Tropical Grassland Society of Australia Inc.

TGS news & views

about pasture development in the tropics and subtropics

Volume 17 No. 1
March 2001

Newsletter subscription: $25 per annum
Print Post approved : No. 424043–00007

Pastures for protection

Joe Miller, Mareeba

The water that runs off pasture land on the Atherton Tableland is clean and carries few nutrients.

Crystal clear water on the Atherton Tableland

Most of the nutrients found in the Johnstone River are not actually in solution but are attached to particles of soil. As long as we can reduce soil loss, we can reduce nutrient contamination and its problems all the way to the Great Barrier Reef.

The Malanda and Upper Johnstone Landcare Group has received Natural Heritage Trust (NHT) funding to study how grazing management on dairy and beef pastures could minimise soil loss.

All types of pasture

Ten paddocks on seven farms are being monitored for pasture cover, composition and yield, soil fertility and for management of grazing and fertility. The pastures range from nearly pure signal grass and setaria, through guinea–legume mixtures, to swards dominated by Pinto peanut. Slopes range from 2% to 40%, annual rainfall from 1500 mm to 3000 mm. Pasture growth was continuous in 1999 but there was a dry season with frosts in 2000.

Ground cover has always been high whatever the pasture type, grazing management, slope, soil fertility or amount of herbage present. It was always over 80% and exceeded 95 % on 30 paddocks.

Pasture paddocks on the Tableland

continued on page 3 ...

Pastures for Protection and Production
See page 10 for Practical Abstracts of the TGS 2000 Conference Proceedings

Newsletter editor:
Ian Partridge
Tel: (07) 4688 1375
Fax:(07) 4688 1477
partrii@dpi.qld.gov.au

Published by the Tropical Grassland Society of Australia Inc
306 Carmody Road, St Lucia Qld 4067

Note our new Web address

Society News

Our Internet address

Our old Web address of www.powerup.com.au/~tgsoaust was difficult to remember so we now have a shorter and friendlier address:

www.tropicalgrasslands.asn.au

See it for membership forms, the book list and pdf newsletter.

Our Society e-mail address: tgs@tag.csiro.au

Newsletter on line

We have put the newsletter on the Web site as .pdf files in two forms for the last couple of issues. There is a small file without pictures and a larger file with the photographs included. At present, these are open to the world to view so some of you might be thinking that there is no need to pay your subscription.

In the coming year, we aim to make the newsletter available only though a password.

We are asking you to let us know your e-mail address when you return your subscription for 2001 and will be able to advise you of the password—which will be changed each year.

We also plan to cease mailing the newsletter directly to members on line, especially those overseas where postage is so expensive. Most on-line users have access to good printers and can print the pdf file.

We will advise members by e-mail when the new issue of the newsletter goes on line. This could be more than a month earlier than the hard copies going through the printers, distribution and postal service.

.

Don't forget to put your e-mail address on the membership renewal form when you return it. A membership form will be included—please give this to a neighbour or friend who might be interested to join.

New members

Mr. A. de P.M Aguiar	Minas Gerais, Brazil	Consultant
Mr Paul Back	Rockhampton	Research
Mr G. Manyawu	Marondera, Zimbabwe	Research
Ms J. White	Surat, Qld	Extension
Ms Mary Paterson	St Lucia, Qld	Student
Mr Larry Daniels	Emerald, Qld	Farmer/grazier
Nat. Resources Training Institute	Thimphu, Bhutan	Extension
Ms Maree Bowen	Gayndah, Qld	Research
Mr Gerritt Rootman	Warmbaths, South Africa	Research
Mr Kingsley Ayisi	Sovenga, South Africa	Research
Dr Jose Mex	Yucatan, Mexico	Lecturer
Mr Chris O'Donnell	Gayndah, Qld	Research
C.L. Quarin	Corrientes, Argentina	University
Mr David Allworth	Toowoomba, Qld	Consultant
Mr Trevor Howard	Darwin	Extension
Mr David Counsell	St Kilda, Victoria	Consultant
Annie Lane	Darwin	Research
Mr D. Barber	Peak Crossing, Qld	Student
Mr P.J. McEntee	Albury, NSW	Extension
Mr T. Gilmore	Nowra, NSW	Agribusiness

... continued from page 1

Lower cover usually related to previous grazing history, but to stocking rate rather than whether grazing was continuous or rotational. In conservatively stocked pastures, litter was often an important component of cover, especially in pastures rich in twining legumes such as glycine and greenleaf desmodium (yes, both are still important). But there is hardly any litter in pastures that are being or had been stocked heavily.

