Welcome to the Summer edition of the Innovator for 2015-2016. In my last column I mentioned we had compiled our submission to the review of University Research Centres, and we have now received feedback.

The panel were strongly supportive of the CSU-DPI alliance, acknowledging that while transaction costs were increased, the combined strengths of the alliance greatly increased our ability to undertake multi-disciplinary agricultural research and development. Our strong links with industry, in particular the farming systems groups, was viewed as a key asset. The Graham Centre was responsible for 26% of the University’s research income between 2010-14, making it the biggest Centre by far, and the panel noted there was considerable potential to increase this further. We should celebrate our achievement in this regard.

In reviewing all CSU research centres, the panel assessed the alignment with the CSU Research Narrative. A key recommendation in the process was a need for the University to review the Research Narrative to strengthen the implementation component. This will be completed by March 2016. Each research centre is required to review its mission for alignment with the University Research Strategy. This is timely for the Graham Centre, as we will be preparing our new strategic plan for 2016-2020, for approval by the Board of Management. Other tasks in response to the centre review include a review of membership arrangements (it was noted we had a very large membership base) and implementation of strategies to improve publication rates. These are linked - membership entitles our members to apply for internal grants, but it is expected in turn that our members secure grant income in areas of alignment with the Centre’s mission and publish the work. Our membership criteria will be revised to better reflect this.

CSU and DPI have also reviewed the current governance arrangements for the Centre as part of a new alliance agreement. It is expected the new alliance agreement will be signed before Christmas, and I will be able to report on details of this in the New Year. Suffice to say, the new alliance will create a governance structure that will allow greater engagement from senior managers within both CSU and DPI, yet retain the independence of our industry representation.

As a final note, I am pleased to report the University’s significant improvement in our Excellence in Research...
Australia (ERA) ratings. CSU achieved a rating of at or above world standard in 16 research areas, compared to 10 areas in the last ERA (2012). For key areas of research within the Graham Centre of Animal Production, Crop and Pasture Production, Veterinary Sciences and Food Sciences, the University achieved an ‘at world standard’ rating, while for Horticulture (an area shared with the National Wine and Grape Industry Centre), we achieved a rating of ‘well above world standard’. This is an excellent result for CSU, and congratulations to all Graham Centre members who contributed to this.

Best wishes to all for Christmas and the New Year.

Professor Michael Friend

A ‘Top gong’ for researcher working in China

Each year some 650,000 foreign experts work on projects for varying periods in China. The Chinese Government gives 50 Friendship Awards each year. The Friendship Award is the top ‘gong’ given to foreigners, with Professor David Kemp receiving the award this year.

Professor Kemp received his award from the Chinese Premier Li Keqiang at the recent ceremonies held over two days at the Great Hall of the People, Beijing, China. The Vice Premier Ma Kai officiated at other parts of the ceremonies.

Some of this year’s awardees work in agriculture and forestry, while others include a Nobel Prize winner in genetic engineering, engineers involved in water management, industrialists and financiers. During the ceremonies, awardees were invited to give their views on how China could continue to develop.

Professor Kemp has previously received major awards for foreign experts from both the Inner Mongolian and Gansu Provincial Governments.

Professor Kemp has worked in China since 2001, with Drs David Michalk, Warwick Badgery, Karl Behrendt, Taro Takahashi, Messrs Colin Langford and Geoff Millar, and other Australians, plus some 40 Chinese scientists and students from six institutes across China, to help herders in northern and western China to improve their incomes and their degraded grasslands.

When they started this work, herders were amongst the poorest people in China, with an income of less than US$2 per head per day. About 90% of the 400 million hectares of grasslands were considered to be degraded, and old herders talked about having trouble seeing the cattle when they were young, but now all they can see are mice. Similar problems also exist across the vast Eurasian grasslands that extend from eastern China, through to Hungary.

In normal years, livestock would lose 20-30% of their bodyweight through autumn, winter and spring when temperatures drop below freezing. On the Mongolian Plateau temperatures can decline to -40°C in mid-winter, during which time lambing occurred.

Professor Kemp and his research team also work on the Tibetan and Loess Plateaux.

Their research has shown that the reorganisation of livestock management by herders, and encouraging improved market systems, has resulted in significant improvements. Culling half the livestock improves household incomes and helps grassland rehabilitation. The project has shown tangible results that now form part of national programs.

The projects led by Professor Kemp are supported by the Australian Centre for International Agricultural Research (ACIAR), with additional funding from the Australian Department of Agriculture and the (former) Australian Greenhouse Office, under various agreements between Australia and China to foster good relationships and aid developing countries.

Many people in China are still very poor and the country is still in a development phase. China wants foreign expertise to improve the skills of people at all levels, and the Chinese government now funds the majority of the work being done.
Selecting for increased water soluble carbohydrate concentration in wheat

Water soluble carbohydrate concentration in stem bases has been shown to contribute to stability of grain yield of wheat under terminal water deficit. Initial studies have indicated moderate broad sense heritability, however marker assisted selection could facilitate greater genetic gain for this complex trait.

Water soluble carbohydrate is subject to the dynamics of supply from photosynthesis and demand from maturing grains and other sinks, but is also influenced by phenology, plant size, stem diameter, and canopy senescence, under the influence of declining water availability during grain fill.

NSW DPI Rice Breeder Ben Ovenden won Best Student Poster at the International Wheat Conference in Sydney during September, where he presented the results of his research selecting for increased water soluble carbohydrate concentrations in wheat. Photo: Livinus Emeberi

Research conducted by Graham Centre PhD student and NSW DPI Rice Breeder Ben Ovenden examined genetic contributions to the expression of water soluble carbohydrate concentration, and its relationship to yield expression in contrasting conditions, using Genotype × Environment, and investigated the application of GWAS and genomic selection to genetic improvement.

G×E expression was complex, though it was possible to interpret sequentially via consideration of yield component expression. As expected, GWAS did not identify any major loci explaining substantial genetic variance. Genomic prediction models provided a robust whole genome analysis which assisted understanding of genetic control of this complex trait.

Ben presented the results in a poster, in terms of refinement of breeding strategies for wheat cultivars with improved capacity to tolerate terminal water deficit with greater yield stability, at the recent International Wheat Conference, 20-25 September in Sydney where he won Best Student Poster.

