Welcome to the Autumn edition of *the Innovator*.

Since the Graham Centre alliance between Charles Sturt University and NSW Department of Primary Industries was formed in 2005, we have achieved a number of successes including:

- National Life Science Hub (NaLSH) and laboratory facilities
- Increase in Research by Higher Degree students from 20 to 100
- Partnerships with Farming Systems Groups
- Australian Research Council (ARC) Industrial Transformational Training Centre Functional Grains Centre
- Strong collaborative teams and multi-disciplinary research in weeds, animal integration with livestock and cropping enterprises.

This is my final ‘From the Director’ and I would like to take the opportunity to thank the Graham Centre Team; Toni Nugent, Maree Crowley, Raylene Heath and Sharon Fuller for their efforts and dedication over the past years.

Thank you also to the Centre’s Industry Advisory Committee and Board of Management for your direction and strong support.

I welcome Associate Professor Michael Friend to the role of Acting Director and wish him, members and the Centre’s team all the best for the Centre’s next phase. It is an exciting time to be at the forefront of agricultural research.

I believe the future is very optimistic for both government and private sector support for profitable food and fibre production systems for regional, national and global markets.

Best wishes and enjoy reading *the Innovator*.

Professor Deirdre Lemerle
Erosion and soil stability risk of incorporating stubble with fertiliser to increase soil organic carbon

There is currently some evidence to suggest that incorporating stubble through cultivation with fertiliser addition can increase carbon sequestration in soil. If this method of increasing soil organic carbon is going to be adopted by growers, research is needed to address the concerns of erosion and the negative impact on soil structural health that may occur with such management.

Mr Gregory Lord, a fourth year Agricultural Science student is investigating changes in soil structure and erosion risk of soil that has been cultivated to incorporate stubble with fertiliser compared to soil that has had stubble retained. A series of field-based experiments and measurements will be conducted utilising existing grower field trials that have been established under the Graham Centre’s Department of Agriculture funded project “Enabling Landholders to Adopt Profitable and Sustainable Carbon Cropping Practices”.

The trail sites comprise large scale plots (paddock length, multiple header pass width) in a replicated experiment. In field rainfall simulation will be conducted to measure any difference in erosion between treatments. The structural stability of the soil and infiltration rates will be determined in field and laboratory analyses. Changes in soil organic matter will be determined and related to erosion data to determine casual mechanisms.

Greg has been awarded a GRDC Undergraduate Honours Scholarship ($10,000) in support of his Honours research in 2015, and a top-up scholarship of $2000 from the Graham Centre. His Honours research will be conducted under the supervision of Dr’s Sergio Moroni (Main Supervisor, CSU), Jason Condon (Co-Supervisor, CSU) and Iain Hume (Co-Supervisor, NSW-DPI)

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Fostering relationships with industry

Professor Alan Curtis, Graham Centre member, Charles Sturt University, Albury has been appointed to the newly formed Local Community Advisory Group with Murray Local Land Services (LLS). Alan has extensive experience and expertise in community group involvement in Natural Resource Management.

The Local Community Advisory Group will provide advice and feedback on processes for the Murray LLS to support and work collaboratively and consultatively with community. The group provides a link between the Murray LLS, their customers and stakeholders, ensuring projects and services target the needs of the community.
## 2015 Honours Scholarships

