Grassland Society of NSW Inc

Newsletter

Welcome to the last issue of the Grassland Society of NSW newsletter for 2013 – I know I say this every year, but where has the year gone? You will notice that this issue is a bit shorter than normal, but rest assured the newsletter will return to the longer format in the New Year.

Much of this newsletter is devoted to reporting highlights from some of the pre and post meetings of the International Grassland Congress held in September. There is a report from a SMARTfarm tour in Armidale (page 4) as well as some interesting abstracts from the fourth Spatially Enabled Livestock Management Symposium held at the University of Sydney's new Centre for Carbon, Water & Food at Camden (page 4) and the Pasture plant adaptation to drought and high temperature workshop also held at the University of Sydney (page 7).

The Local Land Services (LLS) Boards are starting to take shape with the selection of the Chairs and government appointed Board members in recent months. Elections for the remaining Board members will take place on 12 March 2014. Three members will be elected to the Board in each region. Nominations for Board member positions are now open. Occupiers of rateable land are eligible to nominate a candidate. Anyone 18 years of age or older can be nominated for elections provided their normal place of residence is in the region. Nominations close at 5 pm on 31 January 2014. The election results will be announced on 14 March 2014.

Ratepayers across the State are encouraged to enrol to vote by lodging an enrolment form to be eligible to vote in the 2014 LLS elections. Persons on the electoral rolls of Livestock Health and Pest Authorities will not have their names automatically transferred to the LLS electoral roll. Enrolments close at 5 pm on 17 February 2014. For more information visit http://www.dpi.nsw.gov.au/locallandservices

I have recently become familiar with the Art4Agriculture program. The vision of Art4Agriculture is to design and deliver community events that are a celebration of the diversity, sustainability, creativity and progress of primary industries, their people, place and produce. One such event is the Archibull Prize - an innovative and fun program which provides student participants with opportunities to meet young farmers and engage in genuine farm experiences, gain knowledge and skills about the production of the food they eat, fibres they use and the environment they live in. Check out the program at http://www.art4agriculture.com.au/index.html

Carol Harris
Editor

In this newsletter

Merry Christmas
and
Happy New Year

to all Grassland Society of NSW members and their families

Grassland Society of NSW - Pasture Updates

Pastures turn tropical

A recent tour of pastures in the Trangie district challenged more than 20 local producers to modify management on their properties according to NSW Department of Primary Industries (DPI) development officer, Trudie Atkinson.

"The Grassland Society of NSW Pasture Update showcased local properties where innovative management has lifted pasture quality and quantity, allowing producers to boost livestock production and farm sustainability," Ms Atkinson said.

"The spring tour of 'Dunnield' drew positive responses from participants who were able to see how Peter and Fiona Howe have doubled their potential carrying capacity by sowing a third of the property to tropical perennial grasses." Ms Atkinson said the Howes made the decision to maintain conservative stocking rates, increasing the rate by just 30 per cent, as a buffer against seasonal variability.

"The Howes have pushed production by harvesting tropical grasses for hay which opens the pasture sward and encourages the germination and growth of valuable annual legumes," she said.

Research at the Trangie Agricultural Research Centre highlighted the ability of tropical grass pastures to respond to summer rainfall and enhanced soil nutrition to significantly lift forage production for livestock.

Ms Atkinson said important ongoing research was evaluating temperate and tropical legumes which could be grown as companion crops to supply nitrogen to tropical grasses.

"More than just promoting grass growth, legumes supply high quality feed for stock and it's that double benefit which has led Meat & Livestock Australia to fund our research through its Feedbase Investment Program."

DPI Pasture Unit staff, Lester McCormick and Suzanne Boschma provided tips on successful pasture establishment; with advice on managing feed quality and the use of supplements to benefit livestock production presented by Central West Catchment Management Authority livestock officer, Brett Littler.

Pasture Update series at Bingara

The Grassland Society of NSW pasture update recently held in Bingara provided landholders with a range of information on pasture management and new technologies.

Lester McCormick, Vice President of the Society said the purpose of the update was to provide graziers with the latest information on current research outcomes and new pasture technologies which are supported by science.

"The Bingara update focused on improving the production and feed quality from our pasture systems," Mr McCormick said.

"The day commenced with various presentations including Linda Hygate Manager Meat & Livestock Australia (MLA) who outlined the Feedbase Investment Plan.

Ms Hygate said there are three pillars to the plan; Plant Breeding and Evaluation, Productive & Sustainable Pastures and Grazing Systems Management.

"MLA has significant co-investment with Australian Wool Innovation (AWI), to achieve these national projects. The pasture updates are also part of the national investment in feedbase improvement," Ms Hygate said.

"An important component of maximising red meat production on tropical grasses is to understand your production system and the quality of the feed required.

"Tropical grasses grow quickly but only over the warmer months. The area grown needs to be limited to what you can use through grazing or fodder conservation.

"When tropical grasses are not meeting the growth demands from livestock, supplementation or alternative feed sources need to be planned."

Legumes require a ready source of phosphorus and sulphur if they are going to contribute to forage production and produce nitrogen for grasses growth, targeting fertiliser use is always better than blanket applications. Soil testing is an important starting point for targeting fertiliser use and knowing you have productive species that can use the added nutrient.

