
### Iraqi zero-till technology uptake increased

During 2010, the ACIAR/AusAID funded project on 'Development of conservation cropping systems in the drylands of northern Iraq' has continued making excellent progress. This project, set to run until 2011, aims to increase crop productivity, profitability and sustainability in the drylands of northern Iraq through the development, evaluation and promotion of conservation cropping technologies involving zero-tillage, stubble mulching, improved crop cultivars and better crop management.

Thus far, growers in Ninevah province have widely adopted conservation cropping systems. Local villagers have been trained to produce and market seed and zero-till machinery. Local agricultural agencies have received technical training to plan, implement and monitor research and development programs.

The program holds regular demonstrations to promote uptake of 'best-bet' improved varieties and crop management systems for wheat, barley, pulse and forage legumes. In Iraq alone, 31 farmers grew approximately 1800 ha of zero-till crops. Last year in Syria, 160 farmers grew 6575 ha of zero-till crops using local zero-till seeders.

The increase in uptake is mainly because farmers can see that crop yields were favoured by zero-till, early sowing, low seed rates, and 4–6 cm depth of seeding. The same performance from zero-till was seen in wheat, barley, oat, chickpea, lentil, faba bean and field pea varieties. Manufacturers and farmers in Iraq and Syria were able to fabricate and/or modify zero-till seeders. See our Education and Outreach program for more details on Iraqi training at UWA.



# Leadership

( liːdʃɪp ) the ability to lead



## 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 productivity and prosperity of agricultural industries; addresses 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.**

### UWA takes lead on capacity building in African agriculture

The Rural Economy, policy and development program has played a significant role in building capacity in African agriculture. Africa's leaders are intensifying efforts to find 'sustainable solutions' to end hunger and poverty in a continent that faces many challenges. They see agriculture as the engine to overcome this.

Mr Luke Abatania came to the UWA School of Agricultural and Resource Economics (SARE) in March 2009. After completing his studies he intends to return to his job as Research Fellow at the Institute of Agricultural Research in the College of Agriculture and Consumer Sciences, University of Ghana. In 2008, Luke won a special scholarship from UWA Vice Chancellor Professor Alan Robson to undertake his PhD studies at UWA. The scholarship was initiated following a MoU between UWA and the University of Ghana.

Luke's research interests include the sustainability of agricultural technologies, adoption and impact of improved agricultural technologies on farm household income/welfare and farm productivity analysis. "I believe my current research focusing on identifying performance bench marks for Ghanaian farm households through efficiency analysis will improve the lives of farmers in Ghana," he said.

Another Ghanaian, Mr Donkor Addai, was also attracted to pursuing his PhD at the SARE. He is researching 'The economics of technological innovation for adaptation to climate change by broadacre farmers in WA'. "I like UWA very much. Some of the outstanding features are highly skilled and friendly academic staff, great study environments, closeness to city centre, first class facilities and supportive professional staff," he said.



### **R&D investment, climate change and agricultural productivity**

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

They found that R&D and climate change both affect long-run productivity growth of broadacre agriculture in WA. Climate change lessened agricultural productivity in the long run whilst R&D boosted this productivity. The researchers applied sophisticated statistical tests to the productivity data to reveal positive causality between R&D expenditure and productivity growth both in the short- and long-run. A significant portion of output and productivity growth in the long run was explained by R&D expenditure. These results suggest that an increase in agricultural R&D investment is critical to improving and sustaining the long-run productivity growth of WA broadacre agriculture in the face of adverse climate change.

R&D investment in agriculture may lessen the adverse impacts of climate change. The potential worsening of climate due to global warming, when combined with other challenges such as the loss of productive land due to land use competition, salinity, wind erosion and soil acidity, indicate agriculture in WA faces serious challenges. Investing in agricultural R&D is one way of addressing these challenges to ensure productivity growth in agriculture is supported, thereby helping maintain agriculture's beneficial role in bolstering the State's economic prosperity.



# Esteem

( *ɪ'sti:m* ) high regard or respect; good opinion

## 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.



HON TERRY REDMAN AND W/PROF KADAMBOT SIDDIQUE WITH THE UWA INSTITUTE OF AGRICULTURE 2010 POSTGRADUATE SHOWCASE PRESENTERS.

### UWA 2010 Industry Forum

The UWA Institute of Agriculture 2010 Industry Forum, entitled 'Agriculture education for the future', was held on 16 July 2010. This year we changed the format to a half-day program with only four speakers. 2010 also saw an open invitation to the agriculture industry and community, unlike restricted numbers in previous years.

Winthrop Professor Alan Robson, Vice-Chancellor of UWA and Hackett Chair in Agriculture, Ms Sarah Panizza, an undergraduate student in agricultural science and commerce at UWA, Dr Natasha Teakle, UWA alumni and current Research Fellow at UWA, and Mr Rob Delane, Director-General, Department of Agriculture and Food WA (DAFWA) presented their views on the topic.

