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NEWSLETTER

VOLUME 22: NUMBER 4, 2007

STOP PRESS
TRAVEL GRANTS FOR GRASSLAND CONGRESS!

The International Grassland Congress will take place next year in China (29/6-5/7/08 in Hohhot). State Management Committee has decided that the funds normally allocated to the Society's Travel Grants should be used more specifically to assist members to get to the Congress.

The Congress early-bird Registration is about A$500, and Management Committee has decided to offer 8 Travel Grants for this amount, to assist members to attend.

If you wish to apply for a Grant, the Application Form can be found in a previous Newsletter (Volume 22, number 1) or can be obtained from Dr Hugh Dove (hugh.dove@csiro.au).

Early-bird registrations are required by the Congress before 29 February 2008, so grant applications must be made SOON! They will be evaluated by Committee as soon as they are received.

Hugh Dove
for State Management Committee

CONTENTS

Trade names are sometimes mentioned in this Newsletter in refereed papers. No endorsement or criticism of these products by the publisher is intended, nor is any endorsement or criticism implied of similar products not mentioned

Along with the majority of Society members I was over-optimistic in the last issue when I mentioned "The feeling of optimism about the drought breaking in many areas…". Sadly, as I write this 80% of New South Wales has been drought declared... We all fervently hope that the situation has changed for the better by the time this issue is distributed.

The next International Grassland Congress will be held jointly with the International Rangelands Conference in Hohhot, China. Full details of the conference, including a registration form, accommodation and tours is available on the website www.igc-2008.org

Sheep numbers are down to 87 million – the lowest number for over 80 years. However the good news is that wool prices are increasing – there was a 3.9% rise in the third week in October.

When our seasons return to normal again it is with pleasure that there will be a considerably wider choice of legumes and grasses to sow, thanks to the good work being done in the Department at Wagga Wagga, Glen Innes and Tamworth.

A product I know very little about is "haylage". It is frequently mentioned in British Grassland Society publications. Apparently it is 50-70% Dry Matter and made into 90centimetre bales and is popular with horse owners. Do any of our members have any experience of making haylage and/or feeding it?

Sadly we have been told that our excellent secretary, Dianne Smith wishes to retire at the end of this year. Personally I cannot thank her enough for the excellent job she does in handling all the material I send her and putting it in an acceptable form for the printer.

Members who studied either Agricultural or Veterinary Science at Sydney University will be sorry to hear of the death of my old friend Dr Don Walker. He was Reader (=associate professor) in the department of animal husbandry from 1958 – 1988. He taught and researched animal, nutrition and was the world expert on the nutritional requirements of the pre-ruminant lamb.

Haydn Lloyd Davies
Editor

Lotus breeding for eastern Australia

John Ayres & Leah Lane (Glen Innes 'Centre for Perennial Grazing Systems', NSW Department of Primary Industries), Walter Kelman (CSIRO Plant Industry, Canberra)

The *Lotus* genus comprises a diverse group of legumes totalling *ca.* 180 species. Of these, birdsfoot trefoil (*Lotus corniculatus*) has untapped potential as a new and important alternative perennial legume for permanent pastures in eastern Australia where white clover or lucerne are poorly adapted.

Birdsfoot trefoil is adapted to low fertility acidic soils, is drought tolerant and winter hardy, and is potentially valuable for utilising excess water in the soil profile thereby reducing 'recharge' into groundwater. Foliage contains condensed tannins, a property that confers bloat-safety.

Available varieties of this promising species require a high photoperiod (ca.16 hour day-length) for full expression of the prolific flowering, seed-bank development and seedling recruitment that is the primary regeneration mechanism for persistence. However, day-length in northern and central NSW (where new deep-rooted vegetation is required to manage soil water recharge) is 14 – 14.5 hours and current varieties of birdsfoot trefoil flower too sparsely for seedling recruitment to occur. Long term persistence of birdsfoot trefoil requires the development of new varieties adapted to the short day-length conditions that prevail in eastern Australia, especially in northern NSW.

Research on birdsfoot trefoil at Glen Innes has been undertaken in 3 strategic phases:

- A major state-wide project (1994-1999) defined the *Lotus* (birdsfoot trefoil, greater lotus) zones in NSW, developed management guidelines for *Lotus*-based pasture, and identified the limitations of birdsfoot trefoil for permanent pastures in NSW
- A subsequent project (1999-2002) evaluated and characterized a world-sourced birdsfoot trefoil collection for adaptation to low latitude conditions in eastern Australia
- A breeding phase (2003 - ongoing) has progressed elite birdsfoot trefoil germplasm to experimental variety status.

