Welcome to the Summer edition of the Innovator.

As 2014 draws to a close, it is a good opportunity to reflect on the Centre's successes throughout the year. Earlier this month we celebrated our member’s achievements, along with the Centre’s highlights and activities at our End of Year function. Congratulations to all members who received awards (see page 8).

A big thank you to our Graham Centre team for your efforts during the year. The success of our outreach activities, communications and member support shows the increasing success of the Centre across the industry.

Our post-graduate student numbers continue to grow with 80 students studying during 2014. Improving research training as part of increasing research capacity is a major goal of the Graham Centre, and our students play an important role in knowledge generation, increasing the productivity, profitability and sustainability of our cropping and livestock enterprises, as well as increasing food quality and supply chain value. Congratulations to all those students who graduated recently (see pages 16-17).

The Graham Centre has increased the number of Honours scholarships from five to ten for the coming year, with research topics for these scholarships being spread across the Centre’s research portfolio. The Centre has again awarded four summer scholarships in 2015. These students will work with researchers over their summer break, gaining an insight into the world of research in their chosen field.

The future strategic direction of the Centre is under review after 10 years to reflect the changing R & D environment and to maintain relevance.

We are planning a key event in March to celebrate 10 years since the formation of the Graham Centre. Further details will evolve over the coming months.

This edition outlines our research activities, industry links, staff profiles and upcoming events.

Best wishes for a safe and happy Christmas and New Year.

Enjoy reading this edition of the Innovator.

Professor Deirdre Lemerle
Putting policy ideas on the table - improving outcomes for smallholder rice farmers

A conference proceedings just released by the Australian Centre for International Agriculture Research (ACIAR) outlines insights and ideas on policy measures for improving rice-based farming systems in the Mekong Region.

The report, *A Policy Dialogue on Rice Futures: Rice-based Farming Systems Research in the Mekong Region*, marks the conclusion of a A$14.8 million ACIAR program on farm productivity and policy-focused research in the region. The Rice-based Systems Research (RSR) program is one of four programs developed by ACIAR under the Australian Government’s Food Security through Rural Development initiative (2009-2013).

The event actively engaged 60 senior policy makers and agricultural researchers, primarily from Cambodia, Laos, Vietnam and Australia; the resulting report comprises 25 edited papers, including five synopses of panel and audience deliberations.

ACIAR’s convenor of the event, Dr Mike Nunn, noted the important contributions made by researchers from the Graham Centre for Agricultural Innovation and their collaborators at the conference and in the papers presented in the proceedings.

For ACIAR, the ‘dialogue’ approach proved an effective platform for bringing together key regional players in its partner countries to further extend the impact of its research-for-development investments. Dr Nunn noted that ‘the dialogue challenged the researchers to consider the key policy messages arising from their work. This took some researchers out of their comfort zone, and pushed them into thinking hard about the intersection of their work with policy.’

The policy dialogue comprised five half-day thematic forums, each consisting of 4-5 presentations followed by a panel discussion. The first set the scene by addressing big-picture ‘rice futures’ in the Mekong region. The four that followed focused on intensification and mechanisation, diversification, climate change and natural resource management, and policy and knowledge.

The lively dialogue around these policy-oriented papers, along with networking among delegates, stimulated fresh thinking about how to optimise research outcomes in the ‘real world’.

One of the big take-home messages from the forum, according to Dr Nunn, is that farmers in the Mekong Region who continue to grow rice alone are likely to struggle.

‘In Cambodia, for example, an individual farmer would need to grow three hectares of rice to earn an income equivalent to working in the city at the going rate of US$100/month. It’s easier and less risky for them to choose the latter’.

Although the low profitability of growing rice alone limits the prospects of many Mekong Region farmers, the dialogue event revealed a plethora of policy responses with the potential to change the fortunes of the region and its farming communities.

‘Policy settings and research investments need to be about much more than just increasing production’, says Dr Nunn. ‘This program demonstrated opportunities to significantly improve rice-growing practices; however, there is also a need to manage infrastructure, value-add, diversify and integrate other components into the farming system to increase farmers’ incomes.’

For more policy ideas and insights on the future of the Mekong region’s rice-based farming systems download the conference report at www.aciar.gov.au, where video interviews with several conference participants can also be viewed.
Snapshot of RSR-funded projects led by the Graham Centre

**CSU – Developing improved farming and marketing systems in rainfed regions of southern Lao PDR (Project CSE/2009/004)**

This project aimed to increase food supply and income from lowland and upland farming systems in the rainfed regions of southern Laos, which have significant potential for market surplus in rice, other crops and livestock. The approach involved:

- Intensification and diversification with other crops and livestock
- Better understanding farming and marketing systems
- Developing new technologies and marketing approaches
- Sharing and scaling-out knowledge and technologies
- Supplementing irrigation by smarter water use.

**NSW DPI – Improved rice establishment and productivity in Cambodia and Australia (Project CSE/2009/037)**

This project aimed to enhance rice system productivity in rainfed and irrigated lowland systems in Cambodia, especially in those that are direct seeded. The approach for achieving this was through:

- Enhancing productivity, especially through direct seeding
- Improving direct-seeded production using existing machinery and weed control
- Testing other mechanisation options for direct-seeded rice and conservation tillage
- Finding ways to improve irrigated rice productivity and profitability.