<table>
<thead>
<tr>
<th>Student</th>
<th>Supervisors</th>
<th>Project Title</th>
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</thead>
<tbody>
<tr>
<td>Rowan Alden* (GRDC Scholarship)</td>
<td>Ben Stodart, Gavin Ash</td>
<td>The effect of climate variability on emerging pathogens in cereal rotations</td>
</tr>
<tr>
<td>Matthew Dunn* (Holbrook Landcare Network Scholarship)</td>
<td>Jason Condon</td>
<td>TBA</td>
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<tr>
<td>Jake Fountain</td>
<td>Marta Hernandez-Jover, Luzia Rast, Rob Woodgate</td>
<td>Biosecurity knowledge, attitude and practices of commercial sheep producers in NSW and Victoria</td>
</tr>
<tr>
<td>Brooke Kaveney</td>
<td>Jason Condon, Sergio Moroni, David Gale</td>
<td>Effects of salinity on rice production</td>
</tr>
<tr>
<td>Brenton Kilby</td>
<td>Shokoofeh Shamsi, Matthew McLellan</td>
<td>Optimising diagnostic techniques featured in the isolation, identification and risk evaluation of common production internal and external parasite</td>
</tr>
<tr>
<td>Susie Kracht</td>
<td>Bing Wang, Peter Wynn</td>
<td>Lactoferrin as a new feed additive reduces incidence of intrauterine growth restriction (IUGR), improves milk production and optimises growth and development of piglets</td>
</tr>
<tr>
<td>Kayla Kopp</td>
<td>Michael Friend, Susan Robertson</td>
<td>The effect of condition score and barley grain supplementation to twin bearing merino ewes on lamb birth weight, growth rate and survival</td>
</tr>
<tr>
<td>Greg Lord* (GRDC Scholarship)</td>
<td>Sergio Moroni, Jason Condon, Iain Hume</td>
<td>The erosion and soil stability risk of incorporating stubble with fertiliser to increase soil organic carbon</td>
</tr>
<tr>
<td>Marie Nakai</td>
<td>Padraig Strappe, Chris Blanchard, Laura Pallas</td>
<td>Bioactive effects of rice extracts on adipocyte cellular differentiation and metabolism</td>
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<tr>
<td>Aurelie Quade</td>
<td>Gavin Ash, Ray Cowley</td>
<td>Efficacy of multigene resistance to Sclerotinia in canola</td>
</tr>
<tr>
<td>Meg Ryan</td>
<td>Chris Blanchard, Hassan Obied, Janice Sangster</td>
<td>The effect of different cooking methods on the antioxidant content of coloured rices</td>
</tr>
<tr>
<td>Chloe Steventon</td>
<td>Andrew Peters, Shane Raidal, Jane Quinn</td>
<td>A case series of Panicum gilvum toxicoses and subsequent photosensitivity in sheep, goats and wildlife in the Riverina</td>
</tr>
</tbody>
</table>

* Partly funded by external source.

## 2015 Internships

<table>
<thead>
<tr>
<th>Student</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Javier Atayde</td>
<td>Sergio Moroni, Jason Condon</td>
</tr>
<tr>
<td>Tabby Brooks</td>
<td>Thiru Vanniasinkam, Chris Blanchard</td>
</tr>
<tr>
<td>Jennifer Connor</td>
<td>Jane Quinn</td>
</tr>
<tr>
<td>Alexandra (Allie) Cornell</td>
<td>Marta Hernandez-Jover, Rob Woodgate</td>
</tr>
<tr>
<td>Rebecca Nees</td>
<td>Geoff Gurr, Olivia Reynolds</td>
</tr>
<tr>
<td>Sally Poole</td>
<td>Sergio Moroni, Jason Condon</td>
</tr>
</tbody>
</table>
Members of the Brazilian farmer cooperative, Cooperativa Agraria Agroindustrial (http://www.agraria.com.br) visited the Rhizolysimeter at Charles Sturt University in January. The farmers were particularly interested in gypsum as an ameliorant of sub-soil acidity and the contrasting recommendations in Australia and Brazil. From the Riverina, the group travelled to Western Victoria before boarding a flight to New Zealand to look at dairying in the South Island for three days.

Graham centre PhD student Naveed Aslam attended the Joint ISNH/ISRP International Conference in Canberra during September 2014, and presented two papers on his PhD research. His papers were titled ‘Pattern of partitioning of aflatoxins from feed to urine and its effect on serum chemistry in Nili-Ravi buffalo heifers’ (oral presentation) and ‘Transfer of aflatoxins from highly contaminated feed to milk and effect of mycotoxin binder on transfer rate in Nili-Ravi buffaloes’ (poster presentation).

