Tropical Grassland Society of Australia Inc.

TGS news & views

about pasture development in the tropics and subtropics

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Tropical Pastures Conference 2007

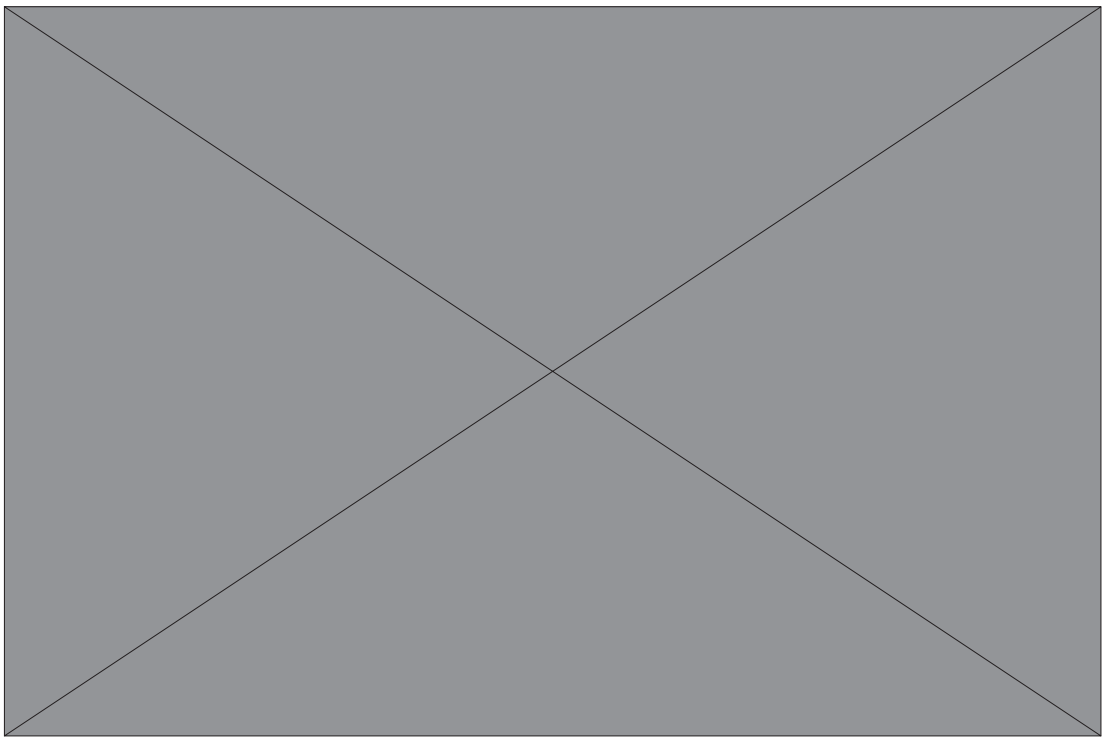
The conference held at Dalby Agricultural College went off well with nearly 100 attending. These were made up of producers, Landcare and catchment management officers, pasture seed company representatives, departmental officers from Primary Industries and Natural Resources and pasture agronomists of old.

The dinner at the college was attended by more than 40 and the networking progressed well into the evening with so many old and new faces.

The range of speakers was excellent although, as often occurs, the whole program seemed a bit tight. Although several attendees said that they would have liked more time, in general discussion at the end of each talk was not greatly restricted.

The theme of the conference was returning marginal cropping lands to permanent pastures. The content was covered by descriptions of

- what makes land marginal for



George Lambert gives his extension thoughts on pasture management under the chair of Kevin Lowe at the Tropical Pastures Conference

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Society News

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The Pasture Picker is running again. The database was not searching for a couple of weeks in March when Microsoft changed their requirements and these changes were not enabled in Pasture Picker at the time. My thanks to Greg Pinington who keeps us going when things fall over.

And we are endeavouring to get the journal archive more up-to-date. There should always be an 18-month delay before the new issues are accessible so that our members get the science before the general public. At present, the latest journal available on the web site is December 2003 but we are working with the typesetters to add the links to 2004 and some issues for 2005.