Contact: Dr Ben Ovenden, T: 02 6951 2679, E: ben.ovenden@dpi.nsw.gov.au

Sheep enterprises continue to perform in 2015

Sheep breeding enterprises in 2015 continue to perform well with many enterprises experiencing increases of $3-$5 per DSE or 12-17%.

Recently NSW DPI updated 10 sheep enterprise gross margins (GM’s) with the 20 micron merino joined to a maternal meat ram having the highest GM of $35.93/DSE ($359.30/Ha) and the highest increase of $5.13/DSE compared to last year (Figure 1).

This was due mainly to an increase in the sale value of 1st cross ewe hoggets and an increase in wool value for both Merino and crossbreds.

An interesting note, while this enterprise has to also purchase replacement ewes at a higher price, it is selling almost double the number of ewe hoggets and a similar number of cast for age (CFA) ewes.

The self-replacing 18 micron wool enterprise had the next highest increase of $4.17/DSE followed by the self-replacing Dorper enterprise with an increase of $4.01. Again this was due largely to an increase in the sale value of excess ewes.

The 20 micron Merino and 1st cross ewe enterprises joined 100% to terminal rams experienced a significant reduction in GM of $4.97 and $2.95/DSE or -13 and -8% respectively.

Australian funds primarily support Professor Kemp and his colleague’s involvement in this work.

In November, Professor Kemp and the research team will hold a workshop at the International Grassland Congress in India, providing an update on the work done, before returning to China for further project work, before it gets too cold.

The next phase of their work will investigate how the Chinese Government can better use its funds to achieve grassland improvement, while improving herder incomes. This new work will include Mongolia, which is the first ACIAR project in that country.

Contact: Prof David Kemp, T: 02 6365 7526, E: dkemp@csu.edu.au

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The 20 micron Merino and 1st cross ewe enterprises joined 100% to terminal rams experienced a significant reduction in GM of $4.97 and $2.95/DSE or -13 and -8% respectively.
However, with the high value of terminal lambs combined with higher wool values these enterprises continue to perform well with the third and second highest GM of $33.26 and $34.11/DSE respectively.

The average GM's for the previous five years (2011 to 2015) are depicted in Figure 2. During that time, self-replacing 18 micron Merino and 20 micron Merino enterprises joined to either 100% Terminal or maternal rams performed best.

The 20 micron self-replacing merino enterprise with 25% of ewes joined to a terminal ram also performed surprisingly well. It appears to cover all bases; breeding replacements, wool production and sale of prime lambs. It will be interesting to see how it performs over the next few years.

Each GM is calculated with the assumption that the enterprise is running 10 DSE per hectare. The self-replacing Dorper enterprise has the lowest cost structure with variable costs totalling $201/ha, and even with the lowest income of $498/ha it has the best cost to income ratio of 0.4 to 1 (Figure 3).

It is interesting that wether enterprises have the highest cost to income ratio of 0.58 and 0.59 to 1, with variable costs totalling $351 and $326/ha for 18 and 20 micron enterprises respectively. The high cost structure is primarily driven by high wool harvesting costs and high total cost of replacements.

The enterprises with the highest GM's, the 20 micron ewe joined to 100% terminal or maternal rams and the 1st cross ewe joined to terminal ram, have the highest cost per hectare, but this is offset with higher income. Their cost to income ratio is 0.54, 0.52 and 0.53 to 1 respectively.

So how are sheep enterprises comparing against cropping?

In the GRDC 2015 Farm Gross Margin Guide, APW Wheat is predicted to have GM's of $256, $418 and $671 per hectare for low, medium and high rainfall zones respectively. This assumes a grain price of $280 per tonne and yields of 1.5, 2.7 and 4T/ha.
It is interesting that a drop of $40/T (back to $240) reduces GM’s to $197, $312 and $514 per hectare respectively. This drop in price plus a one tonne drop in yield (back to 3T) for the high rainfall zone reduces its GM to $302 per hectare, similar to the five year average for sheep GMs.

It is important to note that GM’s only take into account variable costs directly associated with the enterprise and do not take into account capital costs, such as machinery or livestock inventories.

To access the full GM outputs visit http://www.dpi.nsw.gov.au/agriculture/farm-business/budgets/livestock. Each GM is calculated with and without typical supplementary feeding costs as well as displaying a range of sensitivity tables allowing the user to see the impact on GM’s resulting from changes to key production, income and cost indicators.

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CSU top of the crop

When it comes to putting their knowledge of grain production and marketing into practice, CSU agriculture students have shown they’re the cream of the crop.

The seven-member CSU team scooped the pool at the Australian Universities Crops Competition hosted by GrainGrowers in Temora from 16-18 September.

CSU was named as the top team overall and CSU students claimed the first three places in the individual competition.

Bachelor of Agricultural Science (Honours) student Mr Matthew Dunn, originally from Leeton in the Riverina, was the highest scoring competitor and has been awarded an overseas study tour to further his knowledge of grain production.

“I’m really looking forward to the study tour and am hoping to gain some insight into the unique American agricultural production systems,” he said. “I find American agriculture very interesting and am honoured to have been given this opportunity.

“Once I graduate I hope to find a job in agronomy, agricultural research, or plant breeding.”

Other CSU students weren’t far behind in the points score. Ms Jessica Kirkpatrick from Beaufort in Victoria was awarded second place, and Ms Cheyne Gibbs from Urana in southern NSW claimed third prize.

The annual crop competition tests students on everything from seed identification and grain grading to business management and production practices.

Seven universities, including two from the United States, took part in the event.

Head of the CSU School of Agricultural and Wine Sciences, Professor Gavin Ash said the team’s success is a testament to the industry-relevant knowledge and practical skills they have gained throughout their studies.

“The outstanding success of the team reflects the students’ dedication and skill, and also the field-based, authentic approach to education CSU is renowned for,” Professor Ash said.

“Charles Sturt University has a mixture of state-of-the-art laboratories and teaching spaces with close proximity to the University’s commercial farm. Our students study on-farm, real world problems from first year and throughout their degrees.”

Coach and team supervisor Dr Sergio Moroni from the School of Agricultural and Wine Sciences said the competition offered students an opportunity to meet top agriculture students from across Australia and overseas.

“The CSU team showed a high level of maturity, cohesion, organisational skills and focus,” he said.

“They volunteered to be part of the team and worked very hard outside of their study commitments to accomplish such an impressive achievement.

