

the INNOVATOR

Charles Sturt
University



Department of
Primary Industries

SUMMER 2012 EDITION

The Newsletter from the EH GRAHAM CENTRE for Agricultural Innovation



Finishing the paddock: Barry McCormack of 'Glenwood' Winchendon Vale (North of Marrar), was glad to get to the end of a long day harvesting this wheat crop. Photo: Daniel Smith, Coolamon.

From the Director's desk

Happy New Year and welcome to the summer edition of the Innovator.

Our Industry Advisory Committee (IAC) plays a critical role in defining the focus and strategic direction of the Centre. The IAC guided the development of our new Strategic Plan 2011-2016, which is now available and soon will be widely distributed.

I would like to acknowledge and thank a number of our IAC members who are retiring: Mr Greg Fraser (Plant Health Australia), Dr Tony Fisher (CSIRO fellow), Mr Lee O'Brien (Murrumbidgee Catchment Management Authority), Dr Steve Thomas (GRDC) and Associate Professor Andrew Vizard (The University of Melbourne). Their input, time and efforts have been invaluable.

Five new members will join existing IAC members, Mrs Lucinda Corrigan, Mr Mark Harris, Mr David Wolfenden and Mr Mike O'Hare in 2012. We welcome Mr Andrew Bouffler, Dr John Passioura, Ms Diana Gibbs, Mr Russell Ford and Ms Angela Avery. More details will be provided about the new IAC members in our Autumn edition of *the Innovator*. We look forward to their input.

This issue contains news of recent Centre events and workshops, new and current research projects including weeds, canola and dairy training in Pakistan,

student graduations, conference reports and details of upcoming important events.

I look forward to working with you during 2012.

Regards

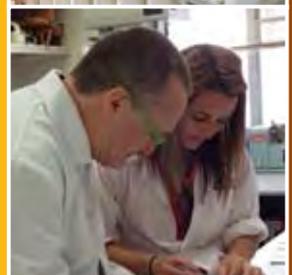
Professor Deirdre Lemerle

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NEWS



In photo (left to right): Craig Bretherton, Office of Environment and Heritage, Mark Gardiner, Wagga Wagga City Council, Deirdre Lemerle, Graham Centre and Tracey Oakman, Murrumbidgee and Southern NSW Local Health Districts. Photo: Toni Nugent.

Committee keeps an eye on air quality

The Air Quality Steering Committee, a community consultative group, was established in December 2009 to monitor air quality across the Riverina. The group looks at sources of pollution (e.g. stubble burning), and aims to develop management strategies to reduce air pollution. The recent publication 'Stubble Management - an integrated approach' is one such strategy.

The committee meets two times a year to discuss and review progress in monitoring air quality. Committee members include Tracey Oakman, Murrumbidgee and Southern NSW Local Health Districts, Craig Bretherton, Office of Environment and Heritage, Mark Gardiner, Wagga Wagga City Council, Deirdre Lemerle, Graham Centre, Derek Ingold, farmer, Old Junee, Helen Burns, Graham Centre, Tony Kolbe, CSU - Centre for Inland Health and retired member Louis Du Plessis.

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Strategic Plan sets direction through to 2016

The **Graham Centre Strategic Plan 2011-16** focuses on eight key strategic areas and outcomes to consolidate and expand the Centre during the next five years. The Strategic Plan is now available and will be distributed widely over the coming months. Download copies from our website - hard copies available on request.



Stubble Management: The Graham Centre's stubble management brochure is available at a number of local outlets and also online at: www.grahamcentre.net. Stubble Photo: Ben White.

Stubble management - an integrated approach

The benefits of stubble retention are well known, but wet seasons have seen a shift in farmer attitudes towards stubble management. The coming season is shaping up to be similar to 2012 and managing high stubble loads requires careful planning to ensure effective sowing during the following season.

The Graham Centre's brochure 'Stubble Management - an integrated approach' is now available for farmers, agribusiness and the wider community. The brochure provides an overview of stubble management options - at harvest, after harvest and at sowing, and the need for an integrated management approach that combines several strategies. Other information on weather conditions, new research findings, the Rural Fire Service and where to go for further information are also included.

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Ministerial visit to the Graham Centre

The Minister for Primary Industries, Katrina Hodgkinson, visited the Graham Centre in October as part of her visit to DPI and CSU, Wagga. Centre Director Deirdre Lemerle and IAC Chair Lucinda Corrigan met with the Minister showing her the new NaLSH facilities, highlighting the Centre's expanding capacity in facilities and showing our research to increase productivity in a variable environment. Ms Hodgkinson also met with Centre PhD students, gaining an understanding of the wide scope of research being undertaken.



Ministerial visit: Minister for Primary Industries, the Hon. Katrina Hodgkinson, MP (centre), inspected new facilities and held discussions with research higher degree students during a visit in October. Photo: Toni Nugent.

Forming collaborative partnerships

Dr Abul Hashem, a Senior Research Officer with the Department of Agriculture and Food Western Australia visited the Graham Centre on 24 November. While here, Dr Hashem spoke with several Centre members regarding potential collaboration on national and international projects. He also toured the facilities here in Wagga and spoke with several post-graduate students.



Collaborative partnerships: Dr Abul Hashem and Centre Director, Deirdre Lemerle inspect a wheat crop at the Centre's field site. Photo: Rex Stanton.

Graduations

A number of Graham Centre members participated in the Faculty of Science graduation ceremony at Wagga Wagga on 14 December. Congratulations for the completion of studies are extended to:

Doctor of Philosophy

- **Kah Yaw EE** "Characterisation and bioactive properties of protease inhibitors and phenolics components from Australian Wattle (*Acacia Victoriae Benthama*) seed".
- **Karen Kirkby** "The chemistry of ascorbic acid and sulfur dioxide as an antioxidant system relevant to white".
- **Jeffrey McCormick** "Growth, development and yield of dual purpose canola (*Brassica napus*) in the medium rainfall zone of south eastern Australia"

Bachelor of Medical Science (Pathology)

- **Nicole Camlin** (with distinction)
- **Andrew Dombrovski** (with distinction)

Andrew was also the winner of four prize categories and Nicole one prize category.

Bachelor of Animal Science (Honours)

- **Naomi Hand** (Honours Class 1)
- **Brodie Argue** (Honours Class 2 Division 1)
- **Jessica Rose** (Honours Class 2 Division 1)



Hard work pays off: Jeff McCormick (right), is congratulated by Professor Nicholas Klomp, Dean, Faculty of Science at CSU's graduation ceremony in December. Jeff's PhD supervisor's were Dr Jim Virgona (CSU), Dr John Kirkegaard (CSIRO) and Dr Guy McMullen (NSW DPI).



NEWS

Program logic

The concept of Program Logic was introduced to 20 Graham Centre researchers at a half day pilot training workshop in November. Helen Burns (Research Liaison Officer-Industry Links) and Caroline Love (CSU Lecturer in Agricultural Extension and Adoption) worked with Clear Horizon consultants Kate Nichol and Kym Whitney-Soames, who have a track record in delivering participatory planning, monitoring and evaluation training to government agencies and RDCs.

Feedback from the workshop was very positive, with participants strongly recommending that all research staff should be introduced to the program logic concept - from management through to early career scientists and PhD students.

What is Program Logic?

Program logic provides a framework that is ideally, but not always, applied during the development stages of a project or program. The model:

- Helps define the parameters of a project
- Identifies resources
- Clearly spells out the outcomes and issues the project will address
- Clarifies target audiences - the supply chain from research findings to application
- Promotes communication - the adoption pathway
- Spells out the changes that will occur because of the project
- Ensures assumptions are explicit (e.g. linkages and activities)
- Clarifies how, when, and who will monitor outcomes.
- Facilitates measurement of impact - what evidence must be collected during the course of the project to allow impact to be measured and so facilitate evaluation
- Clarifies the budgetary needs at each stage of the project.

