
Last year saw the consolidation of our research priorities and focus on mixed farming systems research. We achieved significant increases in the publication of scientific papers, the quantity of research income and the number of research higher degree students. We also improved our communications to stakeholders and staff in various ways, and will endeavour to improve this even more as we grow the research capacity of the Centre. Our industry links have also expanded with the doubling in size of our Industry Advisory Committee (Chair: Lucinda Corrigan), and the formation of our Field Site Steering Committee (Chair: Mark Harris).

We are looking forward to a very busy year meeting many of you at some of our events, including:
- Ag Enrichment Day for Riverina secondary school children – 18th June
- 2030 Forum – ‘Creating a vision for temperate mixed farming systems for 2030’ – 12th August
- Launch Graham Centre Field Site – 8th September
- Graham Centre Beef Field Day – 7th December (tentative)

In 2010, we will be focussing our CSU-Research Centre Fellow Scheme ($720,000) to enable staff to increase our activity in the strategic research initiatives areas of: stubble and conservation cropping; sustainable pasture systems and forage conservation; healthy food products; weeds; bio-protection; animal parasites; and resilient farmers.

Check our website for more information about our activities. We hope you enjoy this issue with information about our student projects and other aspects of our research.

Professor Deirdre Lemerle
Director
Student activities

Ewe and lamb behaviour at lambing is influenced by both shelter type and birth number

John Broster, PhD Student

Supervisors: Dr Michael Friend, Dr Bindi King, Dr Remy Dehaan, Dr Susan Robertson and Dr David Swain (Central Queensland University)

A significant number of lambs born each year in Australia die within 72 hours of birth. Periods of high wind, combined with rain and low temperatures can lead to marked increases in the mortality level. Under these climatic conditions mortality levels may be reduced with the provision of shelter.

This research is using GPS collars and contact loggers to compare both shelter use and interactions between ewes with twin lambs across two shelter types (hessian rows and shrub belts), whilst also comparing ewes with single and twin lambs in a single shelter type (hessian). Two types of shelter, hessian or shrubs, were compared to see if shelter type influences utilisation and behavior as the area sheltered is relative to shelter height.

Both the GPS collars and contact loggers are placed on ewes before lambing, while contact loggers are placed on the lambs about six hours after their birth. The contact loggers record the time of the initial contact (within approximately 4 – 5 metres) with any other collared animal and the length of each contact. The GPS collars provide the location of the animals at 30 second intervals enabling the determination of shelter use by ewes before and after lambing.

Contact levels between ewes immediately after lambing were only 10% of the initial levels (1 hour day-1). For single-born lambs, lambs averaged 11 hours contact per day with their mother, while for twin-born lambs, each lamb averaged 9.25 hours per day with its mother and 14.7 hours per day with its sibling. The level of contact between ewes and each of their offspring in the hessian was 24% lower (P<0.05) for ewes with twin lambs than with singles. For ewes with twin lambs the level of contact was 17% lower (P<0.05) in the hessian shelter compared with shrub shelter.

After lambing, ewes crossed through the Hessian rows more than before lambing, and after lambing ewes with twin lambs passed through the rows more (40% increase) than those with singles, while there was no difference before lambing. In the hessian after lambing ewes with twin lambs travelled more distance per day (12 km) than both those with single lambs (8.5 km) and ewes with twin lambs in shrubs (7.7 km).

Further information: John Broster (02) 6933 4001, jbroster@csu.edu.au.
**Dillon bush**

*Hayley Rutherford, Honours Student*

**Supervisors:** Dr Rex Stanton, Prof Deirdre Lemerle, Prof Richard Groves

Dillon bush (*Nitraria billardieri*) is a spiny perennial shrub that becomes an invasive native weed in degraded pastures typical of broad scale grazing systems. Although it occurs in all mainland states of Australia it is a particularly serious weed on the Riverine Plain of NSW. The decline of perennial grasses and palatable shrubs such as saltbush has reduced the competition against Dillon bush and in 1998 it was estimated that this weed was expanding in broadscale pastoral areas at a rate of between 1% and 2% per year.