“I had the privilege to share in their excellent and confident performance during the competition. The
seriousness of the competition, however, did not deter them from enjoying themselves”.

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New alliance targets future of mixed farming

CSU has signed a new formal agreement with four mixed farming systems groups to develop a strong future for farmers and farm businesses in central and southern NSW and northern Victoria.

Through the Graham Centre for Agricultural Innovation, the University’s Deputy Vice-Chancellor (Research, Development and Industry) Professor Mary Kelly has signed the strategic alliance along with representatives of Central West Farming Systems, FarmLink Research, Holbrook Landcare Network and the Irrigated Cropping Council.

It creates a powerful team to deliver research, development, education and training for cropping and livestock production and systems integration in dryland and irrigated systems in the southern and central west NSW and northern Victoria.

Professor Kelly said, “Essentially, our new agreement puts a framework around the work we already do together and the work we want to do in the future.

“"We are motivated by the need to develop robust, sustainable and formal linkages to deliver more profitable systems for all the growers represented, while keeping our individual identities and independence.”

FarmLink Research Chief Executive Officer Ms Cindy Cassidy said, “Central West Farming Systems, Holbrook Landcare Network, Irrigated Cropping Council and FarmLink have an extensive member base of farmers, advisors and researchers focused on the future of farming in the region.

“Our partnership with CSU reflects our commitment to education and research to achieve profitable and sustainable farming.”

The new formal alliance links CSU researchers, students and graduates with the farmers and research trials, offers scholarships and workplace learning opportunities for students, and shares skills in research management, governance, and technology.

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Three hot tips for working in Pakistan

Lahore. A city where vast expressions of wealth dissect derelict buildings and poverty with no true line of division. Traffic, goats, and people co-exist in chaos, causing the clocks to run a little slower here. Pakistan is an entity that cannot be described in a handful of sentences. Just when you think you are on top it, something new will crop up and
Pakistan has deep ties with agriculture. It provides occupations to 50% of Pakistan’s working population, many of whom are subsistence farmers. Thirty-five million rural Pakistanis engage in the production and maintenance of 160 million animals.

Milk is a highly valued commodity here. Representative of this, Pakistan weighs in as the fourth largest producer of milk in the world. Here the buffalo reigns supreme. Sixty-four percent of the nation’s milk is produced by riverine buffalo. These resilient animals produce milk with a fat content of up to 8%. The Pakistani people have grown accustomed to this quality making buffalo milk highly demanded across the country. The wonderful buff has been neglected in recent times by the scientific community. Reasons for this could be attributed to the majority of buffalo residing in developing countries. Publications on buffalo endo-parasites are few and far between.

The purpose of my trip; to complete a large endo-parasite survey (to species) in Pakistan’s buffalo herd. From this base we intend to investigate impacts and develop an integrated parasite control strategy. With the support from the Australian Sector Linkages Program Dairy Project we will distribute our outcomes back to the farmers.

At the current count we have met with over 100 farmers and taken samples from 1000 animals across the Punjab district. The farmers have been inviting, offering tea at every stop (an unavoidable event). Collection and processing of these samples has not come easily. All the speed bumps have been successfully navigated thus far. There are however a number of proverbial spanners that could get thrown into the works at any time. I would like to take this opportunity to extend some ‘hot tips’ to any intrepid researcher who finds themselves in Pakistan. Western colloquialisms do not carry their meaning to Pakistani ears so I am taking this opportunity to get some out of my system.

1. **Don’t hold your breath:** You will most certainly die. Nothing is going to happen on time. Get used to this and move on. Yes, some days are worse than others. All you can do is schedule as best as possible. I have been using my ‘twilight zone time’ as an opportunity to complete emails and write my journal.

2. **When it rains it pours:** This one can be taken quite literally. If you intend to do any outdoor activities June - August expect it to be hot, humid, and probably raining. On my trip I have experienced two seriously impressive rain events in September where the city stops for the day. In rural areas the rain can also cause havoc. Dirt roads are un-drivable, and shelter to carry out work while staying dry is unlikely. Assume you are going to lose days, even weeks to rain if you come during this time frame.

3. **Pack everything but the kitchen sink:** Bring anything you require for your work with you. If you have room put the sink in as well. My biggest road blocks have been solely my

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1. Graham Centre PhD student, Thomas Williams, recently visited Pakistan to complete a large endo-parasite survey in Pakistan’s buffalo herd.
2. When it rains in Pakistan it pours so assume you are going to lose days, even weeks to rain if you visit during June - August.
3. Tanveer and his children; one of the attendants at the University guesthouse where Thom stayed. Always a friendly face with a huge smile who makes a smashing karahi. Photos: Thomas Williams
fault. If you intend to do any lab work here, make sure the equipment has been sourced before your arrival. If it is remotely unusual it could be extremely difficult to source. If you do have this problem fear not. The Pakistani people are problem solvers. After time, numerous phone calls and ‘insha’ Allahs’ you will find a suitable alternative nestled somewhere in the city.

One of my favourite quotes relates to the regular power outages that have become synonymous with this country. As we plunge into darkness for the third time that morning, the whir of diesel generators begins:

‘You see, this is why it is great to conduct research in Pakistan, the electricity never far away.’

This perfectly captures the positivity exuded by Pakistanis. No dismay is bought on by an apparent lack of continuous power. Never is there a problem that cannot be solved with a little Pakistani ingenuity. The country is amazing, the people are warm and inviting. I would not hesitate to come here again.

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Editor’s note: Reprinted with permission from Researchers in Agriculture for International Development (RAID). Check out the RAID blog at http://www.raidaustralia.net/

Weed management in conservation agriculture

Conservation agriculture (CA), incorporating crop residues and reduced or no-tillage has benefits and costs, including, increased groundcover, soil conservation and productivity, lower energy and labour costs, and improved sowing time. CA is dependent on herbicides for weed control leading to herbicide resistance, changes in weed species and dynamics, and reduced herbicide performance.

Weeds have a major impact on global agriculture and food security through reduced production and high control costs. New knowledge is urgently required to ensure durable and safe herbicide use, and the development of cost-effective non-chemical (cultural and physical) options and the integration of these with herbicide use. There is considerable concern worldwide about the lack of new modes of action entering the marketplace to replace herbicides as resistance spreads.