W/Prof Robson spoke about UWA's role in training agriculture scientists for the future. He expressed concern about a declining interest in agricultural education in Australia at a tertiary level, whilst the agricultural sector is growing in complexity. He advocated a more integrated approach to what is an interconnected set of disciplines. UWA is taking a systems approach that cuts across the whole food and fibre value chain. He said it is vital to highlight, in a positive and understandable way, how

our agricultural science and technology is keeping us at the forefront of world innovation and discovery. He said that agriculture should be promoted accurately as a dynamic sector which offers strong prospects.

Ms Panizza spoke highly of the quality of teaching and learning environment in smaller classes compared with her counterparts in Business and Engineering. Dr Teakle had an equally positive experience studying at UWA for her undergraduate and PhD studies. She stressed the need for finding good postgraduate students and being able to pay them competitively.

Mr Rob Delane said that with recent challenges and opportunities in agriculture, we need to see shifts in technology, science, changing our practices and how we work together. Different skill sets might be required of people working in agriculture. The Department will become more focused on those areas of the supply chain like input, production, economics and markets, where it can have the biggest impact. Our focus is moving away from on-farm production assistance to post-farm supply chain facilitation. For a more in-depth look at the presentations, go to [www.ioa.uwa.edu.au](http://www.ioa.uwa.edu.au).



## 2010 Postgraduate Showcase

Each year the Institute selects eight agriculture-related postgraduate students to present their research to an audience of industry, academics and students.

- Opening address: Hon Terry Redman (Minister for Agriculture and Food WA)
- Session 1 Chair: Mr Peter Roberts (Farmer member, GRDC Western Panel)
- Session 2 Chair: Hon Philip Gardiner (MLC, Agricultural Region)

Go to [www.ioa.uwa.edu.au](http://www.ioa.uwa.edu.au) to view the presentations.

**Table 1: 2010 Postgraduate Showcase Frontiers in Agriculture**

Session 1:	
School of Plant Biology	
Ms Parwinder Kaur	White rust disease of Brassica juncea caused by Albugo candida in Australia
Mr Lalith Suriyagoda	Response of perennial pasture legume Cullen australasicum, to low water and phosphorus availability and the use of modelling to predict adaptation to the southern Australian wheatbelt
School of Earth and Environment	
Mr Basu Dev Regmi	Dynamics of zinc accumulation in wheat grains grown in conventional and biological farming system
School of Animal Biology	
Ms Alex Wells	Exploring farmer's intentions for making on-farm changes in response to social concern over ethical issues in agriculture: the case of mulesing
Session 2:	
School of Animal Biology	
Ms Sharon Tay	Physiology of lambs is altered by their mothers' high-salt intake during pregnancy
School of Agriculture Resource Economics	
Ms Jessie Beltran	Economic analysis of weed management options in rice production in the Philippines
Ms Fiona Gibson	What motivates choice? A case study of community willingness to pay for recycled water in Perth
Mr Andrew Kennedy	The impact of genetic improvement and alternative lambing systems on the profitability of sheep enterprises



## Dowerin Field Day

The UWA Institute of Agriculture was one of the coalitions of agriculture industry organisations who formed part of the Department of Agriculture and Food WA's 'Careers in Agriculture' display at the Dowerin Field Day in August.

Over the course of the two-day event, the Institute promoted its current and future research. Field day visitors engaged with UWA scientists about research in a variety of areas that will assist farmers in animal production (reducing methane emissions); weed management (herbicide resistance), soil management (soil carbon) and new crop varieties (salt-tolerant plants). UWA showed that its agricultural research was committed to finding novel innovations

in sustainable agriculture. Amongst the displays was an interactive display for visitors to look at microscopic bugs in the soil and microbes found in the stomach of sheep, the new Harrington Seed Destructor and WA No-Till Farming Association (WANTFA). There was considerable interest in the newly developed salt-tolerant chickpea species, located at the Council of Grain Growers Organisation (COGGO) display. Primary Industry Centre for Science Education (PICSE) at UWA provided a sugar concentration display using a spectrometer and was a winner with young and old. Industries with new innovations and grower groups were also keen to develop relationships with researchers at UWA.



### UWA 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 in March, August and December 2010. The December 2010 reflected the slight change in branding at the UWA Institute of Agriculture, featuring its new, dark green colour.

### Media releases and publications

The UWA Institute of Agriculture sustained its presence in the media during 2010. The Institute, with the support from Brendon Cant and Associates, issued 33 media statements during the year. These media statements received several hits nationally and internationally.

