Registered by Australia Post:
No PP 242028/00004

NEWSLETTER

VOLUME 21: NUMBER 3, 2006

After commenting on the excellent Spring pasture growth in Issue No. 1, I am sorry that at the time of preparation of this editorial more than 60% of the state has been officially drought declared. We hope that rains will come soon and although pasture growth will be limited a "green pick" seems to stimulate growth from supplementary feeding.

I have received a preview of the 2006 programme from Dr Belinda Hackney of our Society's annual conference in Wagga Wagga from the 25th to 27th July in Joyes Hall and the Convention Centre. All talks will be in Joyes Hall; morning and afternoon tea and lunch will be in the Convention Centre which is about 100 metres from Joyes Hall. There will be two bus tours. One will be to Tarcutta to visit a weed control site then on to a sheep and cattle property. The other tour will be to a NSW Department of Primary Industries pasture research site and to another site to be confirmed. The overall theme of the conference will be "Waging War on Pasture Weeds" including a session on "Pasture, weeds and animal interactions".

CONTENTS

Editorial cont.

Our Grassland Society is very grateful for the very generous support it has received and continues to receive from our sponsors. Without the support of sponsors we would be forced to drastically reduce its activities. The sponsorship structure is :-

Premier Sponsor (2)	$3,000.00
Main Sponsor	$1,500.00
Corporate	$750.00
Local	$250.00

President Mick Duncan, on behalf of the Society states that in the future the Society will publicise sponsors on the Internet site and in the newsletter.

I have recently downloaded 17(!) pages on the programme of the 26th Biennial Conference of the Australian Society of Animal Production to be held in Perth from 4.00 pm on Sunday 9th July until 12.30 pm on Friday 14th July. The programme includes papers from two of our members – Professor Jim Scott and Dr Hugh Dove. Details can be obtained from Dr Chris Oldham, Department of Agriculture, South Perth WA 6151.

The Society is pleased to learn that the NSW Department of Primary Industries pasture plant breeding programme – Drs Brian Dear and Belinda Hackney on subterranean clover, rose clover, serradella and purple clover at Wagga, John Ayres and Carol Harris on tall fescue, white clover and trefoils and Tim O'Brien on lucerne breeding at Tamworth – are all being well supported by the Wool Industries Authority, Meat and Livestock Corporation and the Grains Research and Development Association. We are grateful to these funding bodies for being supportive of such an important programme.

I look forward to meeting members at Wagga.

Haydn Lloyd-Davies
Editor

Report on visit to XX International Grasslands Congress, Dublin, Ireland

Libby Salmon, CSIRO Plant Industry, Canberra

Grasslands systems across the world are typically geographically dispersed, culturally diverse and demand skills in several disciplines to research and manage them. The XX International Grasslands Congress (IGC) in June-July 2005 was an important meeting bringing together over 1000 delegates with 860 papers presented in Dublin and hundreds of papers presented at 5 specialist satellite meetings held across the United Kingdom. The role of new research in practical farm systems was also highlighted with well-attended Producer Forums run by the British Grassland Society. There were some excellent talks by farmers from Scotland, the Netherlands and England that articulated the frustrations and creativity of producers operating within highly constraining European Union (EU) legislation.

This report outlines the key issues from the IGC for farmers in temperate Australia, reflecting my interests in decision support for producers using a "whole system" approach. I presented 2 papers, a poster and was co-author of the lead paper in a session on decision support systems for grazing at a satellite meeting at Cork, attended by 120 delegates. There was clearly a revived interest in modelling and decision support which reflects the emerging demand for and parallel development of computer tools to tackle the complex issues that agriculture faces globally. Australia has been developing and using computer-based tools for some time and the conference confirmed the maturity and world-leading position of our decision support tools (GrazFeed, GrassGro and FarmWi$e) and their derivatives (for example, the Green Feed Budget Calculator demonstrated at the congress by Curnow and Hyder, 2005). These tools have been created in response to our extremely uncertain weather and high level of exposure to fluctuating world commodity markets. Managing this variability is also suddenly more important for farm viability in Ireland under new EU legislation. In response, Irish researchers have developed a model of pasture production ("GrazeGro") which shares similarities with one of our decision support tools ("GrassGro") (Barrett and Laidlaw, 2005). To help them make better tactical grazing management decisions, Irish dairy farmers have funded the monitoring and publication in the rural press of fortnightly pasture growth predictions from GrazeGro under the Irish "GrassCheck" program.

Discussions at the conference emphasised the need for Australian farmers to be pro-active and extremely efficient to compete with the political and physical advantages of livestock production systems in other countries. Computer-based decision support tools are increasingly recognised as an effective way to help farmers in developed countries improve farm management and were extensively reviewed (Hannaway *et al*, 2005; Moore, 2005; Barrett and Laidlaw, 2005; Delgarde and O'Donovan, 2005; Donnelly *et al*, 2005). In developing countries, agricultural decisions are possibly more complex and carry even greater risks, and computer models are seen as "negotiation" frameworks for planning at landscape and policy scales (Thornton, 2005). Simplification of communication with computer models through selection of pictures has made essential and complex information available to resource-poor farmers and the success of this approach is instructive for the developers of effective decision support tools elsewhere. Remote sensing by satellite is used to monitor grassland condition in northern China (Akiyama *et al*, 2005) and satellite weather data have been combined with models of plant growth in a pasture forecasting system for East Africa (Kaitho *et al*, 2005). Australia's "Pastures From Space" in the "Pasture Watch" program is a similar delivery mechanism for remotely sensed pasture information to farmers, but it has yet to be linked with dynamic models to provide forecasts of pasture growth beyond 7 days (Gherhardi et al, 2005).