In Australia, CA has been practiced since the 1980s and herbicide resistance is widespread. Herbicides are simple and cost-effective and it is not until farmers ‘hit the wall’ with resistance that they consider alternative non-chemical
options. Leading farmers now are managing resistance and reducing weed seedbanks with diverse crop/pasture rotations that provide more control options.

In contrast, many smallholder farmers in south Asia still practice aggressive tillage with traditional weed control. Low adoption of CA in these areas is due to; lack of knowledge, system complexity, lack of suitable planting equipment, and limited access to herbicides. Recently, rapid increases in herbicide usage due to rising labour costs, is leading to risks of environmental pollution, human and animal safety, and development of herbicide resistance.

As community and political pressures increase for food security, environmental protection and adaption to climate change, government incentives for farmers to adopt CA will increase. Farmers require reliable information on the benefits and costs of weed control technologies. As complex biophysical and socio-economic factors influence adoption, this is more likely if practices lead to systems that are flexible, profitable and reduce risk.

A symposium ‘Weed management in conservation agriculture’ was held as part of the 25th Asian-Pacific Weed Science Society Conference in Hyderabad, India 13-16 October 2015. At the Symposium six invited presenters discussed the opportunities and challenges facing weed management in CA as agricultural production intensifies in the Asian-Pacific region, by integrating ‘lessons learnt’ in Australia with traditional practices used in other areas. Collaboration, effective communication and sufficient funding will facilitate this process.

Thank you to the Australian Centre for International Agricultural Research for providing funds to support travel to the Conference.

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Exploring the world of veterinary epidemiology and economics

A group of six Graham Centre and CSU academics and students attended the 14th International Symposium on Veterinary Epidemiology and Economics in Merida, Mexico, in early November. This symposium is the most important international conference in veterinary epidemiology and is held every three years.

The group presented five oral presentations and two posters. Dr Marta Hernandez-Jover presented two oral papers on research conducted on biosecurity and disease surveillance among livestock producers. Dr Viki Brookes, Geraldine Lammers and Claire Ferris each presented an oral paper on research on *E. coli* in cattle and beef. Sahibzada Shafullah (Shafi) and Shumaila both presented a poster on their PhD project.

The conference had over 500 attendees from all over the world (Australia was the third country on number of attendees), and it provided a great opportunity to disseminate research conducted at the Graham Centre and CSU, network with experts in different fields of veterinary epidemiology and start new research collaborations.

Graham Centre travel scholarships supported all six who attended the conference. Merida has been identified as the cultural capital of the Yucatan peninsula and surrounded by Mayan ruins. Everyone enjoyed attending the conference.
and exploring the region and the Yucatan culture, including the food and drinks.

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**Probiotics to improve the fitness and performance of sterile fruit flies**

Restrictions on the use of agrichemicals used to manage Queensland fruit flies (Qflies) (*Bactrocera tryoni* Froggatt) means fruit and vegetable crops are more susceptible to Qfly damage. The sterile insect technique (SIT) is an internationally accepted tool used to manage Qfly populations, however, mass-reared sterile fruit flies do not necessarily perform as well as wild male flies. Seminal contributions from around the world have shown the importance of microbial symbionts, particularly symbiotic bacteria, in the performance and mating success of pest fruit flies. Knowledge and an understanding of the microbial symbionts that co-exist with fruit flies, may lead to improved quality of mass-reared sterile flies. NSW DPI researcher Dr Ania Deutscher, together with colleagues Dr’s Toni Chapman and Olivia Reynolds, is investigating the use of beneficial microorganisms to increase the quality and performance of mass-reared Qflies for SIT, as part of the SiTplus project ‘Area-wide integrated pest management using the sterile insect technique to control the Queensland fruit fly’. This project is funded by Horticulture Innovation Australia Limited (HIA) using the Summerfruit levy with co-investment from NSW DPI, the Traprock Group and funds from the Australian Government.

Supported by the Graham Centre and HIA, Ania travelled to Guatemala in October to attend a workshop and meeting on the ‘Use of Symbiotic Bacteria to Reduce Mass-Rearing Costs and Increase Mating Success in Selected Fruit Pests in Support of SIT Application’. The workshop and meeting were coordinated by the International Atomic Energy Agency and the Food and Agriculture Organisation of the United Nations. The meeting was attended by experts in fruit fly ecology, microbiology, and molecular biology, fruit fly mass-rearing facility staff, research fellows and PhD students.

Ania gave an oral presentation titled ‘A Novel Molecular Sequencing Technique to Determine the Effect of Mass-rearing on the Queensland Fruit Fly Larval Gut Microbiome’. She is testing a novel next-generation sequencing technique developed by Associate Professor Aaron Darling and Dr Catherine Burke from the University of Technology Sydney, to identify potential bacterial probiotic candidates. This method results in close to full length 16S rRNA gene sequences and reductions in errors typically introduced during amplification. Early results suggest low bacterial diversity in mass-reared Qfly larval gut bacterial communities compared with their wild counterparts, the former which may therefore benefit from probiotic supplements.
Ania obtained invaluable knowledge, skills and contacts at the workshop and meeting that will enhance development of a probiotic supplement for Qfly mass-rearing. Topics included identification of bacterial gut communities, bacteria being tested as probiotic candidates, genome sequencing, and the functional role of gut bacteria in fruit flies. The development of a probiotic supplement will improve the quality and performance of mass-reared sterile Qfly and contribute to the increased efficiency and effectiveness of an SIT program.

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Root Research Symposium

The International Society for Root Research symposium, held in Canberra in September provided an opportunity for Graham Centre PhD student Dominic Skoneczny to meet researchers from around the globe. Dominic was a nominated student ambassador representing the Graham Centre and CSU at the symposium.

The symposium summarised root and rhizosphere research conducted on a global scale and had over 330 participants from over 30 countries. Dominic also spent one year leading the social media group and developing networks among young researchers, including students, interested in root research. Student ambassadors developed a root research communication hub for young scientists and prepared a networking handbook. Dominic also presented a poster entitled ‘Comparative metabolic profiling of naphthoquinones in root periderm of two invasive Echium species’ that was of interest to the national and international audience.