The Program Logic Training was initiated in response to clear messages from our main funding providers that research projects must demonstrate strong links to all stakeholders and be effectively monitored and evaluated.

Positive feedback

One participant immediately used program logic to resolve some project development issues, quoting;

"I have applied program logic to sort through comments on project reasoning and strategy from the Phase 1 review to now, and have a framework on which to build the full proposal. Having seen the

formal process I will be using the approach for proposal development in the future."

Even participants who had used similar strategies in the development of projects, found program logic to be beneficial in providing a common language and 'disciplined' framework for colleagues and collaborators.

The logic model encourages all stakeholders to be part of the planning stage and the workshop highlighted the benefits of this in creating a 'shared vision'.

This is particularly relevant at a time when research projects often include multiple and diverse collaborators with different needs and expectations.

'I found the program logic training most useful. It formalised a lot of what happens organically but also identified a way to solve those leaps of faith that appear throughout...' and '...it covers all bases (eliminates surprises), encourages documentation of assumptions, teases out the key evaluation questions.'

Participants at the pilot workshop suggested the program for future workshops be tightened to include a combination of program logic, monitoring and evaluation.



Framework for project development: Graham Centre researchers participated in a program logic training workshop during November 2011. Photo: Toni Nugent.

On the strength of the positive feedback management is supportive of similar professional development training workshops for 2012 as a means of maximising the outcomes and effectiveness of research projects.

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Farewell to Vice-Chancellor

The Graham Centre Board of Management (BOM) met for their final 2011 meeting in Wagga in early December. The BOM and Research Management Committee (RMC) members enjoyed a dinner the evening before the BOM meeting, to thank and farewell CSU Vice-Chancellor and Graham Centre Board Member Professor Ian Goulter.

Professor Goulter has been instrumental in establishing and guiding the Graham Centre and we wish him well in his retirement.



Farewell: Graham Centre Industry Advisory Committee Chair, Mrs Lucinda Corrigan, pictured with Professor Ian Goulter at a farewell dinner in December. Photo: Toni Nugent.

Great debate steals the spotlight

Graham Centre staff and members gathered on 15 December for the annual Graham Centre End of Year Function. The Inaugural great debate addressing the topic 'There is no future for the sheep industry in the mixed farming zone' provided much entertainment with the 'Government' team of Jim Virgona, Julie Pattermore and Michael Friend claiming victory over the 'Opposition' team of Gaye Krebs, John Harper and Jane Quinn.

Members were also recognised for high achievements throughout 2011. Award recipients are listed below.

- Publications Excellence
 - CSU - Adjunct Professor Brian Dear
 - NSW DPI - Dr Guangdi Li
- Highest Research Income
 - Professor Gavin Ash
- Team Leadership
 - Professor Gavin Ash
 - Dr Andrew Milgate

- Excellence in the supervision and support of Higher Degree Research Students
 - CSU - Dr John Harper
 - NSW DPI - Dr David Luckett
- Research Leadership
 - Dr Mark Conyers
- Staff Engagement
 - CSU - Professor Peter Wynn
 - NSW DPI - Dr Ian Links
- Coordinating the Seminar Series 2011
 - Professor Leslie Weston
- Outstanding Media Coverage and Research Promotion
 - CSU - Professor Gavin Ash
 - NSW DPI - Dr Ed Clayton
- Centre support beyond expectations
 - Adjunct Professor Gordon Murray
- Post-Graduate Student Support
 - Joe Moore
 - Jennifer Spinner



Entertaining debate: Above - 'Opposition' team members, Gaye Krebs, John Harper and Jane Quinn put up a good fight against 'Government' team members Michael Friend, Julie Pattermore and Jim Virgona. Photos: Toni Nugent.





NEWS

SAVS Honours Role

The Graham Centre is supporting five School of Animal and Veterinary Science Honours students over the coming year. Congratulations to the students listed below.

Production and food security (meat and milk)	Biosecurity and pest management (includes animal disease)
<ul style="list-style-type: none"> Ian Croft - feedlot cattle production (Supervisor: Dr Paul Cusack) Trystan Keylock - Dairy fertility (Supervisor: Dr Jan Lievaart) 	<ul style="list-style-type: none"> Ellen Litchfield - equine cushings (Supervisor: Dr Jane Heller) Shahid Khalfan - respiratory disease in horses (Supervisor: Dr Sharanne Raidal) Felicity Rutledge - respiratory disease in horses (Supervisor: Dr Kris Hughes)

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Wagga Wagga Plant & Invertebrate Pathology Group

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Wagga Wagga Plant & Invertebrate Pathology Group

The Wagga Wagga Plant Pathology Group are researchers, students and technical staff who work on plant diseases, their causes and their control. Most are located at the Wagga Wagga campus of Charles Sturt University in the [School of Agricultural and Wine Sciences](#) and at the [Wagga Wagga Agricultural Institute](#), a part of the Primary Industries section of Industry & Investment NSW (see [Governance](#) for linkages within the group and to other organisations).

The group is situated at one of the [key locations in Australia](#) where research in plant pathology is done in the agricultural production zone. Proximity to key clients and stakeholders in viticulture and broad acre agriculture creates a clear focus of research education relevant to these industries.

Members of the WWPPG are drawn from the [EH Graham Centre for Agricultural Innovation](#) and the [National Wine and Grape Industry Centre](#).

- + Vision
- + Mission
- + Governance
- + Capacity

QUICKLINKS

- > [Recent presentations](#)
- > [Disease alerts](#)
- > [Education](#)

Department of Primary Industries

The Wagga Plant and Invertebrate Pathology Group consists of researchers, students and technical staff from CSU and NSW DPI. Members of the Plant and Invertebrate Pathology Group are drawn from the Graham Centre and the National Wine and Grape Industry Centre. They have recently launched their new website <http://www.csu.edu.au/research/grahamcentre/people/plantpathologygroup/index.htm>

Improving dairy production in Pakistan

Our research and extension program in dairy production for the 8.5 million small-holder farmers of Pakistan has entered a second phase of four years after being implemented over an initial three year phase. Endeavouring to develop more effective linkages with other extension providers in Punjab state, our team lead by Dr Hassan Warriach, an Adjunct Lecturer with CSU School of Animal and Veterinary Sciences, initiated a program at the Sarsabz farm facility, owned by Nestle.

Most farmer clientele milk buffalo and various breeds of tropically adapted cows, including Sahiwal, Red Sindhi, Cholistani and 12 other breeds and their various crosses. However the Sarsabz facility milks only Holstein cattle imported from Australia. The facility is managed by Dr Faisal, a young and passionate dairy veterinarian who has developed a wide knowledge of the management of Holstein animals under the harsh environmental conditions of Punjab. Australian Holsteins do well in this environment as long as the investor has sufficient funding to provide the luxuries that these high producing cattle demand to meet their genetic potential for production. This includes measures to minimise heat stress through the provision of shade, sprays and fans along with appropriate soft and clean bedding material. Providing a clean, dry environment for calves is also critical to maximise their growth velocity to puberty.

These same principles apply on small-holder farms throughout Pakistan although understandably the finance is not available for the erection of expensive infrastructure. However shelters for shade and troughs to provide access

to water around the clock are well within the reach of the average farmer. Combining these small changes together with feeding more higher quality forage can go a long way to doubling farm income from their 2-10 cow herds.