**Camel milk and urine!**

*O'haj Mohamed Haimed, Visiting PhD Student*

**Supervisors:** Dr Hassan Obied and Dr Samson Agboola

O’haj is a PhD student from Sudan on a 5-month visit (December 2009 – May 2010), funded by an AusAid/ACIAR Project. His research aims to isolate certain anticancer or antiviral ingredients from camel milk, camel urine and/or their combination, through chemical screening and bio-activity guided extraction and detailed identification. This work is being carried out at the School of Biomedical Sciences and Chemical laboratories at CSU. O’Haj is the Head of Department of Clinical Chemistry at the University of Gezira, Sudan.

**Rice sheath brown rot disease**

*Dante Adorada, PhD Student*

**Supervisors:** Assoc Prof Gavin Ash and Dr Ben Stodart

The rice sheath brown rot disease was observed in Leeton, NSW in 2005. The cause of the disease was identified and first recorded by Cother *et al.* (2009) as *Pseudomonas fuscovaginae*, a pathogen which has not been previously reported in Australia. The bacterial studies in Cambodia provided a basis for identifying this previously unrecorded bacterial pathogen of rice in the Riverina region of southern NSW, posing a threat to Australian rice export industry. Dante L. Adorada, of Charles Sturt University and the EH Graham Centre is investigating the pathogen’s identity, pathogenicity, epidemiology and diversity for formulating effective disease management strategies.
Honours scholarships 2010

Due to the excellent quality of applicants, the Graham Centre has awarded eight honours scholarships for the 2010 academic year. Each scholarship has a total value of $5,000, comprising $3,000 stipend for the student and $2,000 to support the project.

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Inaugural Annual Graham Centre Beef Field Day 2009

The purpose of this inaugural field day was to present the results of a survey sent to beef producers in the Hume Livestock Health and Pest Authority (LHPA) District. This survey asked questions on disease monitoring and how they, the producers, would decide when and how to treat sick cattle; 430 producers replied – an overwhelming response!

The field day, held on 1 December 2009, was organised by the Graham Centre in conjunction with the School of Animal and Veterinary Sciences (SAVS) and supported by Pfizer Animal Health, Bayer and Fort Dodge. The program included short presentations in the morning and several workshops in the afternoon. Lucinda Corrigan (local beef producer, a director of the MLA and Chair of the Graham Centre’s Industry Advisory Committee) opened the day and presented some key data about the Australian beef industry. Professor Nick Sangster (SAVS) discussed the current issues in parasitology; this was followed in the afternoon by an interactive workshop.

Associate Professor Bruce Allworth (SAVS), also Director of the newly founded “Fred Morley Centre”, presented some challenging ideas on successful reproduction management and economics. Bruce later presented a workshop on how to benchmark your own farm.

Professor Peter Chenoweth (SAVS) gave a presentation on aspects of male fertility affecting herd reproductive rate. Several other issues important to breeding herds were discussed in a workshop led by Peter, with additional contributions from Dr John Wilkins (I&I NSW) and Steve Whittaker (LHPA). Producers were given loads of information on how to monitor and improve fertility in cattle.

The state of the art in diagnosis and control of pesti virus was presented by Khyle Stewart (Pfizer) which subsequently led to a very busy workshop run by Dr Peter Kirkland (I&I NSW), who is recognised world-wide as the leading scientist on this disease.

John Piltz (I&I NSW) spoke on how to produce good quality fodder and presented the latest outcomes of ongoing field trials. Tony Morton (LHPA) presented the ins and outs on grass tetany, a disease which has been around for a long time and is still high on the list of diseases significantly affecting production.

A large number of beef producers attended the inaugural Graham Centre Beef Field day on 1 December 2009. Photo: Helen Burns.
Equally important information on biosecurity was presented by Steve Dunn (I&I NSW); current food safety issues by Michael Ward (Sydney University); and food safety and its impact on red meat market access by Patrick Hutchinson (MLA). These topics are not always in the spotlight but are major issues affecting sustainable beef production in Australia.

During the break there was also opportunity for producers to read the posters prepared by staff and students from CSU on current research and the outcomes of the initial beef producer survey. The large number of participants (185) and the very positive feedback has definitely encouraged us to turn this field day into a major annual event which will create a platform for research, collaboration and knowledge transfer between beef producers, the Graham Centre, I&I NSW, LHPA and SAVS. See you all again at our next field day, scheduled for December 2010.