Leslie Weston presented a keynote address at the meeting on “The bioactivity and role of root-produced secondary metabolites in the rhizosphere,” while Dr Xiaocheng Zhu presented a poster on “Production of sorgoleone by Sorghum leiocladum, a native Australian sorghum species,” and James Mwendwa presented a poster on “Weed suppression in selected cultivars of wheat, an assessment of crop competition versus allelopathic suppression” as a part of his GRDC funded PhD research project.

Contact: Mr Sahibzada Shafifullah, E: sshafifullah@csu.edu.au
23rd International Grassland Congress

The 23rd International Grassland Congress (IGC) was held in New Delhi, India, on 20-24 November. The Graham Centre was represented by Emeritus Professor Ted Wolfe, who was a member of the organising committee for the 22nd IGC, held in Sydney in 2013.

Ted presented a paper on behalf of a team of collaborators from NSW and WA, led by Dr Belinda Hackney of the Graham Centre. Dr Hackney’s team highlighted the success of work undertaken since 2007 in the mixed farming zone of southern NSW to evaluate several new types of hard-seeded annual legumes. A feature of this work has been the early involvement of farmers in the evaluation program. Legumes such as biserrula, bladder clover and gland clover have proven to be worthy alternatives to subterranean clover during the pasture phase of crop-livestock systems, with advantages such as easier seed production, a broader sowing window, better weed control, excellent pasture and livestock production, and higher crop yields due to the nitrogen input from legumes.

The Congress was attended by 620 participants. The plenary sessions were particularly interesting, especially the presentations by Dr David Michalk (Australia) that pulled together the Congress themes of sustainability, biodiversity and livestock production. Dr Michalk presented a comprehensive and thoughtful paper about the congress theme of sustainability, biodiversity and environmental issues, relating the Australian example of an increase of 21% in sheep meat production from 1980 to 2012, despite a reduction in the sheep population from more than 150 million to around 70 million. Dr Ralph von Kaufmann (Kenya), contributed a valuable complementary paper emphasising the need to solve the grazing-land conundrums with a business-oriented approach that raises productivity, boosts sustainability and provides employment.

These papers along with other plenary and keynote papers were collected and published by the Congress organisers in three books that were made available to conference participants. Copies of the books will soon be available for purchase. The oral and poster papers, currently on disc, will be published on the conference website http://igc2015.org/ in time.

A feature of the program, carried over from IGC2013 to IGC2015, was a ‘Farmers Forum’, which was colourful in terms of dress and content. This group of farmers later sang an environmental anthem in support of their traditional rights and practices.

Before the Congress, Ted visited the Kangayam grassland area in southern India, famous for a unique farmer-led management system that features buffel grass, rotational grazing and ‘live fences’ (hedges). Ted also took the opportunity of a post-conference tour to visit the Taj Mahal and other tourist icons in India.

Contact: Prof Ted Wolfe, E: twolfe@csu.edu.au

From left: The ‘Farmers forum’ was a feature of the program at the 23rd International Grasslands Congress held in Delhi, India during November. Indian farmers wore traditional dress and sang an environmental anthem in support of their traditional rights and practices.

Sheep grazing Kangayam grassland in Tamil Nadu State, southern India.

Ted Wolfe visited the Taj Mahal when in India for the 23rd International Grassland Congress. Photos: Ted Wolfe
Strengthening oilseed industry partnerships

Graham Centre PhD student Clare Flakelar was the guest speaker at the recent Australian Oilseeds Federation General meeting, held in conjunction with their Annual General Meeting on 29 October at The Rendezvous Hotel in Melbourne. Clare presented the research she has conducted to date, and gave an overview of what is planned for her PhD project: enhancing canola seed and oil quality through the retention of bioactive components. The presentation was received favourably with much discussion and feedback.

Several questions were asked following the presentation specifically; the conditions that have the highest impact on the bioactive compounds, the difference in concentrations of the bioactives in crude pressed oil vs crude solvent extracted oil, and questions surrounding consumer preference and whether they would be inclined to accept a darker oil or one with a more distinctive taste. Clare exchanged contact details with several people at the meeting requesting further details and discussion surrounding her project and what it could mean for industrial processors. The CEO and President stated their interest in hearing an update of the project in the near future.

Clare said, “Overall, the meeting was a very valuable opportunity for me to present my research, and to gain insight into industry direction.”

Clare will continue to work on strengthening the links she has made in the hope that the research can provide further information and opportunities for industry, and build collaboration between CSU and industry.

Contact: Ms Clare Flakelar, E: cflakelar@csu.edu.au

National Centre for Groundwater Research and Training

The Graham Centre social research team, Prof Allan Curtis, Dr Jennifer Ticehurst and Dr Emily Mendham, have commenced work on the National Centre for Groundwater Research and Training (NCGRT) Murray Darling Basin Authority (MDBA) partnership project ($2 million over 2 years). The NCGRT team includes CSU’s social researchers, hydrologists from Flinders University and environmental modellers and economists from Australian National University. Allan has contributed to project steering committee meetings chaired by the MDBA held in Canberra and Adelaide, and led stakeholder engagement through workshops held in October in Bendigo and Wagga.

The project will identify and assess opportunities to achieve better outcomes from existing water resources. Initial scoping suggests these opportunities will focus on farmers using groundwater as a buffer during dry seasons, on-farm water use efficiency measures and facilitating groundwater trading.

The project is intended to inform MDBA polices beyond the current MDB Plan. The Victorian case study is based on the Campaspe catchment below Lake Eppalock, and the NSW case study is based in the Murrumbidgee. Activities have included field visits, meetings with local governments, water authorities, state agencies and regional Natural Resource Management bodies. The Graham Centre social researchers will play a critical role in data collection for subsequent integration efforts. All irrigators in each case study will be surveyed during 2016 to assess their current and intended adoption of on-farm Water Use Efficiency (WUE) measures; the social acceptability of a limited set of conjunctive use (combining surface and groundwater) opportunities; and the level of farmer interest in trading groundwater in areas where those resources are under-utilised (i.e. use is much lower than entitlements or allocations).