This practical "whole system" approach was demonstrated across a range of research areas, from evaluation of plant characteristics to achieve high intake (Wales *et al*, 2005) to new ryegrass cultivars developed using gene insertion (Pollock *et al*, 2005) and comparison of dairy cow strains under intensive and extensive management systems (Horan *et al,* 2005). The trend to specialisation in livestock production underway in many parts of the world, including Australia, was countered by a re-evaluation of integrated crop-livestock systems, both on individual farms and regionally. These integrated systems have been shown to have better opportunities for local nutrient recycling, use of perennial plants and higher energy use efficiency and it was acknowledged that analysis of these complex farming systems is only possible with some form of computer modelling (Entz *et al*, 2005).

Future demand for ruminant products

Global demand for milk and meat products is increasing, driven by increased demand from developing countries (Delgado, 2005). By 2020 about 27% of the global increase in demand for meat, is predicted to come from ruminants (up from 23% over the last 2 decades), as the real cost of grain and environmental and disease issues slow the rapid expansion of intensive poultry and pig meat industries. This demand will not necessarily be accompanied by higher prices, which are predicted to fall slightly, but this is an improvement on the threefold decrease in real (inflation-adjusted) prices for beef, for example, from 1970-1998. The challenge is to design production systems that will meet this demand. Intensification can only occur in regions in which higher production is sustainable, while in developing countries, ruminants are often grazed in marginal environments. Delgado predicts that any expansion in demand in developed countries will probably be met locally, while demand from developing countries, particularly in Asia, will be largely supplied by exports from Latin America.

What might this mean for Australian graziers? Terms of trade for Australian graziers will continue to decline, but perhaps, theoretically, at a lesser rate. Producers who make environmentally sustainable productivity gains, especially if those gains are largely based on better utilisation of grass rather than reliance on supplements, may be in a better financial position than in the recent past, as long as access to these expanding markets is secured. Raw trade figures indicate the potential for the expansion of beef production in Latin America. Argentina, Brazil and Uruguay together only export 50% more beef than Australia currently, but have 10 times the number of cattle (ABARE, 2004). These countries have tremendous natural advantages for pasture and livestock production and lower labour costs than Australia, supporting Delgado's view that Latin America will be a significant future beef exporter and, therefore, competitor for Australian export markets.

Do we need to worry about European trends in agriculture and consumer preferences if our markets lie elsewhere?

Yes, in so far as these trends set research objectives for limited global research funds. In Europe, reduction of *agricultural pollution* is a common objective and is also important for intensive Australian livestock industries, particularly dairying. Research in Europe may become more applicable to more extensive Australian production systems as European livestock production is de-intensified in response to pollution and conservation controls, and there is greater reliance on legumes rather than fertilizers as a source of nitrogen. In Europe, legume-based farming systems similar to those used in Australia are referred to as "organic" systems. In the face of these production limitations, UK farmers need to generate more income to survive the removal of direct production subsidies and some exposure to the sort of commodity price risk faced by Australian producers. On a mid-conference tour to Co. Wicklow, it was sobering to see Irish farmers struggle to come to grips with the real profit drivers in their production systems because their focus is often on "farm payment" maximisation. The "Single Farm Payment" supports farmers in this adjustment phase but can be withheld if environmental guidelines are breached (Rath and Peel, 2005). EU funding is available for on-farm projects which improve European concepts of *biodiversity*, such as replanting hedgerows.

Food safety is now a common concern for all producers, populations living near farms and consumers of meat products: an outbreak of BSE or Avian Influenza in one corner of the world can reduce market share for the product as well as provide opportunities for supply by competitors.

How can farmers in temperate Australia improve pasture production?

New plant breeding technologies are not confined to crops and can deliver real gains in precision breeding of pasture plants (Pollock *et al*, 2005). However it is questionable whether the grazing industries can realise the potential benefits of these technologies, if the cost of research is to be recovered through seed sales (which are limited). Other investment strategies for this research are required. Benefits of new cultivars will also not be realised unless optimal management is practised on farms.

The tangible benefits of gene technologies include developing genetic markers which can speed up selection programs. Markers have been identified for water soluble carbohydrate content in perennial ryegrass and markers for roots help understand grass-clover interactions in mixed swards. Gene mapping of legumes (e.g. lucerne and white clover) is part of these selection programs. Lines of perennial ryegrass (PRG) that contain stress tolerance genes from fescues have been developed, and UK and New Zealand researchers are working on improved drought tolerance of PRG by finding genetic markers for root depth (Faville *et al*, 2005) and lower protein content of white clover. The former has relevance to future management of water tables in Australia latter while the latter is an important objective for management of nitrogenous pollution in intensive European farming systems. Another technique, genetic manipulation, helps understand the function of specific genes and mechanisms for expression of desirable plant characteristics, but public perceptions will need to change before these are fully utilised. Brummer (2005) from the USA suggested that molecular markers and biotechnology were unlikely to improve a complex trait like yield in lucerne, and should be used within long term recurrent selection programs designed to explicitly select for yield.
Pollock suggested a role for computer models of landscape and plant interactions to help identify the management systems and environments that will suit novel plants.