Development of quality control protocols for implementation of smallholder dairy farmers

Graham centre PhD student Naveed Aslam attended the Joint ISNH/ISRP International Conference in Canberra during September 2014, and presented two papers on his PhD research. His papers were titled ‘Pattern of partitioning of aflatoxins from feed to urine and its effect on serum chemistry in Nili-Ravi buffalo heifers’ (oral presentation) and ‘Transfer of aflatoxins from highly contaminated feed to milk and effect of mycotoxin binder on transfer rate in Nili-Ravi buffaloes’ (poster presentation).
Opening new avenues for international collaboration

A two month renewed research stay in Germany has proved productive for Dr Ketema Zeleke from the School of Agricultural and Wine Sciences, Charles Sturt University. Ketema was hosted by Dr Claas Nendel, Acting head of the Institute of Landscape System Analysis, Leibniz Centre for Agricultural Landscape Research - ZALF. His stay was sponsored by the Alexander von Humboldt Foundation during November-December 2014.

During his stay, in collaboration with Dr Nendel, Ketema analysed wheat experimental data from his project and conducted modelling using the FAO AquaCrop program. He also wrote and submitted a paper for publication, in conjunction with Dr Nendel, to the Journal of Agricultural Water Management entitled ‘Evaluation and Application of the FAO AquaCrop model for two wheat cultivars under different field management conditions in south eastern Australia’. Their paper is currently under review.

Using APSIM, another paper entitled ‘Analysis of options for increasing wheat (Triticum aestivum L.) yield in south eastern Australia: the role of irrigation, cultivar choice and time of sowing’ (Authors: Ketema Zeleke, Claas Nendel, Peter Martin and Eric Koetz) was finalised and the final version is being reviewed by the co-authors before submission to the Journal of Agricultural Science.

Ketema’s stay in Germany has opened further opportunities for collaboration with his ZALF colleagues. He gained experience with new agro ecological model ‘MONICA’, developed by Dr Nendel, and widely used by the students and staff at ZALF. Ketema and his international colleagues plan to run similar experiments in Australia and modify the model for Australian conditions.

Ketema has been advised that, as an Alexander von Humboldt Foundations Fellow, he is eligible to host a German scientist or post-doc for a period of up to two years in Australia through the Alexander von Humboldt Foundation’s Fellowship. He is looking at opportunities to get a post-doc from ZALF, Germany, for a research stay working within the School of Agricultural and Wine Sciences, CSU.

Ketema appreciated the team approach of the staff at the institute and thanked the generous support of the Alexander von Humboldt Foundation that has opened new avenues for collaboration with German colleagues in his research field.

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Interactions of manganese and iron with faba beans in soil water pores after rice harvest

The options for crops following rice is a topic of considerable interest to farmers. Research by PhD student Shamsul Haque has highlighted the fate of metal ions available in flooded/saturated rice cultures, showing that the history of rice crops influences the availability of manganese (Mn) and iron (Fe). In addition, changes in manganese concentrations were influenced by faba bean plants. Shamsul’s research has found the growth of faba beans is greater in post-saturated soil compared to post-flooded soil.

Two soil types were compared (red sodosol and grey vertosol) with sampling at four distinct depths (2.5, 7.5, 15 and 25 cm). The results showed that Mn and Fe concentrations had relatively stable lag phases of up to six weeks after drainage, and then declined at various
rates depending on soil type, water management and crop regimen. Profile studies showed a maximum concentration of Mn (9.2 mg/L) at 25 cm in sodosol, while the maximum Fe (47.4 mg/L) occurred at 25 cm in red sodosol. Mn concentrations remained high for a longer time in the presence of faba beans compared to the controls. The presence of a previously grown rice crop influenced the fate of Mn and Fe, including decreases in both post-saturated soils, and increases in both (in the majority of cases) post-flooded soils. These changes suggest a continuation of anoxia maintained by rice soil, mostly by its mat root system.