This work has been supported by the following funded projects:

1. *Lotus management and improvement for weaner production* (JF Ayres & MJ Blumenthal, 1994/95 - 1998/99, Meat Research Corporation)

2. *New lotus varieties for acid soils in northern NSW* (JF Ayres, 1999/2000 – 2002/2003, NSW Government 'Acid Soil Action Program')
3. *Development of birdsfoot trefoil cultivars for permanent pastures in the northern recharge zone* (JF Ayres, 2002-2005, Grains Research & Development Corporation & CRC for Plant-Based Management of Dryland Salinity).
4. *Lotus provides new opportunities for grazing on the Northern Tablelands of NSW (JF Ayres & J Lowien, 2004-2006,* National Landcare Program
5. *Development of birdsfoot trefoil cultivars for permanent pastures in the northern recharge zone (JF Ayres & WM Kelman, 2005-2007, CRC for Plant-Based Management of Dryland Salinity).*

The first project investigated the potential of lotus-based pastures to improve grazing production in the high rainfall zone, and reflected on the respective zones of adaptation of birdsfoot trefoil and greater lotus. The second project characterised birdsfoot trefoil and greater lotus germplasm for traits associated with adaptation under short photo-period conditions, and identified promising genotypes for subsequent breeding work. The third project undertook breeding processes to develop breeding lines of birdsfoot trefoil. The fourth project is currently testing and demonstrating birdsfoot trefoil-based pastures under commercial conditions. The last project is currently progressing 3 experimental varieties through cultivar development, PBR and commercialisation activities.

The aim of present breeding work with birdsfoot trefoil is to undertake cultivar development to produce varieties adapted to short day-length conditions in the high rainfall (750-1000 mm AAR) permanent pasture zone. This work is collaborative work between NSW Department of Primary Industries and CSIRO Plant Industry.

The breeding process for development of birdsfoot trefoil varieties in the NSW DPI/CSIRO program involves both inter-population crossing and mass recurrent selection from both broad (world sourced accessions) and narrow (adapted populations) germplasm sets followed by polycrossing in discrete morphological groups, followed by implementation of cultivar development processes (PBR, seed increase, merit testing) and commercialisation. Breeding objectives are verified with estimates of genetic parameters based on analysis of genetic variance components. Genetic gain is estimated from response to selection based on the performance of synthetic populations relative to progenitor populations using accepted response to selection models. The PBR process is used to validate distinctiveness, uniformity and stability at the F2 stage of the experimental variety. Agronomic merit is determined in parallel with the cultivar development phase.

In the current breeding project, parent populations of the experimental varieties show high heritability and proven genetic gain in the trait 'umbels per flowering stem' that is being addressed to achieve improvement in regeneration, hence persistence. Three contrasting experimental varieties (Phoenix, Venture, Matador) have been developed to provide for different target production systems and grazing applications – these currently have provisional PBR protection and are proceeding through final stages of cultivar development.
This project is directed at providing cultivars for permanent pastures in eastern Australia - to increase the proportion of grazing lands (beef cattle and sheep enterprises) based on deep-rooted permanent perennial pastures in recharge environments. The immediate target region is the northern upper catchment (NSW Northern Tablelands/North West Slopes) of the Murray-Darling Basin with agricultural enterprises based on beef cattle, sheep and mixed farming. Cultivar developed from this program will also have potential adaptation elsewhere in summer rainfall and winter rainfall regions of the High Rainfall Temperate Perennial Pasture Zone.

Achievements with *Lotus* improvement to date include:-

➔ From the results of adaptation studies undertaken from Glen Innes at 21 sites across NSW, the potential *Lotus* zone in NSW has been shown to be 1 million hectares of greater lotus and 2.5 m hectares of birdsfoot trefoil. The location of these zones has been projected to be:

- Greater lotus: high rainfall coast (coastal plains, lowlands and hill-country) and favoured moist environments in tablelands regions where AAR > 1,000 mm
- Birdsfoot trefoil: low fertility acidic soils in tablelands and slopes environments where AAR is 650 - 1,000 mm.

➔ Research at Glen Innes has published on the short photo-period limitations of existing birdsfoot trefoil varieties and nominated 'selection for seed yield components' as the appropriate breeding objective to achieve persistence under Australian conditions. *Lotus* research at Glen Innes has produced a total of 48 publications (including 18 scientific papers).

➔ From genetics studies undertaken in collaboration with CSIRO Plant Industry, evidence has been provided for the feasibility of genetic improvement through selection for the seed yield component 'umbels per tiller' to overcome this photo-period limitation. This trait has high heritability and the consequent genetic improvement attained has been documented.

➔ The breeding program will achieve pre-commercial launch of 3 new birdsfoot trefoil varieties in 2008.

Further reading on the *Lotus* program:

Kelman WM, Ayres JF (2002) Genetic analysis of seed yield components in birdsfoot trefoil (*Lotus corniculatus*). 'Plant Breeding for the 11th Millennium' (Ed) JA McComb Proceedings of the Twelth Australasian Plant Breeding Conference, pp 504-506 (Australasian Plant Breeding Assoc Inc): Perth, Western Australia.