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**CSU staff celebrate milestones**

Congratulations to Professor Jim Pratley and Mr John Broster on their recent awards from Charles Sturt University (CSU). Prof Pratley celebrates 40 years at CSU, while John celebrates 20 years at CSU. Both received their awards from Professor Andy Vann, Vice Chancellor, CSU in November.
2015 Graham Centre Honours and Summer Scholarships announced

Congratulations to the following Graham Centre scholarship recipients.

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<th>Honours scholarships recipients</th>
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<td>Rowan Alden</td>
<td>Ben Stodart and Gavin Ash</td>
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<td>Matthew Dunn</td>
<td>Jason Condon</td>
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<td>Jake Fountain</td>
<td>Marta Hernandez-Jover, Rob Woodgate and Luzia Rast</td>
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<td>Brooke Kaveney</td>
<td>Jason Condon, Sergio Moroni and David Gale</td>
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<td>Brenton Kilby</td>
<td>Shokoofeh Shamsi and Matthew McLellan</td>
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<td>Kayla Kopp</td>
<td>Michael Friend and Susan Robertson</td>
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<td>Susie Kracht</td>
<td>Bing Wang and Peter Wynn</td>
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<td>Gregory Lord</td>
<td>Sergio Moroni, Jason Condon and Iain Hume</td>
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<td>Marie Nakai</td>
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<td>Meg Ryan</td>
<td>Chris Blanchard, Hassan Obied and Janice Sangster</td>
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<td>Chloe Steventon</td>
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<td>Tabby Brooks</td>
<td>Thiru Vanniasinkam and Hassan Obied</td>
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<td>Siobhan Carson</td>
<td>Marta Hernandez-Jover and Rob Woodgate</td>
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<td>Alexandra Cornell</td>
<td>Rob Woodgate</td>
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<td>Isaac James</td>
<td>Michael Friend and Shawn McGrath</td>
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Jim Pratley’s life in agriculture

Professor Jim Pratley’s life in agriculture will be kept on record at Australia’s National Library thanks to Year 6 Kapooka Public School students Lily Watkins, Victoria Kean, Ashley Gardiner and Cassie Baker. As part of an initiative funded by the Murray Darling Basin Association, Wirraminna Environmental Education Centre and Riverina Local Land Services, students from across the Riverina had to research, photograph, illustrate and interview local agricultural identities. The students then pulled the information together into a short story, with the competition winners having their stories published.

Read Professor Pratley’s story online

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Prof Jim Pratley’s achievements in agriculture have been documented in a book recently published by Year 6 students at Kapooka Public School.
International award for a leader in animal production

Graham Centre member Professor Peter Wynn, Professor of Animal Production in the School of Animal and Veterinary Sciences CSU in Wagga Wagga, received the 10th Asian-Australasian Association of Animal Production (AAAP) Animal Science Award for his ‘outstanding contribution to animal production’.

He was nominated for the award by the Australian Society of Animal Production.

Society President Dr Russell Bush said, “Peter is well known throughout the Asia region for his dedication and service to education and research in animal production.

“His distinguished career spans four decades with service given to Australia’s leading research and educational institutions, including the Australian Wool Innovation company, Australian Department of Agriculture, CSIRO, University of Sydney, and Charles Sturt University,” Dr Bush said.

Professor Wynn leads an Australian Centre for International Agricultural Research (ACIAR)-funded team to help smallholder dairy producers in Pakistan through improved dairy extension services. He has initiated training programs for many Australian and Pakistani students and has raised sponsorship for numerous young scientists from developing countries to attend international conferences.

Professor Wynn is involved in Pork CRC research projects exploring nutritional and endocrine strategies to improve growth efficiency of piglets.

Professor Wynn also lectures in both the Animal and Veterinary Sciences programs at CSU. As coordinator of the University’s Master of Animal Science, Professor Wynn has gained a reputation for nurturing young animal science researchers from Africa, South America and Asia along with North American and Australian students. He also currently supervises or co-supervises six PhD students.

Each year, Professor Wynn provides guidance and support for a CSU undergraduate student team in the Australian Intercollegiate Meat Judging Competition held in Wagga Wagga. He was the instigator of the national workshop format for this important event and coordinates teams from across Asia and the USA to participate in the competition.

Professor Wynn received the 10th AAAP Animal Science Award during the opening ceremony of the 16th AAAP Animal Science Congress at Universitas Gadjah Mada, Yogyarkarta, in Indonesia on 11 November.

The CSU academic addressed the conference on the topic of genetic selection strategies to improve the productivity of sheep.

In 2010, Professor Wynn was made a Fellow of the Australian Society of Animal Production in recognition of his distinguished international service to animal science.

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Australian Museum Eureka Awards showcase the best of the best

Congratulations to Associate Professor and Deputy Director Graham Centre Michael Friend and the Evergraze team on their selection as finalists in the Department of Agriculture Landcare Eureka Prize for Sustainable Agriculture section at the recent Eureka Awards.

Congratulations to the Evergraze team on their selection as finalists in the Department of Agriculture Landcare Eureka Prize for Sustainable Agriculture section.
EverGraze was a project based on great science, but importantly integrated the outcomes of that science into whole farm systems to show that significant improvements in profit and Natural Resource Management can be achieved concurrently. The Evergraze project has resulted in significant practice change on thousands of Australian farms.