Pastures for production

The production from paddocks ranged from liveweight gains of 83 kg /ha/yr to 6,000 litres of milk plus 150 kg liveweight gain/ha/yr. Expressed in common units, output varied from 3,300 MJ metabolisable energy and 12 kg protein/ha/yr to 39,000 MJ metabolisable energy and 206 kg protein /ha. The lowest productivity came from continuously-grazed pasture.

Runoff water from pasture was generally almost free of sediment; indeed, most sediment movement from troughs, camps and laneways was trapped by good pasture within a few metres.

Other observations invite comment:

Boys play; girls too exhausted

1. Soil movement in runoff from dairy farms comes from laneways and around troughs whereas on beef farms it comes from areas kept bare by cattle. These bare areas appear to be cattle playgrounds. 'Playgrounds' are kept bare by pawing and horning in camps and on creek banks by beef cattle with time on their hooves. Dairy cows appear to have almost no spare time after grazing, ruminating, resting and milking. A cattle behaviour specialist will be asked about this and for possible management to minimise it.

Grass better than trees

2. During extended periods of heavy rain, farmers report clean runoff from pasture but turbid runoff from rainforest. Leaf litter in the rainforest may be effective initially in absorbing raindrop energy but it can break up and float away if heavy rain continues for some days.

Setting up the rainfall simulator on a Tableland pasture.

The project paints a healthy picture of pastures on the Atherton Tableland and suggests that most river silting took place early in the land development sequence or under annual cropping in the past.

Virtual rainfall

By good fortune, in another NHT project, Cyril Ciesolka, with the Department of Natural Resources, is looking at nitrate movements on and in soil under various forms of land use. Cyril takes his rainfall simulator around the country to demonstrate to farmers and to research how different levels of cover reduce runoff. He recently used the rainfall simulator on several of these monitored pastures as a further check on nutrient movement.

The rainfall simulator can simulate rainfall of different intensities. Producers check how little water runs off well-grassed pasture land.

Speargrasses

Speargrass is the common name for several native species in northern Australia. In the far north, annual sorghum (*Sorghum intrans*) is called speargrass because the culm or seed stalk can be 3 metres tall and is physically like a spear. In eastern Queensland, *Heteropogon contortus* is 'black speargrass' or 'bunch speargrass'—bunch because the seed head awns mat together in a bunch, 'spear' because the seed is hard and very sharp. In more southern and inland areas, *Aristida leptopoda* is white speargrass because of its thin and sharp seeds. Then we could go further south again for rough speargrass (*Stipa scabra*).

Black speargrass

Black speargrass is considered to be one of the most important native pasture resources in Queensland and covers some 25 million hectares of rolling to hilly country under eucalypt woodland. This importance is partly because it provides quite good quality feed for several months of the year and partly because it grows in regions with relatively good rainfall. In the NT, black speargrass is viewed as less desirable in their native pastures because it does not seem to be readily eaten. Uneaten blocks of red-coloured leaves tend to attract the eye, and property managers often feel unhappy that black speargrass is increasing.

Speargrass lost

In the main speargrass zone of eastern Queensland, speargrass has been under pressure on several fronts, aided by productive technologies such as Brahman cattle, nitrogen supplementation and hardy legumes. But the results of the decline are not universal.

In southern Queensland's high rainfall districts with sandy soils, speargrass has long been replaced by blue couch (*Digitaria didactyla*). Further inland, heavily grazed speargrass has been invaded by inedible wire grasses (*Aristida* spp.) in the Burdekin district of northern Queensland, much speargrass disappeared in the 1970s, with the landscape saved by the edible Indian couch (*Bothriochloa pertusa*).

In central Queensland

In central Queensland, speargrass seems to be more resilient but can still be pressured by continuous heavy grazing. The DPI's long-term grazing trial at Galloway Plains in Calliope has subjected speargrass pastures to stocking rates ranging from a steer on 8 hectares to a steers on 2 hectares, with other pressuring factors such as supplements and legumes.