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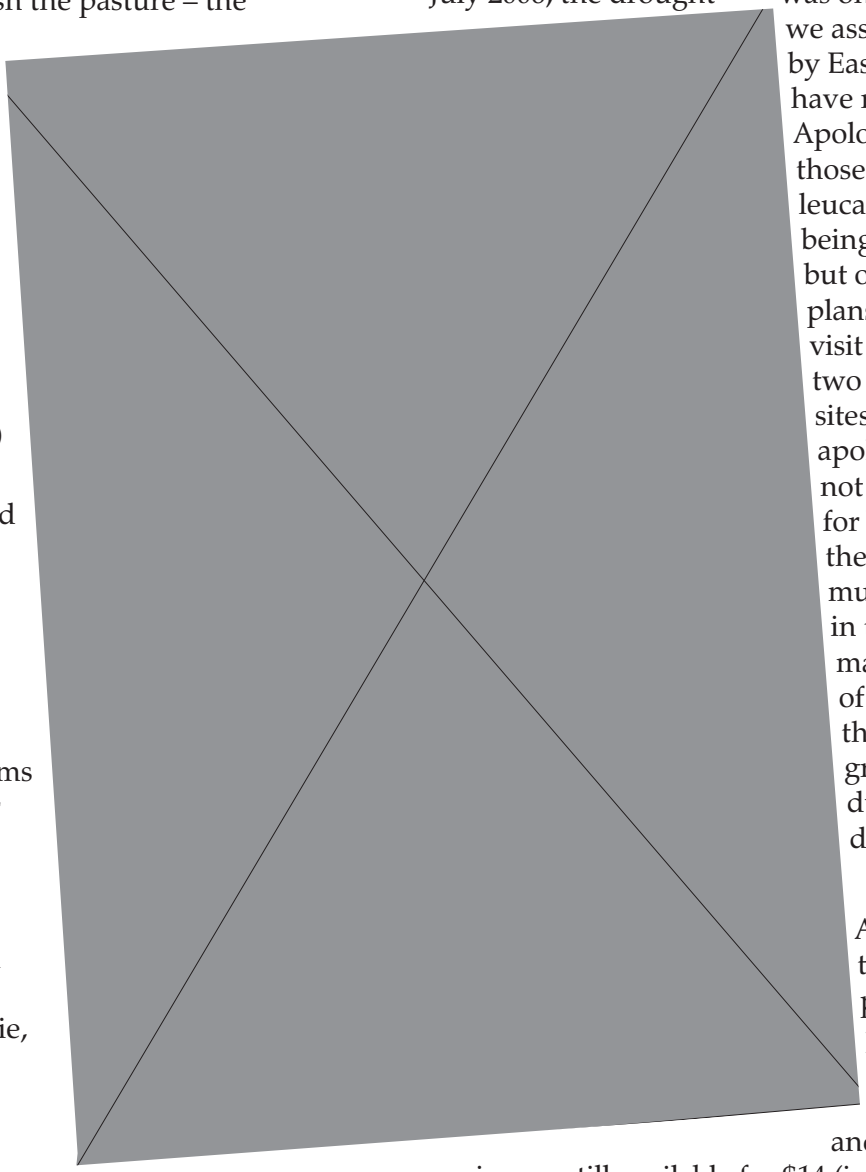
cropping (Andrew Biggs, NRW)

- the benefits from returning to pasture (Mark Silburn, NRW)
- whether we can revert to the original native pasture species (Richard Silcock, DPI&F)
- which improved grass and legume species are most suitable, and should they be sown as single species or as mixtures (David Lloyd and Brian Johnson, DPI&F)
- what is the place for, and benefits of, leucaena tree legume (Scott Dalzell, University of Qld)
- how best to establish the pasture – the science (Sid Cook, QMDC) and the practical experiences (David Illing)
- is seasonal forecasting useful when establishing pastures and managing them (Jeff Clewett, Agroclim Australia)
- how should the pasture be managed – as a tool and in practice (George Lambert, CA and Nevin Olm, Warra Landcare)
- what grazing management systems are suitable (Trevor Hall, DPI&F)
- what are the economics of returning marginal cropping land to pasture (Peter Wyllie, Horizon Rural Management).

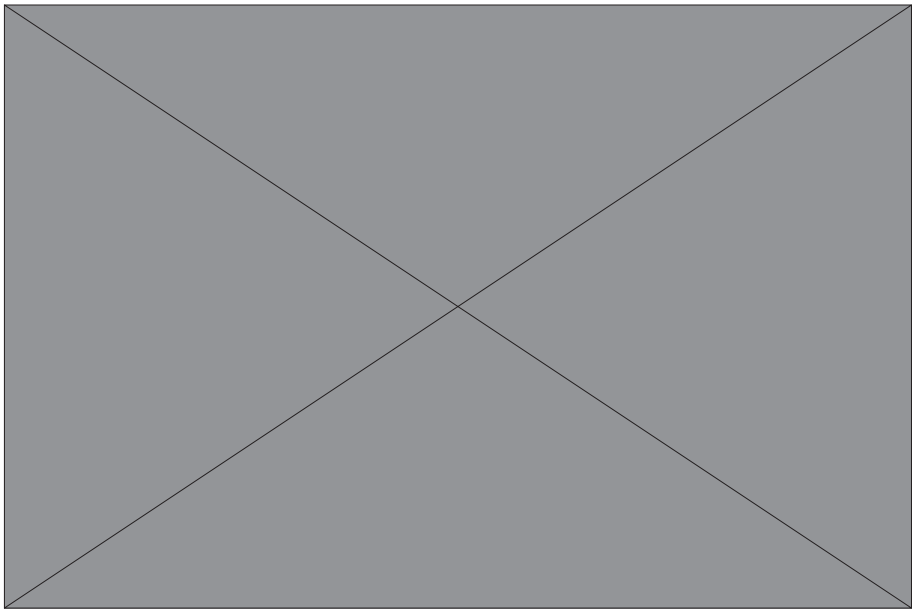


On the second day, George Lambert described the results of a survey into the most useful sources of information for rural landholders in the Condamine Alliance region before the bus trip. Various delays with the bus meant a late start and resulted in time to visit only one pasture development property, that of Bryant Ussher, north of Chinchilla. However, this was the only place in the district with any green foliage and that was the leucaena he had planted.