Kelman WM, Ayres JF (2004) Genetic variation for seed yield components in the birdsfoot trefoil cultivar, Grasslands Goldie. *Australian Journal of Experimental Agriculture* **44**, 259-263.

Ayres JF, Blumenthal MJ, O'Connor JW, Lane LA, Nicol HI (2006a) Birdsfoot trefoil (*Lotus corniculatus*) and greater lotus (*Lotus uliginosus*) in perennial pastures in eastern Australia 1. Effects of grazing management on persistence. *Australian Journal of Experimental Agriculture* **46**, 503 – 519.

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

Ayres JF, Kelman WM, McCorkell BE, Lane LA (2007) Characteristics of greater lotus (*Lotus uliginosus* Schkuhr) populations grown under low latitude conditions in eastern Australia. *Australian Journal of Experimental Agriculture* **47 (1)** 17-24.

Ayres JF, Kelman WM, Lane LA, McCorkell BE (2007) Regeneration characteristics of birdsfoot trefoil (*Lotus corniculatus* L.) under low latitude environments in eastern Australia. *Australian Journal of Experimental Agriculture* **47**, 833-843.

Ayres JF, Kelman WM, Wiedemann SG, Lane LA, McCorkell BE (2007) Developing birdsfoot trefoil (*Lotus corniculatus* L.) varieties for permanent pasture applications in low latitude regions of eastern Australia. *Australian Journal of Experimental Agriculture* **47** (in press).

The mixed farming puzzle – McMaster putting the pieces together

Carol Harris, NSW DPI Glen Innes

Is integration of livestock and cropping enterprises worthwhile or should they be separated?

If they are integrated what are the further benefits to production and sustainability from introducing perennial fertilised pastures into the rotations? Answering these questions is the goal of a mixed farming systems trial underway by researchers from the University of New England and the NSW Department of Primary Industries at Warialda. This project is part of the Grain & Graze program that is a collaborative partnership between Land & Water Australia, Meat & Livestock Australia, Australian Wool Innovation, and the Grains Research & Development Corporation.

A field day attended by 200 producers held at the Douglas McMaster Research Station in October was the launch of the mixed farming systems trial. The trial comprises three farmlets set up to compare three distinct management systems to produce credible paddock scale evaluation. The farmlets consist of equal areas of the three dominant soil types in the Warialda area; native pasture hilltops, red basalt slopes and black flats.

Producers, extension officers and researchers have combined to direct research priorities and to evaluate adoption of mixed farming enterprises for the region. This group designed the following three management systems;

1) A "typical" system based on current practice on the North-West Slopes of NSW where there will be no grazing on the cropping areas of the farmlet.
2) An "integrated system" where cattle will be allowed to graze all areas of the farmlet.
3) An "integrated pasture" system with livestock management similar to the integrated system, but with fertilised perennial pastures sown on all soil types of the farmlet.

The trial seeks to quantify the overall performance and sustainability of each management system. This will require the collection of detailed data on a number of parameters including; soil fertility, soil moisture (infiltration, bulk density, and moisture content), pasture herbage mass & quality, ground cover, liveweight gain, grain yield & quality, input costs and output prices from each farmlet.

The mixed farming systems trial is at the forefront of trialling the latest precision agriculture technology in collaboration with the Precision Agriculture Research Group at University of New England. An aim of the project is to determine the usefulness of tools for assessing and monitoring grazing pattern, behaviour and how this impacts on compaction (GPS tracking collars), soil water status (EM survey) and pasture growth and crop vigour (Crop Circle). These tools will allow the collection of spatial data and an assessment of the environmental implications of the three management systems under variable climate conditions.

For more information, contact the project leader Carol Harris at NSW DPI Glen Innes on 67301900.

NSW Department of Primary Industries – check out NSW DPI's updated web sites

Dr Philip Wright, Director, Science Strategy, NSW Department of Primary Industries

Research capability is integral to the generation of innovations and practical solutions for NSW primary industries. These industries operate in a highly challenging environment - they are exposed to strong international competition, large climatic variability and numerous physical and biophysical threats. To be sustainable and competitive, primary industries depend on having a strong local R&D capacity.

NSW Department of Primary Industries (NSW DPI) addresses this need by maintaining a research presence in a wide range of locations across NSW.

The 'Science and Research' division of NSW DPI is the largest provider of research in the public sector. NSW DPI coordinates research investments across hundreds of projects, fosters alliances and cooperative ventures, conducts testing for industry at nationally accredited laboratories and provides a strong science base for policy development.

Summary information about the work of NSW DPI's Science and Research Division is available from http://www.dpi.nsw.gov.au/research/branch and information about research and advisory projects at the regional centres is at http://www.dpi.nsw.gov.au/research/centres.

The Grassland Society gratefully acknowledges three of its sponsors for 2007/2008.

Sowing Pastures – Will it Pay?