Contact: Prof Allan Curtis, T: 02 6051 9730, E: acurtis@csu.edu.au

Social acceptability of environmental watering

During October, Prof Allan Curtis presented the results and recommendations from the first social research in Australia examining the social acceptability of environmental watering. The CSU project was funded by the Australian Government as part of a large investment implemented by the North Central Catchment Management Authority (NC CMA), directed at ensuring the best possible outcomes from the application of about 100 gigalitres of environmental water allocated for use in the Gunbower Island Forest (on the Murray River near Cohuna, and to the west of Echuca).
During 2014, Dr Emily Mendham and Prof Curtis conducted stakeholder interviews and a survey of town residents and rural property owners in the area adjacent to Gunbower Island. The research team submitted their report in early 2015 and subsequently met with the NC CMA staff implementing the Gunbower Island project to discuss their findings and recommendations. Amongst the recommendations were the suggestions that project staff should take more time to engage the local community in their work on Gunbower Island, and in particular, should do that by working from the values and management goals that are shared by CMA Staff and the local community.

All stakeholders were concerned about the health of fish and the CMA staff identified a ‘fish forum’ as being an effective way to begin the process of building more positive relationships with local stakeholders. The ‘fish forum’ was held at the Cohuna Bowling Club on October 22. Over 70 local people attended the forum, shared a meal and listened to a range of experts from fish ecologists to fishers, and explored ways to work together to ensure there are viable fish populations. Prof Curtis was invited to present the social research findings to set the wider context for the forum, as an opportunity to build effective partnerships and establish a platform that would endure beyond the life of current funding cycles.

The CSU social researchers will re-survey town and rural residents in 2017 to assess whether project activities have enhanced residents’ knowledge about the ecological values of Gunbower Island, and the social acceptability of environmental watering in Gunbower Island.

Contact: Prof Allan Curtis
T: 02 6051 9730, E: acurtis@csu.edu.au

Soil acidity affecting faba bean nodulation and growth

As faba bean expands into the cropping programs of south-eastern Australia its adaptability to acid soils is being tested. The 2015 commercial faba bean crops being monitored by Mark Norton and Helen Burns of NSW DPI suggest that paddock selection and timely lime application are essential if crops are to achieve high yields. This work is a component of a Grains Research and Development Corporation - DPI funded project, aimed at improving the performance of legume crops on the acid soils in the southern region high rainfall zone.

Feedback from farmers and advisers in 2014 surveys suggested that poor nodulation of faba bean crops may be limiting yield. Investigation in 2015 of faba bean crops with poor nodulation reported by growers and advisers in SA, VIC and NSW, together with the project monitor crops, indicated that soil acidity is likely to be a major culprit reducing nodulation, root growth, vigour and yield potential of crops grown on acid soils. Analysis of the nodulation scores for faba bean crops and pH of soil sampled from the top 10 cm of monitor paddocks showed a strong correlation ($r^2=0.89$) between effective nodulation and soil acidity (Figure 1), indicating that as soils became more acidic nodulation declined.

![Figure 1. Nodulation score (maximum score - 25) of commercial faba bean crops as related to surface soil pH$_{Ca}$.](image)

Although most monitored paddocks had received lime in recent years, soil tests from those with poorly nodulated crops gave a pH$_{Ca}$ reading below 5.0 in the surface soil (0-10 cm). Other samples taken at intervals further down the soil profile indicated that; surface-applied lime is having a limited effect on subsurface pH (Table 1), and that lime spreaders should be checked to ensure even distribution.

Faba bean crops are compromised if grown in soils with pH$_{Ca}$ below 5.2. The survival of faba bean Group F rhizobia is also compromised at pH$_{Ca}$ below 5.0, as was clear from the poor nodulation of monitor crops growing in acidic soils. The observations suggest that growth of faba beans is affected by an acid throttle and growers should check soil pH before sowing sensitive crops such as faba bean.

Most growers have a minimum tillage farming program and rarely incorporate lime. The consequence is that lime remains on the surface and is slow to react, having limited...
effect on the pH of the subsoil. Standard soil procedure using the whole bulked 0-10 cm soil profile may be misleading as surface-applied lime moves very slowly into the subsurface layers.

If lime incorporation is not an option it is essential that lime is applied well before sowing of sensitive species such as faba bean. The time for lime to impact on the subsurface layers will depend on soil type and rainfall.

Be aware that surface-applied lime will also affect the breakdown of Group B residual herbicides. As shown in Table 1, liming may result in an alkaline surface layer, which according to herbicide labels extends the re-cropping interval for legume species. For example, the re-crop interval for sulfonyl urea applied to soil of pH Ca less than 5.8 (i.e. pH W less than 6.5) is 12 months, but this extends out to 22 months when pH Ca greater than 5.8. This is likely to be longer in dry seasons. Check re-cropping intervals on herbicide labels.

While growers have achieved high yields from faba beans, these are not possible if nodulation and root growth is affected by subsurface acidity. The 2015 experiences have highlighted the importance of forward planning to manage soil acidity and herbicide programs.

Contact: Ms Helen Burns, T: 0427 721 816, E: helen.burns@dpi.nsw.gov.au

What’s the smoke point of olive oil?

The smoke point of olive oil will be the focus of a new research project to be undertaken by NSW DPI and CSU. Funded by Horticulture Innovation Australia, the project will investigate ways to predict the temperature at which olive oil starts to smoke.

Lead investigator, NSW DPI’s Dr Jamie Ayton, said “There is a lot of misinformation about smoke point on the web, and this project will help provide a clearer picture as to safe uses for olive oil, especially when frying.”

In addition, the project will aim to find rapid ways of predicting the smoke point of an oil so that oil producers can provide accurate information to consumers. CSU is providing support to the project in the form of analyses of minor components of olive oil.

“Olive oil minor components give the oil its unique aroma and flavour properties as well as providing potential health benefits through antioxidants. However, we don’t know if these compounds have any effect on smoke point and this project will help answer that question,” said CSU’s Associate Professor Paul Prenzler.

Contacts: Dr Paul Prenzler, T: 02 6933 2978, E: pprenzler@csu.edu.au
Dr Jamie Ayton, T: 02 6938 1970, E: jamie.ayton@dpi.nsw.gov.au

Table 1. The pHCa of samples taken from commercial monitor paddocks show that surface-applied lime has had a limited effect on increasing subsurface pH.

<table>
<thead>
<tr>
<th>Depth</th>
<th>Lake Bolac, Victoria*</th>
<th>Holbrook, NSW**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pHCa of soil from area of poor crop growth</td>
<td>pHCa of soil from area of good crop growth</td>
</tr>
<tr>
<td>0 - 3</td>
<td>5.3</td>
<td>7.3</td>
</tr>
<tr>
<td>5 - 7</td>
<td>3.8</td>
<td>4.8</td>
</tr>
<tr>
<td>12 - 14</td>
<td>3.8</td>
<td>4.3</td>
</tr>
</tbody>
</table>

* Lime surface-applied at 2.5T/ha in 2006 and 2013, not incorporated.