Table 2: IOA 2010 Media Statements

Date released	Media Statements
January 18	Infrared technology to become part of everyday life
January 21	Herbicide resistant weeds threaten global crops
January 28	UWA Ag Science reunion reveals diverse career options
February 17	UWA suburban turf talk: a dry argument
February 26	PhD student cuts the mustard in travel award
March 2	Herbicide hero wins seed of light award
March 2	World class plant scientist joins UWA
March 25	Why WAHRI when you're on a good thing
March 29	Ensuring a good cup of tea
April 22	UWA and Saudi Arabia strengthen ties
May 13	Stay one step ahead of the weeds
May 19	Native rodents go high tech
May 25	East-west sowing packs a punch on weeds
June 15	Parasite ID to save WA'S honeybee industry
June 16	Showtime for UWA agriculture postgrads
June 21	Half would pay for recycled water
July 5	Plant nutrition expert wins international recognition
July 28	UWA pesticide leaching learning workshop
August 5	Liquid gold under the microscope at UWA
August 10	A national focus for herbicide resistance research
August 10	Australian growers to benefit from nation-wide weed assault
August 11	Agriculture education for the future at UWA
August 18	Agriculture at UWA on world stage
August 20	States unite to feed the world despite climate change
August 24	Soil scientist digs up dirt on crime
September 1	Plant roots: biological plow or plug?
September 21	Scientist-detectives find clue to toughening vital plants
September 24	Ionizing out soils to lift wheat yields
October 14	Thought for food
October 20	Ancient crop may be a lifeline for farmers
October 28	UWA honours pioneering staff and state-builders
November 3	Tunnel vision works for climate ready cereals
November 24	Climate change soil surprise



## Website – [www.ioa.uwa.edu.au](http://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. Late in 2010, the Institute revamped its website, including a new colour change, and made it more user friendly. The new website includes features like agriculture-related postgraduates, publications, and a specific stamp for our newsletter. It is also easier to navigate between pages.



## Food and Agriculture Lectures

- There were ten public lectures and one occasional lectures (Table 3) arranged under the banner of IOA 'Food and Agriculture' attracting audiences of between 30 and >90 people.
- The local and international speakers were all well-received and their subject matter provoked interest and discussion in a range of areas.
- Details of these public lectures are available on the UWA Institute of Agriculture website ([www.ioa.uwa.edu.au](http://www.ioa.uwa.edu.au)).

## Mike Carroll Travelling Fellowship

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. Ms Parwinder Kaur was the recipient of the 2009 Mike Carroll Travelling Fellowship. Ms Kaur, a Brassica researcher, used the fellowship to spend seven weeks in India attending the 5th International Conference on Plant Pathology, meeting leading scientists and conducting experiments at Punjab Agricultural University. She researched the pathogen *Albugo candida* which causes white rust disease in *Brassica juncea*.



MRS HELEN CARROLL AND HER DAUGHTER, MS MARIE-LOUISE CARROLL, WITH THE 2009 WINNER OF THE MIKE CARROLL TRAVELLING FELLOWSHIP, MS PARWINDER KAUR.

Table 3: UWA IOA Food and Agriculture Lectures 2010

Date	Presenter	Organisation	Title
Hector and Andrew Stewart Memorial Lecture			
16 March	Prof Louw Hoffman	University of Stellenbosch	Game: more than just meat
Brian Carlin Memorial Lecture			
2 March	Dr Miguel Garcia-Winder	Inter-American Institute for Cooperation in Agriculture (IICA)	Training of Animal Science Professionals for meeting the challenges of the XXI Century
Regular Food and Agriculture Lectures			
2 February	Dr Colin Piggitt	ACIAR/AusAID Iraq Project International Center for Agricultural Research in the Dry Areas (ICARDA), Syria	Development and promotion of conservation cropping in Iraq and Syria
24 February	Prof Jorg Imberger	Centre for Water Research, UWA	A vision for the South West
5 March	Dr Don McFarlane	South-west Western Australia Sustainable Yields Project Leader, CSIRO	The future of water availability in south west WA
13 April	Dr Fabio Fiorani	CropDesign N.V. – A BASF Plant Science Company	TraitMillTM at BASF Plant Science – A phenotyping approach from an industrial perspective
12 October	Prof Alan Tilbrook	Monash University	Scientific Advances in Animal Welfare
3 November	Prof Rowan Sage	University of Toronto	Exploiting the engine of C4 photosynthesis in crop plants to better serve humanity
23 November	Dr Brent Clothier	Plant & Food Research, New Zealand	Soil carbon and the development of international carbon footprinting protocols
Occasional lectures			
2 March	Dr Howard Eagles	University of Adelaide	Using many genes for selection and cross prediction in plant breeding

# Education

## The UWA Institute of Agriculture undertook or facilitated several training initiatives during 2010. The most significant were:

### Masters of Climate Change at Kerala University

UWA has played a significant role in helping Kerala Agricultural University (KAU) establish its Master of Science Climate Change Adaptation Course. The course was officially launched at Kerala, India on September 6, 2010.