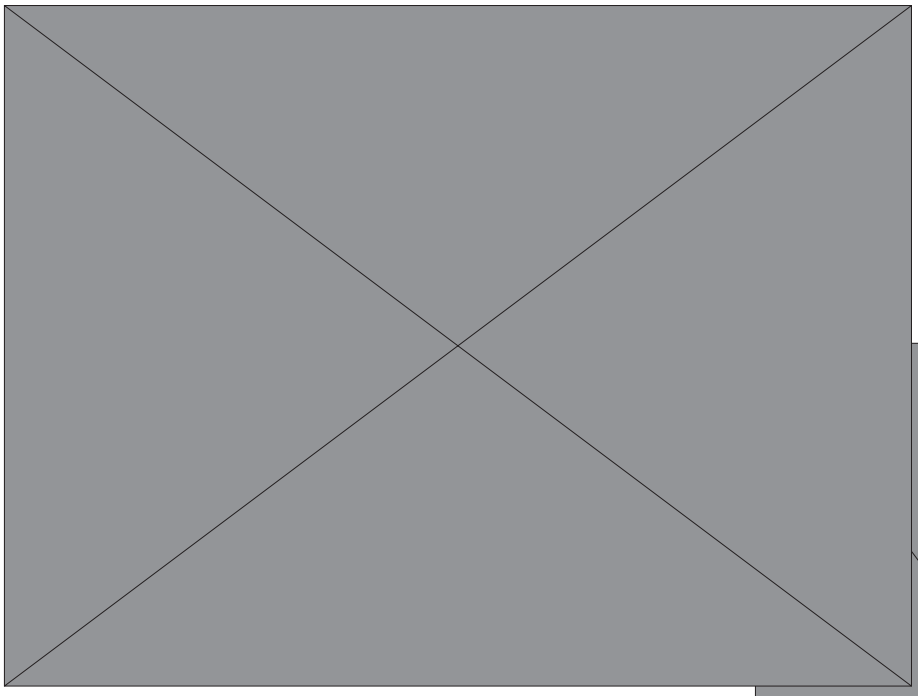
When this conference was planned in June/July 2006, the drought was ongoing but we assumed that by Easter it would have rained. Apologies to those who felt leucaena was being oversold, but our original plans were to visit another two sown grass sites. However, apologies may not be called for because there was much interest in the use and management of something that provided green feed during this drought.

A book of the working papers was produced for the conference and extra copies are still available for $14 (including postage). Please order through Ian Partridge (07 4688 1375) or Cam McDonald and TGS Book sales (07 3214 2289). The final proceedings will be published in the Tropical Grasslands journal September issue.

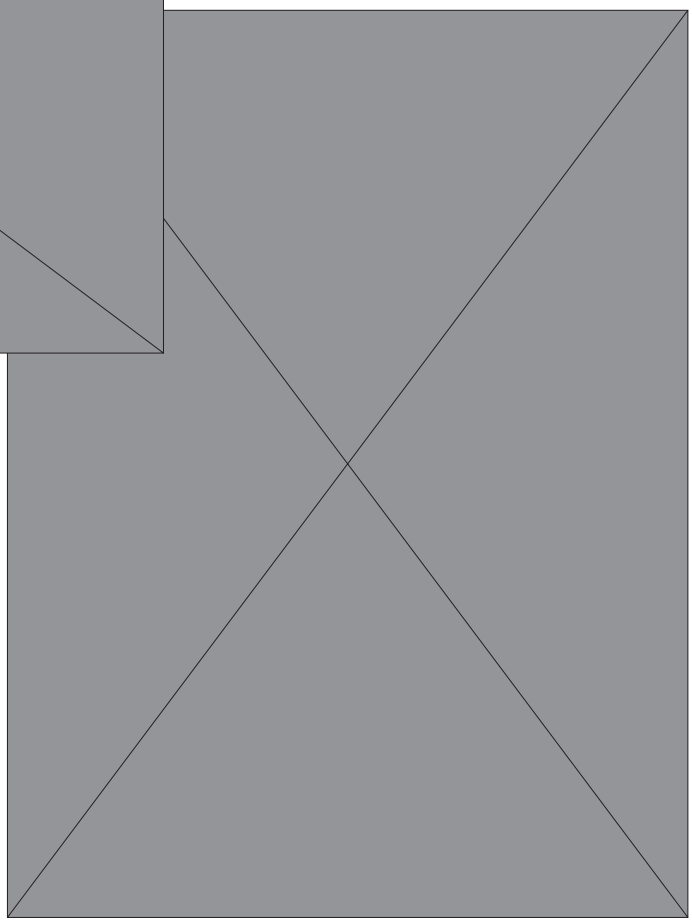
The conference field visit



Bryant Ussher describes his leucaena plantings, management and animal production to conference delegates.