** Lime surface-applied at 2T/ha in 2010, plus 2T/ha in 2015 shallow incorporation with speed tiller.

Researchers Paul Prenzler, Jamie Ayton, and Kerrie Graham with the purpose-built smoke point apparatus. Photo: Clare Flakelar
Improving extension systems for smallholder dairy farmers in Pakistan

Agriculture Sector Linkages Program (ASLP) dairy project team leader David McGill shares his thoughts on their final forum held in Pakistan during October.

We are coming to the end of a dairy development project in Pakistan investigating approaches to improve the extension system to help smallholder dairy farmers with farm productivity and profitability. After eight years working in Pakistan, with all its challenges, joys and learning experiences - I can proudly say (and know) that we have done a fantastic job. Working in field trials, coordinating farmer discussion groups, maintaining interest and encouraging adoption is difficult in any country. However, in Pakistan with the additional challenges of logistics, security, politics, an inexperienced field team and literally millions of farmers, it was most definitely a tough gig and I am proud of what our team achieved.

What is arguably an even tougher gig however, is to try communicating and sharing the project’s outcomes, impacts and benefits to the wider dairy community of Pakistan. It is not just about making them aware of what we did, it is also about convincing them that the approach we took was something that could be replicated and scaled out to even more smallholder farmers throughout the country.

Our ASLP Dairy Project team were faced with this exact challenge in just the last few months. With the end of the project imminent (December 2015), we were tasked with running a final forum to share our approach, results and impacts with other donors, Government officials, Non-Government Organisations (NGOs), researchers and the private sector. This is a stock standard undertaking at the end of any project. However, it is also one that fills me with dread; not only from the point of preparing and
organising one, but also from the audience viewpoint. I have been to many project or scientific forums in my somewhat short career. Perhaps I have a short attention span or perhaps I am not the attentive scientist I should be, but either way I tend to find most (not all!) of these events a little bit...you know...boring. They tend to include presentation after presentation of research stories somewhat similar, sometimes interesting and in some way applicable to my role, but despite this, I just can’t bring myself to stay tuned for the day.

With this in mind and assuming that at least a few other people struggle in the same way, we decided to test our team in Pakistan. The challenge was simple:

“100 Pakistani officials from academia, Government, donors, NGOs and the private sector walk into a big hall at 9am. Assume they are bored when they arrive. You have to keep them engaged until 4pm, whilst also clearly sharing our extension approach and convincing them that it was effective and worthwhile replicating.”

So, what did we do?

Step 1. Think about it.

We had to outline what messages we wanted to get across and how we wanted to do it. To do this we ran brainstorming sessions with team members from both Australia and Pakistan. It was similar to one we had observed with CSU and Professional Assistance for Development Action (PRADAN) in Delhi using single pieces of paper for each single idea (thanks Gavin Ramsay and his team for this technique). Using this process any idea could be given some traction and each piece of paper could be moved around the table or floor to try and group ideas/themes. This process helped us list and prioritise the themes and ideas we wanted to share on the day. Furthermore, it got the team thinking about different ways to present the material.

Step 2. Come up with (realistic) schedule for the day.

Our team put a lot of thought and effort into playing out the day and determining how we could run it most effectively. In doing this we considered the attendees, when people would be arriving and leaving, when they would be hungry, when they would likely lose interest and how we could ensure we clearly got our message across. The schedule we came up with is shown in Figure 1.

Figure 1. Program schedule for ASLP Diary Project final forum.

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**Program Schedule**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
</tr>
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<tbody>
<tr>
<td>08:30 am - 09-10 am</td>
<td>Reception &amp; registration of participants</td>
</tr>
<tr>
<td>09:10 am - 09:20 am</td>
<td>Project documentary</td>
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<tr>
<td>09:20 am - 09:40 am</td>
<td>Role play</td>
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<tr>
<td>09:40 am - 09:50 am</td>
<td>Recitation from the Holy Quran</td>
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<tr>
<td>09:50 am - 10:20 am</td>
<td>Project background</td>
</tr>
<tr>
<td>10:20 am - 11:00 am</td>
<td>Presentation of outputs and impacts</td>
</tr>
<tr>
<td>11:00 am - 11:20 am</td>
<td>Tea break</td>
</tr>
<tr>
<td>11:20 am - 02:00 pm</td>
<td>Slideshows of project activities</td>
</tr>
<tr>
<td>02:00 pm - 03:00 pm</td>
<td>Lunch break</td>
</tr>
<tr>
<td>03:00 pm - 04:30 pm</td>
<td>Closing ceremony</td>
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</tbody>
</table>

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The schedule included buffer time at registration/arrival:

- Early participants could enjoy tea and networking whilst perusing posters.
- Formal proceedings could start without being disturbed by late arrivals.

Step 3. Show up, be prepared, look sharp and smile.

Although these last few steps seem somewhat simplistic, carrying through with these whilst also trying to prepare posters, interactive presentations, organising food and logistics can be more difficult than expected. The team was mindful to practise their individual booth presentation numerous times, refining their talks to less than 15 minutes, allowing plenty of time for questions. Furthermore, we took particular care to really be aware that the whole team were on time and ready to help out well before the start and that we were all dressed looking like a team. We even had shirts and vests (for the women) stitched with an ASLP brand so participants knew who to direct questions to.

Lastly, it was the role of each team member to engage with participants throughout the day, so having a friendly smiling face is imperative to making everyone feel welcome. We were very fortunate and happy to have such a phenomenal young team of researchers to drive our research program, and they showed that at the final forum they could also step up and present in a challenging situation. Well done to them for their efforts in running an outstanding and engaging forum. We have been told it was one of the best (if not the best) final project forum senior ACIAR staff have seen.

Contact: Mr David McGill,
T: 02 6933 4805, E: dmcgill@csu.edu.au
A TYPICAL DAY FOR ME INCLUDES: Wake up, head to the gym or go for walk, morning coffee. Answer emails, check twitter, organise things for the day, another coffee. Work, work, work, coffee again (maybe I have too much coffee). Head home, play with the dog, pat the cat, make dinner, maybe watch some Netflix, and go to bed.