More information: Dr Jan Lievaart 02 6933 2086, jlievaart@csu.edu.au

**Multi-phase experiments in biology: a widely-applicable approach to increase efficiency by separating field and laboratory effects**

Do you conduct experiments where plants are grown in the field and then sampled for tests in the laboratory? If so, then you should be using multi-phase experimental design and analysis to extract the best information from your work. Instances where multi-phase design is appropriate include: chemistry analysis of field plot grain samples (e.g. oil content of canola, milling yield of wheat, micro-malting of barley); quality analysis of forage samples (e.g. digestibility of silage or hay); plant pathology assessments (e.g. detached leaves exposed to a pathogen); entomology (e.g. plant material detached for insect feeding studies); mineral analysis of plant material (e.g. ICP elemental analysis of grain, carbon isotope analysis of leaves), – the list is huge.

A multi-phase approach allows you, the experimenter, to independently estimate both the errors from the field and the errors from the laboratory. Of course, many laboratory technicians will tell you that their lab procedure is accredited, very accurate and has only small, random errors – errors that are much smaller than those seen in the field. However, experience is showing that this belief is often ill-founded. Lab procedures may use internal standards, and/or retest a subset of samples but that does not allow correct estimation of the laboratory errors – only a proper multi-phase design and good analysis can do that.

A multi-phase design features additional replication in the second phase plus re-randomisation of the samples to be tested. Third (or higher) phases may be appropriate if the procedures warrant it. For example, phase 2 may be a design for grinding some wheat grain samples from a field trial (phase 1), and phase 3 might be the testing of those ground samples for dough strength. The multi-phase design will allow all errors to be estimated with additional precision and make your final results more accurate and more useful.

Researchers will typically respond to a multi-phase design suggestion by saying that resources are tight and they cannot afford to do tests on additional samples in second (or subsequent) phases. Experience shows that compromises are possible so that the overall sample number is constrained without reducing the effectiveness of the analysis.

In practice, a good starting point is that the extra replication employed in phase 2 be about 20% of the experimental units in phase 1. As experience is gained with a particular lab procedure then fewer phase 2 extra samples may be sufficient. In fact, the additional accuracy achieved in phase 2 may permit a smaller number of phase 1 replicates to be used (e.g. 2 field reps rather than the full 3 or more). Let’s consider an example. A field plot trial of canola contains 60 genotypes with 3 replicates in the field (phase 1). Leaf samples are to be taken for 13C (carbon isotope discrimination) analysis in the lab. The phase 2 design might include the first two field reps (120 samples) plus an extra 20%, which is an extra 24 samples (120 x 0.2). These extra samples are taken from random field plots in a balanced way. The whole phase 2 set of 144 samples is then randomised and sent to the lab to be analysed in a defined order (using a suitable blocking structure if required). That number of 144 is less than the full 180 samples from all 3 field reps but the result from the multi-phase approach will be better. Of course, the full 3 reps in the field experiment will still be used to estimate phase 1 traits, such as yield, etc.
Multi-phase experimental design requires some additional computing but can be achieved by software such as the DiGGer package in R. The analysis process requires the fitting of more complex models but the structure is logical and sensible and easily within the grasp of numerate scientists. We use REML in Genstat, or ASREML in R (can also be used stand-alone) to do the data analysis.

The improvement in the results from a multi-phase approach can be quite dramatic. In pathology experiments in lupins we showed that an appropriate 2-phase design doubled the amount of non-treatment variance that was accounted for, greatly increasing the heritability of the trait being investigated. For this procedure, the laboratory errors were often of a larger magnitude than the field errors. This had a great effect on the efficiency with which disease resistance could be selected for in our lupin breeding program.

It is even possible to use multi-phase techniques to design and analyse partially-replicated experiments, or unreplicated experiments (with replicated controls), and to use a spatially-embedded single phase 2 replicate within a multireplicate phase 1 design – but that’s another story.