Reliability of feed supply in autumn and winter: research into seasonality of pasture supply.

Variation in pasture yield from year-to-year is something Australian producers grapple with as a matter of course, so when an Irish researcher discusses reliability of supply, they are typically referring to much smaller differences in total annual yield (1-4t DM/ha) than those experienced here (roughly 7-10t/ha) (Drennan *et al*, 2005). Nonetheless in Mediterranean/winter-dominant rainfall environments there are common problems with limited pasture growth in winter due to low temperatures and, in autumn, due to a lack of moisture. In summer and autumn poor pasture quality also hampers animal production.

The problem of extending the pasture growing season was addressed in terms of pasture utilisation as well as supply (Porqueddu *et al*, 2005). Fertiliser management to maintain legume content of pastures and maintaining high but sustainable stocking rates are key requirements for maintaining a profitable feed base. On the supply end, the financial and environmental costs of extending the growing season of grasslands by applying more water and nitrogen fertiliser is being re-evaluated in many economies. Farmers do not need to be told that the value of new a pasture species, cultivar or mixture depends on establishment costs, persistence and the "fit" with the animal production system.

Selection for increased cold tolerance of Italian, perennial and hybrid ryegrasses and buffel grass has provided cultivars with increased early spring growth. Porqueddu *et al* considered deep-rooted winter-active perennial grasses and herbs like chickory (*Chicoium intybus*) to be the principal means of providing green feed into early summer, as summer-active or subtropical grasses have lower fodder quality and problems with seed availability, cost, competition with other, more desirable species and have potential as weeds (e.g. *Eragrostis curvula*, or weeping lovegrass in Australia). This review did not mention lucerne (*Medicago sativa*), perhaps the plant most commonly used in southern Australia to supply high quality feed in early summer. Grassland Society members can be reassured that they are receiving some of the latest information locally: reference to the extension of the growing season by 3-4 weeks with arrowleaf clover (*T. vesiculosum*) was from a report in the combined conference proceedings of the Victorian and NSW Grassland Societies in 2003. Supply of green feed early in the growing season from grazing cereal crops was referred to in several countries (rye and triticale), as were various combinations of forage brassicas and spring cereals.

Changes to species composition or the timing of senescence of pastures induced by grazing management methods like deferment or cell grazing can alter the length of the growing season but are considered to be of secondary importance after stocking rate and fertiliser management, and may have unfavourable outcomes. For example, tiller density and subsequent spring yields may be reduced by insufficient grazing intensity early in the growing season.

There don't seem to be new miracle plants or management technologies available that will consistently solve the problem of seasonal pasture production. For example, the *stay-green* trait that was originally bred in fescue and transferred to perennial ryegrass made grass look greener at the end of the growing season but did not confer consistent benefits for livestock production (Wilman *et al*, 2004). The challenge for farmers is to profitably develop and manage, for the farm's animal enterprises, the sequence of locally available feed resources, and the use of computer modelling was considered a legitimate way to attempt this complex task (Porqueddu *et al*, 2005).

Filling feed gaps through fodder conservation

A review of silage making indicated that the nutrient quality of silage remains variable, despite a range of technologies to control the process of fermentation and inhibit "preservation saboteurs" (O'Kiely and Kaiser, 2005). In temperate regions advances in silage quality have focused on the growth and management of specialised fodder crops. Methods to predict ensilability of pasture have been around for at least thirty years and recently have been refined by improved feed analysis technologies, for example near infrared spectrometry (NIRS).

Future trends

New products: livestock and grasses as biofactories

The potential of grasses and their endophytes to produce non-food energy and fibres and a range of valuable pharmaceuticals and other chemicals ("biopharming"), was outlined by British (Askew, 2005) and New Zealand researchers (Roberts *et al*, 2005). The impetus for these developments comes from the price of fossil fuels, agricultural policies affecting land management options in the European Union and the high cost of producing recombinant proteins from mammalian cells. Future use of grasslands includes these biotech options as well as management to preserve water quality and biodiversity and as carbon sinks.

Despite its limitations, the tight legislative controls under which European farmers operate have helped conserve their grassland resource. In the absence of these controls, and under increasing pressure from overgrazing and competing land use, grasslands in developing countries are threatened. These grasslands are a global resource that warrant the attention and support of Australian farmers and scientists. A large international congress like the IGC provides scientists and farmers with an opportunity to share common problems, survey solutions, shake up their thinking and seek new technologies. I wish to thank the Grasslands Societies of Southern Australia and NSW for their generous support to attend the IGC.

References are available directly from the author.

Management for Productive, Persistent and Profitable Native Pastures

Michael Keys and Bruce Clements, Agronomists, NSW DPI, Queanbeyan and Bathurst

There is no adverse effect on the persistence of native pastures following regular fertiliser application, provided stocking rates are increased to use extra feed grown.

This is the finding from a long term grazing demonstration on native pastures near Blayney, now in its twelfth and final year. On Howard Sinclair's property "Amaroo" at Newbridge the long term effects of relatively high annual applications of superphosphate (SSP) or reactive phosphate rock (RPR) to modified native pastures have been compared with "district practice" – 125kg/ha single super applied every third year – since 1995. RPR and SSP produced similar results in all respects.