KAU's new Integrated Climate Change Adaptation Degree Program (3 plus 2 program) will be the first of its kind in India and Asia. UWA has provided significant input into the development of this course. W/Prof Kadambot Siddique, W/Prof Karl-Heinz Wyrwoll and W/Prof Peter Davies from UWA provided advice in developing the course structure and contents. KAU and UWA will be working together in climate change adaptation strategies through crop simulation models, smart genetics, agronomic packages, eco-system management and decision support systems. Other partners in the course include the Indian Space Research Organisation (ISRO), Kochin University of Science and of Technology (KUSAT) and International Crops Research Institute for the Semi-Arid Tropics (ICRSAT).



IRAQI PLANT BREEDERS GET HANDS ON CROSSING EXPERIENCE AT UWA.



W/PROF ALAN ROBSON, MR PETER FORBY, REGIONAL DIRECTOR, GOVERNMENT OF WA, WA TRADE OFFICE, INDIA AND W/PROF KADAMBOT SIDDIQUE ARE AMONG THE DIGNITARIES WHO LOOK ON AS MINISTER DR THOMAS ISAAC AND MR CHACKO, VICE-CHANCELLOR OF KAU LIGHT THE FLAME TO LAUNCH THE NEW MASTERS OF SCIENCE IN CLIMATE CHANGE AT KAU.

### Iraqi training program

UWA is still involved in several training programs to help redress the decline in Iraqi agriculture. The International Centre for Plant Breeding Education and Research (ICPBER) at UWA ran a five-week intensive training course *Crop Improvement for Iraq* from 22 September 2010. The course was funded by AusAID under the Iraqi Partnership Facility, Coffey International Development. It was attended by 20 breeders from various Institutes and branches of the Iraqi Ministry of Agriculture from all parts of the country. The attendees had a diverse range of background experience in and knowledge of plant breeding.

The lectures covered topics ranging from basic genetics and plant breeding principles through to advanced new technologies currently being applied to plant breeding throughout the world. Lecturers were from the UWA, Department of Agriculture and Food WA, InterGrain Pty Ltd and Canola Breeders WA Pty Ltd.

Eight agronomists and extension specialists from Iraq and ICARDA visited DAFWA and UWA from 21 August until 26 September 2010 for a one-month zero-till cropping extension study visit. They also visited the Dowerin Field Days. This visit enhanced capacity of Iraqi research and extension programs to develop and promote improved conservation cropping technologies in Iraq.

### Master class in participatory breeding

Plant breeders from Afghanistan, Australia, Bangladesh, China, East Timor, Ethiopia, India, Indonesia, Iran, Nepal and Tanzania gathered at the International Centre for Plant Breeding Education and Research (ICPBER) at UWA for a Master Class on Nov 22, 2010. The course was officially opened by the Hon Terry Redman Minister of Agriculture and Food WA. In his address, Hon Redman said that the State government was committed to making WA the grains hub of Australia.

The focus of the Master Class was participatory breeding with farmer interaction particularly for marginal areas in the developing world untouched by the effects of the Green Revolution. The major sponsor was the Crawford Fund. It promotes and supports agricultural research designed to benefit the developing world. Other sponsors included the Australian Centre for International Agricultural Research (ACIAR), Grains Research and Development Corporation (GRDC) and the International Centre for Agricultural Research in the Dry Areas (ICARDA), Syria.

Participants shared their work experience improving the outputs from breeding using farmer interaction, and were exposed to new paradigms in the statistical analysis of on-farm trials of the SAGI project (Statistics for Australian Grains Industry). Presenters came from ICARDA (Syria), Bangladesh, South Africa and Australia.



### Inspiring Malaysia

3000 students, teachers, alumni and members of the public attended a three-day UWA Science for our Future festival held in Kuala Lumpur on August 3, 2010 as part of Australia's National Science Week.

Federal Land Development Agency (FELDA) Malaysia in collaboration with the WA Trade Office, Kuala Lumpur (WATOKL) and UWA promoted science and sent a clear message that society needs scientifically literate graduates. The drawing cards for students were meeting Nobel Laureate W/Prof Barry Marshall; former WA Premier W/Prof Carmen Lawrence, School of Psychology; and W/Prof Kadambot Siddique, Director of the UWA Institute of Agriculture.

Themes included the prevention, diagnosis and treatment of disease, restoring and maintaining a balance

within natural environments, ensuring food sustainability, and the need for science graduates to contribute to these areas. Presenters inspired students with flames, hydrogen explosions and infections. W/Prof Kadambot Siddique aspired maize into a ball of flames to demonstrate the conversion of food into fuel. Students also saw bubbles filled with hydrogen explode as a segue way into alternative fuels, and disease transmitted under UV lights.

Gifted science students could discuss their ideas and science issues, and ask challenging questions over lunch with the UWA experts. Some of the students were amongst the top ten performing high school graduates in Malaysia.