There, the speargrass is tending to decline slowly at high stocking rates but with a relative increase in forest bluegrass (*Bothriochloa bladhii*) when the paddocks are not burned or cannot carry a fire.

How good is forest blue?

Graziers have generally regarded forest bluegrass as a desirable species but it appears that the stock have a lower opinion and prefer speargrass. Under the highest stocking rates, slender chloris (*Chloris divaricata*) has increased.

Burning has not had the expected benefit in this trial as there is less speargrass in the burnt paddocks than in the unburnt. But the lesson for commercial graziers from this is that green pick must be given a chance to recover without heavy grazing after the fire . At low stocking rates, burning has given speargrass the edge over forest blue.

Seca stylo has thickened greatly to reach 15 Seca plants per square metre and to make up more than half the herbage. However, on properties, periodic spelling and burning paddocks sown with Seca can maintain a better balance between the grass and legume. The Seca recovers from seed and stump, but grass seedlings and shoots must be given a rest from grazing.

In general, moderate stocking and periodic burning will keep our valuable speargrass country in good shape.

From David Orr, DPI Rockhampton

Knowing what's growing

Being able to identify native grasses has always been important to pasture specialists, and with the strengthening Landcare ethic, it has become increasingly of interest to many other members of the grazing industry and indeed of the general public. You cannot judge the effect of management on your pastures unless you know what is growing.

In 1973, John Tothill and Bryan Hacker produced *The Grasses of southeast Queensland* for the Tropical Grassland Society, and followed this with *The Grasses of Southern Queensland* in 1983. The books were printed by the University of Queensland Press with hard covers. Maybe the authors did not feel sufficiently confident to say that it covered most (nearly all?) of the grasses found in the state, but I have not found any missing in travels from the far north to the far west of the state. So northerners and westerners should also be potential users.

By the 1990s, the hard cover book was out of stock and UQ Press was not going to reprint a book that might have to be held in stock for a decade or more.

Grasses – our best seller

The Society took over the copyright and reprinted *The Grasses of Southern Queensland* as a paperback—but with better quality paper than the original. We get this printed on the Docutech system, a high-quality digital photocopier. We can run off batches of 50 books as required without have to hold (and pay for) large stocks.

Since 1996, we have printed 350 copies, sold 312 to today and the demand keeps coming.

Check our Web site for our book list (www.tropicalgrasslands.asn.au) if you would like to purchase a copy ($50).

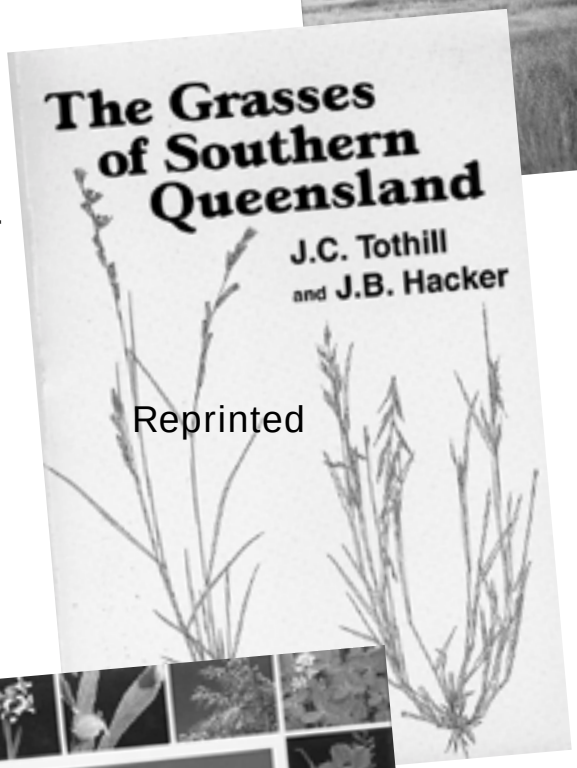
Do the same for legumes?

In 1990, Bryan Hacker wrote the *Guide to Herbaceous and Shrub Legumes of Queensland* which was also printed by UQ Press. This legume book is out of print and now out of stock.