Connecting with companies like Nestle provides us the opportunity to access chillers for our project villages, as well as markets for higher quality milk that is increasingly demanded by the ever discerning Pakistani consumer. One of the major challenges of our project is to promote the networking of the various organisations that contribute to Pakistan's complex dairy industry, most of which do not communicate with each other. We see this as one more step to achieving this important goal.

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Does minor beak trimming cause chickens pain?

Removal of the tip of the beak of chickens in the egg-laying industry is a routine practice to control deleterious pecking. Animal welfare concerns surrounding this practice have centred on the possibility of trimming causing short and long term pain.

With the support of a Graham Centre Honours Scholarship to Marianne Joyce, and input from Dr Ian Links (NSW DPI and Graham Centre member), Gary McKenzie (Spatial Data Analysis Network) and Michelle Eastwood (Charles Sturt University Veterinary science student), a new behavioural test was devised to investigate the effects of beak trimming.



Improving dairy production: Developing more effective linkages and networks with extension providers in Pakistan will help the 8.5 million small-holder farmers to improve dairy production.

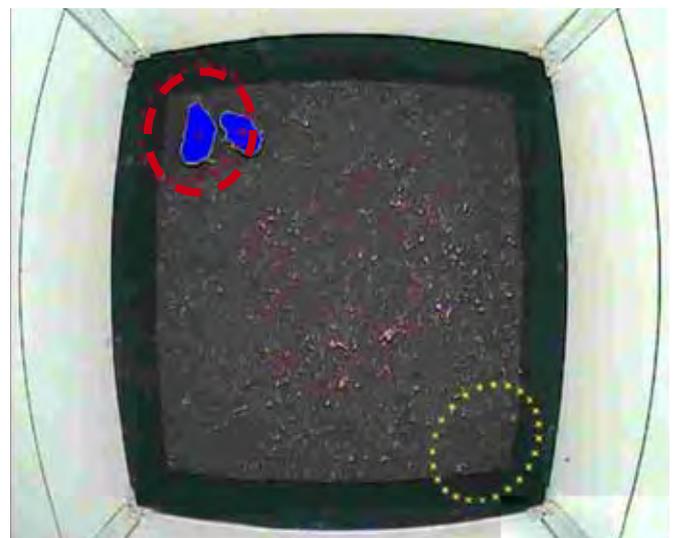
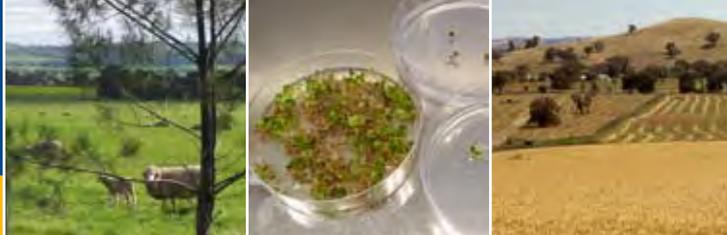


Figure: Chicks searching for food above the magnetic coil (red dashed circle) and the location of the control coil (yellow dashed circle).



RESEARCH ACTIVITIES

Comparing pecking force

"We compared the force of pecks between intact-beak and beak-trimmed chicks with or without topical application of lignocaine during a pain-free period (within 24 hours of beak trimming) or after this period (2-9 days of age)," Raf explained.



Recording pecking force: Pecking stimulus attached to the force displacement transducer is used to record the force of pecks.

"Beak-trimmed chicks pecked harder than intact-beak chicks within 24 hours of beak trimming, possibly as a means of compensating for the loss of sensory feedback in beak-trimmed chicks. At 2-9 days of age, beak-trimmed chicks took longer to peck the pecking stimulus and showed fewer pecks in total, suggesting a reduced pecking motivation. However the force of pecks, did not differ among treatments at 2-9 days of age suggesting that beak-trimmed chicks were not experiencing pain from the beak."

The possibility that beak-trimming leads to a loss of magnetic sensitivity in the beak, as suggested by recent findings of magnetite in the upper beak of chickens, was further examined by training chicks to use a magnetic stimulus to locate hidden food in one corner of a square arena. In un-rewarded magnetic tests, the location of the chick relative to the magnetic stimulus was determined by

automatic image recognition. In the magnetic tests, hungry intact-beak chicks stayed nearer to the magnetic stimulus, and spent proportionally more time within 125 millimetres of the magnetic stimulus that had previously been associated with food compared to beak-trimmed chicks. This indicates that intact-beak birds were better able to detect the magnetic stimulus than beak-trimmed birds.

So what does all this mean for chicks?

The research concluded that minor beak trimming at a young age does not result in pain in domestic chicks, but instead leads to impaired function of the magnetoreceptors and mechanoreceptors of the beak. This suggests that minor trimming where only 1/5th of the beak is removed may offer welfare benefits but the effects of the loss of sensitivity on welfare needs to be carefully considered.

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Characterising root systems of canola genotypes

The canola group at the Graham Centre is responsible for pre-breeding research on improving tolerance to drought (or water-limited conditions). Successful and efficient extraction of soil water by the canola plant's roots is a key component of drought response, whatever form the 'drought' takes; a poor Autumn break, a mid-season dry spell (as occurred in 2010), or an early/sharp finish to the season. The distribution of rainfall during the growing season, the amount of stored soil moisture, and the distribution over soil depth of that moisture, will all influence crop performance.

The canola pre-breeders want to characterise the root system of various canola genotypes and to see which of these genotypes is most resilient to drought, (that is, shows the smallest yield depression when faced with reduced soil moisture).

Canola root experiments

Several canola root experiments were conducted in 2010 by Ray Cowley, John Harper, Sergio Moroni, David Luckett and Margaret McCully, CSIRO Plant Industries, Canberra. The first examined the production of stubby roots of canola using split pots. The stubby roots are formed as soil moisture declines, and they respond rapidly to capture water from the next rainfall event.

We hypothesise that high stubby root numbers are beneficial, and this will be tested once differential genotypes are confirmed. The stubby root photos are



Improving tolerance to drought: (A) Experiment examined the production of stubby roots of canola. Stubby roots form as soil moisture decreases and they rapidly respond capturing H₂O from future rains. (B) This experiment examined the effect of timing of terminal drought on chlorophyll fluorescence in the leaves. (C) Using rhizoboxes, the speed of root growth and the shape of the early root system in canola was examined. Photos: Toni Nugent.

analysed automatically using a customised macro plugin for the open-source software 'ImageJ'. The macro was developed by two European collaborators.

The second root experiment used long pots to examine the effect of the timing of terminal drought on chlorophyll fluorescence (CF) in the leaves. CF is used as a very sensitive indicator of the plant's stress status, and shows changes before the plant is visibly affected. Again, the pre-breeders are seeking differential genotypes that can be further investigated.

The final root experiment examined the speed of root growth and the shape of the early root system. The hypothesis here is that canola plants that get their roots established quickly, and exploit the greatest soil volume, will be the most drought tolerant.

This investigation used rhizoboxes with a clear perspex face that allows the roots to be photographed. The rhizoboxes are set at a slight angle and the roots tend to track down the clear face. The startling early finding from this experiment was that small canola seedlings with only their cotyledons fully expanded, already had roots down at 30 centimetres soil depth.

The genotypes tested in the rhizoboxes include a set of six from Ray Cowley's collaborators at Colorado State University. These genotypes have putative differences in root mass. They are the same genotypes that were grown in the new, CSU Rhizolysimeter in 2010, to examine root number and distribution.

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New agreement advances Australia-China agricultural collaboration

Marking another successful bilateral project in the field of agriculture, Ambassador Frances Adamson participated in a signing ceremony for a new project between the Australian Centre for International Agricultural Research (ACIAR) and China's Ministry for Science and Technology, focusing on sustainable livestock grazing systems on Chinese temperate grasslands.

