Grassland Society of NSW Inc

Newsletter

Welcome to another jam-packed newsletter with a diverse range of articles from Life Cycle Analysis for a wool enterprise (page 2); to the use of fertiliser to lift productivity (page 3 and page 10); to a range of new perennial pasture cultivars ready for commercialisation on page 6.

The Australian Grasslands Association (AGA) is a partnership between the Grassland Society of Southern Australia and the Grassland Society of NSW and this year Evergreen Farming of Western Australia joined as an Associate. The second research symposium "Perennial grasses in pasture production systems" hosted by AGA was held in Canberra in May. The event was very successful with 24 invited and contributed papers – on page 9 there is a full report by the AGA President, Rob Salmon. Paper abstracts & poster papers will be reprinted in upcoming issues of the newsletter.

The next big conference in NSW is the International Grassland Congress (IGC) – September 15-19 in Sydney. Go to www.igc2013.com for full program and registration details. Grassland Society of NSW travel grants are available to support producer members interested in attending the IGC – more details can be found on page 14.

If you are not able to attend the whole IGC – a one day satellite meeting "Pasture plant adaptation to drought and high temperature stress" sponsored by the Grassland Society of NSW on September 14 in Sydney might be of interest (details on page 13).

Recently the NSW Government launched an Issues Paper for their Agriculture Industry Plan (IAP) – this is the latest in a series of IAPs targeting key sectors of the NSW economy. A taskforce of nine industry leaders, headed by beef producer Lucinda Corrigan has identified key issues for the IAP including; productivity, profitability and innovation; workforce and skills; business and regulatory; investment and ownership; markets and export; and connecting with the community.

The NSW Government is calling for stakeholders in the states agricultural sector to have their say and contribute to the plan that will lay the groundwork for the sectors future. A discussion paper is available online at www.haveyoursay.nsw.gov.au – submissions close on August 2. Don't miss your opportunity to add your thoughts to the plan.

Carol Harris
Editor

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The emission profile from a wool producing property at Yass

Phil Graham, NSW Department of Primary Industries, Yass

The following is a partial summary of a recent paper published in the Animal Production Science journal, titled "Greenhouse gas emission profile for 1 kg of wool produced in the Yass region" by staff from NSW DPI (Brock, Graham, Madden, Alcock) and can be accessed at http://dx.doi.org/10.1071/AN12208

Marketing at the retail level in Europe is starting to use Life Cycle Analysis (LCA) on the products they sell and in New Zealand; companies have started to supply this information. A LCA was conducted for NZ lamb to show that the argument related to food miles was not accurate. Even allowing for the transport to Europe, NZ lamb had lower emissions than UK lamb.

This paper explained how a LCA for a region and product could be produced using a range of programs (GrassGro to provide the animal emission and pasture data, international data bases for products used by the farm and Farm Gas for nitrous oxide). Prior to this analysis, a case study approach was used, collecting all the data off one farm for a few years. The authors of this paper believe that the pasture data collected for the cases studies was inaccurate.

The product chosen for this paper was wool, but the same process could be used for lamb or beef. This was the intention of the authors.

GrassGro was run for the period 1960 to 2010 (Yass weather file) and then the median year for methane production was selected and the pasture production details from that year were used to calculate the nitrous oxide result from pasture decay.

The embodied emissions in the inputs to the farm, (power, fuel, fertiliser, drench etc) were calculated using the available international databases.

The total emissions /ha were 2.9T of CO2 –e /yr. Table 1breaks this into the different categories.

Methane swamps everything else; the emissions in farms inputs are insignificant.

The difficulty or noise in LCA occurs when you try to apportion the per ha figure to a product. The self replacing merino ewe enterprise used at Yass produces three products, wool, surplus merino hogget ewes and mutton from the CFA ewes and 18 mth old wethers. The usual method used is to break up the total emission figure in the same proportion as the income from the products. Table 2 shows the percentage breakup for a wool operation and an operation using the same ewes, but joined to terminal rams and buying in replacements.

There was very little difference in the total emissions between the two enterprises and the wool produced was the same fibre diameter in both enterprises, but because the income profile was different, the amount of the total emission attributed to wool varies considerably.

The resulting CO2-e for 1 kg of wool were 24.9 for the self replacing ewes and 14.8 for the merino * terminal. So 1 kg of wool of 19 microns has a different value depending on the enterprises run. This is a weakness of LCA that needs to be addressed. The paper looks at the impact on the final figure per kg of changing markets prices, fibre diameter and, fleece weight. All these factors changed the final figure, but not to the same extent as above.

It is the view of the authors that a LCA figure needs to outline the production system used to put the result in context, but more importantly new methods are needed to deal with allocating multiple products from the one enterprise.

Table 1. Total emissions in CO2-e/yr and by emission category for a wool enterprise at Yass.

AREA OF EMISSION	TOTAL EMISSIONS in CO_2 -e/yr
Methane from the animal	86
NO2 from animal waste directly	5
NO2 from animal waste indirectly	5
All inputs to the farm	2
NO2 from decomposition of pasture	1

Table 2. Emisions breakdown (percentage) by product for wool enterprise at Yass

	Wool	Mutton	Lamb or Hogget ewes
Self replacing merino	36%	32%	12%
Merino * terminal	31%	11%	58%

A timely reminder on potassium

Jim Laycock, Technical Agronomist, Incitec Pivot Fertilisers

Potassium (K) is a major plant nutrient required by plants in similar quantities as nitrogen (N), and in larger amounts than phosphorus (P).

It plays an essential role in plant production and product quality. Most Australian soils contain adequate levels of potassium, but even so, some potassium deficiencies have been reported in many regions of Australia.

Potassium deficiencies have been documented as early as 1930 at Warncoort in Victoria (Anon 1930).