Legumes also require inoculation by the correct strain of rhizobia and the team from the Australian Inoculants Research Group, with NSW DPI

Attendees at the Trangie Pasture Update inspecting pasture experiments at the Trangie Agricultural Research Centre

described a range of factors affecting nodulation. Effective nodulation is a factor of the number of rhizobia applied to the seed and in the soil.

High numbers of rhizobia die when inoculant is applied to seed and as the rhizobia dry out. Rhizobia death can also be exacerbated by the ingredients used in making the slurry for a seed coating, some of the factors that affect rhizobial survival are; water quality, polymer adhesive, rhizobial strain and age of inoculant. In addition colouring can also adversely effect rhizobia survival.

A technique for establishing a range of hard seeded legumes, at the time of sowing tropical grasses was described. The temperate legumes being used are arrowleaf, gland and bladder clover, pink and yellow serradella and biserrula. Unscarified and podded seed are sown with the tropical grass and a granular inoculant used. Initial trial work saw grasses and legumes sown together in December 2011, the grasses germinated and the legumes followed in February 2012. In September 2013 both grasses and legumes were persisting.

A feature of the day was the field tour to Phillip and Annette Butler's property "Glenayr". Phillip described how he was using tropical grasses in his grazing system and provided the detail for successful establishment. He advised annual summer grass weed control prior to sowing was essential.

Mr McCormick said the Department of Primary Industries' (DPI) experiment on tropical legumes drew plenty of attention.

"The season had been less than favourable but the tropical legumes; desmanthus, leucaena, the stylos and burgundy bean had all survived last winter and the desmanthus had produced pod already," Mr McCormick said.

"This experiment is part of a national project funded by MLA, running through to 2017."

Luc Farago, Border Rivers Gwydir Catchment Management Authority (CMA) advised the changes to the Native Vegetation Regulation which included improving service delivery, changes to exemptions and that the codes for self assessment are currently being determined.

Mr McCormick said the Grassland Society would like to thank the Upper Gwydir Landcare Association for their significant contribution to making this day a success.

Shear Growth - Meating the Demand

A Pasture Update was held at Taree on 5 December 2013 where cattle and sheep producers heard about localised pasture-based issues and pasture research being funded by MLA and it's partners.

Topics covered included :- Fertiliser and strategic use, Phosphorus levels driving legumes for greater total pasture production, perennial legume options, their importance, grazing management and tolerance, new research and options to successfully establish legumes, lamb fatalities - why and how they happen, ewe and lamb nutrition - lambing percentage and early weaning strategies, livestock strategies and options for finishing livestock and hitting critical joining targets and farm Budgeting - cash flow and cost management

A more detailed report of this Pasture Update will be available in future newsletters.

The Grassland Society with funding through MLA will be conducting more of these regional events over the next three years with the aim to better service the pastoral industry and Grassland Society members.

Information on these events will be posted in future newsletters and the website: www.grasslandnsw.com.au

Pre and Post International Grassland Congress meetings

Editors Note: Prior to, and after the International Grassland Congress (IGC) held in Sydney in September 2013 there were a number of related and specialised meetings across Australia. A diverse range of information on Grassland Agriculture was shared at these meetings. The following presents some of the highlights from these events. Thanks to Mark Trotter for the information on the SMARTfarm Tour & Spatially Enabled Livestock Management Symposium, and to Mark Norton for the information on the Pasture plant adaptation to drought and high temperature workshop.

SMARTfarm Tour & Spatially Enabled Livestock Management Symposium

Post the IGC in September a SMARTfarm tour to Armidale attracted 25 leading researchers from the USA, UK, Uruguay, Brazil and New Zealand. The group toured leading grazing property "Sundown Valley" and the UNE SMARTfarm.

There were plenty of hands on sessions to try out the new technologies. A biomass sensor calibration exercise (using the newly developed Trimble Greenseeker) pitted two teams (New Zealand vs the rest of the world) against each other to create the most accurate calibration curve, sadly the Kiwi's walked away with a clear win, yet again proving their prowess in the pasture science field.

Also post IGC, the fourth Spatially Enabled Livestock Management Symposium was held at the Faculty of Agriculture and Environment's new Centre for Carbon, Water & Food at Camden. Jointly organised by the Faculty of Agriculture & Environment, Faculty of Veterinary Science (both from The University of Sydney) and the Precision Agricultural Research Group, University of New England.

The conference was extremely well attended with approximately 60 scientists, farmers, industry representatives and agricultural media representatives from throughout Australia plus a number of overseas attendees including NZ, US, Ireland, Netherlands, Argentina and Uruguay. Over the course of the symposium 32 speakers delivered presentations on a wide variety of topics. These ranged from 'virtual' fencing to measuring biomass remotely; using technology to monitor and record animal behaviour; automatically recording animal liveweight and using a number of technologies to help explain spatial patterns of nutrients in paddocks due to livestock excretion. In addition, a number of studies investigating automated dairy systems, robotics and technologies to determine ovulation and animal health were presented.

While some of the technologies are still very cutting edge and not ready to be used in any kind of practical sense, others are likely to be ready for real-world application in the near future while some of these technologies are already being used in a commercial sense (Pasturewatch). The future is indeed bright for many of these technologies and they will increasingly become part of the modern farm manager's toolkit to help optimise production in farming systems.