So, next time you are planning an experiment, think about whether a multi-phase design is appropriate. After all, if you are going to spend all that time, money and labour growing the plants and measuring stuff, you may as well get the best results possible, sharpen your conclusions, select your new cultivar more reliably, and make it easier to get those findings published.

References

More information: Dr David Luckett, (02) 6938 1835, david.luckett@industry.nsw.gov.au or Ray Cowley, (02) 6938 1900, ray.cowley@industry.nsw.gov.au.

Committee memberships promote agriculture

Research Professor of Agriculture, Jim Pratley’s involvement with numerous committees has elevated the profile of the Graham Centre’s challenges on issues such as food security and skills shortages in agriculture. Below is a summary of Jim’s activities:

- Helped to form the Australian Council of Deans of Agriculture (ACDA) in 2007 and has been its honorary Secretary since its inception. The ACDA considers issues that are of common interest whilst recognising that from time to time members are competing with each other. This alliance has allowed Jim to access data on graduate numbers, for example, so that graduate supply for the job market can be ascertained with greater accuracy than official channels can achieve. This has had an effect on enrolment numbers and the view on agriculture as a career by the media.

  ACDA has also done an exercise on the job market in agriculture to demonstrate that it is indeed much larger than anyone had envisaged.

  The ACDA meets in Canberra twice a year to engage with people of influence and to exchange views.

- Member of the Rural Research and Development Council which was created by the
current Federal Minister for Agriculture. The council is advisory to the Minister and has as its immediate task the development of an investment plan for research to be completed in 2010. The Council also advises the Minister on the allocation of special funds for research provided by his Department.

- Member of the State Minister's Ministerial Advisory Committee on Primary Industry Science (MACPIS) which meets two or three times a year to review R&D in the department and advise the Minister on issues of importance at the time.
- Member of the Research Advisory Committee (RAC) of the Australian Farm Institute. In this role Jim participates in the development of recommendations on research projects which the AFI might facilitate and the RAC also reviews all research reports before they are published by the AFI.

**International links**

**China**

**Workshop on perennial crops - Kunming**

The Yunnan Academy of Agricultural Sciences in Kunming, China received funds to hold a small workshop on perennial crops, to link with their research and expertise in perennial rice, a plant designed to stabilize the sloping uplands of southeast Asia, where slash and burn is practiced on eroding landscapes. Professor Fengyi Hu, the Deputy Director for Research at the Food Crops Research Institute invited six delegates for the one-week workshop at Kunming, which included field visits to lowlands in Sanya (Hainan) and uplands in Xishuanbanna (Yunnan), as well as glasshouses and laboratories in YAAS Kunming. The invitees included Drs Stan Cox, David Van Tassell, Lee DeHaan (The Land Institute in Kansas USA), Professor Don Wyse (University of Minnesota USA), Dr Eric Sachs (Mendel Bioenergy USA) and Professor Len Wade (Graham Centre). Kunming is the sister city of Wagga Wagga, so there was interest in exploring collaboration via perennial rice for Lao, or cold tolerance for China-Australia.

Further information: Prof Len Wade (02) 6933 2523, lwade@csu.edu.au.

**International Convention on Biological Invasions – Fuzhou**

Professor Geoff Gurr attended the International Convention on Biological Invasions (ICBI) to co-convene a symposium, present an invited keynote and present a second talk. This major international meeting, held in the eastern Chinese city of Fuzhou in Fujian Province in November 2009, attracted several hundred delegates from dozens of nations. Gurr’s keynote opened the symposium on the interactions between invasive alien species and native species. The principal focus was an Australian system that has been the subject of a Horticulture Australia Ltd-funded project run in collaboration with Dr Leigh Pilkington of Industry and Investment NSW and PhD student Villiami Heimoana. In that system the effects, both positive and negative, of the arrival in Australia of an exotic ladybird (*Hippodamia variegata*) have been explored. In inland NSW vegetable crops this predator had become the dominant ladybird species and is present year-round. An important aspect of the study involved collaboration with
Dr Andrew Mitchell of I&I NSW to employ innovative DNA-based methods to analyse the gut contents of field captured predators. This has shown that although the new arrival may contribute towards pest suppression by consuming several important pests of vegetables it also feeds commonly on a native predator, the brown lacewing (*Micromus tasmaniae*). This finding illustrates the risks associated with use of exotic agents in biological control.