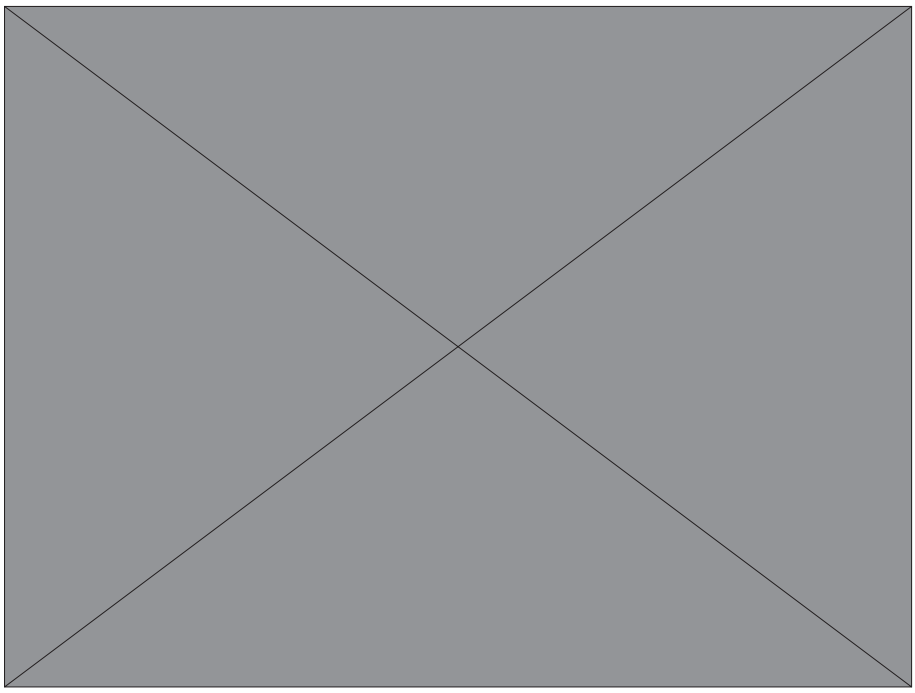
Young leucaena scrubs providing the only green feed in the district. The on-going drought has prevented any grass being sown between the rows of leucaena



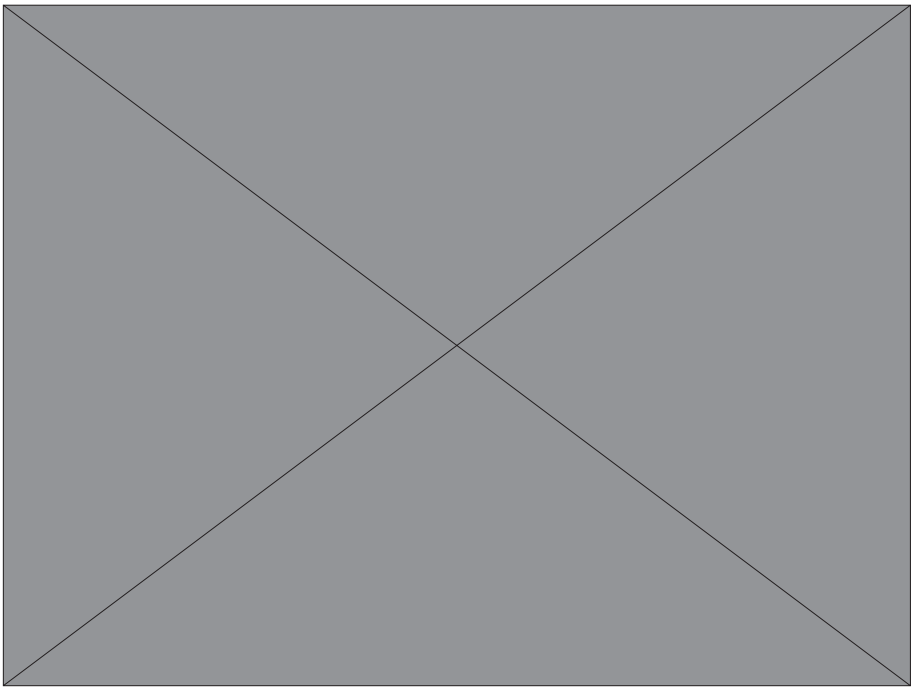
Can this new planting survive the dought and then any frost?

Jim Pulsford , founder member of TGS (left) discusses its prospects.

Society networking after the dinner



Maurie Conway (left), organiser of the 2000 Tropical Pasture Conference in Emerald, relaxes with George Lambert, organiser of the 2007 event.



Lyle Winks, editor of the Tropical Grasslands journal, and Cristine Hall, conference secretary, discuss the future of pastures with Wal Scattini (right).

Loss of pasture science (world-wide)

Letter to the Editor from a 'past' pasture scientist

Dear Ian Partridge, Dear Max Shelton,

I have been glancing through the last TGS newsletter and felt - in a way - disappointed about the news on "our future?"

On the other hand, I think, the developments just reflect world-wide reality in grassland research and forage sciences. If you check the participation of the last few International Grassland Conferences, then I heard that hardly young people participated. There are no junior disciples coming up it seems. But what should they be attracted by? To my knowledge, there is no "booming" dynamic tropical grassland research going on in Australia the previous world leader in tropical pasture research. The "glitter" has gone and the research left seems to be much less attractive.

But also with regard to new recruits from other tropical countries, it seems that grassland and/or forage sciences are not as attractive as the more fashionable molecular sciences. I have been teaching "Agrobiodiversity and plant genetic resources in the tropics" as well as "Grasslands and forage husbandry in the tropics" in an MSc-course at University since I have returned to Germany in 1999 (from CIAT previously, later ILRI). While agrobiodiversity has continuously attracted a good group of students, in some years grasslands had to be cancelled due to lack of interest! Now, this does hardly refer to young German students but largely to those coming from all over the tropical world (from Bolivia over Ghana to China!) to study in Germany. By the way, it is alarming how little these young people know of grassland and forage research, given the extension that such vegetation covers on our planet!