Michael Keys, Agronomist (Special Projects), NSW Dept Primary Industries - Queanbeyan

Perennial pastures have become very expensive to establish so new sowings must establish well and enable graziers to run at least 12 dse/ha. Based on a sowing cost of $235/ha and gross margins of $25/dse, it takes between 9-12 years to cover costs at current interest rates depending on the increase in stocking rate. Liming is not included in this sowing cost.

This data was produced using current costs for seed, fertiliser and contract spraying and sowing rates (to allow for labour, machinery cost and depreciation) for the southern and central tablelands. The results were presented at a recent training day for 25 DPI agronomists and technical staff at Bungendore. They visited the site where 20 years previously, a large scale comparison of direct drilling versus conventional ploughed seedbeds and six different types of pasture seeders was conducted.

The comparisons showed that direct drill sowing was just as successful as conventional sowing into a ploughed seedbed. However complete weed control and accurate seed placement was essential no matter what method was used.

The work showed heavy grazing was not able to provide good weed control and few perennial grasses established in those blocks. Except when using the single disc seeder, all seeders (several different tyne configurations with narrow, direct drill pasture points and a triple disc) were able to successfully establish perennial grasses in the direct drill blocks.

Using a cash flow development budget developed by NSW DPI Agricultural Economist, Fiona Scott, the cost of pasture establishment and the influence of various stocking rates were discussed. The spreadsheet showed that unless stocking rates can be increased by 5 dse/ha or more, it is unlikely that the real cost of sowing can be re-couped. If lime was required (costing an extra $180/ha @ 2.5 t/ha) it takes an extra 6 years to re-coup the cost.

Implications:

- Only sow new perennial pastures in paddocks that have high production potential ie good soils, topography and aspect.
- Only sow new perennial pastures where you have the livestock numbers and enterprise(s) to capitalise on the extra pasture production.

- Choose species that have a proven record for both production and persistence (eg sub clover and phalaris are very hard to beat in the Central and Southern Tablelands)
- Make sure you allow sufficient funds each year to maintain soil fertility and to purchase the extra stock required to use the higher production of the new pasture.
- Do not sow introduced pastures on highly acidic soils where liming is required – if present utilise acid tolerant, modified native pastures instead.
- Use lime to preserve soil pH on hay paddocks with highly fertile soils where product removal lowers surface soil pH.
- Do not ignore the productive potential, especially during winter, of well fertilised annual grass/sub clover pastures.
- Run a cash flow development budget before you commit to sowing a new perennial grass pasture.

Conclusion: recent changes in the cost-price squeeze requires re-assessment of pasture sowing options and approaches. Sown perennial pastures now need to persist for 15 years or more and carrying capacity (production) must be increased by 6 dse/ha. To ensure value for money new pastures need to be used by a high value enterprise such as prime lambs or vealers that require high quality pasture.

Greater lotus in northern NSW – summary of a recent scientific paper

John Ayres (Glen Innes 'Centre for Perennial Grazing Systems', NSW Department of Primary Industries) and Walter Kelman (CSIRO Plant Industry, Canberra)

Following release in 1974 of the first improved greater lotus variety Grasslands Maku, plantings of greater lotus-based pastures in eastern Australia expanded to about 100,000 hectares by the late 1990's.

In this limited zone of application, greater lotus is known to be a bloat-safe and botanically stable perennial legume with C4 grasses in high rainfall (1200-1600 mm AAR) coastal districts, and with temperate perennial greases in hinterland tablelands environments where AAR>1000 mm. However, greater lotus is susceptible to periodic moisture stress in summer which is characteristic of the year-to-year variability of seasonal rainfall experienced in this high rainfall zone. These considerations of the zone of adaptation of greater lotus are based on

experience with the tetraploid variety Grasslands Maku which has known limitations: weak seedling vigour associated with winter cold, susceptibility to frost and poor seed-set at low latitudes (ie northern NSW).

Since the development of Maku, more recent developments of populations (in New Zealand) from re-selection within Maku, and the development of breeding lines from crossing and selection of diploid New Zealand and Portuguese sources (in Australia), have provided an opportunity to evaluate a broader genetic base of greater lotus for adaptability to low latitude environments in eastern Australia. Accordingly, a study was undertaken at the 'Centre for Perennial Grazing Systems' at Glen Innes to determine the prospects for further genetic improvement of greater lotus to extend greater lotus-based pastures into the environments most conducive to the warm season growth characteristics of greater lotus - namely the summer rainfall region in the high rainfall zone of north-eastern New South Wales and south-eastern Queensland.

The study assessed a collection of 10 greater lotus varieties and breeding lines, comprising diploid and tetraploid populations with a range of Mediterranean parentage. Morphological characteristics and seasonal herbage production were measured under glasshouse conditions, and reproductive traits were measured in the field at Glen Innes and Armidale. Results show large differences between the lines in leaf and stem characteristics, and narrow but useful diversity in seed yield components. The diploid populations Sharnae, LUX97 and BL_{G4704} (which have high levels of Mediterranean parentage) expressed high year-round growth performance, and Sharnae was exceptionally high in cool-season growth. These diploid lines set more seed than the cultivars Maku and Sunrise under the low latitude conditions of the study.