Congratulations to Dr John Kirkegaard and Dr James Hunt, CSIRO and Mr Stuart Kerns, GRDC on winning the Department of Agriculture Landcare Eureka Prize for Sustainable Agriculture for their Water Use Efficiency project.

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Observations on North American landscapes

During August-September 2014, Ted Wolfe and his wife journeyed to eastern Canada and parts of the United States, involving three train trips (New York to Toronto, Boston to New York, Chicago to Denver) and two coach tours (Toronto to Montreal, Denver to Las Vegas). The cities were fun, and Ted particularly enjoyed ‘reading the landscape’ when travelling cross-country. On this set of travels, three matters had him thinking.

Abandoned farmlands

Ted was amazed at the amount of farmland that appeared neglected or abandoned. Their first encounter was near Albany in New York State when, after turning left into the Mohawk Valley from the Hudson Valley, there was a stretch of about 150 km of an unbroken ‘woody and weedy’ landscape. Other stretches occurred on drives through Ontario from Toronto to Kingston and then on to Ottawa, and from Quebec to Montreal. Although he couldn’t get any decent photos of these stretches through the dirty windows of a lurching train or the tinted windows of a rocking bus, the landscapes were similar to the ‘shrub-dominated abandoned farmland’ or ‘herbaceous abandoned farmland’ described and illustrated in an article from Quebec (Benjamin et al. 2007). Why is abandoned farmland a feature of Northern Hemisphere locations such as Ontario, Quebec and even Latvia (Ruskule et al. 2013), and not in Australia? In part, the answer could lie in the continental climate at these northern latitudes, where winters are too severe to graze livestock on pastures year-round, as in Australia. Hence, on livestock farms, the limiting factor for grazing is the ability to house livestock in winter - additional summer grazing is not needed. If the land is not suitable for cropping, it is unwanted for grazing.

A second factor may be that the land areas each side of the railway line in New York State, and along the highways in Ontario and Quebec, are probably owned by developers, who are quite happy to sit on this land until profitable opportunities arise.

The aesthetic appeal of these abandoned areas is perceived rather negatively by both rural dwellers (Benjamin et al. 2007, Ruskule et al. 2013) and land use experts (Ruskule et al. 2013). In these studies, which assessed fields according to their use (crop, pasture, hay, plantation, woodlands etc.), abandoned fields rated worst, followed by cornfields, with woodland mosaics and forests fairing best. However, the shrub and vegetative cover of these abandoned areas does have a significant role in carbon fixation, at least in the short-medium term and in the absence of fire.

Biodiversity in intensive farmlands

In Australia, pastures and livestock are essential components of cropping systems (e.g. the sheep-wheat belt) due to the inherently low fertility of Australian soils. Compared with Australia, North American farms are either more fertile or more fertiliser is used, and their farming systems are integrated (crop farms interacting with livestock farms) rather than mixed (crops and livestock on the same farm). While much is made of the lack of biodiversity in the simple corn-soybean rotations of North America and some European countries, these farmlands often incorporate significant areas of woodlands (more than 5%), areas that are more evident than in our sheep-wheat belt (often 2-3%). In terms of rebalancing land use to retain biodiversity, promote carbon fixation and provide shelter for farm animals and wildlife, Ted broadly rated American farms ahead of Australian farms. Australia’s area of ‘abandoned’ farmland is small but Ted believes we could do more to reintroduce woodland areas and shelter belts into our landscapes and farmlands.

American rangelands and canyon lands

As in Australia, there are huge areas of semi-arid country in the western half of the US. Most of this land is ‘public land’, under the control of US Federal land agencies such as the Bureau of Indian Affairs, the Bureau of Land Management, the Bureau of Reclamation, the Department of Defense, the US Forest Service and the National Parks Service. These agencies have different, sometimes conflicting, charters and responsibilities. Unless irrigation is available (and there are some excellent aquifers between the prominent mountain ranges), these lands have little agricultural value as farmlands or grazing lands. As in Central Australia, their real value lies in tourism and recreation, both of which are huge industries in most of the States of western USA.

The scenery is truly spectacular, due to the canyon lands that characterise areas of Arizona, Utah, Colorado and South Dakota. Fortunately, low rainfall keeps (or has kept) erosion rates in check, at least since the era of dustbowl farming.
However, severe climatic events are becoming more common and one occurred in Nevada and Arizona while Ted and his wife were in the US.

References


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Yanks wiped out Aussies in their own paddock

The Australian Universities Crops Competition (AUCC), now in its 6th year, took place in Temora, NSW, during October and was attended by eight Universities (six Australian and two from the United States).

The AUCC University prize was won by Kansas State University, with the top three individual prizes also shared by the North American students from Kansas State and Iowa State Universities.

Charles Sturt University was well represented by Lucy Darragh, Anna Dye, Catherine Worner, Albert Gorman and Joshua Hart, with Dr Sergio Moroni (left) and Mr Kerry Schirmer (right) coaching the team.

The American students were very focused, highly motivated and self driven, and participate in three crop competitions per year in the US.

Graham Centre celebrates a successful year

The Graham Centre celebrated a successful end to 2014 on 2 December, with members, staff and industry gathering for the Centre’s End of Year Function.

Professor Deirdre Lemerle gave an overview of the year presenting the Centre’s highlights and achievements, followed by the presentation of awards in recognition of members’ outstanding achievements during the year.

Congratulations to all award recipients.