Potassium deficiencies are more common in regions with an annual rainfall of more than 500 mm where there are high yielding cropping systems or intensive grazing enterprises.

Deficiencies are most commonly seen in the southern coastal regions of Victoria and South Australia, the south west of Western Australia, coastal regions of Tasmania, southern, central but rarely on the Northern Tablelands of New South Wales and some coastal regions in Queensland.

Responses to applied potassium are predominantly seen in pastures, particularly the legume component. Although not common in the eastern states, I have seen potassium deficiency in grazing cereals on the Central Tablelands and central west slopes of NSW.

Table 1. Removal of nutrients in various agricultural products

PRODUCT	Mean Nutrient Concentration (kg/t FW)					
	N	P	K	S	Ca	Mg
HAY						
Lucerne	28	2	24	2.6	9.9	2.7
Clover or medic	22*	1.7	18	1.6	8.6	2.3
Clover/grass	21*	2	18	1.7	5.3	1.9
Oaten	13	1.6	17	1.1	2.3	1.2
Pasture	18*	1.8	15	1.6	5.0	1.8
Sorghum	16					
Chopped corn	12	2.4	10.8	1.0	1.5	1.4
SILAGE						
Grass	24*	2.8	24	2.2	5.3	2.1
Pasture	26*	2.8	26	2.3	5.9	2.1
Maize	12*	1.9	15	1.0	2.1	2.4
Oaten	20*	2.5	23	1.8	3.7	1.7
Sorghum	15					
GRAIN						
Barley	16	2.7	4.6	1.2	0.65	1.2
Oats	15	3.2	3.8	1.2	1.0	1.1
Sorghum	15	3.2	3.6	0.8	1.6	1.3
Wheat	28	3.2	3.7	1.1	0.65	1.2

Source: Adapted from the National Land and Water Resources Audit Project, Nutrient Balance in Regional Farming Systems and Soil Nutrient Status, Appendix 6, September 2001.

Potassium in the plant

Potassium is important in plants for photosynthesis, respiration and enzyme activation. It is also required for protein synthesis and improves cold tolerance.

Potassium deficiency can be seen in this Wedgetail wheat on the slope of the hill where the dark green, high growth patches contrast with the paler low growth areas affected by potassium deficiency, Central Tablelands NSW 2009.

Potassium also has an important role in plant water relations, where it enables the plant tissue to “hold on” to its water. Potassium ions are actively transported into root xylem vessels where they assist in water uptake into the xylem.

The active transport of the K+ ion into and out of guard cells greatly assists in reducing the effects of moisture loss in dry periods. However, there is no evidence to suggest that foliar application of potassium will reduce the effects of moisture stress when soils are at wilting point.

Potassium is an essential macronutrient for all plants. It is a component of cell solutions, but not a part of the plant structure.

Tissue levels may be as high as 4% of plant dry matter, but are usually about 1-2%. Luxury uptake by pasture species (phalaris, cocksfoot, perennial ryegrass, sub-clover and white clover) can result

in potassium tissue levels as high as 7% This "luxury" uptake of potassium has implications for animal health with an increased risk of grass tetany. (Hosking 1986).

Potassium in the soil

The total amount of potassium in a soil is a function of:

- soil parent material
- extent of weathering and leaching of soil minerals
- type of clay minerals
- soil texture
- organic matter content, and
- potassium fertiliser history.

Like other nutrients, a large amount of potassium exists in soils, but only a small amount of it is available to plants.

Most of the potassium taken up by plants is from the soil solution (Anon 1977). Very little potassium is obtained by plant roots directly from exchangeable ions attached to clay-mineral or organic matter surfaces.

As plants remove the potassium from the soil solution, it is replaced at a rate depending mainly upon the rate of movement of potassium ions in the soil water (van Diest 1978). If this process cannot keep up with plant demands, plant growth will suffer and a response to potassium fertiliser could be expected (Hosking, 1986).

Table 2. Critical K value for a range of soil types

SOIL TEXTURE	CRITICAL K VALUE	CONFIDENCE INTERVAL
Sand	126	109-142
Sandy loam	139	126-157
Sandy clay loam	143	127-173
Clay loam	161	151-182

Source: Gourley *et al.* (2007)

Potassium deficiency

The first effect of potassium deficiency in plants is a decrease in growth.

With increasing deficiency and further depression of growth, the pasture plant leaves can develop deficiency symptoms that are sometimes sufficiently distinctive to be useful diagnostically (Hosking, 1986). However, by the time leaf symptoms appear, the yield of some plants may have dropped by 50% (Parberry 1967).

Marginal leaf spotting, commonly white /yellow in colour in pasture legumes is a characteristic of most species, not to be confused with insect attack, fungal leaf spotting or herbicide damage.
Symptoms are more common in spring when plant demand for potassium is at its highest.

In pastures, low potassium supply may cause a shift in composition in favour of grasses due to the different root morphology and nutrient uptake mechanisms between grasses and legumes. The root hairs of grasses are longer and more numerous and this gives them an advantage over clovers in nutrient and water uptake.

Deficiency symptoms are not often seen in pasture grass species.

However, in cereals, symptoms appear first and are more severe on old leaves where they appear on the tip and advance along the margins towards the base, usually leaving the mid-vein alive and green (Grundon 1987).

Causes of potassium deficiency

Some soils are naturally low in potassium. Soil test results for 1,811 sandy loam pasture soil samples from across eastern Australia from 3/10/2011 to 19/03/2012 at Nutrient Advantage Laboratory Services indicate that 29% (Figure 1) of those pastures were potentially potassium deficient, depending on the pasture species grown.