A problem with this publication as regards reprinting is the use of colour photographs rather than the line drawings in *Grasses*.

However, I have checked the quality of good digital photocopies of a few pages and the pictures come out well—perfectly good enough for identification except, obviously, if colour is important.

Would you like TGS to reprint *Legumes* as a softcover monochrome version?



Please let me know if you see a demand. My contact numbers are on the front page.

IJP

Letters to the Editor

Conservation on the farm

I read with interest Col Middleton's Presidential Address, published in TGS News & Views 16 No 4, December 2000. Leucaena has made a tremendous impact in the area to which it is well adapted, and must be the most sustainable legume/grass pasture production system in the long term for our tropical districts. Col defends the use of leucaena and of exotic legumes and grasses in general, and his arguments were very thought-provoking.

However, few present-day biologists would agree with one of Col's statements. Col states that "National Parks (plus other protected lands) are the places to totally protect native plant diversity, not land dedicated to agriculture use and from which farmers have to make a living using sustainable production systems". Does this mean that there is no place in livestock-raising properties for conserving plant diversity?

It is generally believed that our National Parks and other protected lands are insufficient to protect existing plant and animal biodiversity.

Some species do not occur in such protected lands. To be sustainable in the long term, populations need to be a sufficient size to avoid genetic deterioration, and populations in protected areas are not always sufficiently large for this to be the case.

There is no doubt that we are living in an era of climate change (although it is less certain whether this is man-induced or natural). Protected areas may be suitable for species now but may not be in 50-100 years time. Species will need the opportunity to move to areas where the climate is favourable. This aspect has been emphasised both for common and rare animal species by J.R. Busby (Bureau of Flora and Fauna, Canberra) in the conference 'Greenhouse – Planning for Climate Change', published in 1988.

It is my belief that all landowners have some responsibility to allow for the needs of wildlife on their own land. This does not mean that they should not clear trees or should not plant leucaena, buffel grass or stylo. It means that graziers might consider leaving corridors for the benefit of wildlife, connecting areas of habitat value, and including areas of high plant diversity. Often these corridors are ideally placed along creek lines, areas of high habitat value. The sacrifice in terms of land area is small, but the overall benefit large. Many graziers and farmers are coming to appreciate the desirability of this sort of planning through the *Land for Wildlife* scheme. Many primary producers, concerned with livestock and horticultural production as well as ecotourism, have committed 7,000 ha of Queensland to be retained as habitat The scheme has only been actively promoted over the past 4 years, but already participants range from the NSW border to Cape York.

It is also to the credit of the leucaena growers in central Queensland that they have prepared and actively promote a code for managing leucaena, so as to avoid it invading natural ecosystems.

And is it only the graziers who have this responsibility? No, I believe not. Hasn't the Banrock Station vineyard won credit for conserving wetlands on its vineyard property in South Australia?

Bryan Hacker

Leucaena growers request

I am writing to you on behalf of the Leucaena Network to congratulate you on the excellent article published in Volume 16 No.3 of your newsletter. As individuals concerned about the current mis-information regarding commercial leucaena becoming a weed threat, we were greatly encouraged to read some positive information for a change. Thank you for your accurate reporting! We encourage you to keep up the good work.

The Executive of our Network have asked if it would be possible to get some 30 copies of that particular newsletter.

Tim Larsen
Sec. Leucaena Network, Banana

Reply to Bryan Hacker's Letter

I have no beef (excuse the pun) with almost all of what Bryan says. However, what he seems to have missed (or perhaps I did not elaborate on) is that National Parks are but a small part of the 'protected' lands to which I referred. By far the larger part of protected lands are those 'protected' from clearing on both leasehold and freehold land under Government legislation. May I dare suggest that there were many of those 'disagreeing present-day biologists' to which Bryan refers (as well as graziers) who contributed to the development of the land-clearing guidelines aimed at protecting the diversity of native plants and animals.

Bryan asks whether my arguments in relation to the use of leucaena (and other exotics) implies that 'there is no place in livestock raising for conserving plant diversity'. Nothing could be further from the truth. Having been closely involved with farmed leucaena for all its commercial life (since 1962), my argument is that almost all farmed leucaena has either replaced crops (exotic sorghum, wheat, sunflower and so on) on cropping land or has been incorporated into existing grass pasture (e.g. buffel, green panic, rhodes grasses) on land cleared decades ago under Government direction (Brigalow and other government settlement schemes). Native plant diversity on this land was lost long before leucaena came along. If properly managed, the inclusion of leucaena in these circumstances has little impact on the diversity *status quo* but it will surely add many other environment positives lost with any original clearing.