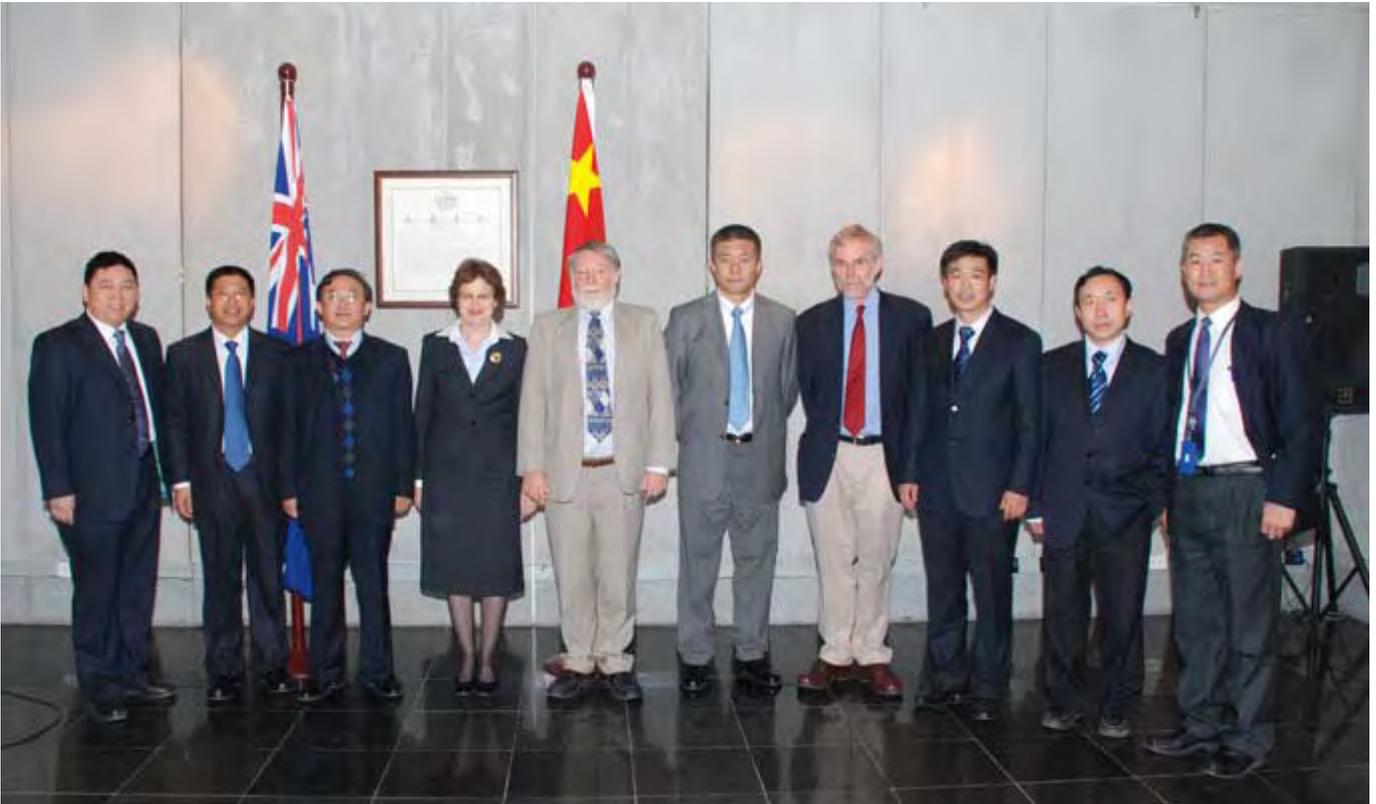
Other key guests including Dr Jia Jingdun, Director-General, China Rural Technology Development Centre, Ministry of Science and Technology and Professor David Kemp, Chair of the Organising Committee, 22nd International Grassland Congress 2013 and Professor of Farming Systems at Charles Sturt University (CSU), were present along with project officials and senior scientists from Gansu Province and Inner Mongolia Autonomous Region.

The Ambassador noted that ACIAR was an important part of Australia's official partnership program with China, with its funding promoting collaborative research to improve sustainable agricultural production in developing regions. The goal of ACIAR's work is to reduce poverty and enhance food security, and to conserve and rehabilitate the natural resource base for agriculture.

ACIAR is working closely with the Ministry of Science and Technology to deliver its program in China. Cooperation in agricultural research is an important part of the broader relationship and Australia is proud to be able to assist China manage the twin problems of grassland degradation and low incomes across China's grasslands.



RESEARCH ACTIVITIES



Signing ceremony: Pictured left to right: Prof Hou Fujiang, Deputy-Dean, Grassland College, Lanzhou University, Gansu; Prof Han Guodong, Dean, Life Sciences, Inner Mongolia Agricultural University, Inner Mongolia; Dr Jia Jingdun, Deputy Director-General, Ministry of Science & Technology, Beijing; Ambassador Frances Adamson; Dr John Dixon, ACIAR, Canberra; Prof Wu Jianping, Vice-President, Gansu Agricultural University, Lanzhou, Gansu and Chief Scientist (Animal Production) Ministry of Agriculture, Beijing; Prof David Kemp; Prof Zhang Yingjun, Grassland Department, China Agricultural University and Chief Scientist (Forages) Ministry of Agriculture, Beijing; Dr Hou Xiangyang, Director, Grassland Research Institute, Chinese Academy of Agricultural Sciences, Hohhot, Inner Mongolia; and Mr Wang Guanglin, ACIAR Country Manager for China.

The new grasslands project commenced in July 2011 and will continue through until December 2015. There are five organisations in China involved, CSU, staff from NSW Department of Primary Industries and the University of Tokyo. All project leaders assembled in Beijing in October 2011 for a signing ceremony at the Australian Embassy.

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Picnic showcases Graham Centre wetlands

The Inaugural Graham Centre Wetlands picnic on 26 October provided an opportunity to showcase the wetlands to community and school groups. Representatives from local Landcare groups, Greening Australia, Wagga Wagga City Council, TAFE and local schools attended. Participants heard and saw the development of the wetlands as part of the Graham Centre field site, and the opportunities for including native ecosystems within agricultural landscapes.



Wetlands on show: The Graham Centre has been successful in its bid for a further \$20,000 through the Murrumbidgee Catchment Management Authority's *Murrumbidgee Community Partnerships Project* to further develop the wetlands as an educational tool. Photo: Toni Nugent.

New project funding

GRDC have funded a year extension of Hanwen Wu and Deirdre Lemerle's project 'Improving integrated weed management in conservation farming systems in south eastern Australia' to the tune of \$100,000 over 2011-2012.

A second project authored by Leslie Weston and Rex Stanton, Deirdre Lemerle and Hanwen Wu will investigate integrated weed management options for summer annual weeds in the southern Region. This project has been funded by GRDC for three years for a total of \$430,000. The project will address issues with summer annual weed biology and management, focussing on fleabane, witchgrass, hairy panic and windmill grass across NSW. Additional studies in Wagga Wagga will address the impact of crop residue, burning, timely tillage and precision application of post-emergent herbicides on weed management in mixed farming systems. Project collaborators include FarmLink and Central West Farming Systems, regional district agronomists and crop advisors.

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Weed management: Witchgrass is one of the weeds that will be included in the study of annual summer weeds. Photo: Michel Dignand.

PICSE Activity Centre

Charles Sturt University, in partnership with The Primary Industry Centre for Science Education (PICSE) has established an Activity Centre at the Graham Centre during 2011. The Primary Industries Centre for Science Education - a partnership between universities, agribusiness, research organisations, schools, community

and governments - is raising national awareness and engagement in the science that underpins sustainable food and fibre production.