Surprisingly, faba beans did not emerge in soils from flooded rice crops, but did from soils that had been flooded without rice plants. Regrowth of rice tillers was significantly higher (48-89 %) in post-saturated soils compared to post-flooded soils, and faba bean total dry matter production was also 65 % greater in post-saturated soils than post-flooded soils.

Contact: Mr Shamsul Haque
E: khaque@csu.edu.au, T: 0421 238 528

Harnessing Separation Science to Improve Food, Beverages and Health

Using analytical chemistry to understanding oil quality, oil processing, storage and domestic use was the topic of research when Associate Professor Paul Prenzler gave an oral presentation at the Royal Australian Chemistry Institute’s National Congress, in Adelaide, December 2014. While at the conference Paul was able to network with researchers from Monash and Macquarie Universities who have interests in peptides and bush medicines, providing opportunities to link in to the Graham Centre, as well as the ARC Industrial Transformation Training Centre for Functional Grains.

Paul planned a research collaboration with colleagues at Macquarie University to investigate Wiradjuri medicinal plants. This resulted in Paul being named as an Associate Investigator on a NHMRC application to be submitted by the end of March. The outcome of this collaboration will be stronger links with the Wiradjuri community and opportunities to develop a research program at CSU around finding bioactive compounds (possibly with food applications).

Contact: Assoc Prof Paul Prenzler
E: pprenzler@csu.edu.au, T: 02 6933 2978

Vegetable oil quality was featured in Associate Professor Paul Prenzler’s talk at the RACI National Congress in Adelaide. Photo: Clare Flakelar
Research and education for rural development and food security to build resilient rural environments: Australian and Indian perspectives

Australia and India are both significant food producing countries with contrasting rural structures. However, each can learn a lot from the other and the potential for research and learning collaboration has not been effectively harnessed. In addition to technical efficiency food production in both countries depends on resilient rural communities.

The Graham Centre for Agricultural Innovation in association with Indian partners is holding a two day symposium titled ‘Research and education for rural development and food security to build resilient rural environments: Australian and Indian perspectives’. The symposium will be held in New Delhi in April. The event will showcase the strengths and benefits from collaboration as demonstrated by the various organisations.

The symposium will consider the issues and develop processes to overcome barriers as a step to establishing a virtual centre to advance mutual understanding and co-operation for rural development.

In doing so the symposium will harness the knowledge and skills of participants from India and Australia who are leaders in their fields, and are influential in research and its application in both the field and policy. It will build new and expand current relationships between Australian and Indian researchers, practitioners, educators and farmers. In addition, members of various development and funding bodies have been invited to participate, thereby expanding and deepening the knowledge of those organisations of the relationships between India and Australia and the knowledge of both countries.

A shared cyberspace between India and Australia on questions of rural development in association with community and local knowledge has the potential to chart a new philosophy and praxis of developmental futures for both countries; futures beyond the ones immediately and obviously available.

The centre will build an innovative approach to dealing with distance including physical distance and differences of perspective incorporating cultural, organisational, discipline and language distances. Building a virtual platform as an initial step will enable engagements to cross the physical distance with the next challenge being to develop processes to cross the other distances.

Symposium themes

The symposium will provide examples from current collaborative projects and activities to illustrate the exciting opportunities, and explore approaches to enhance those opportunities. The three themes for the symposium are:

1. Existing collaboration activities and approaches
2. Building knowledge together - farmers, practitioners and academics as co-researchers
3. The potential of collaboration - benefits issues and challenges - building a new future in collaboration and communication

Symposium outcomes

The symposium will develop the key ideas and themes for the virtual centre; a workshop to be held the following day will develop the processes for its establishment, management and funding. Attendance at the symposium is open while participation in the workshop is by invitation.

In addition, on-line proceedings will be produced from the symposium.