Professor Gurr’s second talk reported early results from a CRC National Plant Biosecurity-funded project with Dr Leigh Pilkington of I&I NSW and PhD student Anna Rathe. This study is preparing Australia for the possible arrival of an important pest, the glassy winged sharp shooter and the plant pathogenic bacterium it vectors, *Xylella fastidiosa*. Work recently conducted by the PhD candidate whilst working at the collaborating laboratory at the University of California, Riverside, showed that the bacterium was present in several native Australia plant species tested. Even this early data provides important information since these plant species could be the focus of surveys for the pathogen should an incursion occur in Australia.

**Outputs**


Discussions are underway to produce a special issue of the journal *Biological Invasions*.

Further information: Prof Geoff Gurr, (02) 6365 7551, ggurr@csu.edu.au.

**Project updates**

**Biological control of pest snails using native nematodes and bacteria**

Native nematodes and their associated bacteria may provide more effective biological control of conical snails (which are a major crop pest in cropping districts of South Australia and Victoria) than the imported fly. The level of control using the parasitic fly imported from France and released as a snail control agent on Yorke Peninsula between 2001 and 2004 has been disappointing.

As an alternative, Associate Professor Gavin Ash and his team at the EH Graham Centre have achieved mortality rates of up to 90 percent in adult round and conical snails in about a week using nematodes isolated from Australian cropping soils. The nematodes, and the associated suite of bacteria thought to be integral to the process, are yet to be tested in the field. With field trials planned for autumn 2010, Dr Ash is optimistic about the biological control potential of the nematodes he and his team are working with and is aiming towards commercialisation of a nematode-based biological control agent for snails by 2012.

For more information: Assoc Prof Gavin Ash, (02) 6933 2765, gash@csu.edu.au.
Ground cover - chasing the Holy Grail

Helen Burns, Iain Hume and Janet Walker

Maintaining ground cover is one aim of natural resource management (NRM). The Graham Centre and the Eastern Riverina Landcare Network (ERLN) are investigating the consequences of land management practices on NRM targets using ground cover and other NRM measures as benchmarks. The project (Environment & Economic Gains of Changing Land Management to Meet NRM Targets) is funded under the Department of Agriculture, Fisheries and Forestry’s (DAFF) Caring for our Country Landcare Sustainable Practices grant component.

An area located west of Henty, NSW, was chosen for the project as it is typical of the agricultural landscape of the mixed farming zone of south-eastern Australia. The area has four major soil types and we have been investigating the NRM consequence of continuous cropping, pasture and native regeneration on all four soils.

Ground cover was assessed in January, March, June and October 2009. Given the recent dry seasons (2009’s rainfall was only 68% of the long term average – Figure 1) it is not surprising that ground cover was low and the desired 70% ground cover target has been difficult to achieve. We found that land use and farming practice had more influence on ground cover than soil.

Ground cover beneath native vegetation was the most consistent (Figure 2). The average ground cover of native land was consistently above 70%. Notably, dry litter was always a large component of the ground cover on the native and was the dominant component following periods of low rainfall in summer and autumn.

All pasture sites were heavily grazed and had low ground cover in the autumn and winter but the level increased in spring, reflecting the response of winter-growing annual species to rainfall. Cropped land followed the same trend. However, it is worth noting that one cropping site, where full stubble-retention conservation farming is practiced, ground cover was consistently close to, or above 70%, and approached the levels achieved by native vegetation.

The simple message to come from this aspect of the project is that ground cover targets can be achieved in highly productive farming systems. However, this requires mimicry of nature through the retention of dead material, in this case cereal stubble.

Further information: Helen Burns, (02) 6938 1947, hburns@csu.edu.au; Dr Iain Hume, (02) 6938 1984, iain.hume@industry.nsw.gov.au; Janet Walker (02) 6051 7704, janet.walker@industry.nsw.gov.au.