For more information on the symposium contact Dr Lachlan Ingram, 0458 767 677, lachlan.ingram@sydney.edu.au

Editors note: The following are some selected Abstracts from the fourth Spatially Enabled Livestock Management Symposium

Spatial variability in animals, soil and nitrogen

Keith Betteridge, AgResearch Grassland, Palmerston North, New Zealand, keith.betteridge@agresearch.co.nz

Many livestock farmers continue to manage their paddocks as though each was the same and therefore requires the same level of inputs and stock management. However, increasingly more farmers now recognise the productive and environmental value of applying variable management to each of the land management units on the farm (Mackay *et al*. 2001).

Despite Lawrence (2013) showing that substantial savings in fertiliser costs were achieved through soil sampling each paddock on his dairy farm and applying nutrient requirements accordingly, uptake of this simple, cost-effective strategy for managing spatial variability in soil fertility is slow. Uptake of precision livestock farming technologies requires good knowledge of variability in soil type and soil fertility. Soil maps of NZ are available at 1:50,000 scale, though accuracy at the paddock scale can be poor since maps were created by interpolation from lower resolution maps. However, the SUBS programme (Mackay *et al.* 2001) has been developed for farmers to describe their own soils, in conjunction with national soil maps. EM mapping of soils is now an accepted practice, at least on lowland.

Within paddocks, variable soil fertility is also created by stock use of gateways, shelter and troughs, and by camping. High losses of P and N can occur from these sites. With the imminent creation of regional water and air quality standards, NZ farmers may soon be faced with caps on emissions and, therefore, productivity. Thus 'proven' mitigation strategies are urgently required. In hill country, cattle camp on flat land usually at low elevation. GPS and urine sensors were used to show that up to 50% of all cattle urination events in a paddock occur in the campsites that occupy just 5-10% of the area (Betteridge *et al*. 2010). To quantify the N deposited in urine patches a new sensor has been developed. Glued over the vulva, the volume and N concentration of all excreted urine is estimated by this sensor. Data are downloaded by telemetry and the position of the urine patch can be determined either by triangulation using Zigbee, or by GPS on the cow. Diurnal patterns in urinary N loads will be discussed, as will the change in N load of each urination event when cows are shifted to new pasture. The data suggest that cows held for 20+ h on a stand-off area during winter are unlikely to deposit much urinary N during the 2-3 h each day they are on the crop or pasture.

Paddock-scale prediction of annual N leaching using the lognormal distribution patterns of urinary N content and volume, indicate that leaching is higher than if the same data were input to the model as average values of N% and volume.

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Examining the potential for virtual fencing in merino sheep

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Managing livestock grazing behaviour is essential to understand grazing distribution and to optimise grazing management. Many of the problems associated with grazing livestock in extensive systems are related to their uneven patterns of use across the landscape. Fencing is the most frequently used tool for influencing grazing distribution. Virtual fencing (VF) has the potential to automate animal management and provide autonomous animal control in real time. VF requires animals to wear an electronics package that includes hardware, software and an antenna to receive radio frequency signals. However, there is limited information on how VF might affect grazing distribution, animal behaviour and welfare in a large scale commercial context.

The aim of this trial was to study animal responses to stimuli and evaluate the potential of VF for sheep. Using a familiar paddock, eight sheep were fitted with radio frequency (RF) based electronic containment devices (ECD's) to simulate VF and were placed at one end of the paddock. The paddock was subsequently divided in half by an RF ground wire. Within 1.5 m of the ground wire an audible warning was delivered by the device, if the sheep continued to move towards the ground wire an electrical stimuli was applied. The other side of the "virtual fence" was made attractive by the presence of the animal's campsite. The experimental period was 7 h, after which the ECD's and ground wire were removed. The sheep were returned to the paddock to test if their spatial behaviour had been modified because of their experience with VF.

The ewes demonstrated a strong ability for associative learning, one which could be further exploited to reduce the need for electrical stimulation. No short term detrimental effects were noticed, with sheep returning to graze within 10-20 seconds following electrical stimulation. After ECD removal, there was no evidence of any behavioural changes, with the ewes crossing the position of the ground wire and returning to pre-VF spatial utilisation immediately upon returning to the paddock. This experiment found a number of problems facing the fitting of VF units to sheep. The deployment of collars on sheep is not a long term option as they interfere with fleece and skin.

The results suggest that there is potential for the application of VF technology to sheep to modify their behaviour, however, further research is required into how sheep might actually be fitted with VF devices.

This study has been supported by the Australian Wool Education Trust.

UNE SMART FARM: Showcasing the value of broadband connectivity in livestock farming

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The "SMART" in SMART Farm represents a vision to deliver Sustainable, Manageable and Accessible Rural Technologies on-farm which enhance the business and lifestyle of farming. Connected via both satellite and fixed-wireless NBN (the same connectivity options currently available to Australian farms), SMART Farm serves as an education and extension resource for teachers of agriculture and environmental sciences, and as a key platform for up-skilling the wider agriculture sector for NBN-enabled technologies.