This NSW DPI demonstration has shown that even a very high (capital) fertiliser application in the first year was not detrimental to a wallaby grass dominant, modified native pasture used for prime lamb production. Over 10 years one paddock has received an average of 225kg/ha single super every year and two paddocks received 980 kg/ha in the first three years.

What is more, this was highly profitable, as was an annual fertiliser application that applied 12 units of phosphorus every year. Better returns were due to the fact that the pastures could support a higher stocking rate and get a higher proportion of lambs to saleable weight at weaning. The results contradict the common assertion that native pastures should receive only light rates of fertiliser and run relatively low stocking rates.

The critical issue is that stocking rates must be increased to utilise the extra feed grown following fertiliser application. The pastures must be managed in spring to prevent annual grasses and sub clover, stimulated by the increased fertility, from smothering the native grasses. Utilising the spring flush was more easily achieved at “Amaroo” by combining an enterprise with a high spring feed requirement (spring, prime lamb production) with the higher stocking rates.

Such a strategy would be totally inappropriate in very large paddocks or in those where landscape factors such as shallow, rocky soils, steep topography, westerly aspect or low rainfall, would limit pasture response. In such situations, preserving the native perennial grass cover is vital to prevent land degradation.

Pastures are wallaby grass dominant with significant amounts of microlaena (weeping grass) and common wheat grass plus annuals including sub clover. The soil is highly acidic to depth and this fact, combined with the average rainfall of nearly 800 mm annually, make it well suited for RPR. Soil phosphate levels were very low when the demonstration started in 1995.

Over ten years, stocking rates averaged 4.8 ewes/ha in the “district practice” paddock and 6 and 7.2 ewes/ha respectively, in the “annual” and “high” fertiliser rate paddocks. It was two years before the stocking rates were increased in the two paddocks that only received the “low” rates annually and a further two years before the current stocking rate of 6.75 ewes/ha could be achieved. In 2003, stocking rates in all paddocks were only 65% of those in the previous five years, due to prolonged drought.

Table I below shows average net returns over the 10 years on a $/ha/annum basis. The excellent lamb prices in 2003 resulted in that year’s returns from lambs being over 300% higher than previous years. The Control paddock now covers overhead costs ($105/ha) by $28/ha compared to an average of only $12/ha over the 1st eight years. However net returns are even better from the “low” and “high” fertiliser paddocks - averaging $96 and $127 respectively above both variable & overhead costs.

Table 1: Average returns and costs ($/ha/annum) over 10 years

	Control	Lo RPR	Hi RPR	Lo SSP	Hi SSP
Gross Return—Lambs	$143.27	$229.86	$276.37	$239.40	$288.23
Gross Return—Wool	$61.23	$74.99	$89.01	$73.00	$92.05
Variable Costs/ha (excl. fert.)	$58.76	$73.93	$89.84	$74.80	$91.44
Fertiliser Costs/ha	$13.65	$31.59	$45.94	$35.80	$56.08
Net Return/ha	$132.10	$199.34	$229.59	$201.80	$232.77
Profit (net less overheads)	$28.10	$95.34	$125.59	$97.80	$128.77

Conclusion: This work supports the advice that when soil phosphorus levels are very low, very high (capital) applications can be financially worthwhile provided stocking rates are increased and a profitable enterprise is chosen. We have also shown that native pastures can be well fertilised and remain persistent provided they are appropriately managed.

Acknowledgements: This long term demonstration has only been possible due to the continuing support of IncitecPivot Fertilisers in providing the fertiliser for this work.

Want to know more?

Come to an afternoon field day at "Amaroo" this spring.
Inspect the pastures, paddocks and livestock for yourself.

Proposed date: Thursday 26th October 2006
commencing at 1.30pm.

Contacts: Michael Keys ph. 6297 1861 or
Bruce Clements ph. 6330 1217

Pasture Improvement Shortens Drought

Bob Freebairn, Agricultural Consultant, Coonabarabran

Serradella, biserrula, rose clover and some sub clovers, top-dressed with superphosphate, yielded during the 2005 winter/spring dry-matter production of over 4000 kg/ha in a trial area typical of millions of hectares of acid soils throughout north west and central west NSW. Soil pH is 4.3; low total cations (2.7), 20 percent aluminium (as percentage of cation exchange) and low phosphorus, sulphur and organic matter.

In contrast nil fertiliser and no added legumes in the trial and adjoining paddocks yielded less than 500 kg/ha (an 800 percent response to fertiliser/suitable legumes). By October 2005 such non improved areas remained drought affected with little quality feed. Improved pastures were out of drought at least 10 weeks before unimproved pastures.

These marked production differences (seen by a well attended NSW Grasslands sponsored field day in October 2005) have been measured in each of the last three years in research conducted near Narrabri on the property "Newhaven" Turrawan, owned by Fiona (who is also a DPI research economist) and Kathleen Scott.

Sub and naturalised clovers, especially without added fertiliser, do not thrive in this country, and therefore nitrogen levels also generally are low. While there is a good level of many native perennial grasses, they are low in quality because of low soil fertility and result in poor stock carrying capacity and low production per animal.