MY MAIN PROJECT AT THE MOMENT IS: Detecting herbicide resistance in annual ryegrass with diversity array technology (DArT). Herbicide resistance is an ever increasing problem in cropping systems. Annual ryegrass is Australia’s most damaging cropping weed, and has developed resistance to multiple herbicides throughout Australia. A factor in effectively treating resistance is the accurate identification of resistant weeds. Currently, identification of the resistance status can take up to 10 months. This waiting time could be dramatically reduced to as little as three weeks with the utilisation of DArT. My project aims to identify the genetic markers responsible for herbicide resistance in group B and M herbicides using DArT, allowing for the rapid diagnosis of herbicide resistance and assisting in effective resistance management techniques to be employed.

MY FAVOURITE PART OF MY STUDIES IS: Working towards a solution for a real-world problem. I get to be in the lab, the glasshouse and the field.

WHEN I AM NOT STUDYING I LIKE: Reading, woodwork, gardening, watching Netflix, and playing Xbox.

WHEN I AM DRIVING I LIKE TO LISTEN TO: Alt-rock mostly (Rise Against, Linkin Park), but I really enjoy listening to podcasters like Joe Rogan or anything by RoosterTeeth.
**Stephanie Fowler**

**Position:** Research Officer - Meat Science  

**Organisation:** NSW Department of Primary Industries Centre for Red Meat & Sheep Development, Cowra

**Career Brief:** Before I started University in 2008, I spent some time at Tocal Ag College and jillarooing on the Barkly Tablelands, Northern Territory. After breaking a few bones in my left foot in a motorbike accident I moved on to my undergraduate (Bachelor of Ag) and honours degrees (Bachelor of Science (Hons)) with the University of Western Sydney (Hawkesbury), spending most of my holidays working for Australian Country Choice in their feedlots, backgrounding properties and processing plants, as well as for Teys in their Condamine Feedlot.

I started my PhD focused on developing and validating a probe to measure meat quality with Peter Wynn, CSU in conjunction with David Hopkins, NSW DPI and Heinar Schmidt, University of Bayreuth, Germany in 2012, and finished in February this year when I scored a job with the NSW DPI at Cowra as a Meat Researcher, employed to work on CRC for Sheep Industry Innovation (Sheep CRC) and other projects.

**Research/Teaching Activities and Interests:** At the moment my research activities focus on using new technologies for carcase and meat quality assessment, as well as helping to develop new cuts for heavier lambs and determine the nutritive value of lamb cuts, but I am looking forward to being involved with some new projects including one using a hypobaric chamber. I also spend some time reviewing papers for the Journal of Meat Science, Journal of Food Science and Technology, and Trends in Food Science and Technology.

**Professional Links:** I am currently associated with the Royal Agricultural Society Youth Group, Australian Society of Animal Production (ASAP), Future Farmers Network, the Sheep CRC and of course, the Graham Centre.

**A Typical Day for Me Includes:** I am usually up before the sun to feed the cat and dog and put the ponies out in their paddock before heading to the gym and going into the office. I make it to work by about 8:30 am, squeeze in a day’s work, water the orchids in my office then head home by about 4:30 pm to ride my two ponies and take the dog for a walk. This means cooking dinner usually doesn’t happen until about 8 pm, except on Wednesday’s when I head to trivia at the Imperial in Cowra. Once dinner is finished, I squeeze in some TV time (at the moment I am a bit addicted to Gossip Girl) and knit some more of a giant scarf I am making, or spend some time engagement and wedding planning. Then I check my plants at home do a few chores and head off to bed about 10 pm to do it all again the next day.

**My Main Project at the Moment is:** My two main projects are helping with the Sheep CRC projects focused on developing technologies for carcase assessment and further developing the cuts based grading, including new cuts for heavier lambs. I also spend some time finishing off a preliminary investigation into the use of a Raman hand held device to predict beef quality, a project I started earlier this year, and writing a review chapter on the use of Raman spectroscopy in meat science.

**My Favourite Part of my Job is:** No two days are the same, some days I am organising and running sensory tests with loads of people, some days I am in the lab doing the wet chemistry, some days I am behind the computer writing or doing analysis, and some days I am giving presentations and running workshops. I also love that as a researcher there is always something new to learn, keeps life interesting!

**When I am not in the Office I like:** When I am not in the office my life is dominated by horses. I got bitten by the ‘horse bug’ as a 14 year old and have not looked back. These days most of my good friends and my fiancée are all involved with horses so they are pretty hard to escape, but if I am not outside in a paddock or away somewhere at a competition, you can find me at the pub, particularly on trivia night, catching up with someone for a coffee or tucked away knitting something, baking something or growing succulents and orchids.

**When I am Driving I like to listen to:** A bit of everything! I have a whole stack of stuff on my iPod from classical music like La Triviata, to disco, 90’s pop, top 40 hits, Glee and Disney songs. Although I am a shameless car singer and mostly listen to things I know the words and can sing along!
## EVENTS CALENDAR

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<thead>
<tr>
<th>Date</th>
<th>What</th>
<th>Where</th>
<th>More information</th>
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<tbody>
<tr>
<td>9 March TBC</td>
<td>Crop and Pasture Systems Field Day</td>
<td>Graham Centre, Wagga Wagga</td>
<td>Toni Nugent</td>
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<tr>
<td>10 &amp; 17 June</td>
<td>Science and Agriculture Enrichment Day</td>
<td>Graham Centre, Wagga Wagga</td>
<td>Toni Nugent</td>
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<td>18 July</td>
<td>Graham Centre Sheep Forum</td>
<td>Convention Centre, CSU Wagga Wagga</td>
<td>Toni Nugent</td>
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<tr>
<td>5 August</td>
<td>Graham Centre Beef Forum</td>
<td>Convention Centre, CSU Wagga Wagga</td>
<td>Toni Nugent</td>
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</tbody>
</table>

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

Don't forget to follow the Graham Centre on Twitter @GrahamCentre and like us on Facebook https://www.facebook.com/GrahamCentreForAgriculturalInnovation?ref=hl

### Christmas Closure Dates

The Graham Centre offices will be closed from 12 noon, Thursday, 24 December and we reopen on Monday, 4 January 2016.