### Brassica crop breeding workshop

During the first week of October 2010, Brassica experts from UWA, Huazhong Agricultural University (HZAU) and Zhejiang University (ZJU) explored innovative approaches to substantially improve Brassica crops at a UWA-hosted workshop entitled 'Trigenomic bridges for Brassica improvement'. During the workshop, supported by the School of Plant Biology and The UWA Institute of Agriculture, these Brassica experts discussed the new concept of using 'trigenomic bridges' for Brassica crop improvement.

Through trigenomic bridges, Brassica breeders aim to develop new Brassica crops for efficient production of food, oil and bioproducts in an era of global warming, increasing input costs and decreasing soil fertility. The Chinese and Australian collaborators have produced the world's first hybrids between Australian and Chinese trigenomic Brassica plants, developed over the past two years in an Australia-China International Science Linkages project. This workshop aimed to draft an up-to-date review of the world's research in use of trigenomic bridges in Brassica breeding. The Chinese visitors delivered special seminar series during their visit to UWA.



L-R: W/PROF CARMEN LAWRENCE, W/PROF BARRY MARSHALL AND W/PROF KADAMBOT SIDDIQUE ON THE PANEL AT THE UWA SCIENCE FOR OUR FUTURE FESTIVAL.



L-R: MATTHEW NELSON, ANEETA PRADHAN, SHENG CHEN, JINLING MENG, WALLACE COWLING, JULIE PLUMMER, WEIJUN ZHOU, ANNALIESE MASON, ZAIYUN LI, AND GUIJUN YAN.

# Visitors to the Institute



The UWA Institute of Agriculture continues to make linkages with organisations and Universities across the globe. During 2010 we received almost a hundred national and international visitors including Prof Nan Zhibiao (College of Pastoral Agriculture Science and Technology, Lanzhou University; and Gansu Grassland Ecological Research Institute (GGERI), Lanzhou, China), Prof Scott Nissan (Colorado State University, USA), Assist Prof Muhammad Farooq (University of Agriculture, Faisalabad, Pakistan), Dr Pooran Gaur (ICRISAT-India), Prof Rowan Sage (University of Toronto, Canada), Prof Jerry Skees (University of Kentucky, USA), Hon Terry Redman (Minister for Agriculture and Food; Forestry; Minister Assisting the Minister for Education), Prof Damodar Acharya (Indian Institute of Technology, Kharagpur), Prof Siddhartha Mukhopadhyay (Indian Institute of Technology, Kharagpur) and Prof Michael A Huston (Texas State University).





# Awards and industry recognition



UNDERWOOD PROMENADE.

Underwood  
Promenade

The UWA Institute of Agriculture and associated staff and students were recognised for their successes and achievements in their fields during 2010. Of note are: W/Prof Zed Rengel (Humboldt Research Award and Honorary Doctorate from University of Zagreb), W/Prof Stephen Powles (GRDC Seed of Light Award), Assist/Prof Graeme Doole (Australia's best young agronomist), Dr Craig Scanlan (Australian Soil Science Society CG Stephens PhD Award for the best PhD thesis granted by an Australian university in 2009), and Adj/Prof Mick Poole (2010 Farrer Memorial Medal). UWA also recognised one of its greatest agricultural scientists by naming one of the main walkways (Underwood Promenade) on campus after E/Prof Eric Underwood.