- **Award for the Highest Research Income** - Professor Leslie Weston
- **Award for highest Number of Publication Points in 2013** - Dr Anantanarayanan Raman
- **Outstanding Media Coverage and Research Promotion Award** - Ms Soumi Paul Mukhopadhyay and Professor Jim Pratley
- **Award for Best 2014 Publication (PhD Student)** - Ms Stephanie Fowler
- **Award for Best 2014 Publication (Post-Doctoral Fellow)** - Dr Julie Pattemore
- **Award for Best 2014 Publication (Senior Researcher)** - Dr Harsh Raman
- **Multi-disciplinary Team Award** - Plant and Animal Toxicology Group
Private Sector Engagement and Project Development Award - Associate Professor Chris Blanchard

International Reputation and Leadership Award - Professor Peter Wynn

Visiting Chinese scientist learning about livestock systems and grazing management

Plant ecologist Dr Yingxin Huang, Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences, Changchun, China is visiting Wagga and the Graham Centre for three months to learn more about the Graham Centres’ livestock systems and grazing management research and gain skills in this area.

On his first day he received a presentation on a current MLA-sponsored research project focussed on increasing meat production in mixed-farming systems by including grazing crops in the feedbase. Shawn McGrath presented data from the first two years of the project at Wagga Wagga, which includes Dorper and crossbred lamb production systems and the potential use of novel legume species for finishing lambs in late-Spring, and described the research protocols used in this project. This included discussion with Graham Centre members Associate Professor Michael Friend (Charles Sturt University) and Graeme Sandral (NSW Department of Primary Industries) on the current experiment where growth rates of lambs grazing a number of established and novel pasture species are being compared, including French serradella, bladder clover, forage brassica, lucerne, lucerne and phalaris, and chicory and arrowleaf pastures.

Dr Yingxin Huang will be involved with the Graham Centre project and has already assisted Dr Edward Clayton with the collection of blood samples from lambs grazing different pasture species for fatty acid analysis. Dr Huang will be involved with other research activities including weighing of livestock with Shawn McGrath and sampling for dry mater production and botanical composition with Shane Hildebrand.

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Dr Yingxin Huang is visiting the Graham Centre for three months, learning about grazing management and livestock systems. He is working with the Centre’s pasture team (L to R) Graeme Sandral, Ed Clayton (NSW DPI), Yingxin Huang, Isaac James, Michael Friend, Shawn McGrath (CSU) and Shane Hildebrand (NSW DPI). Photo: Guangdi Li
The Federal Minister for Agriculture, The Hon Barnaby Joyce MP and Federal Member for Riverina, The Hon Michael McCormack MP, visited the Graham Centre for Agricultural Innovation in Wagga Wagga to see first-hand research to enhance Australian agriculture.

The visit, on 6 November, followed an invitation to the Minister from Centre Director Professor Deirdre Lemerle extended through the Federal Member for Riverina The Hon Michael McCormack, MP.

Minister Joyce visited research facilities including the phytotron, glasshouses and National Life Sciences Hub. He spoke with academics and PhD students involved in a wide-range of research from the development of new hard-seeded legume options, to biosecurity and pest management, and improving the market value of chickpeas.

Talks were also held about agricultural education with Professor Jim Pratley who compiled the Agricultural Education and Training in NSW report for the NSW Government in 2013.

US Consul General visit
Linkages with the United States have been strengthened with a visit by Mr Hugo Llorens, the US Consul General, to the Graham Centre for Agricultural Innovation and Charles Sturt University on 30 October. The Consul General met with a number of the Centre’s PhD students and researchers, exploring the Centre’s key research areas and benefits to the agricultural industry both nationally and internationally.

CSU agriculture research on show
The Federal Minister for Agriculture, The Hon Barnaby Joyce MP and Federal Member for Riverina, The Hon Michael McCormack MP, visited the Graham Centre for Agricultural Innovation in Wagga Wagga to see first-hand research to enhance Australian agriculture.

The visit, on 6 November, followed an invitation to the Minister from Centre Director Professor Deirdre Lemerle extended through the Federal Member for Riverina The Hon Michael McCormack, MP.
Genome based detection of antifungal bacteria: a breakthrough towards sustainable soilborne disease management

The world is currently occupied by 6.5 billion people and is expected to peak at 9.5 billion by the year 2050. Agricultural scientists are now being challenged to feed an extra 3 billion people over the next 35 years. Humanity needs to further develop environmentally sound and sustainable technologies that maintain or enhance production efficiency in the face of a changing climate.

The over-dependence of farming systems on synthetic fertilisers and pesticides presents economic and environmental problems, both locally (e.g. contamination of drinking water) and globally (e.g. through increased emissions of greenhouse gases). Despite such problems, it is well recognised that high productivity systems will be needed to meet the material, energy, and food demands of the coming century.

One approach to reducing agricultural dependence on synthetic chemicals while maintaining high levels of productivity is to use microorganisms to provide similar services. For example, environmentally friendly bacteria can suppress economically important plant diseases and enhance crop yield through plant growth promotion. But detection of such bacterial species from rhizosphere using traditional direct dual culture methods is laborious, time consuming and unrealistic. Molecular techniques such as marker assisted selection approaches have provided enormous opportunity to screen and select potential novel bacterial species having biocontrol properties.