This germplasm with a high content of Mediterranean parentage that combines high seed-set potential with high growth potential was identified as the most suitable source of germplasm to satisfy the low latitude/short daylength characteristics of this northern region, and the requirements of grazing animals for cool-season growth activity. The findings indicate a potential for future breeding and cultivar development to expand greater lotus usage into low latitude environments.

Further reading

Ayres JF, Kelman WM, McCorkell BE, Lane LA (2007) Characteristics of greater lotus (*Lotus uliginosus*) populations grown under low latitude conditions in eastern Australia. *Australian Journal of Experimental Agriculture* **47**, 17-24.

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, Local sponsors $250.

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Australian Wool Innovation	Corporate
BioAg	Local
Cleanseeds Pty Ltd	Local

Canola hay & silage – cutting time & feed quality

Nigel Phillips, Technical Specialist, Pastures (South), WWAI

Key Points

- Canola crops harvested for forage in 2007 are likely to exhibit good energy and protein levels.
- While there are some animal health risks associated with feeding canola, given the thousands of tonnes of canola hay and silage fed out, the risks are very low.
- Some of this forage may have high nitrate levels so appropriate steps should be taken to mitigate this risk when feeding to livestock.
- Dry matter yields and feed quality will decline significantly after flowering in drought affected canola crops.

Yield & Quality

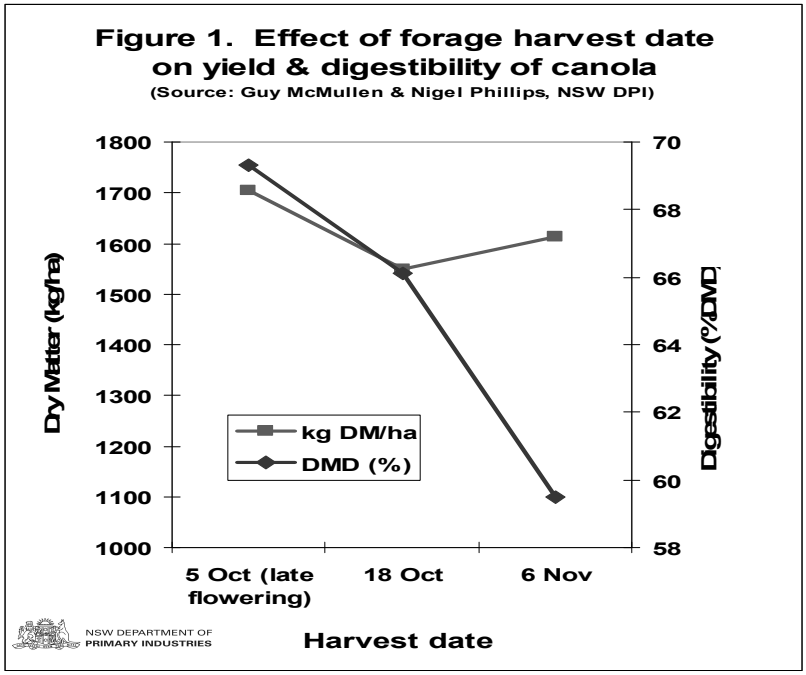
The feed quality of canola crops harvested for forage in 2006 was generally high (Table 1). The corresponding animal performance when fed out was also reported to be good. Feed Quality testing of 2007 canola crops exhibit similar levels.

Table 1. Feed quality of 2006 canola at cutting

	Average	Range
Digestibility (DMD%)	69.4	57 -76
Metabolisable Energy (MJ/kg/DM)	10.0	7.0 – 11.6
Crude Protein (%)	21.0	12 – 31
Nitrate (mg/kg)	2540	52 - 8394

Without sufficient soil moisture for the next 3 to 4 weeks canola crops are unlikely to produce grain and maximum forage yield and feed quality will be obtained by harvesting at flowering. Figure 1 shows the decline in both yield and digestibility of a standing canola crop east of Wagga in 2006. Dry matter yield increased slightly after mid October which was all lower digestibility stem and seed pod material. Leaf mass continued to decline after flowering. This is reflected in the digestibility fall after flowering which is substantial.

As a general rule, a drop of 1% in digestibility will result in a 3% to 5% drop in animal performance when fed. Cutting canola crops after flowering will in most instances result in an increased cost per mega joule in the final product.



Animal Health Issues

All feeds, grains and forages, come with some potential for animal health problems. This is also true of canola. While there are some potential animal health risks from grazing canola crops or feeding canola forages, the instances are very infrequent and the number of animals affected usually small. Some animal health issues appear to be associated with flowering canola crops.

However, these risks need to be put into perspective. Thousands of tonnes of canola, including flowering crops harvested as hay or silage, have been fed to livestock over the last few seasons with only a handful of animal health issues reported. Given this, delaying forage harvest until after flowering will result in lower yield and feed quality in order to mitigate a very low level of animal health risk. Regardless, care should be taken when feeding canola to minimise these risks.