The University's 2,800 hectare, commercial, SMART Farm is a livestock and sheep enterprise. Spatially-enabled livestock management is highlighted through the integration of tools such as remote and in-situ pasture and soil moisture monitoring, livestock tracking, genetics and performance, providing to educators live and interactive data for use in teaching agriculture and environmental science. At the same time, the SMART Farm aims to demonstrate practical and realistic NBN-enabled pathways and tools for increasing productivity, and improving environmental outcomes, safety and work-flow, business resilience and social inclusion on farm.

The SMART Farm project has been developed with a range of educators and industry participants in mind and as a convergence of industry innovation and technology. In addition to supporting a national outreach program for high school students, the SMART Farm is used in supporting undergraduate teaching in Science as well as Rural and Environmental Science, as well as in the Graduate Diploma in Precision Agriculture and the Diploma in Agriculture

Digital homestead: delivering end user value from realtime on-farm monitoring

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Sustainable and viable primary industries must be capable of regularly producing a margin above the costs of production. The real challenge is achieving this in an increasingly dynamic and challenging environment where resources are limited whilst demonstrating improved efficiency to the wider community with respect to environmental stewardship and animal welfare. Viable and resilient farm businesses in the future will make use of a wide range of data to make accurate and timely decisions. More accurate, timely and efficient management (operational, tactical and strategic) across the farm business would be improved by the timely, accurate and objective measurement of resources (from soil and water to feed, animals and product quality and quantity) and the operating environment coupled with sound interpretation and understanding.

In a joint initiative between CSIRO, James Cook University (JCU), Qld Dept Agriculture Fisheries and Forestry (DAFF) and Queensland University of Technology (QUT), the Digital Homestead project is investigating how electronic services enabled by connectivity to the National Broadband Network can support greater productivity for farming enterprises, as well as providing related support and social services to rural residents. Based at CSIRO's Lansdown Research Station near Townsville, QLD researchers are implementing sensor and related technologies to provide information to simple and usable cloud-based decision support systems for farmers and agriculture advisers. It is anticipated that key technological solutions will then be evaluated on a commercial scale at QLD DAFFs Spyglass Beef Research Station near Charters Towers, QLD.

A demonstration site has been established at Lansdown to monitor growing steers in an extensive grazing environment. Three groups of 30 steers each graze one of three 15 ha paddocks in rotation. Each group of three paddocks has one permanent water point that is fenced off and has two spear gates, one for entry and one for exit. A walk over weigh station connected to wireless sensor network is located behind the entry spear gate. The sensor network relays data from a range of static sensors including animal live weight, climate data and soil moisture and pasture/soil reflectance values. Livestock monitoring devices record animal location and activity continuously. The data are uploaded to a central server and can be viewed in real time via the web.

A web-based 'dashboard' has been developed to integrate and present information obtained from both internal (e.g. LW, weather, animal location and behaviour) and external sources (e.g. climate forecasts and market information). The key requirement is that information is presented in a timely and informative way, can be tailored to individual users' needs and preferences, and enables more informed decisions. The design and functionality of the dashboard were based on the ongoing input of industry stakeholders.

We gratefully acknowledge funding through the Queensland Government Smart Futures fund.

Feed management strategy in a fully automated pasture-based robotic milking system

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Automatic, or robotic, milking systems (AMS) involve the automation of the entire milking process (including teat cleaning/preparation, cup attachment, milking, cup removal and post-milking teat disinfection). Detailed reports on individual cows (or groups of cows), such as details regarding each milking session, cow performance, cow traffic and location on-farm, are generated daily from such systems. Cows are generally managed with voluntary cow traffic (whereby cows move around the entire farm system with minimal human interference) to achieve the greatest benefits from AMS.

Management of incentives is necessary to ensure acceptable levels of cow traffic, and subsequent milk yield, is achieved.

The development of a robotic rotary (RR) with reported throughput potential of up to 1,600 milkings per day could have the ability to milk up to 800 cows twice a day. With such high throughput and a single entry point to the milk harvesting equipment, movement through the dairy must be efficient in order to minimise the risk of congestion and any associated negative impacts. Incentives (the strongest and most reliable being feed) are used to encourage cow traffic in any robotic milking system. While most AMS have the ability to provide feed during milking, this is not the case with the RR. Here we report on an investigation designed to determine the impact of a feed reward at milking on pre-milking voluntary waiting times. Cows were managed in an Australian pasture-based system with voluntary cow traffic and milked on a prototype RR. Treatments were given as "Feed On" (pelleted concentrate supplied at milking) and "Feed Off" (no concentrate supplied at milking) and were exclusive (i.e. treatments were not given simultaneously to groups within the herd). The study was of 33 days duration, with cow traffic data collected over 16 days. A survival analysis, with time-varying covariates, was used to model pre-milking voluntary waiting times.

Cows spent a median time of 2.2 h in the pre-milking yard before volunteering for milking, with just over 70% of cows having exited the yard (volunteered for milking) after 4 h. It was found that during the "Feed On" treatment, cows spent less time in the pre-milking yard (0.53 × less time) than they did during "Feed Off". Heifers were faster to exit the pre-milking yard, with older cows spending at least 1.40× longer in the yard before milking. Time spent in the pre-milking yard increased as the number of cows present increased. Feeding a small reward on the RR platform reduced the time cows spent in the pre-milking yard. As AMS becomes more common in Australia, it is essential that research into management strategies that encourage good cow traffic and cow welfare occurs.