Legume species trials conducted by DPI research agronomist Graham Crocker on "Newhaven" over the last three years has shown the consistent and outstanding performance of yellow serradella varieties King, Yelbini, Charano, and Santorini. Hykon rose clover, Casbah biserrula, Margurita and Erica pink serradella (hard seeded Cadiz types), and Mauro biserrula are also doing well. Many other normally very useful legumes are struggling or have failed in the very acidic soil conditions.

In a separate demonstration block, Fiona Scott top-dressed various rates of lime and single super in 2003 (with no further topdressing since) where suitable legumes like serradella and biserrula had been added to the native grasses. While the largest response was from 2.0 t/ha lime plus 500kg superphosphate (total cost about $240/ha plus spreading), a cheaper ($120/ha) option of 1 t/ha of lime and

250 kg/ha of single super also gave a good response and would be very economic. While behind the lime plus legume and super treatments, legumes plus single super gave good responses.

Other research has indicated that lime top-dressed onto pastures can be as effective as incorporation via prepared seed beds. The response may be a little slower, but within a couple of years is much the same. Because lime tends to have at least a 10 year benefit in such soils, and can be highly beneficial to less acid tolerant pasture and crop species its economics can be sound.

Graham Crocker pointed out the need to ensure all legumes were properly inoculated with their correct strain of rhizobia at sowing. Such soils were generally deficient in the symbiotic bacteria; so essential for nitrogen fixing.

The final part of a successful and sustainable pasture in most northern and central NSW areas, on light or heavy soils, is a subtropical introduced or native perennial grass. Premier digit grass and Consol lovegrass have been particularly successful on nearby country similar to the Scott's property. They grow well in conjunction with the annual winter legumes and also help ensure droughts break earlier and start later.

Lotus in perennial pastures in eastern Australia

John Ayres, NSW Department of Primary Industries, 'Centre for Perennial Grazing Systems', Glen Innes 2370 (email: john.ayres@dpi.nsw.gov.au)

A major state-wide study has been undertaken in the Perennial Pasture Zone in New South Wales to investigate the potential of Lotus *(greater lotus,* Lotus uliginosus *Schukr.*; *Birdsfoot trefoil,* Lotus corniculatus *L.) - based pastures to improve grazing production. The study was based on a methodology that combined a grazing experiment to determine the effects of grazing management on Lotus persistence, with a co-learning phase to assess the adaptation and applications of Lotus across the high rainfall zone. A summary of the grazing experiment and on-farm co-learning work is presented below. The full study is reported in a series of scientific papers published in the Australian Journal of Experimental Agriculture and listed at the end of this article – these are available, on request, from the author.*

The effects of grazing management on persistence

A grazing experiment replicated in 4 regions of New South Wales (North Coast, South Coast, Northern Tablelands, Southern Tablelands of New South Wales) comprised combinations of grazing strategy (summer rest, autumn rest, 14day spell, 28day spell), grazing intensity (to low or high herbage mass), Lotus species/cultivar (*L. uliginosus* cvv. Grasslands Maku, Sharnae; *L. corniculatus* cv. Grasslands Goldie, 'Spanish' breeding line) and companion grass (sown, volunteer) treatments. The experiment provided results for the establishment and botanical presence of both Lotus species, and the expression of their persistence mechanisms in these 4 environments. Greater lotus cv. Grasslands Maku established best under coastal conditions and birdsfoot trefoil cv. Grasslands Goldie established best under tablelands conditions. The degree of nodulation of greater lotus cv. Sharnae and birdsfoot trefoil cv. Grasslands Goldie was less than the degree of nodulation of greater lotus cv. Grasslands Maku, but nodulation had no apparent effect on seedling vigour. The population density of all Lotus cultivars declined substantially at the North Coast, South Coast and Southern Tablelands sites under the impact of severe drought conditions. However, both birdsfoot trefoil cv. Grasslands Goldie and greater lotus cv. Grasslands Maku remained relatively stable at the Northern Tablelands site with greater lotus cv. Grasslands Maku maintaining 20-40% presence and birdsfoot trefoil cv. Grasslands Goldie retaining 30-50% presence, depending on time of year.

Conclusions of the grazing experiment

In addition to providing for the nutritional requirements of livestock, grazing management practices need to anticipate the ecological responses of sward components to defoliation. Temperate perennial legumes can be especially sensitive to defoliation either because of preferential grazing, or because of intrinsic morphological or physiological vulnerabilities. In either case, perennial legumes generally benefit from some form of controlled grazing that sustain their adaptive mechanisms. However, in the present study, there was little effect of grazing practice on either *Lotus* presence or on the regeneration processes associated with *Lotus* persistence:

1. The study was undertaken under adverse seasonal conditions and newly established *Lotus*-based pastures were subjected to drought conditions both at establishment and during grazing. Despite these adverse seasonal conditions, seedling populations of birdsfoot trefoil and greater lotus established successfully under tablelands and coastal conditions alike, although Sharnae greater lotus established with relatively low seedling density.

2. Where seasonal conditions remained adverse (Casino, Canberra, Nowra sites) for the 3 year duration of the study, birdsfoot trefoil and greater lotus generally declined regardless of grazing treatment. However, at Glen Innes where rainfall conditions remained moderately favourable, birdsfoot trefoil maintained a high presence in all seasons.