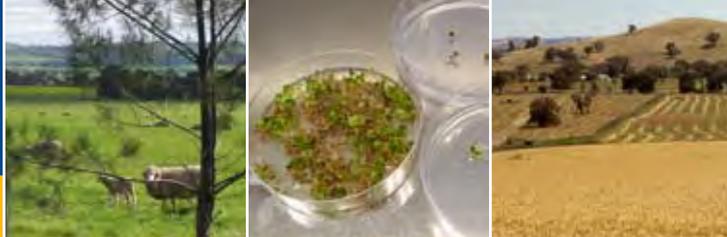
Over the last year this has been achieved by running a number of activities promoting science in Primary Industry to primary and secondary students and teachers. Activities have included the Science Investigation Awards, Teacher Professional Development and the Industry Placement Scholarship (five day camp and five day industry placement).

The five day camp was held late in November and showcased a variety of science based careers in Primary Industry. During the camp students participated in practical activities and lectures giving them a taste of university life.

The students also met many people working in Primary Industry at CSU and DPI and they all provided great advice and inspiration for the students regarding a career in Primary Industry. Students also had the opportunity to visit a



Researcher of the future? Stephanie Dew working with Dr John Harper. Photo: Emma Wordsworth.



RESEARCH ACTIVITIES

number of industries such as Buckman Laboratories, Freedom Foods, Casella Wines and Randall's Organic Rice Farm.

Students from around the Riverina participated in the camp and will now complete a five day Industry placement with a scientist or industry expert. Stephanie Dew, from Mount Austin High School, has already completed her placement at Charles Sturt University. Stephanie has worked with a number of researchers at the University, in the field and in the lab, to get a taste of real-life agricultural science.

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Microscopy of Creepers

A science day (Microscopy of Creepers) at St Michael's Primary School, Coolamon, NSW has helped increase interest and awareness of science amongst the students.



Making science fun: Students at St Michael's Primary School Coolamon enthusiastically took part in a science day conducted by Dr Sergio Moroni. Photo: Sergio Moroni.

Sergio Moroni, Graham Centre member and Lecturer in Crop Agronomy at Charles Sturt University's School of Agriculture and Wine Sciences took equipment (microscopes, some prepared slides and supplies) to the school, while the students brought things they wanted to look at under the microscopes.

There were two groups of students involved in the day; 21 children in Year 6 and 22 children in Year 5.

"The children were fantastic! They were superbly motivated and curious and shared their self-discoveries with one another," Sergio said.

"They brought common things such as leaves, spiders, all sorts of dead and live insects. Towards the end of the day they were looking at their own skin, eyelashes and hair. They went out of the classroom and came back with lizards (dead and live), spiders, soil, plants and fruit."

A cracking good project for Emmanuel

World egg production industries rely on a single sex only (female) with the males generally disposed of by carbon dioxide gassing or rapid maceration one or two days post-hatch. There is increasing pressure to avoid this culling. Significant savings in production costs could be made if this process could be removed altogether or at least reduced, by removing males at an early stage of development in ovo. There are currently no commercially established methods for determining the sex of chicks prior to hatching.

PhD student with the Graham Centre, Emmanuel Quansah, aims to generate transgenic lines of chicken using sperm mediated transformation and artificial insemination. His overall aim is to place an enhanced green fluorescent protein (eGFP) reporter gene under control of constitutive and tissue specific promoters in the W chromosome, the expression of which could then be used to determine sex by laser scanning of whole intact eggs. Emmanuel's supervisory team includes Dr Nigel Urwin and Associate Professor Shane Raidal (School of Animal & Veterinary Sciences, CSU) and Dr Padraig Strappe (School of Biomedical Sciences, CSU).

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Forage seed production systems help sustain Pakistani farmers

Muhammad's PhD project aims to develop, test and demonstrate a model of informal forage seed production systems in Pakistan, identifying the weak links/factors of forage seed production. It will also develop farmer skills for profitable seed enterprises with farming sustainability. Project outcomes include quality forage seed production, profitable seed enterprises and farming sustainability. Muhammad's supervisors are Dr Gaye Krebs and Professor Peter Wynn (SAVS, CSU).

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An oily end for bacteria which cause mastitis or pull the udder one?

Infection of the udder (mastitis) is a complex disease resulting in economic losses to the dairy industry in Australia in excess of \$50 million per annum through loss of milk production and the slaughter of animals no longer able to produce milk suitable for human consumption. It is caused by a variety of organisms including environmental and infectious pathogens. On the majority of dairy farms mastitis is treated with antibiotics and the success rate of cure is highly variable, averaging 50%. Organic dairy farms use alternative therapies including injection of colloidal silver and or a variety of biologicals including honey, whey and various plant extracts, directly into the udder. There is little scientific evidence to support many of these alternative treatments.

Preliminary research has shown that essential oils like lavender, eucalyptus and tea tree have good antibacterial properties, demonstrated *in vitro* against *S. aureus* and *E. coli*. This raises the possibility of using these to treat mastitis and this project aims to investigate whether a variety of essential oils are active against the range of organisms causing mastitis including clinical isolates. Graham Centre PhD student Lynne Appleby is undertaking research screening a range of essential oils, combinations thereof and



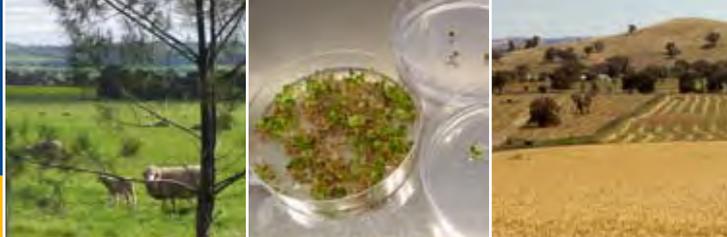
Oils to treat mastitis: A new project aims to investigate whether a variety of essential oils are active against organisms causing mastitis in dairy cows.

components of for antibacterial activity against organisms causing mastitis *in vitro* in specialised media to be developed which mimic milk. Lynne's supervisory team includes Nigel Urwin and Dr Jan Lievaart (SAVS, CSU) and Dr Heather Cavanagh (Associate Dean, Science Faculty, CSU).

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Massive electrical storms hit many parts of the Riverina on the evening of 29 November 2011. This stunning photograph showing lightning over Wagga Wagga, was taken by Geoff Burrows.





TRAVEL & CONFERENCES

Identification of silverleaf nightshade using microsatellite markers and microstructure

Silverleaf nightshade (*Solanum elaeagnifolium* Cav.) originated in America and is a serious summer-growing perennial weed in Australia. It is often confused with the native Solanaceae species quena (*S. esuriale* Lindl.). Both belong to the *Leptostemonum* subclass in the Solanaceae family and are remarkably similar in their morphological traits.

Correct identification is critical for the successful management of *S. elaeagnifolium*, as different biotypes could vary significantly in their response to control measures, such as herbicides and biocontrol agents. To improve the identification of *S. elaeagnifolium*, DNA polymorphism and microstructure of *S. elaeagnifolium* and *S. esuriale* were compared by Xiaocheng Zhu, PhD student with the Graham Centre.

Xiaocheng attended the 23rd Asian-Pacific Weed Science Society Conference in Cairns, Queensland and presented a paper on his research "Identification of silverleaf nightshade using microsatellite markers and microstructure."

"My attendance at the conference showcased the Graham Centre's involvement in postgraduate education and training.



Correct ID critical: Correctly identifying silverleaf nightshade is the key to successful management and control, according to PhD student, Xiaocheng Zhu. Photo: Sharon Kiss.