# New research projects

**Table 4: New research projects**

Title	Funding Period	Funding Body	Supervisor(s)
Phylogeny, pathogenecity and epidemiology of potato spindle tuber viroid and related pospoviroids in Australia	2010–2012	CRC Plant Biosecurity	Prof Martin Barbetti
Western Australian No-Tillage Farmers Association, Planfarm: 'Long term no-till farming systems'	2009–2011	Grains Research and Development Corporation (GRDC)	Dr Kenneth Flower, Dr David Minkey, Mr Neil Cordingley, Mr Cameron Weeks
Bioengineering the microbial communities in pig effluent waste to maximise biogas production in retrofitted effluent ponds	2010–2012	Australian Pork Limited	Dr Sasha Jenkins
Climate change ready wheat cultivars for China and Australia	2010	Department of Foreign Affairs and Trade Australia China Council	Assoc/Prof Guijun Yan
Developing biotechnology solutions for improving phosphate acquisition in plants using functional genomics in rice	2010–2013	ARC Super Science Fellowships	W/Prof James Whelan, W/Prof Andrew Millar, W/Prof Ian Small, Prof Stephen Tyerman
Developing and promoting integrated pest management in Australian grains	2009–2011	Grains Research and Development Corporation (GRDC)	Assoc/Prof Helen Spafford; Dr Daryl Haride, W/Prof Kadambot Siddique, W/Prof Graeme Martin
Demonstration projects for on farm practical methane management strategies – UWA Ridgefield	2010–2012	Meat and Livestock Australia Ex Department of Agriculture Fisheries And Forestry (DAFF)	Prof Philip Vercoe
Central Coast employment strategy	2010	Wheatbelt Development Commission	Prof Matthew Tonts
Better rural fertiliser management to improve the health of coastal waterways	2010	Department of Agriculture and Food WA	Assoc/Prof Neil Coles
Effect of landscapes on pest and beneficial invertebrates on broadacre cropping systems	2010	Department of Agriculture and Food WA (DAFWA)	Assoc/Prof Neil Coles
The application of factor analytic models with correlated genetic relationships to improve the efficiency of hybrid rice breeding for international environments	2010–2012	Bayer South East Asia Pty Ltd	Prof Wallace Cowling
Evaluation of the effectiveness and environmental risks of the application of lime-amended biosolids-clay blends to Bassendean Sands	2010	DAFWA	Ms Rebecca Ovens, Dr Neil Coles
Factors responsible for host resistance to the pathogen <i>Sclerotinia sclerotiorum</i> for developing effective disease management in vegetable brassicas	2010–2013	ARC Linkage DAFWA	Prof Martin Barbetti, W/Prof Dr Krishnapillai Sivasithamparam
Exploiting subterranean clover genetic variation for methane mitigation and ruminant health challenges to the Australian livestock industries	2010–2013	ARC Linkage DAFWA	Prof William Erskine, Prof Philip Vercoe, Prof Rudi Appels, Dr Phillip G Nichols, Dr Andrew N Thompson, Dr Clinton K Revell, Mr Richard Snowball, Ms Fiona M Jones
Anticipating closure of bauxite refineries in Western Australia: the water quality implications of a proposed new design in residue storage areas	2010–2013	ARC Linkage Alcoa of Australia Ltd Worsley Alumina Pty Ltd	Prof Martin V Fey, Prof Christoph B Hinz, Prof Andries B Fourie, Prof Richard W Bell, Dr Ian R Phillips
Sustainable cooperative enterprise: an investigation into the factors influencing the sustainability and competitiveness of cooperative enterprises	2010–2013	ARC Linkage Capricorn Society Limited – Australia CBH Group Co-operatives WA	W/Prof Tim W Mazzarol, W/Prof Geoffrey N Soutar, W/Prof Kadambot Siddique, W/Prof John Watson, Asst Prof Joanne N Sneddon, Mr Peter T Wells, Dr Elena A Mamouni Limnios
Molecular characterisation of the fungal disease defence response in tropical sandalwood ( <i>Santalum album</i> )	2010–2013	ARC Linkage Forest Products Commission WA Integrated Tree Cropping Ltd	Prof Julie A Plummer, Prof Emilio L Ghisalberti, Dr Treena I Burgess, Dr Elizabeth L Barbour, Prof Joerg C Bohlmann
Synthetic natural gas and biochar from biomass for energy services in remote communities and soil carbon sequestration	2010–2015	ARC Linkage ANSAC Pty Ltd BHP Billiton Iron Ore Pty Ltd DAFWA ENN	Prof Dongke Zhang, Prof Zhihong Xu, Prof John W Cairney, Dr Chengrong Chen, A/Prof Hong Yang, A/Prof Ian C Anderson, Prof Vishnu K Pareek
An innovative two-phase anaerobic process for biogas production from green waste and animal droppings for remote communities	2010–2013	ARC Linkage Qingdao Institute of Bioenergy and Bioprocessing Technology South Coast Natural Resource Management Inc	Prof Dongke Zhang, Prof Jinhu Wu
Identifying genes for salt and waterlogging tolerance in pasture legumes – towards sustainable and profitable saltland pastures for Australian farming systems	2010	Bureau of Rural Sciences	Dr Natasha Teakle
Soil carbon storage in Western Australian soils	2009–2012	CSIRO Ex DAFF GRDC	Assoc/Prof Daniel Murphy
'Spatial and Temporal Modelling of Water and Nutrient Flows in Australian Dairy Catchments	2009–2010	Dairy Australia	Dr Mark Rivers, Dr Neil Coles, Mr Simon Clarendon