An investigation, searching for potential bio-control agents belonging to the Bacillus species from canola rhizospheres, has been conducted at Charles Sturt University, Wagga, NSW. Almost 100 bacterial strains were isolated and screened through DNA markers to identify isolates previously associated by molecular community profiling studies with plant health promotion. Upon extraction of genomic DNA from stacked isolates, bacterial populations of interest were targeted using gene specific primers and positive strains were selectively isolated. Restriction Fragment Length Polymorphism analysis was performed with two enzymes, MspI and HhaI, to identify the most genotypically distinct strains. The marker selected strains were then identified by 16S sequencing and phylogenetically characterized. Finally, the selected strains were tested in vitro to evaluate their antagonism against Sclerotinia sclerotiorum and Leptosphaeria maculans on Potato Dextrose Agar.

The results demonstrated that all positive strains recovered have significant inhibitory effect against S. sclerotiorum. Repeated application of this method in various systems provides the opportunity to more efficiently select regionally-adapted pathogen-suppressing bacteria for development as microbial biopesticides.
Mohd Kamal recently presented his findings at the 8th Australasian Soil Borne Disease Symposium, Hobart, Tasmania.

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Olive: A natural medicine in Alzheimer’s disease

Alzheimer’s disease involves not just one faulty biochemical function within brain cells but a collection of enzyme disorders. Collectively, these abnormalities in enzyme functions cause progressive brain damage and lead to dementia and memory loss. To be exact, the discovery of a protease enzyme called beta-secretase-1, which acts by trimming off a protein protruding from a brain cell. This small snip is the first rate limiting step in the build up of microscopic knots of debris known as amyloid that are toxic to brain cells. Beta-secretase-1 inhibitors are an even higher-stakes bet than usual in the field of neuroscience, due to strong support when it comes to inhibiting the build up of amyloid protein.

Since its identification in 2000, inhibitors covering many different structural classes have been designed and developed. Greatly reducing amyloid levels through synthetic beta-secretase-1 inhibitor gives rise to harmful side effects such as liver toxicity and retinal pathology.

Results from our study showed that olive biophenols significantly inhibit the beta secretase-1 which could be a promising natural compound against Alzheimer’s disease. Graham Centre PhD student Syed Haris Omar presented his results at the 74th International Pharmaceutical Federation (FIP) World Congress of Pharmacy and Pharmaceutical Sciences Conference in Bangkok, Thailand during September.

Syed also won the ‘International Pharmacy Award 2014’ and was presented with his award at the conference.

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Strengthening collaborations with China

Associate Professor Paul Prenzler visited Professor Zhong Haiyan at Central South University of Forestry and Technology, Changsha, China, from 23-29 September. The visit was to present a seminar on “The role of analytical chemistry in food quality and health - An exploration of olive products”, to discuss potential collaboration on vegetable oil chemistry, and joint post-graduate supervision. Prof Zhong has twice visited CSU and our collaboration has extended for more than 10 years.

The Chinese government funded the trip through a grant to Prof Zhong. Previously Paul was awarded an Australia-China Special Fund grant to support Prof Zhong’s travel to Australia.

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Using silicone to increase grapevine attractiveness to predators

Dr Olivia Reynolds attended the 6th International Conference on Silicon in Agriculture (ICSA), Stockholm, Sweden, 24 August - 1 September. Olivia presented an oral (co-authored by Vanessa Connick, Geoff Gurr, Aaron Simmons, Yann Guisard, Min An, Helen Nicol (CSU) and Jian Liu and Ren Sen Zeng (Fujian Agricultural and Forestry University) titled ‘Silicon alters the volatile profile of pest-infested grapevines and increases their attractiveness to predators.’

Prof Prenzler and colleague Dr April Cao visited an experimental camellia grove in China, where new varieties of Camellia oleifera, from which the oil is extracted from the seeds are being trialled.

Graham Centre PhD student Syed Haris presented his research findings showing olive biophenols could be a promising natural compound against Alzheimers disease.
Attendance at the ICSA has placed Olivia in a better position to address the practical issues relating to silicon and plant defence, particularly induced plant defence. Olivia has fostered existing contacts and established new contacts with internationally renowned university, government and industry experts in silicon and plant defence, notably enhanced disease and insect pest resistance, improved tolerance to abiotic stress (e.g. drought, salinity), climate change factors, silicon transporters and mechanisms of induced plant defence. For example, discussions with several colleagues including contacts made while attending the conference, has led to the development of a research proposal that will benefit industry with an environmentally-friendly and sustainable control option.

This visit has and will continue to allow Olivia to assimilate the latest ideas into her current work in this area, which will ultimately lead to improved crop management and more efficient and effective pest management under Australian conditions. Sustainable and environmentally friendly control measures, such as the use of crop amendments including silicon, will greatly assist in ensuring market access for the Australian agricultural/horticulture industries to both national and international markets and long-term sustainability of the industry.

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Prospecting in established cereal cropping ecosystems for microbial enemies of root lesion nematodes

In May, PhD student Kylie Crampton attended and presented at the 6th International Congress of Nematology in Cape Town, South Africa. Held once every six years, this specialist conference brought together researchers and companies working in the field of nematology.

Kylie said the breadth and depth of research discussed was amazing and significantly enhanced her knowledge of a broad range of nematodes, their morphologic and genetic characteristics, and their interactions with other organisms.