The authors acknowledge the Dairy Research Foundation for its support and the investors of FutureDairy; Dairy Australia, DeLaval, NSW DPI and The University of Sydney.

Pasture plant adaptation to drought and high temperature

This pre IGC workshop also incorporated "The 2nd International Workshop on Summer Dormancy in Grasses" and provided scientists interested in this area a forum to present research findings , review progress in this discipline and to develop future activities.

The one day workshop comprised presentations from thirteen scientists and was concluded with a summary and discussion session. Five of the morning sessions focussed on the maintenance of forage yield under short-term drought in temperate climates while two presentations from China described the adaptive traits found in two xerophytic/ halophytic plants of the arid western regions of that country. Five of the afternoon presentations focussed on the summer dormancy trait and plant survival over more severe drought. One paper dealt with the relationship between winter dormancy and drought tolerance in lucerne.

The recordings of this Workshop are available at http://www.grasslandnsw.com.au/IGC_Satellite/

Editors note: The following are some selected Abstracts from the Pasture plant adaptation to drought and high temperature workshop.

Identifying perennial grass plant traits for future warmer and drier climates

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There is potential to select pasture species better adapted to anticipated warmer temperatures and lower rainfall, associated with increasing atmospheric carbon dioxide (CO_2) concentrations, to maximise pasture yields. This study assessed the effect of increasing three plant traits, root depth, heat tolerance and responsiveness to elevated CO_2 concentrations, in perennial ryegrass (*Lolium perenne* L.) to adapt to future climates. Pasture production was simulated using the Sustainable Grazing Systems Pasture model at three sites in south eastern Australia: Hamilton (medium rainfall, temperate climate); Ellinbank (high rainfall, temperate climate); and Elliott (high rainfall, cool temperate climate). Two future climate scenarios were created at each site by scaling the historical climate (1971-2010) by +1°C with -10% rain (435 ppm CO_2) and +2°C with -20% rain (535 ppm CO_2). A genotype by environment interaction suggested that the plants traits most effective at increasing pasture yield differed depending on the local climate. Increased root depth was the most effective change in a single trait that increased pasture harvested at Elliott, increased heat tolerance was most effective at Ellinbank, while increasing all three traits was effective at Hamilton. When all three traits were increased at the same time the pasture production advantage was greater than the additive effects of changing single traits at Hamilton and Ellinbank. Further consideration of the feasibility of selecting multiple traits and the effects of a broader range of climate projections is required. Nonetheless, results of this study provide guidance to plant breeders for selection of traits adapted to future climates.

Interspecific hybridisation as a route to improved drought tolerance in white clover

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White clover has poor resistance to low soil moisture, which occurs in low rainfall areas and during drought events. In New Zealand this limits its use in dryland regions such as the east coasts of the North and South Islands, as well as Central Otago and hill country areas. AgResearch's *Trifolium* hybridisation programme aims to produce novel hybrid clovers for agriculture, including improved white clover with traits introgressed from close relatives. The wild relative, *T. uniflorum* L., is of no agricultural value in itself but, due to their close phylogenetic relationship, is easily crossed with white clover to produce fertile, productive hybrids. It is a Mediterranean species and this distribution, along with its physical characteristics, suggested it may be adapted to low soil moisture. We hypothesised that *T. repens* x *T. uniflorum* hybrids would be less affected by drought stress compared with white clover and this was confirmed for backcross 1 (BC1) hybrids under field conditions using a rain shelter facility. Multiple traits were identified which contribute to this, including morphological and physiological differences in responses to drought

stress. Data from a glasshouse experiment has also provided evidence of a deeper rooting habit in *T. uniflorum* than in white clover, which is inherited by BC1 hybrids. This would provide greater access to deep soil moisture under dry conditions. Drought resistance of white clover can, therefore, be improved by interspecific hybridisation. Our results were based on unselected hybrid families, suggesting even greater improvements can be made with selection and breeding.

Summer dormancy expression in the Australian native grass *Elymus scaber*

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The C3 native perennial grass, *Elymus scaber*, has been described as displaying strong summer dormancy. However, the reports of dormancy were not tested under conditions of non-limiting soil moisture. *E. scaber* populations were collected from the localities of Canowindra, Ganmain, Holbrook, Panuara and Wagga Wagga in NSW. To test the level of dormancy, each population was subjected to three irrigation treatments: complete summer watering (CSW), summer drought (SD) and summer drought broken by a simulated mid summer storm (SS), under a rainout shelter. Irrigation treatments were applied from 7th November 2011 at which time the SS treatment was not watered for 75 days before receiving 45 mm of irrigation to simulate a summer storm. The SD treatment was not watered for 114 days. All five populations of *E. scaber* demonstrated significant increasing levels of herbage senescence ($P < 0.001$), irrespective of the irrigation treatment. Following 38 days of constant moist soil conditions, signs of new tiller development was observed in the CSW treatment. With no irrigation, the SD treatment developed limited numbers of new tillers and stayed relatively constant. The SS treatment showed similar new tiller development with the SD treatment. After the application of a mid January simulated rain event, there was a significant increase ($P < 0.05$) in tiller formation from *E. scaber* plants in this treatment. The tillering response among *E. scaber* plants was the same across all populations tested, with no significant population.irrigation effect. The response to the CSW and SS treatments would indicate incomplete summer dormancy in *E. scaber*, in contrast to strong summer dormancy as previously described.