3. In general, there was little effect of grazing management practice on arresting the decline in Lotus presence due to drought, or on enhancing the regeneration processes associated with Lotus persistence. With the exception of short-term increased presence of Sharnae greater lotus from autumn rest at Glen Innes only, there was no consistent effect of grazing treatment on the presence of either birdsfoot trefoil or greater lotus in the 4 environments under study. It is contended that this general lack of impact of grazing management on *Lotus* presence can be explained by:-

- i) For greater lotus, adverse moisture conditions were a primary limitation, resulting in insufficient rhizome mass for the expression of vegetative regeneration processes in response to different grazing practices
- ii) For birdsfoot trefoil, short daylength at low latitude precluded the triggering of reproductive processes (intensive flowering, seedbank development, seedling recruitment) for regeneration and persistence.

The adaptation and applications of Lotus-based pasture

Seventeen sites were established on farms in North Coast, Northern Tablelands/North-West Slopes, South Coast and Southern Tablelands Regions of New South Wales Of the 17 co-learning sites, 9 of 10 sites in northern New South Wales, and 3 of 7 sites in southern New South Wales, established successfully and yielded useful findings. All 5 failed sites were unsuccessful due to establishment failure associated with severe drought conditions at, or shortly following planting. The study confirmed that greater lotus is a valuable perennial legume for high rainfall coastal plains, coastal low-lands, coastal hill-country and niche tablelands environments where average annual rainfall (AAR) exceeds 1,000 mm. Significantly, the study showed that Birdsfoot trefoil has important potential for low fertility acidic soils on the tablelands and slopes where AAR is 650-1,000 mm, especially in northern New South Wales.

Conclusions of the on-farm trials

4. The study provides an increased understanding of the relative zones of adaptation of Birdsfoot trefoil and greater lotus in eastern Australia. In general, greater lotus proved to be a competitive and persistent legume only for very high rainfall (AAR>1,000 mm) coastal environments and niche tablelands sites where local conditions of rainfall, aspect or topography confer favourable soil moisture conditions. Birdsfoot trefoil expressed broad adaptation, drought tolerance and cattle grazing applications on the elevated tablelands and slopes where AAR is 650-1,000 mm. Birdsfoot trefoil showed best potential for providing a new perennial legume where most lacking – the North-West Slopes of New South Wales.

5. The study increased the knowledge base of *Lotus* technology, especially clarifying the importance of establishment practices that result in high seedling density, and grazing tactics that promote full expression of regeneration mechanisms. An experiment phase was combined with a demonstration phase and this methodology of 'co-learning' increased farmer and industry awareness of the unique properties of *Lotus,* especially adaptation to low fertility acidic soils.

6. The study identified new directions for research; in particular, the need to determine whether there is sufficient genetic variation within greater lotus and scope for breeding to develop improved tolerance of grazing under moisture-stress, and the need to develop short daylength Birdsfoot trefoil cultivars to fully realise the large potential *Lotus* zone in eastern Australia.

Further reading

Ayres JF (2004) Lotus – Birdsfoot trefoil. NSW Agriculture Agnote DPI-413, second edition, April 2004.

Ayres JF (2004) Lotus – Greater lotus. NSW Agriculture Agnote DPI-412, second edition, April 2004.

Ayres JF, Blumenthal MJ, O'Connor JW, Lane LA, Nicol HI (2006a) Birdsfoot trefoil (*Lotus corniculatus*) and greater lotus (*Lotus uliginosus*) in temperate perennial pasture. 1. The effects of grazing management on *Lotus* persistence. *Australian Journal of Experimental Agriculture* 46, 506-519.

Ayres JF, Blumenthal MJ, Lane LA, O'Connor JW (2006b) Birdsfoot trefoil (*Lotus corniculatus*) and greater lotus (*Lotus uliginosus*) in temperate perennial pasture. 2. The adaptation and applications of *Lotus*-based pasture. *Australian Journal of Experimental Agriculture* 46, 521-534.

Roberts KC, Coutts J, Ayres JF, Bilston G (2002) Co-learning in the development of *Lotus* pasture technology in Australia. *Australian Journal of Experimental Agriculture* 42, 527-533.

(Editor's Note: This is the text of a contribution sent to me by Dr Rick Young, Research Agronomist at Tamworth Agricultural Institute. Again a good case for perennial pasture accumulating soil organic carbon.)

An Outline of ideas on accumulating Soil Organic Carbon

Rick Young, Research Agronomist, NSW Department of Primary Industries, Tamworth Agricultural Institute, 4 Marsden Park Road, Calala NSW 2340
Telephone 02 67631117 Facsimile 02 67631222
email: rick.young@dpi.nsw.gov.au.

Our hypothesis is that optimal management of response cropping (zero tillage+residue retention+tramlining+nutrient replacement+monitoring soil water and planting when a predetermined depth of soil water accumulates) on Vertosols may result in net accumulation of soil organic carbon. (Vertosols - cracking clay soils with high water holding capacity – the predominant soil type in north western NSW, southern and central Queensland).

Despite claims by the USDA that adoption of improved management of annual cropping systems has the potential to accumulate 240-400 kg C/ha.year, there is little evidence in the literature that improved management of annual cropping systems in Australia will have this effect and the quantities of carbon that might be accumulated as a result. Most Australian work in this area indicates that a phase of perennial pasture is needed to make net additions to soil organic carbon whilst improved management (zero tillage, stubble retention, fertiliser addition) of cropping systems has only reduced the rate of decline in soil organic carbon.