It was a great experience for me to speak in front of experts and listen to up-to-date knowledge and developments in weed science," said Xiaocheng.

Research improves identification of silverleaf nightshade species

Micro-morphological and microsatellite analysis were used in Xiaocheng's research. In the micro-morphological study, significant differences of trichome intrusive base structure were found. Two species were also clearly separated through the microsatellite investigation. In addition, species-specific alleles were detected in quena. Both of the morphological and genetic methods are useful and reliable for early stage identification of silverleaf nightshade and quena.

"We utilised 13 cross-species simple sequence repeat (SSR) primer pairs to investigate the polymorphism between *S. laeagnifolium* and *S. esuriale*," Xiaocheng said.

"SSR markers clearly separated the two species. Three unique SSR alleles were present in *S. esuriale* but not in *S. laeagnifolium*, which could be used to distinguish the two species. Scanning electron microscope (SEM) examination of the microstructure of the leaf surface of these two species showed the complex stellate trichomes on the upper leaf surface of *S. elaeagnifolium* had a deep "root" structure penetrating into the palisade mesophyll, while this structure was not found in *S. esuriale*. A combination of molecular phylogeny and SEM will considerably assist in the correct identification of *S. elaeagnifolium*."

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Are the invasive camel melon and prickly paddy melon populations in Australia variable?

Invasive weeds are the second largest threat to global ecosystems. Camel melon (*Citrullus lanatus*) and prickly paddy melon (*Cucumis myriocarpus*) are two such invasive weeds posing a serious threat to Australian biodiversity and farm productivity.

The available literature in Australia on these melons is unsubstantiated by research, and Razia Shaik's PhD research is characterising the growth and phenology and detailed seed biology studies to investigate the potential role of seed dormancy in the invasion success of these melons, and characterizing the genetic variability among species and geographically distinct Australian populations of both species.

In addition, population genetic variation of invasive melons in Australian will be assessed using the assayed genes, and

compared to variation observed at reported centres of origin and other global populations. This will assist in identifying the diversity and potential sources of these two invasive melons in Australia.

DNA sequencing

A series of DNA sequencing studies were performed to characterise the molecular taxonomic identity and molecular variability among species and geographically distinct Australian populations of both species. Sequence analysis performed using the chloroplast genes *matK*, *t-rna-*val-rps-12** locus, *Psb-ycf-6* genes and nuclear genes including the Internal Transcribed Spacer region, and G3pdh intron region successfully identified these melons at the molecular level of the two melons - camel melon and prickly paddy melon, to be *Citrullus lanatus* and *Cucumis myriocarpus*.

"My project addresses the key issues of basic biology and taxonomic identity. We know the melons have less variability, and we can look at a single sound method of management of these weeds all throughout Australia," Razia explained.

"Interestingly, this work clearly demonstrated that all Australian camel melon populations are identical to each other, indicating the genetic diversity of camel melon in Australia is extremely low, and all populations most likely consist of the same genotype," stated Razia.

"This study potentially suggests that some other adaptability related factors, other than genetic diversity are responsible for invasive success in Australia. Most importantly, the camel melon sample sequences were 100% similar to *Citrullus lanatus* var *citroides* haplotype, which has global presence in South Africa, India, Botswana and the United States. This indicates a possible potential nomenclatural correction in Australian literature (as *C. lanatus* var. *lanatus* is widely used scientific name for camel melon in Australia) and potential sources of introduction of this melon into Australia."

Sharing results

Razia presented a poster 'A comparative analysis between two invasive weeds, camel melon (*Citrullus lanatus* (Thunb.) Matsum. and Nakai var. *lanatus*) and prickly paddy melon (*Cucumis myriocarpus* L.), in inland Australia' at the 23rd Asian Pacific Weed Science Society Conference, in Cairns in September.

"It was a good training opportunity to interact with other students and the broader weed community and to learn about the various challenges faced by the farming communities of the Asian- Pacific region," Razia said.

"The Graham Centre's committed involvement and research



Melons everywhere: Camel melon infested site at Galore, NSW.

priority in weed research was publicised through my work and poster exhibition at the conference."

"The conference also provided me with the opportunity to network and interact with the scientific community, and the recent advances and current trends in weed science are clearer to me."

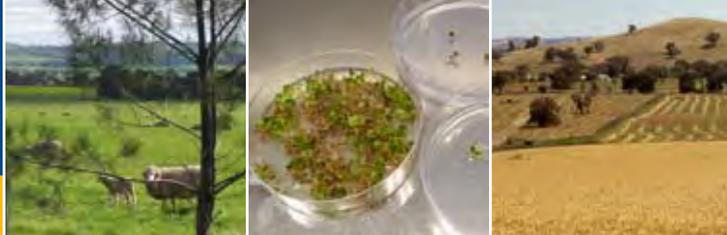
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Pig enthusiasts invade the 13th Biennial Australasian Pig Science Association Conference

A contingent of School of Animal and Veterinary Science (SAVS) students, Professor Peter Wynn and myself descended onto Adelaide for the Australasian Pig Science Association (APSA) 2011 conference. First on the agenda was the annual Pork CRC conference. With the first lot of caffeine coursing through his veins, it did not take Peter long to hit his stride and network at full throttle as only Peter Wynn is capable of. He was a man on a mission; to hook up SAVS students with employers, a mission made easier with a who's who in the international pig world attending the conference. International attendees travelled from Chile, the United Kingdom, New Zealand, China, Denmark, Singapore, the Netherlands and Fiji to name a few.

The highlight of the annual meeting was the presentation of plaques of recognition and appreciation to all Pork CRC supporting partners, with Charles Sturt University receiving a plaque.

The following day, students participated in student workshops in preparation for APSA which started on the Monday. SAVS presenters included Jessira Perovic 'Failure



TRAVEL & CONFERENCES

to program piglet growth performance in barrows through neonatal androgenisation', Jill Groat 'Surface and core body temperature measurements for the assessment of welfare in weaner pigs' and myself 'Semen factors associated with post-breeding sow responses.' Fiona Kelk's paper 'Strategies for the early detection of sick and injured group-housed gestating sows' was presented by Trish Holyoake due to Fiona's work commitments.

Jessira went for the disarming approach, trying to evoke sympathy on account of a hoarse voice due to excessive singing at the formal APSA dinner. Jill Groat (another recently graduated SAVS vet) tried another disarming tack, blaming equipment failure on her lack of significant results.



I went for the comedy routine, which worked too well - I incurred a time penalty while waiting for laughter to die down. Unfortunately no one from SAVS received the medal or prize money but we all did our best to impress. Other SAVS students who attended included Ellen Heycox, Rebecca Wilson and Ross Cutler.

Overall, it was a very successful and enjoyable conference for all in attendance. Collectively we put CSU on the pig world map, highlighting the strength and variety of pig research at CSU. If only we had our own piggery on campus; we'd double our pig research output for sure! Some even had time to see some of the sights such as the famous and very appropriate life-sized pig statues on Rundle Mall (see below). Hopefully the SAVS contingent at APSA 2013 will be even larger than this year.

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'Gain from Grains'

The Australasian Grain Science Association (AGSA) 'Gains from Grains' conference was held 4-8 September in Coolangatta and Tweed Heads. The conference covered a wide range of topics, reflecting the diverse interests and challenges facing the modern cereal chemist.

Graham Centre PhD student Christina Chin attended the conference and presented a paper 'Measurement of cooking time in desi chickpea by objective instrumental methods'.