Kylie’s presentation titled “Prospecting in established cereal cropping ecosystems for microbial enemies of root lesion nematodes” was well received by the nematology community, stimulating good discussion both during and following the session. It promoted her research amongst the large biocontrol group present, and permitted conversation about the challenges and potential solutions to common issues.

There were many opportunities to network with and build linkages with other nematologists...challenges such as riding bicycles through pouring rain, and climbing mountains in near-freezing weather were invaluable for bringing the young and old, established and up-and-coming together!

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Keep up to date with the Graham Centre on social media ...

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https://www.facebook.com/GrahamCentreForAgriculturalInnovation?ref=hl
2014 Honours Roll


Raman A (2014). Edward Green Balfour (1813-1889) and his contributions to Indian agriculture and forestry. *Current Science*, 106, 1594-1600.


“*A good scientist (or student) knows the right answers. A great scientist (or student) knows the right questions.*”

Author unknown


### 2014 Graduations

Congratulations to all Graham Centre students who have recently graduated.

#### Doctor of Philosophy

**John Broster** - Design and characteristics of shelter belts and their influence on survival of new born lambs

New born lamb survival can be greatly reduced by cold, wet and windy conditions. Providing shelter from wind can increase survival levels. Experiments demonstrated the type and configuration of shelter influences contact time between ewes and their lambs, potentially impacting on survival. The probability of poor weather was shown to vary with location and lambing time, and providing shelter was demonstrated to be economically viable only at some locations for specific lambing times, unless the cost of shelter is low.

**Randy Adjonu** – Whey protein peptides as dual-functional ingredients in food nanoemulsions

Bioactive compounds can provide health benefits to consumers. Whey protein peptides can aid in food manufacture as emulsifiers, whilst also potentially providing antioxidant and antipertensive properties. The findings of the research have great commercial significance for the food and pharmaceutical industries, and may help in the design and production of nanoemulsion systems to provide delivery of other bioactive compounds to improve the health of the consumer.

**Adeola Alashi** – Dual functional properties of canola meal protein hydrolysates

The opportunity for utilising canola meal protein as a food ingredient for human consumption was explored in this study. Enzymatic digests of the meal proteins were found to have potentially valuable antioxidant and blood pressure lowering properties, and these hydrolysates could also hinder the formation of fat cells. Subject to further development, these findings offer the prospect of producing new food ingredients from what is currently a low value by-product and thereby increasing the economic return from canola cropping systems.

**Estela Pasuquin** – Response of rice (*oryza sativa* L.) cultivars to altered climatic conditions, particularly elevated temperature

This study aimed to understand the responses of a range of rice cultivars to elevated temperature at varied light intensity and relative humidity. This was to identify cultivar traits that better adapted to a changing climate. Cultivars better adapted to climatic extremes, maintained...
high rates of stomatal conductance, photosynthesis and transpiration, and had higher leaf area and higher total biomass production. Further analysis indicated that plant attributes including more vigorous leaf and stem growth, and higher concentrations of stem sucrose contributed to better adaptation by cultivars.

Sunil Singh – Prioritisation of pest species for biosecurity risk assessments: a case study using plant-parasitic nematodes

Exotic plant pests and pathogens pose varying levels of biosecurity risks to agricultural production. Prioritising the risks from numerous species in a systematic and timely manner is essential for biosecurity decision making. Dr Singh’s research developed and applied a novel approach to prioritising the biosecurity risks from plant-parasitic nematodes to Australian agriculture. The study identified a wider range of nematode species of concern to Australia than previously identified by Australian biosecurity authorities. His research will help in biosecurity decision making.

Master of Philosophy

Cina Vipin – Identification of loci associated with Pleiochaeta Setosa in white lupin

Bachelor of Science (Honours)

With Honours Class 1
Karen Alpen

With Honours Class 2 Division 1
Sri Barber

With Honours Class 2 Division 2
Louise Sundermann

Bachelor of Agricultural Science (Honours)

With Honours Class 1 and the Agricultural Science Medal
Leah Garnett

With Honours Class 1
Brigette Ryan

Diona Schmutter

Bachelor of Animal Science (Honours)

With Honours Class 2 Division 1
Kristy Barnes

Bachelor of Veterinary Biology/Bachelor of Veterinary Science (Honours)

With Honours Class 2 Division 1
Michelle Eastwood

Left to right: Prof Deirdre Lemerle, Assoc Prof Chris Blanchard, Dr Adeola Alashi and Prof John Mawson. Photo: Nicole Baxter

Dr Randy Adjonu and Prof Deirdre Lemerle. Photo: Nicole Baxter
Sheep production on biserrula

Research at Charles Sturt University (CSU) is working towards quantifying and improving the production potential of sheep grazing biserrula-based pastures in southern New South Wales and Western Australia.

The projects are evaluating productivity and developing management guidelines to mitigate against possible outbreaks of photosensitisation in animals grazing this important legume species. CSU researchers are working extensively with colleagues in Western Australia, specifically Professor John Howieson, Dr Brad Nutt and Dr Angelo Loi, founders of this species in Australia, in their endeavours.

Biserrula is a resilient hardseeded annual legume that is well suited to use in crop-pasture rotations as an on-demand break option due to its ability to regenerate without the need for re-sowing following a cropping phase. The time between initial sowing and re-emergence can be considerable with the re-emerging pasture exhibiting vigorous early season growth. In NSW, on-farm research has shown biserrula is capable of regenerating after four years without seed-set. In WA, strong regeneration has been recorded seven years after initial seed-set.