In the majority of pasture soils, removal and/or transfer of nutrients in harvested product has the greatest potential to induce potassium deficiencies. The removal of potassium from farms by the removal of animal products (wool, meat, milk) is small compared with the potential loss through the harvesting and removal of plant material. The removal of potassium in 4,000 litres of milk, 250 kg liveweight of beef or lamb and 50 kg of wool is calculated to be 5.7, 0.5, and 0.75 kg potassium respectively (Hosking 1986).

Potassium deficiency in Urambie barley, Central NSW 2009.

The removal of potassium from a 5 t/ha lucerne hay crop may be 120 kg/ha of potassium (Table 1). This form of removal in productive years can have a major impact on soil potassium levels.

Addressing potassium deficiencies

Soil testing (Colwell or Skene tests) is an effective means of assessing the likely response to the application of potassium based on soil texture (Table 2).

A major consideration with the application of any nutrient is that the nutrient applied will only address that one nutrient deficiency. If a soil has an additional nutrient limitation for plant growth, the most deficient nutrient will be the primary limiting factor. In such cases, it is possible that the expected pasture growth response to fertiliser will not be realised.

At two out of three Five Easy Steps trial sites on the Southern Tablelands of NSW, nutrient deficiencies other than phosphorus (potassium, sulphur and micronutrients) constrained the response

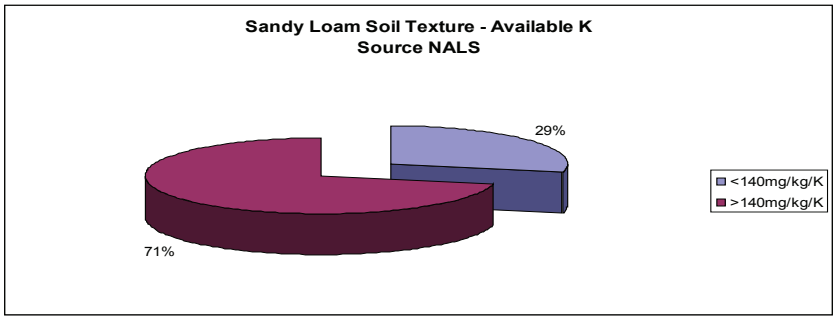

Figure 1. Potential potassium deficiencies based on soil test results from 03/10/2011 to 19/03/2012 on a sandy loam pasture soils. Source: Nutrient Advantage Laboratory Services, 2011-2012.

to phosphorus fertiliser (Simpson *et al*. 2009).

In these cases, it is possible that the expected pasture growth response to phosphorus fertiliser will not be realised. Money invested in phosphorus fertiliser will not be entirely wasted, but will not be used efficiently as the expected carrying capacity will not be realised and profitability of the investment will be compromised (Simpson *et al*. 2009).

A similar trend was seen at an Incitec Pivot Fertilisers trial at Marcus Hill, Victoria, in 2012 (Figure 2). Although not

Figure 2. Dry matter production (kg/ha) from three treatments at the Marcus Hill long term pasture trial in 2012

significant with this single dry matter cut, the trend was upward and there was a higher proportion of clover in the mix.

It is important to continue to monitor soil and plant nutrient status so that any limiting nutrient situations are identified early. Common nutrient deficiencies are molybdenum in acid soils, sulphur and potassium. Deficiencies of copper, boron, zinc and magnesium are also known to occur in some soils across southern Australia (Simpson *et al.* 2009).

Check local conditions with local advisers and use soil testing to detect potential macronutrient deficiencies and plant testing to investigate potential micronutrient problems.

Product choice, rates and timing

The predominant form of potassium for addressing potassium deficiency is muriate of potash (MOP). It is cheaper per unit of potassium than sulphate of potash and Victorian pasture experiments have not indicated any disadvantage in using the chloride form of potassium (Hosking 1986).

Muriate of potash also blends and spreads well with a range of P and S containing fertilisers to supply phosphorus, sulphur and potassium. Suggested rates of application can be based on enterprise and soil test values (see Table 3).

Pasture analysis results exceeding 4% potassium may indicate excessive soil potassium levels. Fodder conservation and cropping can be used to reduce potassium levels in the soil.

To reduce the risk of luxury consumption and associated health disorders in stock, avoid applying potassium fertilisers in early spring and at calving in seasonal herds. Split autumn and late spring applications are recommended in high rainfall areas or when high rates are applied (Havilah *et al*. 2005).

When broadcasting muriate of potash, apply to a moist soil and to pastures with more than 60% groundcover.

Finally, here is a quote by WJ Hosking in the introduction to the excellent 1986 publication “Potassium for Victorian Pastures – a review,” still relevant in today’s agricultural systems.

“Optimum use of potassium fertiliser demands an understanding of the role of potassium in the soil-plant-animal cycle, an ability to identify the presence of a potassium deficiency and to estimate the magnitude of the response expected from using potassium fertiliser, and an understanding of how best to use potassium fertiliser to achieve optimum economic production on a particular farm.”

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Table 3. Suggested rates of potassium application

ENTERPRISE	<80 mg/ kg K	80-120 mg/ kg K	120-230 mg/ kg K	>230 mg/ kg K
Dairy cows <2/ha	40	25	10	0
Dairy cows >2/ha	60	40	20	0
Irrigated lucerne	60	40	20	0
Irrigated pasture	45	30	15	0
Rain fed pasture	30	15	0	0

Source: Havilah *et al*. (2005)

Perennials on path to commercialisation

As Future Farm Industries CRC draws to a close, there are many forage plants waiting in the wings, in varying stages of readiness to take their place centre-stage on farms across Australia. But the path from prospective plant to commercial reality is a long, and often arduous one.

From the time researchers collect prospective plant material to the time a new plant cultivar is in farmers' hands can be many years, but the steps and knowledge gained along the way are crucial to the ultimate commercial success of the cultivar (see Table 1).