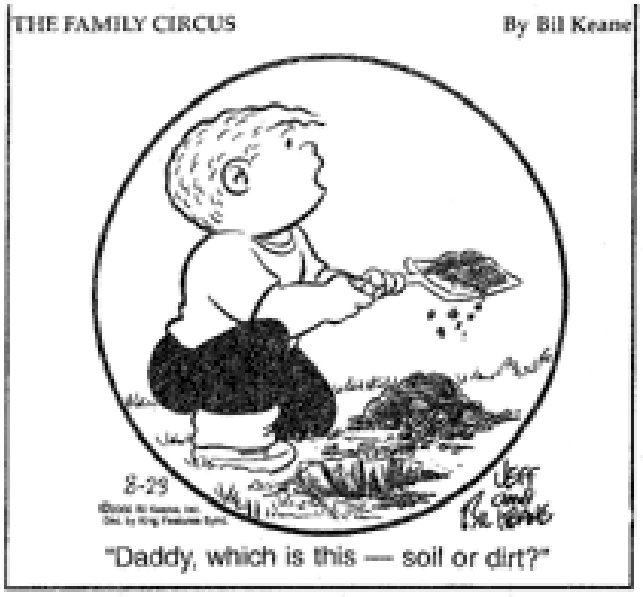
Similarly, if a grazier is given Government permission to clear approved parts of his pastoral land under the Vegetation Management Act and within the property vegetation plan that he is committed to prepare, then surely he is entitled to believe he has been given a right to develop this land with an appropriate sustainable animal production system. This system may or may not include exotic crops or forages. If the grazier has the resources and capacity (and many do) to protect diversity above that minimum which is required by Government on his land then he should be encouraged and applauded for doing so as Bryan suggests.

I think we all agree there has to be a balance between conserving the environment and the rights of landholders to remain viable using sensible production systems. The problem is in finding consensus as to where this balance lies.

In relation to leucaena, I vigorously commend and support the growers for their proactive approach in organising their grower group, but more importantly in adopting a best practice code to ensure leucaena does not have adverse effects on environmental values.

Col Middleton

What's in a word?



This little cartoon reminded me of the first time I heard 'soil' referred to as 'dirt'. When I was in Fiji, a New Zealander said 'That's a good bit of dirt.' about a parcel of land. I was taken back and started thinking.

On farms in England, I had never heard 'soil' called 'dirt.' Was 'dirt' just an Antipodean slang (like referring to beer as something from the urinary tract), or did it actually reflect a different attitude about the value of land and hence the approach to land care? In England, 'dirt' is something unpleasant, 'soil' is something of value.

However, maybe my logic has flaws. 'Dirty' as in 'dirty clothes' means covered in grime of an inorganic nature, such as mud or grease, but not revolting; 'soiled' as in 'soiled clothes' tends to be used for filth of an organic matter. IJP

Mimosine toxicity in southern Texas

Max Shelton and Peter Larsen

The ranch lands in southern Texas were once grassy but are now covered with the woody weed, mesquite (*Prosopis* spp.). Much of the land in the region is degraded, and productivity for cattle grazing is very low. Many ranchers now promote their properties for recreational shooting as the income from this is better than from cattle off poor pasture. Antlers of the local white-tailed deer are highly prized.

Dale Elrod and Anita Kibbeim aim to both fatten steers and run deer for recreational shooting on their ranch near Corpus Christi. Despite annual rainfall of only 500 mm, their sandy silty soils lie over limestone and they plant leucaena.

Planting leucaena

After some early failures with leucaena, Dale met Peter Larsen in 1995, and visited Central Queensland in 1998 for advice. He planted over 300 hectares of Taramba leucaena in 1997–98, and it established well during the drought of '97. He achieved excellent weed control and the leucaena grew to 6 metres tall in the first two years. His cattle gained 1–1.7 kg/day. Dale also estimates that leucaena can lift the stocking rate from 10 hectares per adult deer on mesquite scrub to 2.5 deer per hectare on leucaena, and he plans to establish a total of 4000 ha. He is also a private consultant to deer and cattle growers in the area (and sells Taramba seed) as there are huge areas of suitable soils including those over limestone.