"The conference covered a broad spectrum of cereal

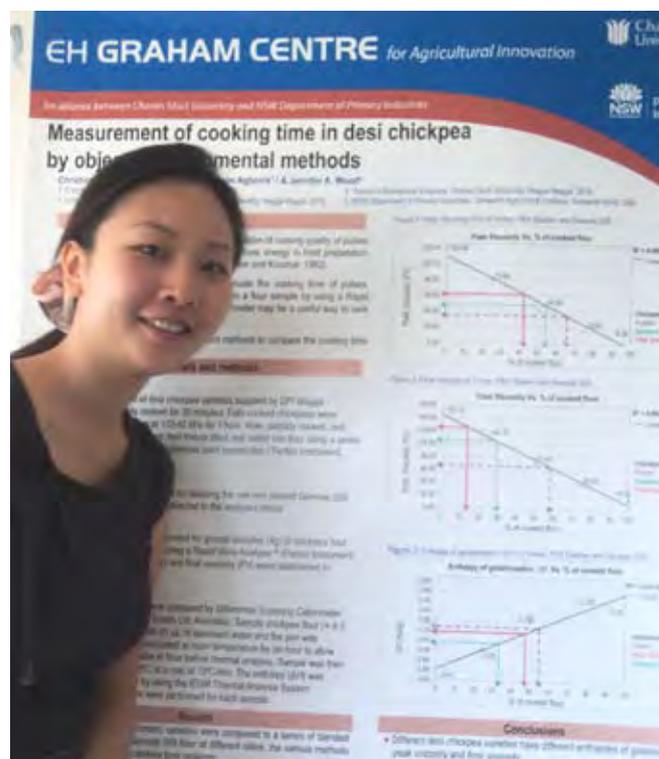
chemistry topics and outlined challenges faced by the modern cereal chemist. My attendance allowed me to share my research findings with local and overseas delegates," Christina said.

"Besides gaining the current insights and knowledge in the research activities currently being undertaken in my field, the challenges faced by grain based food producers in meeting global food supply and the health benefits of grain based food were addressed at the conference."

"I was further convinced that my research objective; to study the chemical components in pulses that affect consumer preferred quality attributes, will provide breeders with additional knowledge in breeding pulses with better quality," she said.

The conference was especially pertinent for the promotion of pulses as a staple and nutritious food in response to food demand with increasing population growth in the future. The poster presentation session provided a good platform for Christina to showcase the Centre's activities and gain valuable feedback from leaders in the field.

"In addition, the conference gave me an opportunity to strengthen my professional networking with other cereal researchers and companies, which may lead to future collaboration," Christina said.



Sharing knowledge: Christina's research will provide breeders with additional knowledge in breeding pulses with better quality.

Conference highlights

The highlights of the conference included discussion on the challenges in meeting the global food supply and delivering health benefits to grain based food consumers.

The keynote address looked at global food supply challenges, and included presentations from international speakers Dr Rajaram and Dr Z He, former and current Wheat Improvement Directors of CIMMYT, based in Mexico and China. In their presentations, they discussed how green revolution technologies were able to avert global food shortage and malnutrition. However, more challenging tasks are ahead such as the gene revolution and the need for the cooperation and involvement of both public and private sectors in agriculture and the food industry are needed to meet the demands of a world population of nine billion by 2050.

Another highlight was the human health and nutrition symposium with Professor Poutanen, Finland, providing an overview of her research and the recently completed 5-year European Union program 'HEALTHGRAIN'.

"HEALTHGRAIN involved a comprehensive network of researchers investigating means to improve health outcomes through enhanced nutritional quality of grain foods and greater consumption by the population. The topics included consumer issues, nutritional aspects of grain foods, regulatory and technological aspects of producing grain products," Christina explained.

The conference also addressed the role of the grain industry in lifting our knowledge level of grain products and how to convey this message to the general population.

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Potential vaccine for psittacine beak and feather disease

ComBio 2011 in Cairns was a joint meeting of the Australian Society of Biochemistry and Molecular Biology and the Australian Plant Society. The conference featured several international speakers, including a Nobel Prize winner, over four days.

Graham Centre PhD student Ian Patterson attended the conference and presented a poster of his research findings on the 'Use of a recombinant beak and feather disease virus capsid protein produced in *Escherichia coli* as a potential vaccine for psittacine beak and feather disease'.

"There was no shortage of talks relating to my field of research as well as talks covering interesting and emerging scientific fields including topics on attaining structural data, functions of viral proteins, and emerging fields, such as metabolomics," Ian said.

Opportunities for collaborative partnerships

"Presenting my poster at the conference generated interest from fellow researchers and ensured I was kept busy during my allotted presentation time. Several people that visited my poster were familiar with my co-supervisor, Jade Forwood, so were familiar with facets of my research. This allowed for a helpful exchange of ideas and possible contacts to improve my future research."

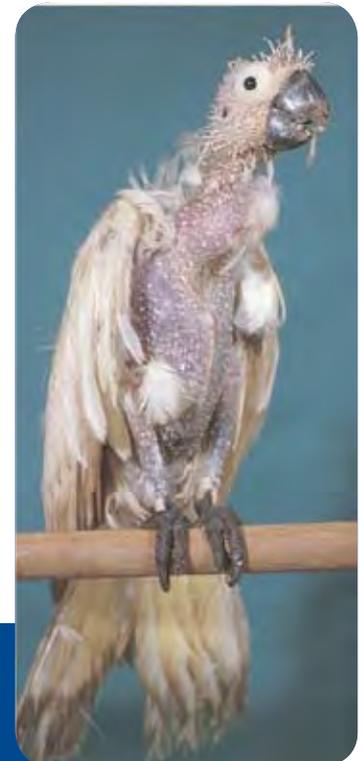
"The conference was attended by individuals with diverse interests and I was also able to talk to several people whose research interests align with the Graham Centre. Speaking with academics from outside institutions allowed connections to be made for future research and they also offered several useful suggestions on ways to gain more information about viral proteins I am studying," Ian explained.

"I am hoping that one interaction in particular will allow for collaboration using NMR to determine the structure of a protein I am researching. This would add important and publishable information to my research, which will also increase the research profile of the Graham Centre."

While in Cairns, Ian also supported fellow Graham Centre PhD student Andrew Peters with his fieldwork and data collection on Low Iles, just a short drive and sail away. This turned into a lab function, as supervisor, Shane Raidal, was also able to make the drive up.

Principles and understanding of this research are applicable to domesticated birds.

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Vaccine to fight disease:

Research using a recombinant beak and feather disease virus capsid protein produced in *E. Coli*, could result in a vaccine for psittacine beak and feather disease.



IN THE LIMELIGHT

In the Limelight

Dr David Gopurenko

Position: Research Scientist Molecular Systematics

Organisation: Department of Primary Industries

Career Brief

David Gopurenko received his PhD in Australia, investigating population genetics and phylogeography of mud crabs across the Indo-West Pacific region. He later conducted Post-Doctoral studies at Purdue University Indiana USA, using genetic parentage analysis to examine sexual selection and mate choice in salamanders. David joined NSW DPI in 2007 at the Wagga Wagga Agricultural institute, and is now the principal investigator to the Institute's DNA Barcoding facilities.

Research Activities and Interests

David conducts DNA barcoding and genetic research on a broad variety of collaborative projects with specialist taxonomists and entomologists from Australia and overseas. These projects focus on species identification, species discovery, systematics and population genetics, mainly of economically important insects and exotic pests. David is also keenly interested in using contemporary molecular genetic methods to enhance biodiversity analysis, and as a means to examine molecular mechanisms contributing to the emergence of reproductive barriers associated with species evolution.

Professional Links

- Society for the study of Evolution

A typical day for me is ... Preparing, sorting, checking, analysing and reporting a constant stream of DNA barcode sequences. I also confer with collaborating entomologist/taxonomists and direct the efforts of technical officers involved in various projects.