Perhaps the greatest risk is nitrate poisoning when grazing standing crops or hay. Nitrate poisoning is less likely with silage which can lose from 40 to 60 % of the nitrate content during fermentation. Nitrate levels can vary widely and are determined by many paddock and seasonal factors. Nearly all cases of nitrate poisoning are associated with hungry animals and/or a rapid change of diet. If in doubt, a laboratory test for nitrate can be conducted.

Producers should also carefully check chemical records to avoid any chemical residue issues before baling or grazing crops.

Carbon accumulation under zero tillage cropping on cracking clays?

Rick Young, NSW Department of Primary Industries, Tamworth Agricultural Institute
Dr Brian Wilson, NSW DECC University of New England

Despite claims of significant carbon accumulation under zero tillage management of annual cropping (zero tillage, stubble retention, nutrient addition) both in Australia and North America, where the potential sequestration rates are claimed to be up to 400 kg C/ha.year, there is little scientific evidence for net carbon accumulation under improved management of annual cropping systems in Australia. Most Australian studies, including a recent study on the Liverpool Plains, have indicated that a phase of perennial pasture is needed to make net additions to soil organic carbon while improved management of cropping systems will only reduce the rate of decline in soil organic matter.

The recent Liverpool Plains study by NSW DPI and NSW DECC, found that carbon levels in a Black Vertosol, low in soil carbon after twenty years' cultivation and cropping, remained at a constant level over six years under several zero tillage cropping systems (continuous winter cereal, continuous sorghum with opportunistic winter pulses, and long fallow wheat/sorghum rotations). Paradoxically, the most productive systems, with annual biomass yields of 10-12 tlha, showed no evidence of soil carbon accumulation; accumulation was evident only under intensive response cropping and perennial pastures with lower annual biomass yields of 5-8 t/ha.

Carbon was found to accumulate at 100-200 kg/ha annually only under zero tillage response cropping where nine crops were grown over six years. Under pastures of lucerne and mixed perennial grasses, soil carbon accumulated at greater annual rates of 200-500 kg/ha. However, the response cropping was considerably more intensive than in commercial practice which is usually around five crops in four years. The fact that plants were growing in almost all seasons was probably the reason behind the small but significant rate of carbon accumulation in this case.

In addition to these experimental observations, a survey of seven Liverpool Plains and Manilla district farm paddocks indicated that soil carbon under continuous cropping and perennial pasture, respectively, was ~55% and ~80% of that under adjacent grassy woodlands. Most often, the amount of carbon under grassy woodland was ~50 t/ha to a depth of 20 cm. The carbon under cropping was variable and did not appear to be associated with management, apart from an extreme case of a long term continuously cropped light textured red soil which had only 25% of the carbon of nearby woodland.

Overall, the average annual rate of loss of soil carbon under cropping was ~1.5% of the original stock. In the drier Walgett and Coonamble districts, the rate of loss was less at ~0.8% annually. However in these drier areas, the original carbon stock under woodland or grassland was also less: 12-25 t/ha.

Current knowledge strongly suggests that dryland farmers in northwestern NSW cannot expect to accumulate soil carbon in continuously cropped land within the short to medium term at least. The inclusion of healthy perennial, especially grass, pastures in rotation with crops may assist in a slow net accumulation of carbon, although this has not been demonstrated over the medium to long term. For carbon trading purposes, woodland systems are likely to sequester more carbon than improved management of cropping systems.

Although it has not been demonstrated that soil carbon accumulates under zero tillage cropping, the increased financial returns and soil and water conservation benefits from these much improved practices are now widely recognised.

DON'T FORGET YOUR 2007/2008 MEMBERSHIP SUBS OF $50 IS NOW DUE

Making Better Fertiliser Decisions

Nigel Phillips, Technical Specialist Pastures (South), NSW DPI Wagga Wagga

Most Australian soils are relatively low in phosphorus and other nutrients. Accordingly, there is a strong link between fertiliser use, pasture production and enterprise profitability. Producers need to ensure that fertiliser usage is both sufficient to deliver maximum profitability but not excessive, thereby avoiding any negative environmental impacts.

In 2003 the Better Fertiliser Decisions Project commenced with the aim of providing a series of tools to help producers and their advisers improve fertiliser practices. The initial step was to collate all the research on fertiliser use in pastures from all of Australia and create an extensive database. This was quite a feat. The creation of the database allowed the project team to look more closely at the critical soil test values for key nutrients in pastures. The 'critical soil test value' is the soil test value where 95% of maximum pasture production occurs. Knowing this value allows producers to target the correct amount of fertiliser to achieve production targets while avoiding excessive fertiliser use that may damage both the environment and the hip pocket.