Resilient communities initiative - Cowra study

The Graham Centre is working with Futures 30, an NRM group at Cowra that is supported by the local Shire Council, to examine future agriculture and landscape change. The project was initiated as a follow-up to involvement in a conference ‘Climate for Change’ held in 2008 and is using the Resilience Theory framework to investigate change management.
An agricultural history of Cowra Shire is being documented that highlights the overarching historical, political, economic and social forces, together with the impacts of the climatic, edaphic and biotic factors, that have determined local farming systems. These are used to interpret historical trends in the area and the evolution of a range of agricultural enterprises. The interpretation is enriched by incorporating the personal experiences of landholders in the district obtained from surveys organised and conducted by Futures 30.

The demonstration of past changes and the drivers of change will be used as a foundation to develop future landscapes with the community through identifying future drivers, their potential impacts and methods to accommodate them.

It is anticipated that a draft of the project will be available in February.

Further information: Dr Peter Orchard, (02) 6938 1895, peter.orchard@industry.nsw.gov.au; Helen Burns, (02) 6938 1947, hburns@csu.edu.au; Dr Alison Southwell, (02) 6933 2636, asouthwell@csu.edu.au.

**Molecular mapping and physical location of major gene conferring seedling resistance to Septoria tritici blotch in wheat**

*Septoria tritici* blotch (STB) caused by *Mycosphaerella graminicola* (anamorph: *Septoria tritici*), is one of the most important foliar diseases of wheat. Fungicides have been successfully used to control the disease and reduce yield losses. However, their application is not cost-effective particularly in lower-yielding environments. Furthermore, some isolates of *M. graminicola* have also developed resistance to strobilurin (QO inhibitor) fungicides. Therefore, utilization of genetic resistance remains the most cost effective and environmentally friendly approach to combat STB disease in wheat.

Industry & Investment NSW’s wheat improvement program has developed germplasm that has shown high levels of resistance to the naturally occurring STB population in southern NSW over a period of at least 10 years. Identification of molecular markers tightly linked to loci associated with resistance to STB would facilitate the development of new cultivars resistant to STB disease.

Dr Rosy Raman and her collaborators (Andrew Milgate, Imtiaz Muhammad, Mui-Keng Tan, Harsh Raman, Chris Lisle, Neil Coombes and Peter Martin) have evaluated three doubled-haploid (DH) populations derived from Chara (STB-susceptible)/WW2449 (STB-resistant), Whistler (STB-susceptible)/WW1842 (STB-resistant) and Krichauff (STB susceptible)/WW2451 (STB-resistant) were assessed for resistance to a single-pycnidium isolate 79.2.1A of *M. graminicola* at the seedling stage. STB resistance in each of the three DH populations was conditioned by a single major gene designated as StbWW2449, StbWW1842 and StbWW2451. Linkage analyses and physical mapping indicated that the StbWW loci were located on the short arm of chromosome 1B (IBS). Four molecular markers linked with STB resistance were located to the distal bin of 1BS.sat1BS-4 (FL: 0.52–1.00) in the 1BS physical map. Markers mapped within 7 cM from StbWW were validated for their linkage and predicted the STB resistance with over 94% accuracy in the 79 advanced breeding lines havingWW2449 as one of the parents. These molecular markers also explained up to 38% of the phenotypic variance at the adult plant stage in all three DH mapping populations. These results have proven that SSR markers are useful in monitoring STB resistance both at seedling and adult plant stages and hence are suitable for routine marker-assisted selection in the wheat breeding programs.

Further information: Dr Rosy Raman, (02) 6938 1684, rosy.raman@industry.nsw.gov.au.
Localisation of quantitative trait loci for quality attributes in a doubled haploid population of wheat (*Triticum aestivum* L.)

Selection of wheat germplasm for a range of quality traits has been a challenging exercise due to the cost of testing, the variation within testing data, and a poor understanding of the underlying genetics. Common wheat is the world’s most important food grain, providing over 18% of the global caloric intake for over 35% of the world’s population. It is primarily milled into flour and provides a diverse array of end-products such as bread, chapatti, noodles and biscuits. These products are generally the end result of various physical, biochemical and technological processes and require certain ‘quality attributes’ such as protein content, water absorption, mixing time and dough strength and extensibility, to make dough. Most of these traits are complex and quantitatively inherited. Furthermore, these traits are invariably influenced by genotype (G) × environment (E) interactions and therefore have a low heritability, making genetic progress difficult.