Peter Zurzolo, Future Farm Industries CRC Chief Executive Officer said it takes the trust and vision of agencies and industry bodies to commit resources to this journey.

"Selecting varieties and cultivars starts with identifying a need," Peter said. "From there, researchers collect prospective plant material and begin the process of selecting the best."

"Since beginning work on plant selection and breeding, the CRC and its partners have investigated many options, but will only take the most prospective through to commercialisation. The process of getting those final few selections requires a great many factors to be considered.

Putting plants to the test

Dr Clinton Revell (DAFWA), who leads the CRC's Future Cropping Systems program, explained that before a new variety or cultivar could be released, there were certain tests required to minimise the risk of negative outcomes.

These tests include:

- consequences for animal productivity and health
- potential to become an environmental weed or an unmanageable crop weed
- potential for problems in managing the agronomic performance or health of the plant.

"We need to balance legal, environmental and social obligations, but still enable new improved cultivars to be developed and released," Clinton said.

Table 1. Steps involved in the domestication of new plant species

Identification of agronomic need or potential opportunity
(new agro-ecological niches or new farming systems)

↓

Germplasm acquisition
(from genetic resource centres or collection trips to centres of origin)

↓

Genotype characterisation
(genotype sorting and measurement of important characters at a central location 1-2 years)

↓

Short-listing of species with desirable characters
(growth habit, pod and seed characteristics)

↓

Nursery trials of short-listed species
(1-2 genoptypes or bulks of 2-5 representative genotypes, limited locations, small plots, 2-3 replicates 2-3 years duration)

↓

Selection of best adapted species for production, persistence and commercial potential

↓

Field evaluation of elite genotypes of the best species, in comparison with best existing pasture options
(5-20 genotypes, multi-location trials in target environments under intended management system, 3-5 replicates, measurement of biomass production and persistence over 3-4 years duration)

↓

Cultivar release decision
(determination of whether the best genotype(s) of the new species should be commercialised)

↓

Duty of care trials
(quantification of any known or likely anti-nutritional or toxic chemicals in the species, conduct of grazing trials to confirm safety to grazing animals and weed risk assessment studies, 1-3 year duration)

↓

Cultivar release
(production and release of breeders' seed to industry, pending satisfactory duty of care trial outcomes)

From Nichols PGH, Loi A, Nutt BJ, Snowball R and Revell CK (2008) Domestication of Mediterranean annual pasture legumes for Australia farming systems. In 'Conference proceedings of XXI International Grasslands Congress', 2008 China.

"We also need to make sure the cultivar will do the job required of it and meet industry expectations."

Commercial reality

Peter Zurzolo said the limitations imposed by the CRC's seven-year term, and the likelihood of successfully delivering material to a commercial partner in that time, influenced the CRC's decisions about which of the original prospective plants were chosen to be taken to full commercialisation.

"Given that the CRC will only exist until June 2014, and has some limited funding, we made some decisions about the plants we would continue working with and those we would hand over to others," Peter said.

"We now have plants in various stages of development or commercialisation. With some, we are currently negotiating the details of commercial release with seed companies. We expect contracts to be in place later this year or early next year, and commercial release to farmers will follow."

Improved lines of old man saltbush, new varieties of cocksfoot, lotus, tall fescue and panic grass, and the first commercially-available messina are all expected to be signed to commercial partners before June 2014 (see Table 2).

"The work on tedera and the improved cultivars of mallee eucalypts will not be completed by the time the CRC closes its doors next year, but substantial progress will be made by then and we expect others will carry on the work the CRC began," Peter said.

More work needed

"Perennial wheat and salt-tolerant wheat are two plants the CRC did some preliminary work on and both would provide tremendous advantages to Australian agriculture. The CRC's initial

research provided 'proof of concept' for each - essentially, the research said, yes, this idea will work.

"But the path from that point to commercial reality was estimated to be at least another decade, if not two. This was considered beyond the scope of the CRC so we are putting in place a process to hand the material on to others to continue the work," Peter said.

Key points

- **Future Farm Industries CRC has many prospective forage plants at various stages of development**
- **It can take many years to develop a new plant cultivar from idea to reality**
- **Farmers can expect these plants to become commercially available over the next few years.**

This article was first published by the Future Farming Industries CRC in Future Farm Issue 13 April 2013. Reprinted with permission.

Table 2. Status of CRC plants in commercial development

PLANT	SPECIAL CHARACTERISTICS	CURRENT STATUS	EXPECTED RELEASE DATE*
Old man saltbush	Elite lines with high palatability, digestibility and nutrition	CRC entering into negotiations with nurseries for supply	2014
Messina	Salt-tolerant and waterlogging tolerant annual legume	Seeking commercial partner in first half of 2013	2014
Lotus	Perennial legume selected for acid soils of the Western Slopes region of NSW	Negotiations with seed companies underway	2014
Cocksfoot (new variety or varieties)	Increased persistence and productivity, better feed quality; tailored to particular areas	Negotiations with seed companies underway	2014
Tall fescue (new variety or varieties)	Increased persistence and productivity, better feed quality; tailored to particular areas	Negotiations with seed companies underway	2014
Panic grasses (new variety or varieties)	More productive subtropical grass	Negotiations with seed companies underway	2014
Tedera	Drought-perennial legume	Breeding and duty of care work continuing; Negotiations with seed company underway	2015
Mallee	More productive breeding lines	Research and breeding work continuing	2019

* Release date given here is the time at which material will be handed over to a commercial partner. The date of availability to consumers will then be determined by the commercial enterprise

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Research Update

Keeping you up-to-date with pasture and grassland research in Australia. Abstracts of recently published research papers will be reprinted as well as the citation and author details in you wish to follow up the full paper.