An important inclusion is the relationship between Colwell Phosphorus, the dominant phosphorus soil test used in NSW, and the Phosphorus Buffering Index (PBI). The PBI is a measure of the soils capacity to hold onto to, or release, phosphorus and is closely related to soil texture. Light textured soils tend to have a low PBI whereas heavy soils tend to have high PBI values. So rather than having one critical soil test value for all soil types the critical value will change with PBI. This allows producers and advisers to better interpret the Colwell P test and to modify fertiliser application according to soil type.

Table 1 shows the predicted critical soil test values for various PBI categories. As the PBI value increases the critical soil test value also increase. In a practical sense, you will need to apply more fertiliser to a heavy soil (high PBI) compared to a light soil (low PBI) to achieve 95% of maximum pasture production if they both test at the same level initially. It should also be noted that there is a range of critical soil test values for a given PBI category. This reflects the influence of other factors driving pasture production, such as environmental conditions, as well as the amount of research data available for the analysis.

While these Colwell P ranges are suitable for most circumstances they may need to be modified for some enterprises. For example, a pasture at Cowra with a soil PBI of 150 and producing 7 tonnes of pasture annually is unlikely to have the same phosphorus demand as an irrigated dairy pasture on the same soil type producing 19 tonnes of pasture annually. The dairy pasture may require a critical

soil test value in excess of 44 mg/kg to ensure that all plant demands can be met as they occur in the field. For this reason intensive livestock producers should seek further advice from their agronomist. For most producers in NSW these ranges should be appropriate but they will still need to be interpreted in conjunction with other factors that may influence pasture production.

Table 1: Predicted critical Colwell P soil test values for standard PBI categories, derived from the national data set

PBI category		Critical value (mg/kg) for mid point of PBI category (range)[1]
<15	Extremely low	23 (20 – 24)
15-35	Very very low	26 (24 – 27)
36-70	Very low	29 (27 – 31)
71-140	Low	34 (31 – 36)
141-280	Moderate	40 (36 – 44)
281-840	High	55 (44 – 64)
>840	Very high	n/a[2]

[1] Critical Colwell P value at the mid-point of PBI class. Values in parenthesis are critical Colwell P values at the lowest and highest PBI values within the range.
[2] Insufficient data to derive a response relationship.

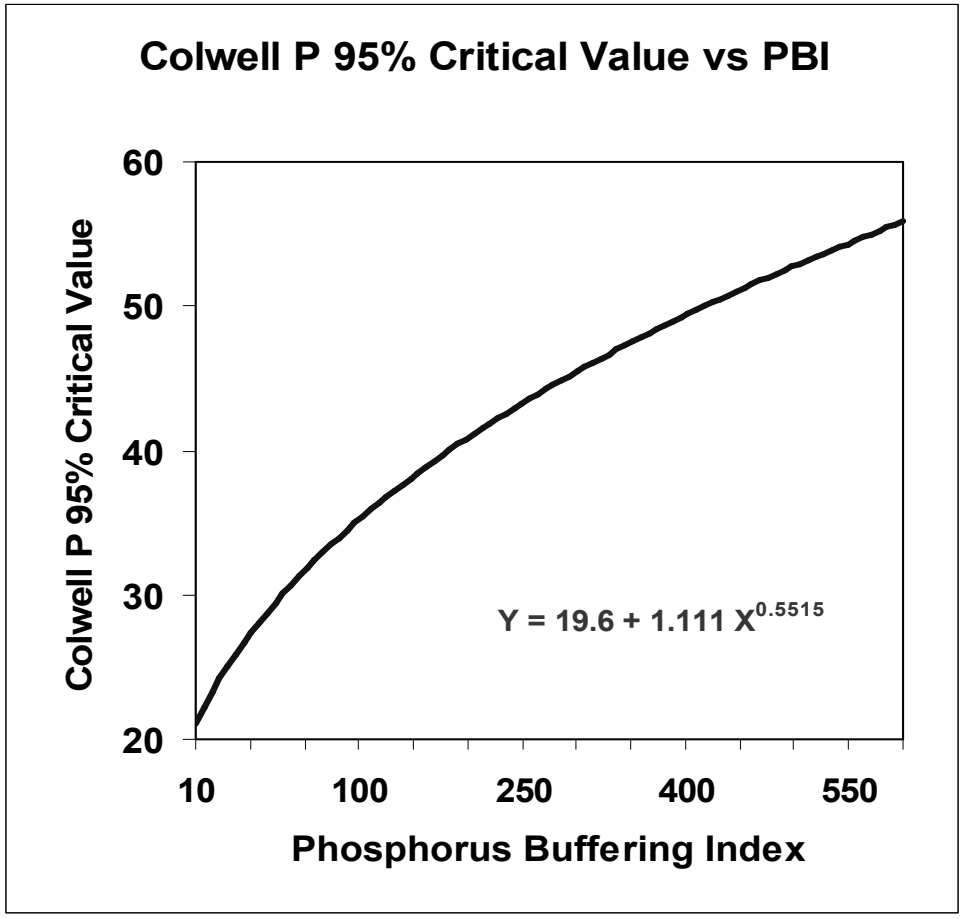
The Better Fertiliser Decisions project has been a landmark project involving the collaboration and support of researchers and industry nationally. The key outputs from the project are:

- The establishment of critical soil test values for phosphorus, potassium and sulphur which include differences between soil types, states and different test methods.
- An interactive database containing all the pasture response data for applied nitrogen (N), P, K and S fertiliser.