Freezing Out Drought: Studies on the relationship between winter dormancy and drought tolerance in lucerne

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Lucerne cultivars can be broadly classified based on their growth response in autumn and winter into four genotypes: winter dormant, semi-winter dormant, winter active and highly winter active.

These genotypic classifications are linked to the cultivars measured rate of survival when exposed to freezing temperatures. Consequently, winter dormant cultivars outperform the more winter active cultivars in terms of persistence and long term production when grown in environments that experience freezing winters. However, it is also commonly noted that in other environments where there is no exposure of the plant to sub-zero temperatures over winter, winter dormant genotypes outperform winter active genotypes. Specifically, this phenomenon has been noted in environments where water is limiting and when the stress of water deficits is alleviated through irrigation, production by winter active and highly winter active genotypes equals or exceeds that of the winter dormant and semi-winter dormant genotypes. Winter dormant genotypes when exposed to water deficit, have been observed to maintain more favourable shoot water potentials, more adaptive stomata, greater rates of photosynthesis and greater taproot starch concentrations when compared to winter active genotypes.

Both freezing stress and drought stress are similar in their effect on cell function in that they both cause considerable cellular dehydration. The strategies that plants employ to adapt to both stress factors are similar and include the accumulation of small molecules (e.g. simple sugars, amino acids) in the cytoplasm to increase the cells osmotic potential and modifications to protein complexes allowing continued function during dehydration. Given the similarities between both freezing and drought stress at a cellular level and the strategies plants employ to minimise stresses on physiological processes it could be expected that there would be cross over between the genes that convey tolerance to both drought and freezing stress.

Several genes associated with freezing tolerance are up-regulated in lucerne plants when exposed to drought stress. However, only a small subset of these genes show a greater level of up-regulation in the drought tolerant winter dormant genotypes and this up-regulation is not seen in the less drought tolerant/ more winter active genotypes. The subset of genes that exhibit up-regulation include the root CAR1 gene, CAS18 gene, and the CORF gene. These genes represent a diverse range of functions including nuclear signalling, encoding for a dehydrin and the synthesis of raffinose

family oligosaccharides. The absence of a consistent response across all genes previously associated with freezing tolerance suggests that the relationship is far from simple. To fully understand the myriad of genes involved in drought stress and their relationships to these involved in freezing tolerance and winter dormancy a full transcriptome analyses is required. If the hypothesis of similarity between the tolerance to freezing temperatures and tolerance to drought is correct, the recent identification of experimental lucerne lines with freezing tolerances being greater than their winter dormancy classification would suggest, presents a possibility to develop winter active cultivars with superior drought tolerance, therefore, making lucerne a more attractive forage crop for dryland pastoral enterprises.

Grasses of the NSW Tablelands

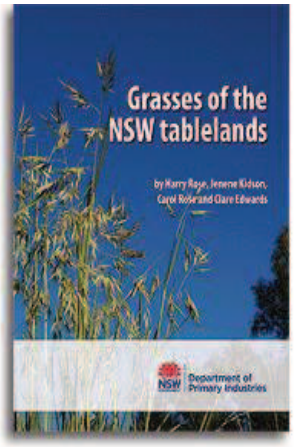
Grass identification is made easier with the release of the Department of Primary Industries' (DPI) publication Grasses of the NSW Tablelands.

DPI Education Officer and Principal author Harry Rose said the tablelands deserved its own volume on grasses as it is such a different environment from the coastal zone.

"The new book covers a range of species including common native, naturalised and sown species found on the tablelands," Mr Rose said.

"A number of grass weeds have been included as weed species identification is an important first step to developing weed management plans."

DPI Development Officer and fellow author Clare Edwards said it is important to be able to recognise what you have to make good management decisions and to monitor species changes over time. "It will assist long-time graziers as well as those new to the tablelands because very few people can readily identify every plant on their property," Ms Edwards said. "The importance of diversity in an animal's diet would suggest that a sound knowledge of a paddock's plants can aid in better livestock management.



"The book is useful to land carers as an easy to use recognition field guide to assess biodiversity and restoration potential, with many of the less common natives included."

Grasses of the NSW Tablelands is a 172 page colour book with multiple quality images of each grass for easy recognition. It can fit in a glove box and is designed to be used in the paddock.

Cost is $20 plus postage ($8) available from Tocal College. Please phone 1800 025 520 or email or look online under publications.

EverTrain Learning

A new online learning program allows farmers to connect from the paddock. The platform is available for agribusiness and farmers to study a range of accredited and non-accredited courses on managing soil carbon, soil biology, salinity and climate risk.

The five EverTrain courses are:

- Managing carbon on agricultural land;
- Managing climate risk in agriculture;
- Salinity concepts NSW;
- Salinity management NSW;
- Soil Biology.

The EverTrain program was developed by the Department of Primary Industries and funded by the Future Farm Industries CRC to promote and encourage adoption of perennial plant-based farming systems in southern Australia.