Effect of warming on the productivity of perennial ryegrass and kikuyu pastures in south-eastern Australia

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Abstract: Grazed pastures in south-eastern Australia are typically based on temperate (C3) species, such as perennial ryegrass (*Lolium perenne*). With predictions of warming to occur in this region, there has been growing interest in the performance of more heat-tolerant and deep-rooted subtropical (C4) pasture grasses, such as kikuyu (*Pennisetum clandestinum*). This study used an existing pasture model to estimate the production of kikuyu compared with the commonly used perennial ryegrass at seven sites in south-eastern Australia, using an historical baseline climate scenario between 1971 and 2010, and the daily temperature of the baseline scenario adjusted by +1, +2, and +3°C to represent potential warming in the future. The seven sites were chosen to represent the range of climatic zones and soil types in the region. First, the model predictions of monthly kikuyu dry matter (DM) production were validated with measured data at Taree, Camden, and Bega, with results showing good agreement. Second, pasture production (t DM/ha), metabolisable energy (ME, MJ/kg DM) content, and ME yield (GJ/ha) were predicted using the baseline and warmer climate scenarios. The study was based on 56 simulations of the factorial arrangement of seven sites × four temperature scenarios × two pastures. The month and annual ME yield of a kikuyu–subterranean clover (*Trifolium subterraneum*) pasture and a perennial ryegrass–subterranean clover pasture were compared. This study showed that in summer-dominant rainfall locations, where the average maximum temperature is >23°C, kikuyu was a more productive pasture species than perennial ryegrass. In winter-dominant rainfall locations during the warmer months of December–March, kikuyu can provide a useful source of ME when perennial ryegrass is less productive. With warming of up to 3°C at the winter-dominant rainfall sites, the average ME yield per year of kikuyu was predicted to surpass that of perennial ryegrass, but inter-annual variation in kikuyu production was higher. The nutritive value, seasonal distribution of growth, total annual production, and its variability are all important considerations for producers when selecting pasture species.

Crop and Pasture Science 64(1) 61-70

http://www.publish.csiro.au/nid/40/paper/CP12358.htm

Perennial Grasses in Pasture Production Systems Symposium

Rob Salmon, President Australian Grasslands Association

The recent symposium held in Canberra on perennial grasses in pasture production systems was the second in a series of regular technical events organised by the Australian Grasslands Association. This technical symposium brought together leading scientists and pasture experts from across Australia and overseas to determine research priorities in perennial grasses. These priorities will play a significant role in influencing future government and private investment.

The Australian Grasslands Association (AGA) is a partnership between the Grassland Society of Southern Australia and the Grassland Society of New South Wales and this year welcomed as an Associate, Evergreen Farming of Western Australia. The Association's goals are to increase the involvement of these societies with pasture scientists by providing a forum through which current research can be published and most importantly to act as a conduit for that research to feed back into the farming sector (via the societies).

Following on from the successful Legumes Symposium in 2012, this event successfully brought together key researchers and scientists from both the private and public sectors, and provided a forum for current research within the perennial grasses area to be presented and debated and for ideas to be exchanged.

This year's perennial grasses symposium was attended by around 85 people, with roughly even split between the public and private sectors, including people who work in state departments of agriculture, universities, CSIRO, the levy-funded Research and Development Corporations, private companies, farm consultants and a handful of graziers. Unlike the our Society's conference that will be held in Albury next month, these AGA events cater specifically for the scientific community. So it is not surprising that the number of farmers who attend is low, although it was really good to have their presence and they certainly had an active involvement in the recent symposium.

The opening presentation by Kevin Reed provided an important historical framework for the event by reviewing the introduction, use and development of perennial grasses in temperate Australian pastures.

Over the two days of the symposium, a total of 24 invited and contributed papers were presented, including a number of high-quality poster papers across several themes:

- developments and innovations in perennial grass agronomy and management;
- developments and innovations in perennial grass breeding;
- opportunities and roles for perennial grasses in a changing climate;
- quality and feed value in animal production systems and
- What is the next quantum leap in perennial grass research?

While the quality and depth of the presentations is too great to summarise here, a few comments about some of the presentations are given below. Bill Malcolm from the University of Melbourne gave an analysis of the economics of pasture persistence compared with pasture production, building some analyses around a question that is commonly raised in pastures debates.

While the analyses acknowledged that a range of assumptions had been made, it outlined that pasture improvement represents a profitable use of additional capital on many farms, and that persistence is a relatively minor determinant of pasture investment returns, despite there being little penalty associated with re-sowing pastures a little later than the optimum frequency. Florence Volaire, from the French

national agricultural research institute (Institut National de Recherche Agronomique), gave her presentation via a Skype video link. She spoke about a large European research program on the persistence and production of perennial grasses under droughts and heat wave conditions. This work has sown that Mediterranean perennial grasses can be expected to become more suitable for larger areas of temperate Europe under climate change. However, there are few well-adapted cultivars currently available in Europe.

Nick Roberts, from the New Zealand crown-owned company AgResearch, outlined a breakthrough in genetic engineering of perennial grasses to increase animal performance, while our own Victorian State Department's Noel Cogan and Luke Pembleton outlined the development of novel methodologies using genomic and phenomic tools to support the next quantum leap in grass breeding.

One of the important outcomes of this symposium was the discussion session held on the final afternoon, from which a set of recommendations for future research directions will be synthesised. This was structured around 25 propositions on perennial grasses developed by delegates over the course of symposium. The audience then ranked each one on their perceived level of importance over the next five to ten years.

Propositions covered specific areas such as whether phalaris breeding has run its course, whether persistence has been over-emphasised as a trait in grass improvement, as well as much broader areas like the potentially greater role for tropical grasses in temperate Australia, and whether or not the gap between potential and average farm performances (the adoption gap) means that Australia can substantially reduce investment into pastures research.