However, Australian work on carbon in annual cropping systems, whether in Mediterranean, temperate or sub-tropical regions, has been completed largely on winter cropping systems.

To date, carbon accumulation under zero-tillage response cropping systems (using both summer and winter crops depending on plant available soil water measured by the farmer) has not been measured.

Recent research on the Liverpool Plains has demonstrated that the higher cropping frequency and biomass production characteristic of zero-tillage response cropping mimics the hydroaulic stability of perennial systems and reduces deep drainage below the root zone to small amounts.

This enhanced water use and production of response cropping, compared to winter cropping, may well translate to overall increases in soil carbon stocks over time on agricultural land capable of maintaining response cropping systems.

The Rural Scene

Phalaris and sub clover goes the distance

Nigel Phillips, District Agronomist, NSW Department of Primary Industries, Wagga Wagga

Long term perennial pastures are an important component of most livestock production systems in the South West Slopes. The cost of establishing these pastures can be as high as $350 per hectare with lime so it is important that you get full value from your investment. Key to the return on this investment is persistence of the sown species. However, it should be noted that long term perennial pastures are not always the best choice for some paddocks and there is still a place on most properties for shorter term perennial and annual pastures.

An extensive survey of perennial pasture paddocks in the southwest slopes has again confirmed that phalaris and sub clover is the pasture of choice for long term persistence. In an MLA sponsored survey, Dr Jim Virgona from the Charles Sturt University has recently completed a study of pastures that have been sown for between 2 and 20 years and critically assessed which species are persisting and producing the goods.

Some of the key findings are:

- Phalaris is the perennial grass of choice, along with subterranean clover, for persistence in long term paddocks.

- Other perennial pasture species did not persist over time and therefore did not contribute significantly to pasture production in the longer term.

- The addition of other perennial grasses to the mixture at sowing had a negative impact on the proportion of phalaris found in the paddocks.

So what should farmers read into this? If you are aiming to establish a long term perennial pasture then phalaris and sub clover is the obvious choice at present. This is an important decision for paddocks that are only marginally arable and where re-sowing on a regular basis is not an option.

The addition of other species to the mixture at sowing such as ryegrass or white clover will add significant costs up front but may only contribute to pasture production for one or two seasons before they die out. If the addition of other species cannot provide extra feed quantity or quality to phalaris and sub clover, or if it can't be captured by the livestock system, then it has little value. It must also be weighed against the reduced production from the phalaris over the remaining life of the pasture.

If long lasting perennial pastures are what you want then the choice is obvious. Invest the money saved on seed costs and allocate it to shorter term pastures or other important inputs such as fertilizer.

Australian phalaris turns 100

Rex Oram, 24 Glynn Place, Hughes ACT 2605

The original seeds of the Australian variety of *Phalaris aquatica* (once called *P. tuberosa*) arrived at the Toowoomba Botanic Gardens in 1883. This seed was sent by the New York Agriculture Department, which obtained it from a Mediterranean country, probably Italy. The seeds were sown in beds at the Gardens in early 1884 along with 20 other imported grasses, but phalaris was the only one that survived the first winter. A few years later, the crowns were dug up and put on a rubbish heap, where they continued to grow well and spread by seed. Soon after the turn of the century, the new director of the gardens, R. R. Harding, distributed crowns of this 'beautiful grass' to many interested people, including Charles Ross, the manager of the nearby Westbrook State Farm. Mr Ross was impressed by the grass, so he grew and sold seeds and crowns to many people in southern Queensland and northern NSW. According to a report in the Glen Innes Examiner of 1/11/32, the first crowns were brought into the New England district in about 1902 by Mr Adolf Meyer. These grew well in his garden, so, in later years, he distributed crowns to various residents of the district. In 1905 Robert H. Gennys, the manager of the Experiment Farm set up at Glen Innes in 1902, bought seed from Toowoomba and distributed it to Hawkesbury College, and to five other Experiment Farms in NSW. About the same time, trials also were sown in Victoria, South Australia, New Zealand and South Africa. As well, Mr Gennys planted a seed production plot at Glen Innes in 1905. In 1906, the going rate for Glen Innes seed was 10 shillings per ounce! It was soon recognised that phalaris grew well on the more fertile soils of the New England region, so this became the first home away from home for the grass.

The plants and seed sold or given away up till 1906 apparently were used only for trials and small scale multiplication of the crowns, but from then onwards several

New England pastoralists enthusiastically took up the challenge of producing larger quantities of seed for sowing broadacre pastures, as well as for sale to others. So it is reasonable to choose 1906 as the inaugural year of the commercial utilisation of the variety 'Australian'.

A network of New England pastoralists vigorously nurtured the infant grass. G. Morris Simpson of Stonehenge Station and Colonel H. F. White of Bald Blair, Guyra establish seed-producing stands in 1908 that soon came into production. Other pastoralists involved in early experimentation included L. P. Dutton of Urandangie, Guyra, Sir Hugh Croft of Salisbury Court, Uralla, Phillip Wright of Wollomombi, and D. P. McAnsh of Deepwater. These pioneers collected information about (and tested) new seeding techniques, fertilisers, grass and legume species. Results and ideaswere freely exchanged. Over the following years, Col. White became a very effective advocate of pasture improvement based on phalaris, tall fescue, ryegrass and white clover supported by phosphate fertilisers.