For more information or to sign up for a course go to

www.evertrain.edu.au

Research Update

Usually this section highlights recently published work in leading journals - this issue, however, features some current research conducted by NSW Department of Primary Industries.

Dorpers the best of the west

New research has revealed Dorper sheep perform better under rangeland conditions in Western NSW than their traditional counterparts, Merinos, following studies carried out at the Department of Primary Industries' (DPI) Trangie Agricultural Research Centre.

DPI rangelands researcher, Dr Yohannes Alemseged, has been comparing the grazing behaviour, diet selection and impact on ground cover between the traditional Merino and Dorper sheep for the past three years, combining information from laboratory experiments, field studies and producer experience. "Our studies have shown Dorper sheep have many benefits in Western NSW because they have a wider diet, they are more flexible and stocking rates can be adjusted much more quickly," Dr Alemseged said.

"DNA sequencing of dung samples from Dorper and Merino sheep revealed much more plant species were consumed by Dorper than by Merino, indicating Dorpers have wider diet selection, which is especially relevant for producers in Western NSW, which covers west of Nyngan and extends to the South Australian border.

"The research also indicated Dorpers might have higher digestive efficiency than Merinos, especially under poor quality diet.

"White Dorpers are developing a reputation for being easy to care for and hardiness in the semi-arid environment – they also have the potential for organic meat production."

However, the research also revealed strategies are needed to avoid overgrazing.

"From a natural resource or ecological perspective, Dorpers are more likely to cause overgrazing under unfavourable climatic conditions if not properly managed because they eat more than Merinos, leaving little behind for groundcover," Dr Alemseged said.

"These strategies might include stocking at a lower rate, establishing on-property feed lots, development of alliances with off-property finishers, or restricted joining of females or heavier culling of older age groups under poor seasonal conditions." The DNA and digestive efficiency studies were undertaken by DPI in collaboration with the Australian Museum and Charles Sturt University (Graham Centre). The project was funded through the Murray CMA.

"The next step of this project is to develop practical management strategies that are supportive of regional and national ground cover targets aimed at reducing wind erosion and maintaining biodiversity values," Dr Alemseged said.

Glen Innes methane research

The Department of Primary Industries (DPI) and University of New England in Armidale will undertake world-first research with uniquely-bred high feed efficiency cattle at the DPI Glen Innes Research Station.

DPI Director of Livestock Systems Delia Dray said the research will measure pasture intake and methane greenhouse gas production of Angus cattle uniquely bred for superior feed efficiency.

"This research will compare methane emissions and feed intake from individual grazing cattle with extremes of high or low estimated breeding values for feed efficiency," Ms Dray said.

"This large difference in breeding values for efficiency allows the researchers to test whether genetic superiority in efficiency is expressed by pasture grazing cattle as well as feedlot fed cattle.

"The research will be conducted in partnership with DPI Principal Research Scientist Dr Robert Herd and University of New England PhD candidate Jose Velazco from Uruguay. "It will involve testing around 62 uniquely bred Angus cattle over the next three months at the Glen Innes Research Station.

"These Angus cattle come from the only known cattle herd in the world bred for superior feed efficiency. Bred at DPI Trangie Research Agricultural Centre over the past 15 years these cattle have repeatedly shown to be more feed efficient in the feedlot."

Ms Dray said new technology to be used during the research includes the Australian designed and manufactured feed bins that will deliver feed-intake markers to individual cattle.

"By collecting faecal samples and determining the dilution of the markers, researchers can determine the feed intake.

"Methane emissions will be measured using new emission monitors imported from the US that are solar powered and operate in the paddock," Ms Dray said.

"It is expected that breeding cattle for lower net feed intake, a measure of feed efficiency, will improve feed conversion of cattle on pasture and reduce their greenhouse gas emissions.

"This outcome will be a win for cattle producers and a win for the environment."

Making meat history

For the first time in its history Meat Science, a prestigious international journal has enlisted an Australian as editor-in-chief. NSW Department of Primary Industries (DPI) senior principal research scientist and Cowra local, David Hopkins, said he was honoured to be invited to take up the position which had previously been the domain of British scientists.

"Receiving up to 1000 submissions each year, the journal encourages scientists to share and discuss their research, largely on red meat and pork qualities," Dr Hopkins said.

The first issue of Meat Science with Dr Hopkins as its new editor-in-chief will be published in February 2014, with many articles already available online, http://www.journals.elsevier.com/meat-science/

A total of seven DPI research papers examining the impact of genetics, nutrition and processing on lamb quality and new processing and packaging technology for beef have been selected by the editorial board to run in the latest edition. The DPI papers were written by Dr Sue Mortimer, Trangie Agricultural Research Centre, Johanne Taylor, Orange and Dr Remy van de Ven, Orange Agricultural Institute and Dr Hopkins, Cowra Agricultural Research and Advisory Station.

From the President

Hello and welcome to my first 'From the President'.

As the newly elected president of the Grassland Society of NSW I firstly wish to thank, on behalf of the state committee and our society members, Mick Duncan, our outgoing president for the tremendous job he has done in leading the society over the last 9 years. Mick has contributed at the highest level for all our benefit, and will continue to do so in his role on the state committee.