Using biserrula as an on-demand break option in a crop-pasture rotation system significantly reduces input costs by removing the need to re-sow pasture after the cropping phase as well as allowing maximal flexibility in terms of altering the crop to pasture/crop to livestock ratio of an individual farm in a short timeframe.

Livestock performance

Agronomically there are significant benefits to including biserrula in mixed farming systems, but little information is available on the performance of livestock grazing biserrula pastures. During spring, on-farm assessment of liveweight gain was measured in prime lambs on regenerating stands of biserrula at Beckom, 100 kilometres west of Wagga Wagga. Additionally, the performance of prime lambs and merino ewes with lambs at foot was assessed in a replicated grazing experiment at CSU, Wagga Wagga. The results of both investigations show similar positive trends.

At Beckom, in early September, four week old Wiltipoll x Australian White lambs and their mothers were placed on a biserrula pasture which had regenerated after a three-year cropping phase. Average entry weight of the lambs was 10 kilograms. Biserrula accounted for 90 percent of the feed on offer at commencement of grazing, with the remainder of the pasture made up of annual ryegrass and barley grass. Average stocking rate over the duration of the grazing period (56 days) was 7.4 DSE/ha (district average grazing pressure 4 DSE/ha). At the end of the grazing period, average lamb liveweight was 30.9 kg - an average daily gain of 350 g/head/day. When split for sex, wether lambs were found to have gained an average 380 g/head/day, while ewe lambs gained 335 g/head/day.

The CSU experiment consisted of four replicates each of the biserrula varieties Casbah and Mauro. These varieties differ slightly in terms of early vigour, time to maturity and hard seed levels. Additionally, three classes of sheep were assessed simultaneously; lactating merino ewes, their lambs, and weaned prime lambs (white Suffolk cross and black Suffolk first cross suckers). The rationale for use of the pigmented and non-pigmented lambs in this study was to assess the potential of pigmentation to mitigate against clinical signs photosensitisation. Sheep were grazed for a period of six weeks commencing in late September through to the end of October (plots were in the early stages of flowering at the commencement of the experiment). The average stocking rate across the site for the duration of the experiment was 17 DSE/ha. In addition to sheep grazing the biserrula plots, the remainder of the merino ewe-lamb flock was grazed on naturalised pastures at CSU (predominately annual ryegrass, barley grass, sub clover and volunteer legumes), were weighed to compare performance.

Merino lambs gained an average 265 g/head/day, merino ewes 210 g/head/day and crossbred lambs 285 g/head/day. There were no apparent difference between weight gain for any group grazing Mauro or Casbah. But their weight gains increased in plots where there were other pasture species, predominately annual ryegrass. In plots where annual ryegrass was present as a volunteer species, the effects of photosensitisation can be almost completely avoided in lambs with significant pigment in the skin of their face and ears.

Photo: Belinda Hackney
of feed on offer), weight gains were up to 30 g/head/day greater than the average weight gain suggesting presence of other species in the pasture, even at relatively low levels, gives improved growth performance over and above that observed on biserrula alone. Growth rates of merino stock on biserrula plots were in stark contrast to the same mob grazing naturalised pastures where in the same period ewes had lost weight (-75 g/head/day) and lambs grew at a much slower rate (120 g/head/day).

Photosensitisation occurred in both trials, with 4% of lambs in the on-farm grazing experiment at Beckom showing evidence of mild photosensitisation (mild skin lesions primarily on the ears). At the time of final weighing, these lambs were resolving, importantly their body weight was no different to the average of the unaffected lambs. At Wagga, a gradation of effect was observed due to the very high proportion of biserrula in some plots (>98%). Where biserrula contributed more than 95% of the feed on offer, mild (superficial tissue loss and swelling of ears and/or muzzle) to moderate (more persistent lesions of the ears) photosensitisation was observed in up to 100% of white crossbred suckers and merino ewes. Interestingly, on the same plots only mild changes were noted in the merino lambs (50% or less of animals). In plots with greater than 10% volunteer species, virtually no animals were affected, and those few (<10% identified) showed only very mild clinical signs.

The results suggest that biserrula enhances growth rates for both meat and wool sheep, with biserrula mixed pastures being optimal as a grazing option. The effects of photosensitisation can be almost completely avoided in lambs with significant pigment in the skin of their face and ears. Presence of other plant species in the pasture, even at very low levels, can also significantly reduce the incidence of photosensitisation.

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Understanding photosensitisation or toxicity in grazing animals

Congratulations to Cecile Bouveret, Graham Centre Research Associate who received the best poster award, out of 22 posters, at the recent Royal Australian Chemistry Institute Natural Products one day symposium held at Charles Sturt University, Wagga Wagga. Cecile is currently a member of the Plant and Animal Toxicology Group directed by Dr Jane Quinn and Prof Leslie Weston.

Cecile’s poster focused on her research project understanding photosensitisation or toxicity in grazing animals caused by ingestion of the pasture legume *Biserrula pelecinus*. The project is investigating cytotoxic and photosensitising activity of plant secondary products (PSPs) from biserrula on NIH3T3 fibroblast cells as a sensitive bioassay. Toxicity is impacted by different factors including lifestage of biserrula, and preservation method for plant tissue. In order to determine which PSPs are associated with photosensitisation and cytotoxicity, metabolic profiling of bioactive purified extracts is underway, using LC ESI/MS QTof. A bioassay-directed separation using thin layer and liquid column chromatography is also underway to further isolate constituents associated with photosensitisation and cytotoxicity.