The symposium has been developed by partners in India and Australia, including:

- The Graham Centre for Agricultural Innovation, CSU
- The Centre for Development Practice, Ambedkar University Delhi, India
- PRADAN, a leading Indian NGO
- University of Western Sydney

The symposium is supported by the Commonwealth of Australia through the Australia-India Council (AIC) of the Department of Foreign Affairs and Trade through the project ‘Advancing Mutual Understanding and Cooperation for Rural Development’.

Contact: Assoc Prof Gavin Ramsay
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https://www.facebook.com/GrahamCentreForAgriculturalInnovation?ref=hl
IN THE LIMELIGHT

Dr Edward Narayan

POSITION: Lecturer in Veterinary Physiology

ORGANISATIONS: Charles Sturt University

CAREER BRIEF: I recently joined the School of Animal and Veterinary Sciences as Lecturer of Veterinary Physiology. Prior to arriving at CSU, I held the position of Research Fellow at Griffith University, Gold Coast and the University of Saskatchewan, Saskatoon, Canada. Before that I undertook short research stints/ postdoctoral research fellowship trainings in New Zealand (Landcare Research Centre, Auckland and Massey University, Palmerston North) and India (Australian Academy of Science Early Career Fellowship, University of Pune, Maharashtra State). I completed a pioneering PhD Biology from the University of the South Pacific in 2009 studying the reproductive and stress endocrinology and breeding biology of amphibians. I have developed non-invasive enzyme immunoassays and radio-immunoassays for the evaluation of reproductive hormonal cycle and stress hormone responses to environmental stressors in amphibians. I was the first person to have elucidated the unique direct embryonic developmental characteristics of the endangered ground frogs from Fiji. Since coming to Australia, I have led various exciting research projects to evaluate physiological stress, health and welfare of iconic wildlife such as the Koala, the Woylie and the Greater Bilby.

RESEARCH AND TEACHING ACTIVITIES AND INTERESTS: I am actively involved in the scientific community and my research/teaching focuses on comparative vertebrate physiology, stress endocrinology, reproductive endocrinology, animal welfare, conservation biology and domestic species physiology. I utilise a number of novel techniques to explore the organism’s response to environmental constraints.

PROFESSIONAL LINKS: I am a member of the:
- International Association of Stress Physiologists
- Society for Experimental Biology
- Asia and Oceania Society for Comparative Endocrinology
- International Society for Wildlife Endocrinology
- Society for Conservation Biology Board of Governors, Oceania.

I also have strong international collaborations and present my research at various international platforms.

A TYPICAL DAY FOR ME INCLUDES: My morning starts with a quick check of overnight e-mails, workout and a short drive to University to take my early morning lecturers or lab classes. The day elongates into meetings with colleagues locally and abroad (through video conferencing), student consultations, monitoring Honours/PhD student research work and others. The evening is spent taking my baby boy for a stroll in the park and a bit of gardening.

MY MAIN PROJECT AT THE MOMENT IS: The physiology of stress in both native wildlife and domesticated species in Australia.

MY FAVOURITE PART OF MY JOB IS: The joy of sharing knowledge and enthusiasm for animal conservation and science.

WHEN I AM NOT IN THE OFFICE I LIKE: Spending quality time with my baby boy and wife; wildlife photography and travelling; indulging in great chocolate, food and wine; and gardening

WHEN I AM DRIVING I LIKE TO LISTEN TO: I mostly listen to the radio and enjoy the surreal atmosphere of Wagga.

When not working, Dr Edward Narayan likes to spend quality time with his wife and baby son.
Sue Street, PhD Student

**Supervisors:** Dr Gaye Krebs (CSU) and Dr Ed Clayton (DPI)

**Thesis Title:** Comparison of nutrient digestibility and rumen parameters in Merino and Dorper genotypes

**Funding Bodies:**
- NSW Department of Primary Industries (Trangie)
- Meat and Livestock Australia
- Graham Centre for Agricultural Innovation

**Relevant Current Employment:** PhD student

**Career and Studies Till Now:** Bachelor of Animal Science, CSU, Wagga Wagga.

**Currently Studying:** Doctor of Philosophy, School of Animal and Veterinary Sciences

**Research Interests:** Ruminant nutrition, in particular looking at the rumen metabolism aspects of why certain breeds of sheep are more energy efficient on low quality diets.