For those that don't know me, I thought a quick brief may be of interest. I grew up on the land in southern NSW at Tumbarumba, with the family expanding its rural interests to Holbrook in 1979. A degree in Rural Science at UNE Armidale expanded my own interest in agronomy and soil and plant science, and that is where my own advisory business, D R Agriculture Pty Ltd, that commenced nearly 10 years ago, strongly focuses.

Much of my work today involves contract research, including pasture species work for MLA, and pasture and crop nutrition and plant response work for other commercial and research entities. Outside of research, I provide private advisory consulting, conduct industry training, and watch the family grow up. I live near Molong in central NSW, with my wife Nicola, and have 3 children, Tom (at Sydney Uni) and Emma and Sam (High School). I look forward with great interest to the challenges ahead for the society, and leading it as a key provider of farmer based industry information.

As I write, the last of the MLA funded 'Grassland Society of NSW Pasture Updates' for 2013, at Taree, is all but here. These Pasture Updates are proving to be a very successful series of producer forums, with many producers benefiting from the more localised dissemination of information. Plans for 2014 are well underway, with the society looking to hold 5 updates. Locations for these are yet to be finalised, so keep an eye on our web site for more information.

Having not held a 2013 Annual conference in preference for the International Grasslands Congress held in Sydney in September 2013, the Grassland Society's annual conference will return in 2014, and will be held in Northern NSW. The likely venue at this point will be Inverell, however final plans are yet to be bedded down. Again, more information coming soon.

So that nearly ends 2013, and for some, they would say thank goodness. It has been a year of very mixed results. Southern NSW in many parts could not of had a better year, up until late frosts hit much of the farming country. The west is extremely dry and continues to be so, fortunately Northern NSW has just received some much needed rainfall, but I know it didn't get everyone, the coast is looking to dry out in spots, and Central NSW is drying rapidly after another testing winter and no spring. Agriculture is a wonderful game, I just wish we had a set of rules to run by, and "General Rain" of 'Squatter' fame would be more common. Here's hoping 2014 delivers a better outcome for all.

On behalf of the Grassland Society of NSW, I wish all our members, their families and friends a very safe and merry Christmas, and I hope to hear of a prosperous start in all regions of NSW in 2014. Stay well, think of others, and don't be afraid to ask "How are you Going?"

All the best,
Regards,
David Harbison, President.

PHOTO COMPETITION

The photo competition has been extended until the end of April 2014.

Send in your favourite pastoral or grassland landscape photo to go into the running for a years free membership.

Email your digital photos to Carol Harris at carol.harris@dpi.nsw.gov.au

Please provide a caption and/or location of the photo.

The Grassland Society of NSW Inc is a unique blend of people with a common interest in developing our most important resource - our Grasslands

The Grassland Society of NSW was formed in March 1985. The Society now has approximately 500 members and associates, 75% of whom are farmers and graziers. The balance of membership is made up of agricultural scientists, farm advisers, consultants, and or executives or representatives of organisations concerned with fertilisers, seeds, chemicals and machinery.

The aims of the Society are to advance the investigation of problems affecting grassland husbandry and to encourage the adoption into practice of results of research and practical experience. The Society holds an annual conference, publishes a quarterly newsletter, holds field days and is establishing regional branches throughout the state.

Membership is open to any person or company interested in grassland management and the aims of the Society. For membership details go to www.grasslandnsw.com.au
or contact the Secretary at secretary@grasslandnsw.com.au or at PO Box 471 Orange 2800

Office Bearers of the Grassland Society of NSW – 2013-2014

State Executive

David Harbison (President)
Lester McCormick (Vice President)
Janelle Witschi (Secretary)
Frank McRae (Treasurer)
Mick Duncan (Immediate Past President)
Carol Harris (Editor)

Committee: John Coughlan, Hugh Dove, Nathan Ferguson, Keith Garlick, John Ive, Hayley Pattison, Warwick Wheatley

Branch Representatives

Loretta Serafin (North West Slopes)
John Coughlan (Central)
Hugh Dove (Southern Tablelands)
Mick Duncan (Northern Tablelands)
Cathy Waters (Central West Slopes and Plains)
Hayley Pattison & Nathan Ferguson (South Western Slopes & Riverina)

If you are interested in reactivating an old branch or forming a new branch please contact the Secretary at secretary@grasslandnsw.com.au or by mail at PO Box 471 Orange NSW 2800

Grassland Society of NSW News

Next Newsletter: The first issue of the newsletter for 2014 will be circulated in March 2014. If you wish to submit an article, short item, letter to the Editor or photo for the second issue please send your contribution to the Editor - Carol Harris at carol.harris@dpi.nsw.gov.au or DPI NSW 444 Strathbogie Road Glen Innes 2370. The deadline for submitting contributions for the next newsletter is February 03 2014 .

New members: The Grassland Society of NSW welcomes new members Floyd Legge, Cudal; Ron Caccianiga, Gravesend; and Darcy Duggan, Barraba

Don't forget you can receive the newsletter electronically rather than a printed version if you wish. Just email Janelle (secretary@grasslandnsw.com.au) your email details and we will add you to the list.

Grassland Society of NSW - PO BOX 471 Orange NSW 2800, www.grasslandnsw.com.au

This publication is prepared by the Grassland Society of NSW Inc and printed by GK Craig Printers, Orange on recycled paper