Contact: Dr Cecile Bouveret, E: cbouveret@csu.edu.au
Professor Allan Curtis

**Position:** Strategic Research Professor

**Organisations:** Charles Sturt University

**Career Brief:** I joined CSU as a teacher and social researcher in 1992 after 16 years as a secondary teacher working in the Albury region. My doctoral research examined Landcare as an example of local organisations contributing to rural development and was completed in 1994. That research included work in five states as part of the first substantive evaluation of the National Landcare Program. My research evolved to embrace the range of topics needed to underpin effective regional NRM.

In 2002 I left CSU to work as a research program leader in the Australian Government’s Bureau of Rural Sciences (BRS). BRS included a range of science disciplines relevant to agriculture and during my time there we were involved in interdisciplinary research that included quantifying the costs of compensating landholders in Queensland to forgo land clearing; and the social and economic impacts of extending the no-take zone in the Barrier Reef.

In 2004 I returned to CSU as a strategic research professor. During the past decade I have also contributed to the university as the foundation director of ILWS and as a Head of Campus.

**Research and Teaching Activities and Interests:** I lead a group of social researchers examining aspects of sustainable agriculture, including biodiversity conservation on private land.

**Professional Links:**
- Member of the International Association for Society and Natural Resources
- Principal Investigator in the National Centre for groundwater Research and training
- Board member of the Australasian Journal of Environmental Management.
- I have a number of ongoing international research partnerships, including in the USA (Ohio State, Oregon State), Canada (University of Alberta) and India (Tamil Nadu Agric University).

**A Typical Day for Me Includes:** Some exercise (a run or mountain bike ride), a drive to work in Albury from the Ovens Valley or travel to meet with research partners somewhere between Tamworth and Horsham, then research-related meetings with graduate students, post docs and others.

**My Main Project at the Moment Is:** Dr Emily Mendham and I are providing social research to support and evaluate the implementation of the Australian Government’s regional delivery program projects in the Wimmera region over the next four years.

**My Favourite Part of My Job Is:** Working with smart, committed researchers and practitioners. That covers most people I meet.

**When I Am Not in the Office I Like:** that there is a farm enterprise to think about.

**When I Am Driving I Like to Listen To:** Van Morrison, Katy Perry, Spotted Dog amongst others. But mostly I just chill out and try to interpret the landscape.

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Allan Curtis chilling out and relaxing on the Gold Coast.
Lynne Appleby, PhD Student

**Supervisors:** Dr Joanne Connolly (CSU), Dr Jane Quinn (CSU) and Dr Jan Lievaart

**Thesis Title:** Plant Essential Oils as Potential Antimicrobials in the treatment of Bovine Mastitis

**Career and Studies Till Now:**
- Bachelor Science (Plant Biotechnology) (2005)
- Casual demonstrating and marking for a number of subjects in the School of Animal & Veterinary Sciences, Charles Sturt University
- Technical Officer, National Wine & Grape Industry Centre (NWGIC) Charles Sturt University (2007 - 2011)
- Laboratory Technician, Rockdale Beef, Yanco (2001 - 2007)

**Currently Studying:** Doctorate of Philosophy (PhD) by research through School of Animal & Veterinary Science Charles Sturt University, Wagga Wagga

**Research Interests:** My general interests are in ensuring a sustainable agricultural sector throughout Australia. I am particularly interested in animal and plant diseases and their control using renewable resources that provide a clean product for consumers.

**A Typical Day for Me Includes:** Morning taxi run for the family, review of emails followed by planning for the day’s work, conducting laboratory experiments for my project, evening taxi run for the family, relaxation, catching up on current literature and writing up.

**My Main Project at the Moment Is:** At the present time my work is focused on establishing cell cytotoxicity for the natural compounds I am studying.

**My Favourite Part of My Studies Is:** I enjoy learning new techniques and performing laboratory experiments. For me the whole process of learning is an essential part of who I am.

**When I Am Not Studying I Like To:** Spend time with my family and friends. Relax with a good book and a glass of red wine.

**When I Am Driving I Like To Listen To:** I enjoy a wide range of music across a number of genres and eras. When driving my go to choice would be music from the 80s however this is dependent on which family members are with me at the time - teenagers have rather different likes to me!

Autumn Edition of the Innovator

The Autumn Edition of *the Innovator* will be available March 2015. Submission of articles for this edition close on **Friday 27 February 2015**.

Please email articles to Toni Nugent.
EVENTS CALENDAR

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<td>4 Mar</td>
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<td>Convention Centre, CSU, Wagga Wagga</td>
<td>Toni Nugent E: <a href="mailto:tnugent@csu.edu.au">tnugent@csu.edu.au</a></td>
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<td>12 June</td>
<td>Science and Agriculture Enrichment Aday</td>
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<td>2 Sep</td>
<td>Graham Centre Cropping and Pasture Systems Field Forum</td>
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<td>Toni Nugent E: <a href="mailto:tnugent@csu.edu.au">tnugent@csu.edu.au</a></td>
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Best wishes for a safe, happy Christmas and New Year

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