Dr Rosy Raman and her collaborators (Helen Allen, Simon Diffey, Harsh Raman, Peter Martin, and Katie McKelvie) published their research recently in Genome, Volume 52, Number 8, 1 August 2009, pp. 701-715.

In this study, a doubled haploid population comprising 190 lines from Chara/WW2449 was grown in two different environments and evaluated for various quality traits. A molecular map comprising 346 markers, based upon simple sequence repeat, sequence tagged microsatellite, glutenin and DArT loci was constructed and subsequently exploited to identify QTLs using a whole genome approach. Fifteen QTLs were identified for thousand kernel weight, grain protein content, milling yield, flour protein content, flour colour, flour water absorption, dough development time, dough strength (Extensograph height and ResScM) and dough extensibility (Extensograph length). The amount of genetic variation explained by individual QTL ranged from 3% to 49%. A number of QTL associated with dough strength, dough extensibility, dough development time, flour water absorption, and flour colour and protein content were located to glutenin XgluB1 locus on chromosome 1B. Marker alleles from Chara were associated with a positive effect for thousand kernel weight, grain protein content, flour protein content, flour water absorption, dough development time, dough strength, and extensibility. WW2449 contributed favourable alleles for QTLs associated with flour colour, milling yield, and dough strength and extensibility. Identification, chromosomal location and effect of the QTLs influencing wheat quality may hasten the development of superior wheats for target markets via marker assisted selection.

Further information: Dr Rosy Raman, (02) 6938 1684, rosy.raman@industry.nsw.gov.au.
In The Limelight

Jan J Lievaart

Position: Lecturer Veterinary Epidemiology

Organisation: Charles Sturt University

Career Brief

I was born on a dairy and beef farm in the southern part of The Netherlands and so have always been passionate about dairy and beef cattle and herd health management. I graduated from the Agricultural University of Dronten in 1994 and from Veterinary Science, University of Utrecht, in 2000 (both in The Netherlands). Prior to joining Charles Sturt University, I worked as a veterinarian in a large animal practice where I was responsible for the herd health visits to dairy farms, where I developed a special interest in mastitis, lameness and the raising of heifers. After three years in practice, I joined Utrecht University as a lecturer at the ambulatory clinic for a year (dairy cattle herd health visits), before I started a part time PhD at the end of 2003. During the rest of my time, I also completed a Master in Veterinary Epidemiology and continued with herd health visits for students. The topic of my PhD is “The assessment and prediction of herd health data for individual farms”. Other research interests include the assessment of animal welfare in cattle and the implementation of the HACCP approach in the dairy and beef industry.

Research and Teaching Activities and Interests

Research activities
- Various projects, but the main topics are herd health (beef and dairy), animal disease monitoring and mastitis in dairy cattle

Teaching activities
- Epidemiology and Population Medicine in various years of the animal and veterinary science courses.

Professional Links
- Dutch Veterinary Cattle Association
- Australian Cattle Veterinary Association
- Member of the biosecurity advisory committee Australian Veterinary Association
- Member NMC (National Mastitis Council)
- Member AVEPM (Association for Veterinary Epidemiology and Preventive Medicine)

A typical day for me includes: wake up early, about 5.30 am, get rid of the emails from people overseas, feed kids, horses, goats, chooks etc before leaving for work. At work, in the morning I always try to meet, email or call as many people as possible (which could be research or teaching related). Afternoons are mostly for teaching or research activities.

My main project at the moment is: a Pork CRC project on milking disorder in sows and a string of mastitis projects, including one on cure rates of clinical mastitis, biomarkers for Staphylococcus aureus mastitis in dairy cattle and goats, the influence of climate change on average herd somatic cell count, a study on management practices related to the prevalence of subclinical mastitis and the development of statistical models (time series analysis and artificial neural networks) to predict the milk vat somatic cell count.

My favourite part of my job is: building a network for epidemiology teaching and research within Australia and overseas.

When I am not in the office I like: to travel with the family in our campervan.