Rows of leucaena planted in southern Texas

Mimosine toxicity?

When we visited the Kibbe/Elrod ranch in September 2000 they were carrying 300 cattle on agistment for contract fattening. Peter noticed that while the cattle looked OK, they were not blooming. Some animals were showing symptoms that resembled mimosine toxicity—weight loss, salivating, loss of switch, strange gait, poor condition, and hollow and bony appearance.

The current group of animals had been grazing for 6 months during a drought when there was little other feed; they were eating high intakes of leucaena.

Dale assured us that cattle on the property had been previously inoculated with rumen fluid flown in from Florida, and that old cattle were always mixed with new cattle for several weeks to ensure that the bug was passed on. However, on further discussion, Dale said that the rumen fluid from Florida had been brought over in thermos flasks at ambient temperature. The flasks blew when opened in Texas, and most of the material was lost; it was possible that the inoculation was ineffective.

No previous group of animals had been held on the property for longer than 6 months, and there had always been a mixture of coastal Bermuda grass and leucaena in their diet. It was reasonable to assume that previous groups of cattle may not have consumed sufficient leucaena for clinical signs of toxicity to occur.

Toxicity detectives

There were several options to test for toxicity:

- test for DHP in urine
- get more leucaena rumen fluid from USDA Florida.
- contact interested scientists from nearby College Station
- contact Dr Milton Alison from Iowa State University, now retired, but responsible for the original isolation and storage of pure culture of *Synergistes jonesii*.

Dr Alison worked with Raymond Jones in his pioneering research.

Action

We gave Dale and Anita the procedure for testing for DHP in urine. Using locally obtained hydrochloric acid and ferric chloride, they tested 3 steers, but all were negative for DHP—suggesting no mimosine toxicity. Meanwhile, USDA College scientists took faecal samples for culturing and inoculated one sick steer and one healthy one with pure culture of *S. jonesii* obtained from Iowa State University.

The sick steer was put in a small paddock, and the healthy one released into the herd. They were retested a week later and again found to be negative for DHP.

Meanwhile more animals were becoming sick, and four died when the temperature dropped from 33 to 5°C in 12 hours during light rain.

High pH P

Raymond Jones told us that he had previously seen a problem with the DHP test not working when the urine was highly alkaline. Since this leucaena was growing on limestone soils, we advised Dale to increase the amount of acid in the test. On 17 October, he rang to say that he had added 3 drops of dilute HCl to the test solution which immediately turned bright pink—high levels of DHP confirming mimosine toxicity.

By this time, many cattle in the main herd were affected, and the sick steer had lost hair from its tail, muzzle, rectal area, sheath, and eyes. Its skin colour was red with light blistering, and it had continued losing weight.

Dale added 6 animals to the small paddock with the sick steer, and started feeding molasses. After four weeks, he noticed an improved appearance and appetite. Its eyes were brighter, it had stopped salivating, and it was not so gaunt. Urine samples taken now tested negative for DHP meaning that that the inoculant in the rumen had built up sufficiently to break down all of the DHP being produced.

Poor-looking steers under leucaena during Texas drought.

After 40 days, all 7 animals in the small paddock were testing negative, starting to grow hair and had healthy appetites. They were released into main herd to let cross-inoculation occur naturally.

Then it rained, the leucaena rows filling with leaf, and the Bermuda grass turned bright green.

Warning

We need to take the possibility of mimosine toxicity on leucaena pastures more seriously and to ensure that our cattle are successfully inoculated. We may not see clinical signs of toxicity unless we are feeding a high proportion of leucaena in the diet for a substantial period of time (6 months), but weight gains can be reduced. All graziers feeding leucaena should test their cattle from time to time to confirm that the mimosine/DHP are being degraded. This can be done at the University of Queensland.