One observation I had with regard to costs: as a member of the (US-American) Society of Economic Botany, I know that one HAS TO BE A MEMBER in order to use the journal for publication. Why has this not been made mandatory also for those publishing in Tropical Grasslands?

The reality may be that - when you return to Australia by making the newsletter more applicable to domestic sciences and more attractive to the domestic reader - TGS may lose a (considerable?) number of overseas members. But - as stated above - grassland sciences are not in its flourishing years any more and this may just be a necessary adjustment to reality until times may change one day and our daughters and sons might return to this branch of agricultural sciences.

This closes with a kind of sad feelings because I was quite proud to belong to this group of scientists who have made a difference to tropical grasslands, I think.

Best regards,

Dr. Brigitte L. Maass

Agrobiodiversity & Plant Genetic Resources in the Tropics Georg-August-University Goettingen Grisebachstr. 6, D-37077 Goettingen, GERMANY

—in Australia

Copy of a letter to Queensland Country Life

The recent Northern Beef industry Research Update Conference held in Townsville has again focused our attention on the lack of funding for R&D on improved pastures for the tropical and subtropical beef industry.

The Update Conference was a successful and enjoyable event. Hosted by the North Australia Beef Research Council and sponsored by MLA and DPI&F, more than 200 delegates including researchers, industry personnel and graziers attended. The interactions among this broad group of beef industry representatives were as significant as the formal program.

Many excellent papers were presented on genetics and gene markers, reproduction, sustainable grazing of native pastures, animal welfare, and nutrition of cattle, but almost nothing on improved pastures. The focus on molecular advances was not unexpected but the potential contribu-

tion of this 'high-tech' approach must be kept in balance with the on-going basic need of animals to be fed properly.

There was one presented paper on sown pastures from Dr Bruce Pengelly (CSIRO). He reviewed the two- year old SOFT database on the world's principal pasture species which brings together the collective wisdom of many retiring pasture scientists. Bruce drew attention to the loss of experience with little prospect that they will be replaced. A poster paper from a younger pasture scientist, Kendrick Cox from DPI&F NQ, lamented the difficulty in maintaining the Australian Tropical Pasture germplasm collection, which has international significance, in the face of funding cuts.

Charles Nason, in his article (QCL 4 January 2007) referred to the lack of support for pasture science and blamed political factors but perhaps our industry needs to re-examine its priorities.

The very strong focus of the Update Conference on sustainable grazing of native pastures was laudable, but it highlighted the limitation of native pastures to sustain intensive grazing. They can only be utilized at low rates (less than 20%), and the environmental needs of this native ecosystem restrict landholders from placing too much emphasis on production e.g. they must conserve fragile ecosystems, wildlife habitats, and biodiversity. In addition, the production capability of native pastures does not match increasingly stringent market requirements, unless the cattle are supplemented. This latter approach can lead to higher rates of utilization causing land degradation, and a lack of fuel-load for fire management of tree thickening. Improved pastures can take pressure off native pastures, which increasingly need to be preserved for conservation and biodiversity value.

It needs to be stated that funding for this environmental work on native pastures is available from many alternative sources (NHT, NAPSQ etc). However, these environmental agencies will not support work that has production efficiency or a private benefit focus. They routinely refuse to promote exotic improved pastures. Perhaps our rural industries, which have historically survived by improving efficiency of production in the face of threats to profitability, should place higher priority on funding research into improving the efficiency of production. The management of CSIRO cut their sown pasture program partly because of its inability to obtain funding from industry sources. QDPI&F has greatly reduced its numbers of pasture scientists compared to a decade ago for similar reasons. These organizations look for co-funding of their programs. Universities have always been smaller players in this discipline and 'scrap for research fund crumbs' but retain the crucial training role.

Most of our northern Australian beef cattle are grazed in subhumid Queensland with cattle numbers concentrated in central and southern Queensland where properties are smaller and very dependent on sown pastures. These pastures currently are the main feed base for Queensland's $3.3 billion turnoff, far exceeding the value of the turn-off from native pastures.

It is not as though there are no problems with sown pastures worthy of some R&D attention. Buffel grass run-down; the emerging need for pasture systems that can not only sustain more intense grazing and are drought tolerant, but also are of high quality and capable of delivering high live weight gains; development of management systems for new pasture legumes; to name a few. If a significant challenge to buffel grass emerged, the shock waves would be felt right through the northern Australia beef industry. The only paper at the Update Conference on buffel grass discussed the problem of its invasion of Epping Forest National Park to the detriment of wombats.

The grazing industry is buoyant and prepared to invest in improved pastures. Graziers are looking to intensify their operations, as new land has become expensive, and native vegetation management restrictions limit their capacity to develop more land on their own properties. Improved pastures are the key to increasing scale and efficiency of production.

Unfortunately, there are few experienced pasture agronomists left in northern Australia, and many of us are close to retirement. There are also decreasing numbers of ruminant nutritionists; and there are few young people being trained in our educational institutions to replace this loss of experience. This shortfall is being picked up by seed merchants and the private sector with varying success and capability. There will be almost no well-trained

pasture scientists available to the northern beef industry within 5-10 years if current trends continue.