Understanding more about production and nutrition in the ‘newer’ breeds of sheep in Australia, such as the Dorper and Australian White

**A Typical Day For Me Includes:** Walking the dog, then coming to work to analyse data and write up. Unfortunately all my practical work finished in 2014

**My Main Project At The Moment Is:** Comparing nutrient digestibility and rumen parameters in Dorper and Merino genotypes on a variety of diets. This has included two animal house studies and three grazing trials. In the final experiment I conducted, we were also looking at the energy efficiency of these animals to try and understand why the Dorper excels so much on low quality diets

**My Favourite Part of My Studies Is:** I loved working with the animals in both the grazing and animal house studies, as each day was always different and new challenges always arose. I have also been fortunate to work with some really great people.

**When I Am Not Studying I Like To:** Catch-up with friends and curl up with a good book

**When I Am Driving I Like To Listen To:** A wide variety of music and talking books on my iPod (my car radio and CD player don’t work anymore 😞).

Winter Edition of the Innovator

The Winter Edition of *the Innovator* will be available June 2015. Submission of articles for this edition close on **Friday 5 June 2015**.

Please email articles to Toni Nugent.
EVENTS CALENDAR

<table>
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<th>Date</th>
<th>What</th>
<th>Where</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 June</td>
<td>Science and Agriculture Enrichment Aday</td>
<td>Graham Centre</td>
<td>Toni Nugent E: <a href="mailto:tnugent@csu.edu.au">tnugent@csu.edu.au</a></td>
</tr>
<tr>
<td>10 Jul</td>
<td>Graham Centre Sheep Forum</td>
<td>Convention Centre, CSU Wagga Wagga</td>
<td>Toni Nugent E: <a href="mailto:tnugent@csu.edu.au">tnugent@csu.edu.au</a></td>
</tr>
<tr>
<td>14 August</td>
<td>Graham Centre Beef Forum</td>
<td>Convention Centre, CSU Wagga Wagga</td>
<td>Toni Nugent E: <a href="mailto:tnugent@csu.edu.au">tnugent@csu.edu.au</a></td>
</tr>
<tr>
<td>2 Sep</td>
<td>Graham Centre Cropping and Pasture Systems Field Forum</td>
<td>Graham Centre Field Site Coolamon Road, Wagga</td>
<td>Toni Nugent E: <a href="mailto:tnugent@csu.edu.au">tnugent@csu.edu.au</a></td>
</tr>
</tbody>
</table>

Farewell Professor Deirdre Lemerle

Charles Sturt University (CSU) weed scientist and a passionate advocate for sustainable agriculture, Professor Deirdre Lemerle has retired as Director of the Graham Centre for Agricultural Innovation. Professor Lemerle has been the Centre Director since its inception 10 years ago and before that spent 25 years with the NSW Department of Primary Industries in Wagga Wagga. Reflecting on her tenure, Professor Lemerle said the alliance between CSU and the NSW DPI has fired-up research to improve the profitability and productivity for agriculture. “There’s a great team of scientists at the Graham Centre and we have developed partnerships with farming systems groups to ensure that our research is needs-driven,” she said. “I’ve also enjoyed working on projects to improve farming overseas, particularly Asia.” Professor Lemerle’s research has included non-chemical weed management and increasing crop competitiveness with weeds. She was awarded the Council of Australian Weed Science Societies Medal for Excellence in Weed Science in 1998, and the CSU Vice-Chancellors Award for Research Excellence to Allelopathy Research Group 2000.

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Locked Bag 588
Wagga Wagga NSW 2678 Australia

Conzylea (fleabane – a prolific and widespread weed) inflorescence buds (left and right) and fruits ready to be dispersed in the middle. Photo: Geoff Burrows