- The Farm Nutrient Loss Index (FNLI), a decision support tool to assess the risk of nutrient loss from the paddock to the off-farm environment in the format of a user-friendly computer program.

All three can be accessed from the CSIRO Australian Soil Resource Information System (ASRIS) internet site: www.asris.csiro.au/themes/nutrient.html

Talk to your agronomist who can assist you with the interpretation of soil test results and help fine tune your fertiliser strategy.



Evergraze 9. Using perennials to boost ovulation rates in Merino ewes

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This paper reports preliminary results from experiments investigating whether flushing using summer-active perennial pastures can increase ovulation rates in ewes, therefore potentially lambs produced and profit.

In one experiment at Wagga Wagga, NSW, four different flushing strategies were evaluated in March 2006 and January 2007: lucerne, chicory, phalaris or phalaris pasture plus 500 g/ewe.day lupin grain. In 2006, oestrus synchronised ewes grazed the pastures for 9 days until oestrus, but in 2007, pastures were grazed for 9 days until 2 days before oestrus.

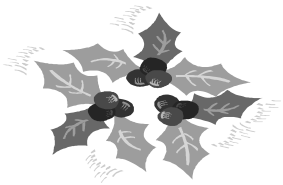
In another experiment at Albany, WA, three different flushing strategies were evaluated in April 2006: kikuyu, or subterranean clover based annual pasture plus and minus 500 g/ewe per.day lupin grain fed for 12 days. Oestrus synchronised ewes grazed the pastures for 21 days, with oestrus occurring at day 14. Ovulation rate at both sites was measured between days 5 and 8 of the next cycle.

Low quantities of live pasture were present pre-treatment at Wagga: in 2006 and 2007, respectively, chicory 400 – 900, lucerne 200 – 300 and phalaris pastures less than 100 kg DM/ha. In both years the ewes weighed approximately 52 kg and were in condition score 3. In 2006, grazing lucerne increased ovulation rate (15%) and the proportion of ewes with multiple ovulations (42%) compared with feeding lupins. The success of lucerne in increasing ovulation rate may be due to reduced intake of pasture during the late luteal phase in this treatment. Conversely, in 2007 when ewes were removed before this time, chicory and lupins succeeded in increasing ovulation rate (up to 22%) and the proportion of ewes with multiple ovulations (up to 185%), compared with phalaris pasture. Lucerne did not significantly increase ovulation rate or percentage multiple ovulations in 2007.

In the Albany experiment pre-treatment, no live pasture was available in the annual pasture compared with the kikuyu with 1242 kg DM/ha. By end of the

experiment the annual pasture had between 145 to 225 kg DM/ha of live herbage, the kikuyu pasture 1979 kg DM/ha. The ewes weighed 57 kg and were in condition score 2.7. Feeding lupins did not change ovulation rate compared to the control and kikuyu pasture reduced ovulation rate (8%). The lower rate on the kikuyu may be due to lower energy and protein availability or an unknown inhibitory compound.

The low quantity of live lucerne and chicory which resulted in increased ovulation rate is encouraging. The results indicate that potentially large increases in weaning percentages can be gained through grazing summer-active perennial pastures.



The Management Committee of the Grassland Society of NSW wishes all members and their families a happy Christmas and best wishes for good seasons in 2008.

From the President's desk

A very dry early spring has been partly relieved by useful but scattered rain in the first week of November. Too late for winter crops, except in the high altitude areas, but very welcome for those planning summer crops.

There is plenty of interest in summer forage crops of millet, sorghum and the legumes; cowpeas and lablab. Follow up rain later in the month would be very welcome as these crops emerge. Many livestock producers are keen to put away some conserved feed to replace fodder reserves that have been diminished in recent years.

Planning for next year's conference at Tamworth has commenced and will result in another great event for NSW pasture and livestock producers as well as the many Society members from the agri business sectors. The conference will be convened by Tamworth district agronomist, Loretta Serafin, who also convened the very successful 2004 conference at Gunnedah. Members will no doubt remember the widespread interest in tropical pastures that was a feature of that conference.

I have just returned from a short visit to the south island of New Zealand looking at pasture industry developments. There is a lot of activity "across the ditch" in rye grass and tall fescue breeding and selection, using overseas and local material. Some of these developments are very relevant to NSW tablelands and coastal areas. I am planning to submit a short article to summarise this trip for the next newsletter (if the editor accepts it of course).

Best wishes for an improved spring and summer to members across the state.

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.

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