The results from this survey are being developed into a paper that will be published, along with the presented papers, in a special edition of CSIRO's Journal of Crop and Pasture Science late in 2013.

The proceedings of the symposium, which contain abstracts of the presented papers and full poster papers, will be loaded on the Association's web site www.australiangrasslands.org.au shortly.

The plan for the next symposium is starting to take shape, which is likely to be held in 2015. The focus will most likely be a more general theme based around 'Pasture Systems', taking into account topics such as managing soils for pasture production, managing animals for pasture production and utilisation, pasture production systems, pasture renovation and renewal, with a strong component on tropical pastures. We are seeking to link with other organisations that are involved in the pasture-related sciences to become involved in the association for the delivery of the next symposium, and hope that the Australian Grasslands Association can continue adding value to members of the Grasslands Society of Southern Australia.

Pasture fertiliser response study – a summary to December 2012

David Harbison, D R Agriculture Pty Limited

In 2011, Wengfu Australia commissioned D R Agriculture Pty Ltd to conduct a pasture fertiliser product comparison study in Central West NSW. Correct site selection was vital to such a study, with both a phosphorus (P) and sulphur (S) responsive site being preferred. Soil test data of the chosen site is presented in Table 1, and the site was prepared in autumn 2011, with the first product applications occurring on the 24th June, 2011. Species present at the time of site selection were phalaris (old and rank), some stipa spp., very little sub clover, the odd bit of vulpia with very little broadleaf weed pressure. It was envisaged that with management (i.e. removal of surplus dry biomass) the clover content would rebound, and the annuals would be reduced with stronger competition from the more desirable perennials.

Prior to the commencement of the actual study in June 2011, the whole paddock, including the study site area, received an application of 125 kg/ha of single super with 0.05% Mo in March 2011. Whilst this was done prior to the commitment from Wengfu Australia, the site was still deemed to be the right one. From industry literature and experience, the first application of approximately 10 kg P/ha and 13 kg S/ha was not considered to be sufficient to overcome the significant deficiencies reported in the soil test, and the site commenced as planned.

The treatments applied covered phosphorus only products, sulphur only products (both elemental and sulphate forms), industry standard single super, and a range of Wengfu Australia's Pasture King products. These Pasture King products vary in the ratio of P:S from approximately 3:1 to the industry standard's single super at 1:1.3. They also vary in the combination of sulphate and elemental sulphur; a potential product benefit that has been proven in many situations to supply year round

Table 1. Soil test results from 0-10 cm sample dated 12/01/11, and 10-20 cm sample dated 25/05/11 taken at commencement of experiment preparations

SOIL ANALYTE	0-10 cm	10- 20 cm
pH (CaCl)	4.5	4.9
Exchangeable aluminium (%)	3.3	1.3
Organic Carbon (%)	2.0%	0.86
Nitrate Nitrogen (mg/kg)	4.1	2.2
Phosphorus (colwell) (mg/kg)	7.0	7.0
Potassium (Colwell) (mg/kg)	370	310
Sulphate Sulphur (KCL-40) (mg/kg)	4.5	2.7
EC (dS/m)	0.05	0.04
CEC (meq/100 g)	6.57	7.76

sulphur to the plant, and in some cases, build soil sulphur at a greater rate than sulphate sulphur. Only time will tell if those potential benefits are realised at this site. The application rates were 0, 15 and 30 kg P/ha, with corresponding S rates according to product analysis. In the S only treatments, the rate of S was determined by that supplied in the single super treatment (i.e. 18.7 kg S/ha). This was applied to separate treatments in either the sulphate (gypsum) form, or elemental (SuStain) form.

Results from all dry matter cuts taken to December 2012 shows the site to remain strongly responsive to applied P, however, a S response has yet to be measured (Figure 1). Statistical analysis of dry matter has reported significant P responses by all P products, with no significance between P products. No significance to S (form or rate) has been detected at this stage.

Figure 2. Pasture product performance experiment - 12th September 2012.

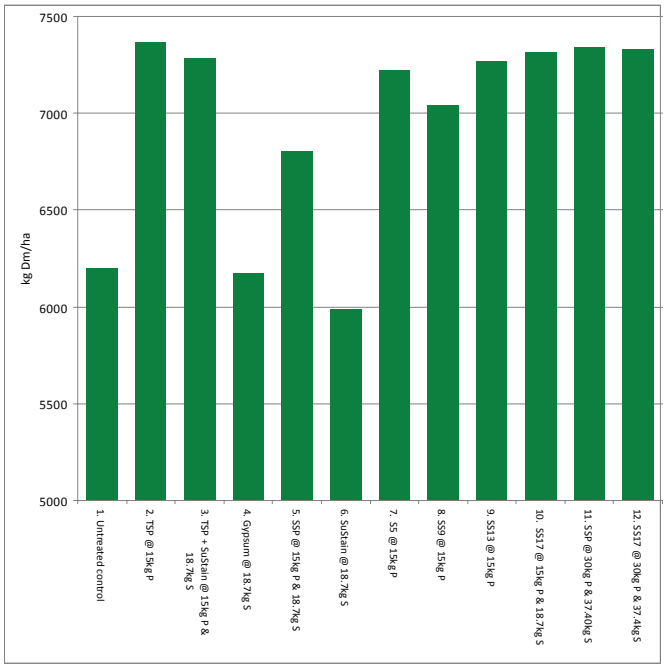


Figure 1. Total dry matter production (kg/ha) of mixed pasture taken in seven separate assessments to 11th December 2012 and summed. LDS 5% = 732 kg/ha

It is extremely interesting to see the three 'non P treatments' falling behind so quickly. The 'background' application of single super with Mo in March 2011 has not appeared to affect the P response, but has it had an early implication on the S response?