To conclude, one must ask the question why sown pasture, given its obvious significance to the northern beef industry, has gone off our radar. We all know that good nutrition remains the major limitation to efficient beef production. Is there a problem with the process that the beef industry uses to determine its priorities?

Max Shelton
Associate Professor
Faculty of Natural Resources, Agriculture and Veterinary Science, The University of Queensland
29 March 2007

The real cost of holding on to stock through drought

What is the real cost of drought if owners are determined to hold onto their stock?

After late April, there is little growth in pasture grasses even if it does rain. In some more favoured areas of southern Queensland, there may be some winter-growing annual grasses, along with some herbage and winter-growing legumes that cattle will eat (and possibly blow on). But this will not provide much bulk and some dry fodder will have to be fed as well.

Stock owners need to ask themselves some key questions:

- How long will I keep feeding?
- Which and how many animals will I feed with supplements?
- What and when do I sell?
- What am I doing to my land by running animals on pasture land that is becoming more degraded each day?
- How long will it take for degraded pasture paddocks to recover?

Many graziers rely on forage crops to produce large amounts of feed quickly when it does rain. But if the crop is planted on marginal stored water, it will fail unless good follow-up rain falls soon. Perennial pastures are more efficient users of rainfall because the plants are always there and the amount of runoff is greatly reduced—provided you have left enough ground cover and not eaten out all the grass.

The obvious cash costs of holding on to stock include:

- cost of supplementary feed
- returns lost from having the money from cattle sales in the bank
- opportunity cost of selling animals lost when they did meet market specifications before they lost condition
- reduction in price of animals in poorer condition and when the market is flooded.
- reduction in animal performance because of poorer quality forage.

But more important are the hidden costs:

- Land degradation—pastures can take years to recuperate when rain patterns return to something more normal.
- Loss of the better grass species and grass seed reserves. They can take more than five years to recover well, and the paddock may need replanting — which is not possible in most native pastures.
- Loss of water through runoff because of a lack of ground cover.
- Loss of valuable top soil in rainfall runoff. The water-holding capacity of the paddock is reduced, soil nutrients go down the creek and the creeks and rivers silt up.

The important point is to make decisions as on agisting or selling early as possible so that the financial losses and damage to pastures are reduced to a minimum.

Have a business strategy in place and act on it. The worst scenario is to keep putting off the inevitable because things will just get worse and end up costing more. Even if it does rain after selling all stock, don't be in a hurry. Allow the pastures to recover and wait for the price of cattle to stabilise.

George Lambert
Condamine Alliance, Toowoomba

Practical Abstracts
from Tropical Grasslands Vol 40 No 1 March 2006

Pasture production, pasture quality and their relationships with steer gains on irrigated, N-fertilised pangola grass at a range of stocking rates in the Ord Valley, Western Australia — Raymond Jones and R. P. LeFeuvre, on pages 1–13.

Performance of irrigated pangola grass pastures was evaluated over two years at stocking rates between 5 and 13 steers/ha) and under 90–350 kg/ha nitrogen fertiliser at Kununurra, Western Australia.

Pasture yields decreased as stocking rates increased and increased with higher N levels. While pasture quality was higher under heavy stocking, steers gains decreased. Moderate stocking at about 5 steers/ha enabled pastures to produce well and remain stable giving good weight gains and economic outcome.

Pasture management in semi-arid tropical woodlands: effects on tree regrowth — by John McIvor, on pages 14–23.

The effects of pasture management on the regrowth of eucalypt seedlings and suckers were measured near Charters Towers. Oversowning legumes and grasses, applying superphosphate and discing the soil had little impact. Although heavy grazing reduced the number of seedlings and suckers, this was only at unsustainable levels. Clearing trees led to more seedlings and suckers than where trees were not cleared; where the original trees were killed in situ, there were more seedlings and suckers and they were larger with more leaf. Clearing increased pasture growth but the regrowth problems and other potential negative impacts show that clearing should be approached cautiously and with careful post-clearing management.

A survey of the use of lucerne, butterfly pea and lablab in ley pastures in the mixed-farming systems of northern Australia — by Brendan Cullen and Jacqui Hill, on pages 24–32.

Legume leys are recommended in northern New South Wales and southern and central Queensland to increase the sustainability of mixed crop and livestock systems, but adoption has been limited. Pastures and managers were surveyed to see how lucerne, butterfly pea and lablab were used and if expectations were met. In southern Queensland and northern NSW, lucerne is rotated with crops whereas, in central Queensland, butterfly pea is more often used as a permanent pasture. Plant persistence supported these uses because there were few lucerne plants left after five years whereas butterfly pea populations generally persisted for at least 10 years. Lablab is used as a short-term pasture to build up soil fertility in crop rotations. Soil carbon levels were only consistently increased, compared to continuously cropped soils, after three years of pasture.

The effect of physical environments on the condition of rangelands in Borana — by Ayana Angassa, Adugna Tolera and Atilaw Belayneh, on pages 33–39.