Current CD in my car is: besides plenty of CD’s to keep the kids happy, Van Morisson and Ilse de Lange (Dutch country singer).
Dr Livinus Emebiri

Position: Cereal Geneticist

Organisation: Industry & Investment NSW

Career Brief

I came to Australia on a combined scholarship from the Australian National University (ANU) and the Australian Government’s Overseas Postgraduate Research Scholarship (OPRS) program. My PhD research at ANU explored the molecular genetics of age-age correlation in forest trees and NESTUR (Needle-to-stem ratio) as a physiological indicator of stem growth efficiency. The results, published in Theoretical & Applied Genetics, marked the start of a new paradigm in molecular genetics of forest tree growth trajectories, and the emergence of ‘Functional Mapping’ in QTL analysis. I then worked at the Molecular Genetics laboratory, CSIRO Forestry & Forest Products, Canberra, first as an Experimental Scientist, charged with the task of completing a research project on molecular marker-aided selection of jarrah (Eucalyptus marginata) for resistance to Phytophthora cinnamomi; and later as a Post-doctoral Scientist, in charge of a new project to characterise the genetic control of vegetative propagation in Eucalyptus nitens using molecular markers. I left Canberra in 1999 to join the Department of Primary Industries (DPI), Victoria, at Horsham, where I conducted pre-breeding research in barley and wheat. In 2009, I joined Industry & Investment NSW to continue research in cereal biotechnology, with firm interest on profitable and sustainable production of wheat by NSW growers.

Research Interests

The main focus of my research is the development of wheat germplasm for risk management of climate conditions and rotation. My research includes:

- Project on stabilizing grain yield and quality under heat stress by manipulation of Heat Shock Proteins (HSPs)
- Development of a Cross Predictor tool for complex traits
- Development and validation of methodologies for high throughput phenotyping
- Grains and Health – genetic potential for acrylamide mitigation in processed wheat products.

Professional Links

- AACC International DownUnder Section

A typical day for me includes: A typical day starts with a cup of coffee, and reading my mail. Then activities are rotated between the glasshouse and/or birdcage, the field and my desk.

My main project at the moment is: (1) Investigating the genetic potential for acrylamide mitigation in processed wheat products from Australian grains, and (2) the development and validation of methodologies for high throughput phenotyping of wheat for heat stress tolerance.

My favourite part of my job is: Publishing research papers.

When I am not in the office I like: to be out learning new things, places and cultures.

Current CD in my car is: Lucky Dube.

Autumn Edition of The Innovator

The Autumn Edition of The Innovator will be released April 2010. Submission of articles for this edition closes on Friday, 19 March 2010. Please email articles to Sharon Kiss.
Recent happenings

The first meeting of the Steering Committee of the Air Quality Pilot Program was held in December. Pictured from left: Louis du Plessis, Derek Ingold, Tracey Oakman, Lauren Bartosh, Rod Pope, Craig Bretherton, Mark Gardiner and Deirdre Lemerle. Photo: Helen Burns (also a member of the committee).

Graham Centre researchers discuss dairy effluent recycling and research needs with farmers in the Inland Elite Dairy Network in November. Photo: Deirdre Lemerle.

The Centre celebrated another successful year at a gathering in early December. Two Board of Management members, Prof Sue Thomas, Deputy Vice Chancellor Research (CSU) and Ms Renata Brooks, Executive Director Science, Innovation & Performance (I&I NSW) presented certificates of appreciation to a number of Centre participants. Photo: Maree Crowley.

CSU Heads of School, Prof Kym Abbott (School of Animal & Veterinary Sciences), left, and John Kent (School of Agricultural & Wine Sciences) discuss Graham Centre research priorities with Prof Sue Thomas and Prof Deirdre Lemerle.

National Agricultural Research Institute (NARI) scientists at Lae, Papua New Guinea, describe rice evaluation experiments to John Kent and Deirdre Lemerle during their visit in November 2009 to develop collaborative links with the University of Technology and NARI. Photo: John Kent.

Deirdre Lemerle and John Kent visited the University of Technology model villages in Papua New Guinea where local food productivity systems are being developed. Photo: John Kent.

Secretariat

Who’s who and how to contact us

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