My main project at the moment is ... An integrative taxonomic assessment of biting midges (Ceratopogonidae: *Culicoides*) in Australasia. This geographically widespread and species rich genus, contains many pests to humans and livestock. I provide DNA analyses to test morphologically defined species affiliations proposed by a collaborating midge taxonomist. I also examine molecular systematic relationships among

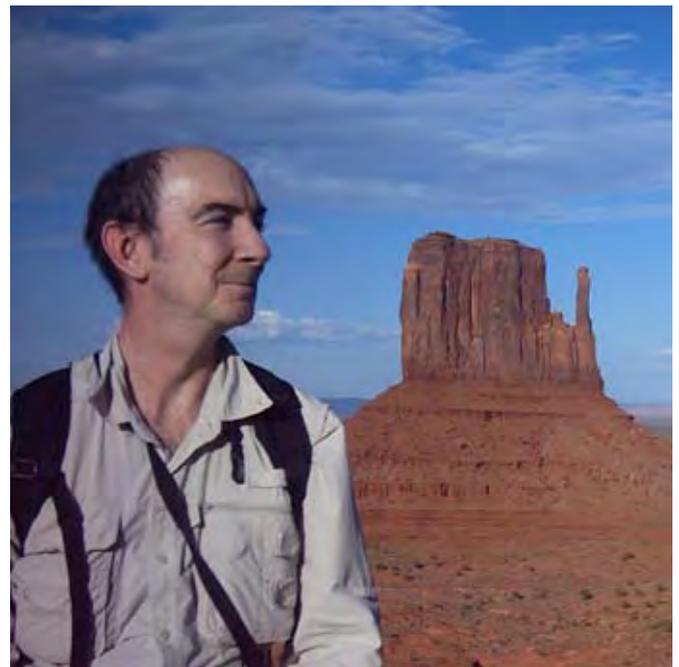
the midge species and identify the geographical distribution of genetic varieties present within focal pest species. Our research here, which includes a comprehensive regional sample, indicates many of the high profile pest midges are in fact complexes of species, some of which are likely to differ by life history, distribution and therefore by their competency as a pest. My work for this project is greatly enhanced by open exchange with other taxonomist, molecular ecologist and bio-security groups involved in midge research. I feel privileged to be involved with this dedicated network of researchers.

My favourite part of my job is ... That wonderful first cognitive moment when the molecular evidence jumps out announcing "this is quite different from the rest ..."

When I am not in the office I like ... to choose a top 5, I would say:

- playing Bach and the blues on the guitar;
- bush walking in extraordinary areas with fine companions;
- observing our feathered dinosaur friends;
- drinking damned-good coffee whilst discussing science, politics and the universe;
- swearing at my cantankerous old motor-cycle which never seems to work when I need it most.

When I am driving I like to listen to ... only ever Bob Dylan - (all 50 years of his career).



David Gopurenko explored Monument Valley, Utah USA in September 2011.

Adeola Alashi, PhD Student

Thesis Title: Dual functional properties of canola meal protein hydrolysates

Supervisors

- Associate Professor Samson Agboola
- Associate Professor Christopher Blanchard
- Dr Rodney Mailer

Funding Body: GRDC

Relevant Current Employment: PhD (full time)

Career and studies till now

- Food technology (OND), Federal Polytechnic Offa , Nigeria (1997 - 2001)
- Food Science and Nutrition (B.Tech), Federal University of Technology Minna, Nigeria (2002 - 2006)
- Trainee Laboratory Analyst, Evans Medical PLC, Lagos, Nigeria (2005)
- Teaching, Mater amabilis Secondary School, Anambra, Nigeria (2008)
- PhD, Charles Sturt University (2010 - to date)

Research Interests:

- Functional foods
- Plant protein chemistry
- Enzymatic modification to improve the technological functionalities of canola meal protein
- Bioactivity of protein hydrolysates

Professional Links

- Australian Institute of Food Science and Technology (AIFST)
- Nigerian Institute of Food Science and Technology (NIFST)

A typical day for me is ... Dragging myself out of bed at about 6am after saying my prayers, then I head off to uni. Most days I have early starts with the aim of finishing early - but I hardly ever do!

My main project at the moment is ... The technological aspect of the functional properties of canola protein hydrolysates.

My favourite part of my studies is ... Obtaining results whether good or bad. It used to be very frustrating initially, but I have learnt that in research, things do not always work the way we figure they would, so I enjoy the analysis as I go along.

When I am not studying ... I like to cook and shop

When I am driving I like to listen to ... Gospel music on 101.9 Wagga's Life FM.



Adeola Alashi at work in the laboratory.

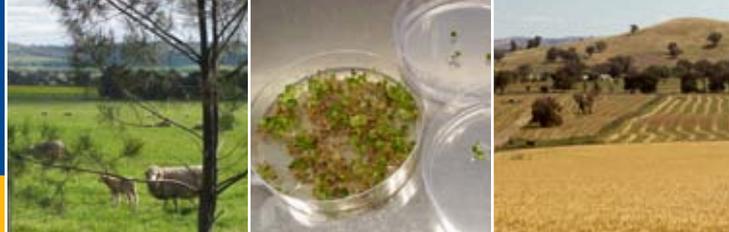


Science or Art?

Another interesting photo from Dr Geoff Burrows – what is it?

The edge of the lemma of cereal rye.

Do you have an interesting research-based photograph that we could include in future editions of the Innovator? If so, please send to Toni or Sharon.



EVENTS CALENDAR 2012

Date	What	Where	More information
7 Feb	Blackleg Breakthroughs - symposium presenting new results about the major disease of canola	Conference Centre, CSU 2-9 pm	www.aginstitute.com.au/blacklegincanola
23 Feb	2012 Conservation Agriculture Field Day	Parkes, NSW	www.canfa.com.au
23-24 Feb	Improving Productivity for Irrigated Croppers	Deniliquin, NSW	Sam North, T: (03) 5881 9926
28-29 Feb	GRDC Adviser Update	Narrandera, NSW	www.orm.com.au
14 March	GRDC Grower Update	Yerong Creek, NSW	www.orm.com.au
18 April	Graham Centre Monograph Seminar <i>Water Resource Protection in Australia: water quality and quantity is a feature of agricultural land use</i>	NSW DPI Conference Room	Leslie Weston E: leweston@csu.edu.au
13 Jul	Annual Graham Centre Sheep Field Day	Convention Centre CSU, Wagga Wagga	Toni Nugent E: tnugent@csu.edu.au
18 Jul	FarmLink Mixed Farming Forum	Temora, NSW	www.farmlink.com.au
8 Aug	FarmLink Ag Tech Show	Temora, NSW	www.farmlink.com.au
10 Aug	Annual Graham Centre Beef Field Day	Convention Centre CSU, Wagga Wagga	Toni Nugent E: tnugent@csu.edu.au
5 Sept	Annual Graham Centre Field Day	Graham Centre Field Site Cnr Coolamon & Prices Road	Toni Nugent E: tnugent@csu.edu.au
18-20 Sept	Henty Machinery Field Days	Henty, NSW	www.hmfd.com.au/
10 Oct	Graham Centre Agribusiness Field Day	Graham Centre Field Site Cnr Coolamon & Prices Road	Helen Burns E: hburns@csu.edu.au
17 Oct	Hart Bros Seeds Field Day	Hart Bros Seeds, Junee	www.hartbrosseeds.com.au/

Autumn Edition of *the Innovator*

The Autumn Edition of *the Innovator* will be available mid April 2012. Submission of articles for this edition closes on **Friday, 23 March 2012**. Please email articles to Toni Nugent or Sharon Kiss.

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