The general condition of the rangelands on a government ranch and 6 communal grazing areas in the Boran rangelands of southern Ethiopia was good (60%) or fair (33%) with only 2% poor. Season, bush encroachment and location had marked effects on range condition. They were generally in better condition during the long rainy season than in the short rainy season and where bush had not encroached. Pastures communally grazed were poorer than those on the government ranch. This is because of increased grazing pressure brought about by the expansion of cropping areas and the establishment of permanent sources of water that attracts permanent settlements. The expansion of cropping in pastoral areas should be carried out with caution and future pastoral development should take notice of the traditional wisdom of pastoralists.

Regeneration of *Lasiurus sindicus* in relation to grazing pressure and root-zone soil moisture in arid rangelands of western Rajasthan (India) — by R.S. Mertia, R. Prasad, B.K. Kandpal and Pratap Narain, on pages 40–44.

Soil moisture in the root zone and grazing pressure affect the yield of Sewan grass (*Lasiurus sindicus*). Uncontrolled grazing reduced the stand density of grass tussocks and their ability to regenerate. Moisture levels in the top and second 30 cm levels controlled resprouting of new shoots while moisture below 60 cm depth had the greatest impact on growth and production. To be sustainable, the rangelands should be given a rest period to regenerate.

Morphological and agronomic characterization of *Indigofera* species using multivariate analysis — by Abubeker Hassen, Norman Rethman and Z. Apostolides, on pages 45–59.

Genetic variation was studied in 41 *Indigofera* accessions to identify valuable characteristics. The large amount of genetic variation suggested potential for genetic variation in *I. spicata, I. arrecta* and *I. crypthana* through selection. Promising accessions were selected from different agro-ecological sites in Ethiopia to study their indospicine toxicity for their use in breeding, collection and conservation programs.

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Diet selection of steers grazing *Stylosanthes hamata* cv. Verano–grass pastures in north Queensland and its potential influence on botanical composition — by Raymond Jones and F.D. Hu, on pages 65–69.

Steers grazed Verano–grass pastures stocked continuously at 0.65, 0.95 and 1.25 steers/ha for three years. Grass species, Nixon (*Urochloa mosambicensis*) and Bowen (*Bothriochloa pertusa*), had more effect on their diet than stocking rate. Overall, those steers on Nixon consumed a diet with 25% legume whereas those on Bowen pastures ate 47% legume. There was generally slightly less legume in the diets at high stocking rates, with most legume over early winter (May to July) and least during the wet season (November to February). As steers on the Bowen pasture selected a diet higher in Verano for a longer period, this could favour the grass and maintain a higher grass content in the pasture over time.

Animal production potential of some new *Leucaena* accessions in the Markham Valley, Papua New Guinea —by K.K. Galgal, Max Shelton, Ben Mullen and Ross Gutteridge, on pages 70–78.

Four leucaena species were planted in hedgerows in a signal grass pasture and grazed rotationally at 3 steers/ha for 8 months. *Leucaena pallida* grew best but gave poorer weight gains (0.36 kg/day) than signal grass on its own (0.48 kg/day). *L. trichandra* produced the least herbage and gave no additional benefit to the steers. *L. collinsii* grew as well as *L. leucocephala* and gave steer gains of 0.56 kg/day. Steers on *L. leucocephala*–signal grass grew at 0.65 kg/day and reached marketable weight (over 400 kg) before 2 years of age. Frequent grazing with occasional trimming would be needed to keep the *L. leucocephala* at browsing height.

Seed in the faeces of ruminant animals grazing native pastures under semi-intensive management in Nigeria — by Alaba Jalaosho, J.A. Olanite, O.S. Onifade and A.O. Oke, on pages 79–83.

Of ruminants grazing during the wet season, cattle voided more seeds/g of dried faeces than did sheep or goats but the germination was much poorer (5%) compared to sheep (32%) and goats (28%). Thirteen species of plants were identified in the cattle faeces.

Tiller cohort development and digestibility in Tanzania guinea grass (*Panicum maximum* cv. Tanzania) under three levels of grazing intensity — by Patricia Santos, M. Corsi, Carlos Pedreira and C.G. Lima, on pages 84–93.

In Brazil, animals on Tanzania guinea grass can gain anything between 0.16 and 0.8 kg/day under stocking rates that can range from 1 to 10 animals per ha depending on the season, soil fertility and grazing efficiency. Plants produce different groups (cohorts) of tillers throughout the season. The youngest cohorts contribute most under heavy grazing. Proportion of leaf and digestibility were related to the stage of development, and declined over the grazing cycle. Management favouring higher tiller turnover appears to be the best way to reduce the negative effects of flowering on herbage quality in April and May.

Importance of indigenous arbuscular mycorrhiza for growth and phosphorus uptake in tropical forage grasses growing on an acid, infertile soil from the Brazilian savannas —by Tsutomu Kanno, M. Saito, Y. Ando, M.C.M. Macedo, T. Nakamura and C.H.B. Miranda, on pages 94–101.

Inoculation with indigenous mycorrhiza increased leaf and root growth in *Brachiaria brizantha, B. decumbens* and *Panicum maximum* but not in *B. humidicola.* It increased P concentrations and uptake in all these grasses. Plant growth and P uptake increased as soil pH increased. For all species, the effect of mycorrhiza on plant growth and P uptake was greatest at low soils pH.

Effects of defoliation frequency on the development and establishment of a vegetatively planted turfgrass *Eremochloa ophiuroides* (centipede grass) — by G.Z. Bao and Masahiko Hirata, on pages 102–110.