Contacts:

For urine tests:

Dr Max Shelton, School of land and food Sciences, University of Queensland, Brisbane, 4072. Ph. 33652541 email: m.shelton@mailbox.uq.edu.au

Mr Dale Elrod, PO Box 131, Falfurrias, Texas 78355. Mobile 3612964002 Fax 3613255629

Practical Abstracts

from Tropical Grasslands Journal Volume 34, Nos 3 and 4 (September–December 2000)

Pastures for production and protection

Tropical pastures - the future — by John Hopkinson and Joe Miller on pages 132 to 138.

The opening paper of the conference described issues affecting tropical pastures. These issues concerned the welfare of land, landscapes and livestock, and about the socio-political climate. They included ley farming systems (particularly the role of legumes); the wisdom of pasture renovation and accompanying nutrient depletion; the importance of diversity; value of natural rangeland; weeds; tree clearing; mine rehabilitation; co-existence with the environment movement; the decline of pasture plant introduction; changing attitudes to beef consumption; animal welfare and methane emissions; and the future of rural communities. Technical and economic issues no longer predominate, tending to be replaced by community ones and the implications of this. Members of the Society were exhorted to [play a more active part in the nation-wide dialogue about future land use.

Soil fertility and animal productivity in the Nebo-Broadsound district of central Queensland —by Jon Burgess and Claire Barrett, on pages 139–146.

The relationship between soil fertility and estimated animal performance in the district was examined. Total soil nitrogen and available phosphorus in the surface soil can be used to classify grazing productivity. Soil levels of 0.08% for total nitrogen and 10 ppm available P are minimum critical levels in country used for fattening. Land with lower fertility is more suited to breeding or growing enterprises.

Minesite rehabilitation —by Mike Gilbert, on pages 147–154.

Minesites in Australia are often developed on pastoral or cropping properties, They must be returned to land use capability similar to the prior land use. Unless top soil is returned to the area, revegetation will encounter harsh soil and moisture conditions. Some of the issues are discussed and points to the principles that can be adopted from the large pool of agronomic research from the Australian tropics.

Which grass for where? —by Bruce Cook and Bob Clem, on pages 156–161.

Grasses throughout the world have developed mechanisms to survive under a wide range of conditions. There is variation in growth habit, soil preferences, drought and flood tolerance. A number of exotic tropical species can be used for forage, soil conservation and soil improvement in the subhumid subtropics.

Pastures on cropping soils: which tropical pasture legume to use? —by Bruce Pengelly and Maurie Conway, on pages 162–168.

Producers are more interested in short-term and long-term ley pasture legumes because of soil fertility decline and changes in the economics in cereal and beef production. Several legumes, including lablab, leucaena, butterfly pea, caatinga stylo and desmanthus, are available for the tropical and sub-tropical cropping zone. The best uses of these legumes are described and suggests areas of research and development.

Managing long-term fertility of cropping lands with ley pastures in southern Queensland —by Errol Weston, John Doughton, Ram Dalal, W. Strong, G. Thomas, J. Lehane, J. Cooper, A. King and C. Holmes, on pages 169–176.

Ley farming has been used for centuries in temperate and Mediterranean areas of the world. Despite decades of research, the uptake by farmers in southern inland Queensland has been slow. This could be due to low profitability, more difficult management, reluctance to change, looking for easier options, other available land, and bloat fears with temperate legumes. However, as fertility declines to critical levels for wheat and protein levels, farmers are sowing increasing areas of ley pasture.

Grass, grass + legume or legume leys: a South African experience —by Norman Rethman, on pages 177–179.

In the first year after leys, the best maize crops followed pure lucerne and grass-legume. In the second year, lucerne with grass was best. Combining grass and legumes have the advantage of yield, lower inputs and reduce bloat risk.

Understanding grazing lands for better management: are we making any progress? —Mick Quirk, on pages 182–191.

This provides a current understanding of the ecology of grazing lands and the implication for management. The importance of an open, but critical, approach is stressed rather than pseudoscience and unfounded generalisations. R&D providers and producers must interact better and more continuously. The foundations for understanding include rainfall variability, soil nitrogen, grazing management, tree–grass interactions, fire and selective grazing.

Grasslands, grazing animals and people —How do they all fit together? —by Wal Whalley, on pages 192–198.