Much work of the 1980's and 1990's on pasture fertiliser response indicated that to overcome a S deficiency, it took in the order of 50 – 90 kg S/ha to be applied as a minimum in any 10 year period. This site has only received approximately 13 kg S/ha (March 2011) in the last 10 years prior to this study starting. It will be a very interesting over the next 18 months to see if the added clover production due to P and S application puts further demand on the S requirements. Additionally, soil tests of individual plots have now been taken to examine the fate of the applied nutrients, and to see what 'soil building' effects these products have had on individual nutrient levels (not yet analysed and yet to be reported).

Figure 2 shows the site in September 2012, with the clover growing well in a P applied plot (right) compared to a S only treatment (left). Other plots of varying performance can be seen further into the study.

NSW Seasonal Conditions Summary -June 2013

NSW Department of Primary Industries

HIGHLIGHTS

- Wetter conditions expected across the state, with higher probabilities in central and eastern NSW.
- Cooler daytime temperatures & warmer night time temperatures likely.
- Widespread light rainfall and isolated heavier falls improved conditions during May.
- Yearly relative rainfall, well below average in western & central NSW, with severe deficiencies in many areas.
- Monthly relative pasture growth was near average with isolated pockets in Central and Riverina regions at lower levels.
- Modelled topsoil moisture levels have improved in most areas. Subsoil moisture generally static.
- Whilst general conditions have improved recovery will be dependant upon follow up rainfall in the coming months. As such it is important that farmers have a clear plan & an understanding of their options. Considerable resources are available to assist in management.

Details at http://www.dpi.nsw.gov.au/agriculture/emergency/drought/managing

The outlook for NSW between June and August indicates that wetter conditions are likely across the state with higher probabilities of above median rainfall in central and eastern NSW.

Cooler than normal daytime temperatures are likely over this period with lowest temperatures predicted in the central Western and northern Lachlan LHPA districts. Warmer than normal overnight temperatures are likely for southern and central NSW with average overnight temperatures predicted for north western NSW.

Conditions deteriorated during the month for parts of the South East, Tablelands, Lachlan, Central West, Central North and New England LHPA districts with significant rainfall deficiencies. The balance of the state received average rainfall. Severe long term (12 month) rainfall deficiencies are evident in most regions west of the Great Dividing Range. Reports from LHPA Rangers indicate that rainfall during May and early June has brought some relief. Hand feeding is common and there is widespread concerns over availability of stock water. Recent rainfall should assist winter cropping programs particularly for those that have dry sowed. Recent rainfall has enabled pasture to reshoot, however shorter days and frosts are likely to prolong hand feeding in most affected areas. While stock condition is stable this is a result of supplementary feeding. In many areas, stock condition is starting to decline and an increasing number of stock are being sold despite reduced prices.

During May widespread light rainfall fell over much of the state typically in excess of 10mm with more isolated heavier falls of between 2550mm. High falls were received in parts of the Hume (50-200mm), Cumberland (50-200mm), and Mid Coast (50-300mm) LHPA districts.

Relative to historical records, rainfall for May was average for much of the state apart from a narrow band running north to south through portions of the South East, Tablelands, Lachlan, Central West, Central North and New England regions, which was below to well below average. Relative rainfall for the last six months was well below average or worse for much of central NSW and the southern Riverina.

Rainfall during May led to improvements in modelled topsoil moisture across most of NSW. Dryer conditions persisting for parts of the Riverina, eastern Darling, northern Central West, northern Central North and eastern New England regions. Modelled subsoil moisture levels remained relatively static with small isolated declines.

Modelled pasture growth during May indicated relatively average growth across much of the state with small areas below average in the; southern Riverina, northern Central West, eastern Central North and eastern North West regions. Over the last 12 months, relative growth has been very low. Modelled relative biomass levels across central NSW were variable, with large areas being well below average.

Acknowledgments: Information used in this report was sourced from the Bureau of Meterology, CSIRO, the Queensland Department of Science, Information Technology, Innovation and the Arts, NSW Livestock Health and Pest Authorities and the NSW Department of Primary Industries.

For more information contact the NSW Department of Primary Industries on 02 6391 3100.

New CliMate App

The App allows you to interrogate climate records (over the last 60 yrs) to ask a number of questions relating to rainfall, temperature, radiation, as well as derived variables such as heat sums, soil water and soil nitrate.

It is designed for decision makers who use past climate statistics, forecasts and knowledge of system status (e.g. soil water, heat sum) to better manage their business.

See here for more info: https://itunes.apple.com/au/app/australian-climate/id582572607?mt=8 or download from iTunes. It does not appear to be available for Android so this one is just for iPhone or iPad for now, but well worth a look if you use either of those.

Pasture plant adaptation to drought and high temperature stress

Satellite Meeting of the 22nd International Grasslands Congress

Sydney University, Saturday 14 September 2013

As the impacts of climate change impinge more and more on agriculture and the demand for increased production of animal protein grows, the search for pasture and forage plants with greater adaptation to drought and high temperature increases. This Workshop will bring together some of the leading researchers in the World in this field as well as providing a forum for young voices new to the discipline to present their findings.