Title	Funding Period	Funding Body	Supervisor(s)
CIM/2009/038 Crops Bangladesh	2009–2012	Department of Foreign Affairs and Trade ACIAR	Prof William Erskine
ARC NWC Co-Funded Centre for Groundwater Research and Training – Discussions with ARC	2010–2014	Flinders University Ex ARC NWC Co-Funded Centre for Groundwater Research And Training	Assoc/Prof Alexander Gardner, W/Prof David Pannell
Enrich Phase 2 – Building functional and resilient systems with forage shrubs	2009–2011	Future Farm Industries CRC	Assoc/Prof Philip Vercoe, Assist/ Prof Zorica Durmic
Evaluation of soft leaf buffalo cultivars – renovation, mowing heights & water use	2009–2011	Horticulture Australia Ltd Research and Development Program	Prof Tim Colmer, Assoc/Prof Louise Barton
Wheatbelt timber capacity research	2009–2010	Wheatbelt Development Commission	Assist/Prof Patrick Beale
Web interface for soil potassium calculator	2010	DAFWA	Assist/Prof Michael Renton
Web interface for PestFax	2010–2012	GRDC	Assist/Prof Michael Renton, Dr Art Diggle
RootMap	2010	GRDC/Utas	Assist/Prof Michael Renton
Climate change ready wheat cultivars for China and Australia	2010–2011	Australia China Council	Assoc/Prof Guijun Yan
Intercross pea lines in preparation for a future ARC Linkage research project and variety release	2010	Council of Grain Grower Organisations Ltd (COGGO) NPZ Pea Foundation	Assoc/Prof Wallace Cowling, Dr William Erskine, W/Prof Kadambot Siddique
Simulation modelling using ROOTMAP for assessing the potential contribution of different nitrogen and phosphorus sources to crops in south eastern Australia	2010	University of Tasmania Ex GRDC	Assist/Prof Michael Renton
Physiological and genetic basis of salt and waterlogging tolerance in <i>Hordeum marinum</i> accessions wheat and their amphiploids	2009	DAFWA	Dr Natasha Teakle
Impact assessment for genetically modified canola in cropping systems	2010–2013	University of Melbourne Ex GRDC	W/Prof Steve Powles
Management of nutrients and water for high quality and quantity of mallee biomass supply	2010–2011	Future Farm Industries CRC	W/Prof Keith Smettem, Assoc/Prof Mark Tibbett
A national soil quality monitoring framework	2010–2014	GRDC	Assoc/Prof Daniel Murphy
Commercial seed technology for <i>Bituminaria bituminosa</i> var. <i>albomarginata</i>	2010–2011	DAFWA Ex RIRDC	Assoc/Prof Megan Ryan, Dr Clinton Revell, Mr Richard Snowball
Completing the smoke effect picture – systems development to reduce the negative effects of smoke on grapes and wine	2010–2012	DAFWA	Assist/Prof Michael Renton
Deep biosphere geomicrobiology – a new frontier for UWA	2010	UWA Research Collaboration Awards	Assist/Prof Deirdre Gleeson, Ms Jennifer Carson, Dr John Moreau
Plant breeding by example – contextual examples linking theory with practice in plant breeding education	2010	University of Adelaide Ex Australian Learning and Teaching Council Ltd	Prof Wallace Cowling, Prof Willie Erskine
Jarrah Forest Fertiliser Trial 2004 Final Assessment	2010	BHP Billiton Worsley Alumina	Assoc/Prof Mark Tibbett
Grower Group Alliance	2010–2012	Mingenew Irwin Group Inc Ex GRDC	W/Prof Kadambot Siddique, Ms Susan Hall
Wheatbelt natural resource management annual community survey	2010–2011	Wheatbelt Natural Resource Management Incorporated	Assist/Prof Colin MacGregor
Global change and food web structure: synergistic effects of multiple drivers of global change on species interaction networks	2011–2013	ARC Discovery Projects	Prof Raphael Didham
Improving heat and drought tolerance in canola through genomic selection in <i>Brassica rapa</i>	2011–2013	ARC Linkage Projects	Prof Wallace Cowling, W/Prof Neil Turner, W/Prof Kadambot Siddique, Assist/Prof Matthew Nelson, Dr Robert Furbank
Physiological and molecular characterisation of salinity tolerance in chickpea	2010	COGGO Pea Foundation (NPZ)	Prof Tim Colmer
Introduction of short duration pulses into rice based cropping systems in Western Bangladesh	2011–2015	Department of Foreign Affairs and Trade (ACIAR)	Prof Willie Erskine, Dr Ken Flower
Centerless governance for the management of a global R & D process – public private partnerships and pulse breeding in Australia and Canada	2010	Cattle Industry Compensation Act (WA)	W/Prof Kadambot Siddique, Dr Cami Ryan (University of Saskatchewan, Canada)
Cause, epidemiology and management of kikuyu grass poisoning in Western Australia	2011	Academy of the Social Sciences in Australia Ex DIISR: ASSA International Science Linkages	Prof Martin Barbetti, Adj/Prof Michael Ewing, Dr Gavin Flematti

# The UWA Institute of Agriculture team

## Director and support team



**Winthrop Prof Kadambot Siddique**  
Chair in Agriculture and Director  
Email: kadambot.siddique@uwa.edu.au



**W/Prof Graeme Martin**  
Deputy Director  
Email: graeme.martin@uwa.edu.au



**Dr Helen Bramley**  
Research Associate  
Email: Helen.Bramley@uwa.edu.au



**Mrs Erika von Kaschke**  
Communications Officer  
Email: Erika.vonKaschke@uwa.edu.au

**Michelle Bailey**  
Personal Assistant  
Email: ioa@uwa.edu.au



**W/Prof Karam Singh**  
Winthrop Research Professor  
Email: karam.singh@csiro.au



**Prof Wallace Cowling**  
Professor  
Email: Wallace.cowling@uwa.edu.au



**Res/Asst/Prof Jonathon Anderson**  
Research Assistant Professor  
Email: Jonathon.Anderson@csiro.au

## External Advisory Board

The members of the EAB represent a cross section of agricultural industries and natural resource management areas.