People used to regard pasture as a crop and so sought the miracle species. This lead to indiscriminate introduction of new species. It meant that farmers relied on cultivation, sowing, fertilising and herbicides for management. However both manager and livestock are part of a complex ecosystem and recognition of this should lead to a more sustainable approach to grazing land management.

Legumes into native pasture – asset or liability? A case history with stylo —by Andrew Noble, David Orr, Col Middleton and L. Rogers, on pages 199–206.

Stylo planted into 1 million hectares of native pasture has had a significant impact on the northern grazing industry through higher productivity and market flexibility. However, legume dominance can accelerate soil erosion and acidification. Solutions based on soil acidity risk mapping and pasture management are discussed.

Cell grazing —the first 10 years in Australia —by Terry McCosker, on pages 207–218.

Cell grazing is looked at as a paradigm shift at industry level and could become accepted science within another 10 years. Results obtained from properties in eastern Australia show that profitability, soil fertility, rainfall use efficiency and biodiversity have generally improved, but animal performance has been variable. Cell grazing is a high-level, time-control method different from other rotational grazing systems.

Cell grazing — a producer's perspective —by Robin Sparke, on pages 219–222.

This paper describes changes in pasture condition and composition, rainfall use efficiency and profitabilty between 1994 and1998.

Change the management and what happens?—a producer's perspective —by Shane Joyce, on pages 223–229.

Past management of Shane's brigalow pastures was intensive, expensive and unprofitable. A different management system incorporating timber retention, no fire, native species, beef per hectare and low cost has improved the resource through cell grazing. The conventional wisdom of the systems of managing brigalow lands is questioned.

Faecal NIRS—what does it offer today's grazier? — David Coates, on pages 230–240.

Analysis of faeces ca be an educational and decision support tool as it reveals what the animal is eating and hence its performance. Calibration equations have been established to predict dietary crude protein, digestibility, grass, legumes, forbs and browse. Other equations are being developed to predict fibre content, intake and animal growth rates. Aspects of sampling and the limitations of the technology are discussed.

The nature and management of rehabilitated pastures on open-cut coal mines in central Queensland —by Andrew Grigg, max Shelton and Ben Mullen, on pages 242–250.

Much rehabilitation involves sowing improved pastures grasses and legumes to give rapid cover and then grazing. These pastures are notably different to those in the surrounding country. Surface stability is the main issue in establishment and maintenance of the systems, and so management may have to more intense than in normal pastures.

Approaches to biodiversity on rehabilitated minelands in South Africa —by Norman Rethman, on pages 251–253.

In South Africa, rehabilitation has moved from an emphasis on preventing erosion to establishing productive grasslands, and to restoration or creation of a diversity of landscapes. Although the local resources determine post-mining land use, once dictatorial regulatory organisations are now listening to the local populace when considering the objectives of rehabilitation.

Effects of pasture cover on soil erosion and water quality on central Queensland coal mine rehabilitation —by Chris Carroll and Andrew Tucker, on pages 254–262.

The greatest risk of erosion is before a pasture cover is established. Once grasses colonise the surface, slope is less important and the salt in runoff water is reduced, except where the soil surface crusts. Rhodes grass can reduce soil salinity. Burning increased runoff and erosion for about month.

Weeds in pasture ecosystems—symptom or disease? —by Tony Grice and Shane Campbell, on pages 264–270.

Weeds use the same resources as forage plants but package them in a form that makes them unavailable top livestock. Weeds are either strongly competitive or exploit the absence of competitors. Ecological weed management has to understand how to reduce the capacity of the weed to capture resources or how to recover them. Heavy grazing reduces competition against weed. Effective biological control agents reduce the capacity of the weed to capture resources.

Weed biology—a foundation for weed management —Shane Campbell and Tony Grice,, on pages 271–279.

To develop integrated weed control strategies, we need to understand the biology of a weed— how long does the weed live, how long before it drops seed and how long does the seed last in the ground?

Options for effective weed management —by Joe Vitelli, on pages 280–294

For effective control, a weed has to be targeted precisely. Each control method has advantages and disadvantages and there is no single magic wand. Single treatment methods are being replaced by integrated control—encompassing chemical, physical and biological control along with effective education and extension of the management components. Prevention and early interventions are still the most cost-effective system.

Copies of these proceedings, which are of general interest to most producers, are available through TGS Book Sales for $20.