Centipede grass is a warm-season turfgrass widely used for lawns and recreation facilities in Japan, and is also suitable for low maintenance areas and for soil conservation. After being planted from sprigs, tiller number, stolon length and plant cover responded to defoliation after about 40 days, but was best thereafter when cut at 30-day intervals. During establishment, centipede grass can quickly develop tillers and stolons but should be defoliated less frequently than established swards.

Effect of *Lablab purpureus* and *Vicia atropurpuria* as an intercrop, or in a crop rotation, on grain and forage yields of maize in Ethiopia — by Abubeker Hassen, Lemma Gizachew and Norman Rethman, on pages 111–118.

Planting these legumes as an intercrop after the maize was planted had no overall effect on the maize whereas planting at the same time reduced the yield of grain but increased that of total fodder. Lablab produced the higher forage yield and had the better residual effect on succeeding maize in the following season.

Presenting summaries of plant density data that are meaningful to your readers–a case for giving the median as well as the mean — by Cam McDonald and Dick Jones, on pages 119–125,

Plant count data are often highly skewed or highly variable. As such, the mean can be somewhat meaningless and not give an accurate picture of plant distribution over the whole area, especially in older well-established pastures. From the point of view of data analysis, the solution is to transform the data but transformed data means do not mean much to most biologists. If the coefficient of variation (CV) is less than 100, presenting the mean is enough, but if the CV is greater than 150, the mean is likely to be at least twice the median. So if the data is skewed, present the median as well as the mean; if the data are highly variable, present the standard deviation or the CV.

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2004 Farrer Oration — Shaking windows; rattling doors — by Bob Clements, on pages 129–136.

The Farrer Oration was carried in full in a special issue – Vol. 22, No.1, March–April 2006.

Pasture management in semi-arid tropical woodlands: colonisation by introduced pasture species — by John McIvor, on pages 137–144.

The rate of colonisation of unsown areas by Verano stylo, Seca stylo, buffel grass and sabi grass varied with the species and location but, overall, killing the standing trees affected only Verano, fertilising affected only buffel grass while stocking rate had no effect. To increase colonisation, management should aim to favour the growth of the species (to increase seed input) and to reduce the amount of herbage at the end of the dry season to provide some bare ground for seedlings to establish.

A review of forage legume research for rangeland improvement in Zimbabwe — by C. Mapiye, J.F. Mupangwa, P.H. Mugabe, N. Chikumba, X. Poshiwa and R. Foti, on pages 145–149.

A wide range of forage legumes was recommended for rangeland improvement depending on soil type, moisture and grazing management. Since 1980, evaluation has been aimed at developing low-input legume-based forages for resource-poor farmers.

Chemical composition, dry matter production and yield dynamics of tropical grasses mixed with perennial forage legumes — by Z. Tessema and R.M.T. Baars, on pages 150–156.

The highest yields of forage were obtained from pure Rhodes grass, guinea grass and from those grasses mixed with lucerne and silverleaf desmodium. Phalaris started well but then declined steadily. Rhodes grass, and especially guinea grass, were more competitive than the legumes. The legume mixtures produced higher yields and higher protein forage than pure grasses, and should be evaluated under smallholder farm conditions in Ethiopia.

Variation in chromosome number and its relationship with agronomic characteristics in a germplasm collection of *Digitaria eriantha sensu lato* — by Marisa T. Pozzobon, Albretch Glatzle, I.F. Conterato, Maria Teresa Schifino-Wittmann and Vanessa G. Smiderle, on pages 157–164.

Twenty-seven accessions of *Digitaria eriantha* were tetraploid, 11 were diploid, others had slightly irregular chromosome numbers. Most were meiotic and produced a high proportion of viable pollen grains. There was no consistent correlation between agronomic characteristics and chromosome number but 95% of accessions originally collected from loamy soils were tetraploid or near tetraploid, 60% of diploid types were more likely to tufted and 70% of tetraploids were stoloniferous.

Herbage production and grazing losses in *Panicum maximum* cv. Mombaça under four grazing managements — by R.A. Carnevalli, S.C. Da Silva, A.A.O. Bueno, M.C. Uebele, F.O.Bueno, J. Hodgson, G.N. Silva and J.P.G. Morais, on pages 165–176.

Sward heights of 115 cm and 90 cm could be useful for monitoring grazing on farms as they related to 100% and 95% canopy light interception. However, the 95% light interception level gave the highest amount of herbage harvested and highest grazing efficiency.

Productivity of vetches (*Vicia* spp.) under alpine grassland conditions in China — Z.B. Nan, A.M. Abd El-Moneim, A. Larbi and B. Nie, on pages 177–182.

Some 30% of the total grassland area in China lies in the Quihai–Tibet Plateau. This is more than 2500 m asl with an annual rainfall of 250–660 mm and annual temperatures of less than 5ºC. Four lines of common vetch (*Vicia sativa*) and one line of narbon vetch (*V. narbonensis*) have potential for seed and forage production in these alpine grasslands.

Research note: Nutritive value of a range of tropical forage legumes — M.J. Valarini and R.A. Possenti, on pages 183–187.

Accessions of centro, axillaris, glycine, common stylo and *Galactia striata* were evaluated for nutritive value and digestibility.

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