Presentations will address a range of topics including:

- Studies of the summer dormancy trait and endophytes to assess their potential to improve the survival and forage production of tall fescue, cocksfoot (orchard grass) and *Elymus scaber* across a range of environments including the southern USA Great Plains, Mediterranean Basin, New Zealand and south-eastern Australia with contributions from Chuck West (Texas Tech Univ.), Florence Volaire (INRA/CNRS, France), Charlie Brummer, Malay Saha, Twain Butler (Noble Foundation, USA), Lulu Hey (Massey Univ. NZ) and Matthew Newell (NSW DPI, Aust.);
- Mechanisms of stress tolerance in two xerophytic and halophytic species with implications for improvement of forage legumes with contributions from, Suo-Min Wang and Ai-Ke Bao, Lanzhou Univ. China;
- Identification of traits of grasses for warmer and drier climates and insights into the role of leaf hydraulics for their relevance to biomass production and drought & heat tolerance with contributions from Brendan Cullen (Melbourne Univ.), Jimmy Hatier (Agresearch N.Z.) and Meisha Marika Holloway-Phillips (Aust. Nat. Univ.);
- Improving the drought tolerance of white clover through inter-specific hybridisation and studies of the role of the winter dormancy trait in enhancing drought tolerance in lucerne with contributions from Shirley Nicols (Agresearch N.Z.) and Keith Pembleton (TIAR, Aust.).

Venue:
University of Sydney, Camperdown Campus, The Education Building (A35, CoCo), Lecture Theatre 424.
For a map of the location and directions of how to get to the building go to these websites
http://sydney.edu.au/education_social_work/coco/contact/maps.shtml
http://sydney.edu.au/education_social_work/coco/images/maps/busMap.jpg
There is a link to a more detailed map of the venue in Google maps also at the first website.

Time:
9.00 am – 5.00 p.m.

Registration:

A$100 includes morning tea/coffee and lunch.

Payment may be made by:
1. Electronic funds transfer (EFT) to the following Bank account:
SWIFT code: WPACAU2S
Bank: Westpac
Account Name: The Grassland Society of NSW Conference
BSB (Bank and branch numbers): 032-833
Account Number: 353 720

Attach your 'First Name', 'Second name' and the word "Workshop' for identification of the payment.

2. Cash on the day (please email mark.norton@nsw.dpi.nsw.gov.au before for a reservation);

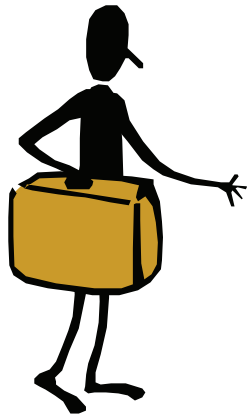
3. Cheque drawn on an Australian Bank in Australian dollars to 'The Grassland Society of NSW'.

NSW GOVERNMENT Department of Primary Industries

THE GRASSLAND SOCIETY OF NSW INC.

Would you like to attend the IGC in September?

Why not apply for a Grassland Society of NSW travel grant?



Travel Grants are open to financial members of the Society with at least two years of continuous membership prior to the date of application - funding is available to attend conferences or other activities associated with grassland science. The committee are particularly interested in applications from our producer members.

More details can be found on the website (www.grasslandnsw.com.au) under the membership tab or by contacting the Secretary (secretary@grasslandnsw.com.au)

From the President

At the time of writing this short piece, some useful falls of rain had been received over much of the state. This will allow sowing of winter cereal and pulse crops, canola and in some locations new pasture. The oft quoted “follow- up”, however, will be a must in the absence of stored moisture.

Dry spells are useful in assessing various pasture plants’ capacities to survive and recover following rain. In the northern tablelands of NSW, tall fescue is a “stand out” in perennial pastures, with cocksfoot also a regular survivor, particularly on the lighter, lower fertility soil types. In southern and central NSW tablelands, phalaris has long been praised for its drought survival. Perennial ryegrass with a less extensive root system, tends to fail before these other temperate grasses, but in good seasons or under irrigation, ryegrass is known for its capacity to produce top quality feed to sustain the more intensive animal production systems.

The Grassland Society has long promoted the use and role of perennial pastures for production and natural resource management reasons. In recent years, there has been some sort of explosion in the number of new temperate grass varieties. This causes confusion at the farm level as producers and their advisers attempt to choose the most appropriate variety for their particular area. Because of a very obvious decline in Government agency capacity to trial new pasture lines, the choice now is more difficult than 10 years ago.

Recently, independent pasture variety evaluation projects, funded by MLA have been established in NSW and Victoria. Your society will be drawing on this work at future meetings and field days to extend results. As well, when data is available, we will be seeking information from the trial coordinators to present results in this newsletter. Results will also appear on the Society internet site in the member’s only area.

All members should have received a letter to advice of an increase in annual subscription from $50.00 to $60.00 per year. In addition I have referred to the IGC conference to take place in Sydney in September and the decision to waive our usual annual conference. Details of these actions are in my letter. I also refer to the plan to hold pasture update meetings later in the year at various locations across the state. Dates will be made available as soon as they are finalised. We are hoping to involve DPI staff in these meetings, but need to wait until the restructure of DPI is finalised and LLS positions are confirmed.

Again, I trust you have all received some rain in recent weeks and that pasture and crop prospects have improved.

Best wishes to all our members.
Mick Duncan.
President.

Grassland Scene from the top of Mount Rankin, between Uralla and Bundarra on the Northern Tablelands of NSW by Katie Austin.

Don't forget the

PHOTO COMPETITION

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.

More details on the website www.grasslandnsw.com.au

Thanks to Katie Austin for sending in an entry.

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 approx 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

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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 second issue of the newsletter for 2013 will be circulated in September. 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 August 26 2013.

New Members: Welcome to new members Gordon Stamp, Yetholme; Warwick Dogherty, Springwood; Central West CMA (Tim Nalder), Orange; and Steven Downes, Jamberoo.

Electronic newsletter: Don't forget you can receive the Grassland Society of NSW newsletter electronically. Just email your details to Janelle (secretary@grasslandnsw.com.au) and you will be added to the list. Next newsletter you will receive an email notification with a link to the newsletter on the website.

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

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