G.M. Simpson and his son Harold concentrated on mechanical harvesting of seed using reaper-binders that were designed for making sheaves of cereal hay. These machines handled the cut stems roughly enough to shake a lot of ripe seed out of the phalaris heads, so a 1.5 m high backboard was added, and troughs were fitted under the backboard and under the knotter that tied the sheaves. Most of the loosened seed was saved in this way. In later years, many tons of seed were sold each year to the Sydney seed merchant, Arthur Yates. The Simpsons also discovered a method for regenerating 8-10 year old stands that had been over-run by redgrass; deep ploughing with a mouldboard plough then rolling in late winter removed the weeds, and gave a good seed crop in the following summer. Col White adopted these seed production techniques and vigorously promoted them as part of the pasture improvement package for the more fertile New England soils. Improvement of the pastures on the lighter, less fertile soils was much more difficult, but was achieved in the late 1920s, particularly by D. P. McAnsh at Deepwater. The New England region also was the first in the world to start a seed certification system for Australian phalaris. This became necessary in 1933 because some traders had been passing off annual phalaris seed as '*P. tuberosa*'. Even so, the area of improved pasture grew only slowly, until the 1950s when aerial seeding was perfected by A. S. Nivison of Walcha, and rabbits were controlled by myxomatosis.

Since then, CSIRO has bred new varieties of phalaris from crosses between 'Australian' and wild populations from Morocco, Algeria, Spain, Italy, Greece, Turkey and Israel. New varieties like 'Sirosa' and 'Holdfast' grow much better and are more palatable in winter than 'Australian', but they sometimes don't survive as well, or later thicken up as well, as 'Australian' after heavy grazing in droughts. So even after 100 years, 'Australian' phalaris still has a role to play, often being sown now as a 50/50 mix with a winter-active like 'Holdfast'. We've come a long way from a few small plots of phalaris in 1906 to over 2 million hectares of phalaris-based pastures across southern Australia in 2006, but the original 'Australian' variety is still a valuable part of our pastoral scene.

DON'T FORGET YOUR
2006/07 SUBS
ARE NOW DUE -
NOTICES WERE SENT OUT
LATE MAY

NSW GRASSLAND SOCIETY SPONSORS
List for 2006

The NSW Grassland Society is very grateful to its sponsors for their generosity. Without the support of our sponsors we would have very restricted activity. Premier sponsors have donated $3,000 (sometimes also in 'kind').
Major sponsors have donated $1,500 and Corporate sponsors have donated $750.

Sponsors	Classification
Combined Rural Traders (CRT)	Premier
Australian Farm Journal	Premier
Meat and Livestock Association	Premier
Dow Agrosciences	Major
Wrightson Seeds	Major
Heritage Seeds	Major
ANZ Rural	Major
PlantTech	Major
Australian Wool Innovations	Major
Hi-Fert	Major
Auswest Seeds	Corporate
Progressive Seeds	Corporate
PGG Seeds	Corporate
Summit Agro	Corporate
Graham Centre	Corporate
The Land	Corporate

From the President's desk

At the time of writing this brief note, the conference is only two weeks off.
Having had a quick preview of the program, I can assure anyone planning to attend that the content is first class, speakers of the highest order and the associated conference tours a real bonus. Belinda Hackney and her team have done a thorough and great job in putting this conference together. Congratulations to them for what will certainly be a very informative and importantly, a most enjoyable conference.

This conference will provide producers, technologists, teachers of agriculture and others with an interest in livestock and crop production with a unique opportunity to hear and see the latest information on integrated weed management. Traditionally, weed control has largely been undertaken with herbicides. With increasing non agricultural community scrutiny of farming techniques apparent, this conference will clearly indicate that researchers, advisers and producers are taking a far more comprehensive and responsible approach to weed problems.

While herbicides will continue to play a key role in weed management, the full range of techniques to keep weeds under control will be under the spotlight at this conference. In keeping with the Grassland Society's perennial objective to feature producers' experiences, a number of practical livestock and crop managers will be presenting papers during the conference. These presentations are always are great complement to the high quality papers presented by research and advisory people.

I hope to catch up with many "old" friends as well as meet people attending the conference for the first time. While the organizers would love to have some fine weather for the outdoor tours, I'm sure some rain would be most welcome, perhaps during the indoor sessions.

Please remember to pay the annual subscription, now due. Those unable to attend the conference will only receive the conference proceedings if currently financial. Those attending the conference will be able to pick up a copy at Wagga Wagga. Conference proceedings are a very valuable source of information for many years ahead. This year's proceedings are packed with up to date information and associated references and are a must for anyone associated with livestock, pasture and crop production.

I wish all a safe trip to Wagga Wagga and return.

Mick Duncan

THE GRASSLAND SOCIETY OF NSW INC.

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 are agricultural scientists, farm advisers, consultants, and 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.

APPLICATION FORM

Name: ………………………………

Address: …………………………..
……………………………………
……………………………………
……………… Postcode…………..

Subscription for 12 months (July to June) is $50. This entitles you to copies of the Newsletters and a copy of the Annual Conference Proceedings.

For more information, please contact the Society's Secretary, Dianne Smith (telephone: 02 6362 6150).

Send membership application to:

The Secretary
Grassland Society of NSW
PO Box 471
Orange NSW 2800