**Mr Bruce Piper**  
Farmer and Chairman, COGGO (Chair)

**Mr Neil Young**  
Farmer and Chairman,  
GRDC Western Panel

**Mr Philip Gardiner**  
Farmer and MLC (Agricultural Region)

**Mr David Fienberg**  
Manager Aust. Grains Centre/Metro  
Grains Centre, CBH Group

**Dr Peter Trefort**  
Director, Hillside Meats

**Dr Tony Fischer**  
Honorary Research Fellow, CSIRO

**Dr Jim Fortune**  
Agricultural Consultant

**Mr Dawson Bradford**  
Farmer, Chair of Lambex, and Chairman,  
WAMMCO

**Ms Verity Klemm**  
Strategic Project Manager,  
Department of Water

**Dr Don McFarlane**  
CSIRO, WA Co-ordinator:  
Water for a Healthy Country Flagship

**Dr Stephen Loss**  
Manager, CSBP

**Mr Terry Hill**  
Regional Services Director, DAFWA

**Mr Andrew Ritchie**  
President, AAAC

**W/Prof Tony O'Donnell**  
Dean, Faculty of Natural and Agricultural  
Sciences, UWA

**W/Prof Kadambot Siddique**  
Director, UWA IOA



## Programs leaders and deputy leaders

### Integrated Land and Water Management



**Leader:**  
**W/Prof Zed Rengel**  
Email: zed.rengel@uwa.edu.au



**Deputy Leader:**  
**Assoc/Prof Daniel Murphy**  
Email: daniel.murphy@uwa.edu.au

### Animal Production Systems



**Leader:**  
**Prof Phil Vercoe**  
Email: philip.vercoe@uwa.edu.au



**Deputy Leader:**  
**W/Prof Graeme Martin**  
Email: graeme.martin@uwa.edu.au

### Plant Production Systems



**Leader:**  
**W/Prof Stephen Powles**  
Email: stephen.powles@uwa.edu.au



**Deputy Leader:**  
**Assoc/Prof Guijun Yan**  
Email: guiyin.yan@uwa.edu.au

### Rural Economy, Policy and Development



**Leader:**  
**Assist/Prof Amin Muger**  
Email: mugeraam@cyllene.uwa.edu.au

### Education, Outreach and Technology Exchange



**Leader:**  
**W/Prof Kadambot Siddique**  
Email: kadambot.siddique@uwa.edu.au



**Deputy Leader:**  
**Mrs Christine Richardson**  
Email: christine.richardson@uwa.edu.au

## Executive Team



**W/Prof Tony O'Donnell (Chair)**  
Dean, Sciences Faculties  
Email: [tony.odonnell@uwa.edu.au](mailto:tony.odonnell@uwa.edu.au)

**W/Prof Lyn Abbott**  
Vice-Dean, Faculty of Natural and Agricultural Science  
Email: [lynette.abbott@uwa.edu.au](mailto:lynette.abbott@uwa.edu.au)

**W/Prof Kadambot Siddique**  
Chair in Agriculture and Director,  
The UWA Institute of Agriculture  
Email: [kadambot.siddique@uwa.edu.au](mailto:kadambot.siddique@uwa.edu.au)

**Mrs Christine Richardson**  
General Manager, Sciences Faculties  
Email: [christine.richardson@uwa.edu.au](mailto:christine.richardson@uwa.edu.au)

**W/Prof Graeme Martin**  
Head of School of Animal Biology  
Email: [graeme.martin@uwa.edu.au](mailto:graeme.martin@uwa.edu.au)

**W/Prof Hans Lambers**  
Head of School of Plant Biology  
Email: [hans.lambers@uwa.edu.au](mailto:hans.lambers@uwa.edu.au)

**Prof Ben White**  
Head of School of Agricultural and Resource Economics  
Email: [ben.white@uwa.edu.au](mailto:ben.white@uwa.edu.au)

**Prof Matthew Tonts**  
Head of School of Earth and Environment  
Email: [matthew.tonts@uwa.edu.au](mailto:matthew.tonts@uwa.edu.au)

**W/Prof Ian Small**  
Centre of Excellence for Plant Energy Biology  
Email: [ian.small@uwa.edu.au](mailto:ian.small@uwa.edu.au)





# Publications 2010

## Refereed journals

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

Tel +61 8 6488 4717  
Fax +61 8 6488 7354  
Email [pam.townshend@uwa.edu.au](mailto:pam.townshend@uwa.edu.au)  
Web [www.ioa.uwa.edu.au](http://www.ioa.uwa.edu.au)

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